ATTACHMENT 6

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Environmental Protection Agency

40 CFR Parts 9, 122, 123, et al.

National Pollutant Discharge Elimination System; Cooling Water Intake Structures for New Facilities; Proposed Rules

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 9, 122, 123, 124, and 125

[FRL–6843–5]

RIN 2040–AC23

National Pollutant Discharge Elimination System—Regulations Addressing Cooling Water Intake Structures for New Facilities

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: Today's proposed rule would implement section 316(b) of the Clean Water Act (CWA) for new facilities that use water withdrawn from rivers, streams, lakes, reservoirs, estuaries, oceans or other waters of the U.S. for cooling water purposes. The proposed rule would establish national requirements applicable to the location, design, construction, and capacity of cooling water intake structures at new facilities. The proposed national requirements would minimize the adverse environmental impact associated with the use of these structures.

Today's proposed rule would establish location, design, construction, and capacity requirements that reflect the best technology available for minimizing adverse environmental impact from the cooling water intake structure based on the placement of the intake structure and the water body type. The Environmental Protection Agency (EPA) proposes to group surface water into four categories—freshwater rivers and streams, lakes and reservoirs, estuaries and tidal rivers, and oceans—and to establish requirements for cooling water intake structures located in each water body type. In general, the closer the intake structure is to areas that are most sensitive or biologically productive, the more stringent the requirements proposed to minimize adverse environmental impact. Under this proposal, EPA would set performance requirements and would not mandate the use of specific technologies.

EPA expects that this proposed regulation would reduce impingement and entrainment at new facilities over the next 20 years. Today's proposed rule would establish requirements that would help preserve ecosystems in close proximity to cooling water intake structures at new facilities. EPA has considered the potential benefits of the proposal and the preamble discusses them in qualitative terms. Expected benefits include a decrease in expected mortality or injury to aquatic organisms that would otherwise be subject to entrainment into cooling water systems or impingement against screens or other devices at the entrance of cooling water intake structures. The proposed regulatory requirements also could reduce adverse impact on threatened and endangered species.

DATES: Comments on this proposed rule and Information Collection Request (ICR) must be received or postmarked on or before midnight October 10, 2000.

ADDRESSES: Public comments regarding this proposed rule should be submitted by mail to: Cooling Water Intake Structure (New Facilities) Proposed Rule Comment Clerk—W–00–03, Water Docket, Mail Code 4101, EPA, Ariel Rios Building, 1200 Pennsylvania Avenue, NW., Washington, DC 20460. Comments delivered in person (including overnight mail) should be submitted to the Cooling Water Intake Structure (New Facilities) Proposed Rule Comment Clerk—W–00–03, Water Docket, Room EB 57, 401 M Street, SW., Washington, DC 20460. You also may submit comments electronically to *ow-docket@epa.gov.* Please submit any references cited in your comments. Please submit an original and three copies of your written comments and enclosures. For additional information on how to submit comments, see ''**SUPPLEMENTARY INFORMATION,** How May I Submit Comments?''

EPA has prepared an ICR for this proposed rule (EPA ICR number 1973.01). For further information or a copy of the ICR contact Sandy Farmer by phone at (202)260–2740, e-mail at farmer.sandy@epamail.epa.gov or download off the internet at http://www.epa.gov/icr. Send comments on the Agency's need for this information, the accuracy of the burden estimates, and any suggested methods for minimizing respondent burden (including the use of automated collection techniques) to the following addresses. Please refer to EPA ICR No. 1973.01 in any correspondence.

Ms. Sandy Farmer, U.S. Environmental Protection Agency, OP Regulatory Information Division (2137), 401 M Street, SW., Washington, DC 20460 and

Office of Information and Regulatory Affairs, Office of Management and Budget, Attention: Desk Officer for EPA, 725 17th Street, NW., Washington, DC 20503.

FOR FURTHER INFORMATION CONTACT: For additional technical information contact Deborah G. Nagle at (202) 260–2656 or James T. Morgan at (202) 260–6015. For additional economic information contact Lynne Tudor at (202) 260–5834. The e-mail address for the above contacts is ''rule.316b@epa.gov.''

SUPPLEMENTARY INFORMATION:

What Entities Are Potentially Regulated by This Action?

This proposed rule would apply to new facilities that use cooling water intake structures to withdraw water from waters of the U.S. and that have or require a National Pollutant Discharge Elimination System (NPDES) permit issued under section 402 of the CWA. New facilities subject to this regulation would include those with a design intake flow of greater than two (2) million gallons per day (MGD). If a new facility meets these conditions, it is subject to today's proposed regulations. If a new facility has or requires an NPDES permit but does not meet the 2 MGD intake flow threshold, it would be subject to permit conditions implementing section 316(b) on a case-by-case basis, using best professional judgment. This proposal defines the term ''cooling water intake structure'' to mean the total physical structure and any associated constructed waterways used to withdraw water from waters of the U.S., provided that at least twenty-five (25) percent of the water withdrawn is used for cooling purposes. Generally, facilities that meet these criteria fall into two major groups: new steam electric generating facilities and new manufacturing facilities.

The following table lists the types of entities that are potentially subject to this proposed rule. This table is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be regulated by this action. This table lists the types of entities that EPA is now aware that could potentially be regulated by this action; other types of entities not listed in the table could also be regulated. To determine whether your facility would be regulated by this action, you should carefully examine the applicability criteria proposed at § 125.81 of the rule. If you have questions regarding the applicability of this action to a particular entity, consult one of the persons listed for technical information in the preceding **FOR FURTHER INFORMATION CONTACT** section.

Category	Examples of regulated entities	Standard Industrial Classification Codes	North American Industry Code (NAIC)
Federal, State and local government.	Operators of steam electric generating point source dischargers that employ cooling water intake structures.	4911 and 493	221111, 221112, 221113, 221119, 221121, 221122, 221111, 221112, 221113, 221119, 221121, 221122.
Industry	Operators of industrial point source dischargers that employ cooling water intake structures.	See below	See below.
	Steam electric generating	4911 and 493	221111, 221112, 221113, 221119, 221121, 221122, 221111, 221112, 221113, 221119, 221121, 221122.
	Agricultural production	0133	111991 11193.
	Metal mining	1011	21221.
	Oil and gas extraction	1311, 1321	211111, 211112.
	Mining and quarrying of nonmetallic minerals	1474	212391.
	Food and kindred products	2046, 2061, 2062, 2063, 2075, 2085.	311221, 311311, 311312, 311313, 311222, 311225, 31214.
	Tobacco products	2141	312229, 31221.
	Textile mill products	2211	31321.
	Lumber and wood products, except furniture	2415, 2421, 2436, 2493	321912, 321113, 321918, 321999, 321212, 321219.
	Paper and allied products	2611, 2621, 2631, 2676	3221, 322121, 32213, 322121, 322122, 32213, 322291.
	Chemical and allied products	28 (except 2895, 2893, 2851, and 2879).	325 (except 325182, 32591, 32551, 32532).
	Petroleum refining and related industries	2911, 2999	32411, 324199.
	Rubber and miscellaneous plastics products	3011, 3069	326211, 31332, 326192, 326299.
	Stone, clay, glass, and concrete products	3241	32731.
	Primary metal industries	3312, 3313, 3315, 3316, 3317, 3334, 3339, 3353, 3363, 3365, 3366.	324199, 331111, 331112, 331492, 331222, 332618, 331221, 22121, 331312, 331419, 331315, 331521, 331524, 331525.
	Fabricated metal products, except machinery and transportation equipment.	3421, 3499	332211, 337215, 332117, 332439, 33251, 332919, 339914, 332999.
	Industrial and commercial machinery and computer equipment.	3523, 3531	333111, 332323, 332212, 333922, 22651, 333923, 33312.
	Transportation equipment	3724, 3743, 3764	336412, 333911, 33651, 336416.
	Measuring, analyzing, and controlling instruments; photographic, medical, and optical goods; watches and clocks.	3861	333315, 325992.
	Electric, gas, and sanitary services	4911, 4931, 4939, 4961	221111, 221112, 221113, 221119, 221121, 221122, 22121, 22133.
	Educational services	8221	61131.

How May I Review the Public Record?

The record (including supporting documentation) for this proposed rule is filed under docket number W–00–03 (proposed rule). The record is available for inspection from 9 a.m. to 4 p.m. on Monday through Friday, excluding legal holidays, at the Water Docket, Room EB 57, USEPA Headquarters, 401 M Street, SW, Washington, DC 20460. For access to docket materials, please call (202)260–3027 to schedule an appointment during the hours of operation stated above.

How May I Submit Comments?

To ensure that EPA can read, understand, and therefore properly respond to comments, the Agency requests that you cite, where possible, the paragraph(s) or sections in the preamble, rule, or supporting documents to which each comment refers. You should use a separate paragraph for each issue you discuss.

If you want EPA to acknowledge receipt of your comments, enclose a self-addressed, stamped envelope. No faxes will be accepted. Electronic comments must be submitted as a WordPerfect 5.1, 6.1, or 8 format, or an ASCII file or file avoiding the use of special characters and forms of encryption. Electronic comments must be identified by the docket number W–00–03. EPA will accept comments and data on disks in WordPerfect 5.1, 6.1, or 8 format or in ASCII file format. Electronic comments on this notice may be filed on-line at many Federal depository libraries.

Cooling Water Intake Structures: Section 316(b) New Facility Draft Preamble and Proposed Rule

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I. Legal Authority

Today's proposed rule is issued under the authority of sections 301, 306, 308, 316, 402, and 501 of the Clean Water Act (CWA), 33 U.S.C. 1311, 1316, 1318, 1326, 1342, and 1361. This proposal partially fulfills the obligations of the U.S. Environmental Protection Agency (EPA) under a Consent Decree in *Cronin* v. *Browner*, United States District Court, Southern District of New York, No. 93 Civ 0314 (AGS).

II. Purpose and Summary of Proposed Regulation

A. What Is the Purpose of Today's Proposed Regulation?

Section 316(b) of the CWA provides that any standard established pursuant to section 301 or 306 of the CWA and applicable to a point source must require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact. Today's proposal would define a cooling water intake structure as the total physical structure and any associated constructed waterways used to withdraw water from waters of the U.S., provided that at least twenty-five (25) percent of the water withdrawn is used for cooling purposes. Cooling water absorbs waste heat rejected from processes employed or from auxiliary operations on a facility's premises. Single cooling water intake structures might have multiple intake bays. Today's proposed rule would establish requirements applicable to the location, design, construction, and capacity of cooling water intake structures at new facilities. The proposal seeks to minimize the adverse environmental impact associated with the use of these structures.

Today's proposed rule partially fulfills EPA's obligation to comply with a Consent Decree entered in the United States District Court, Southern District of New York in *Cronin* v. *Browner,* No. 93 Civ. 0314 (AGS), a case brought against EPA by a coalition of individuals and environmental groups. The Consent Decree as entered on October 10, 1995, provided that EPA propose regulations implementing section 316(b) by July 2, 1999, and take final action with respect to those regulations by August 13, 2001. EPA later moved to amend the Consent Decree by bifurcating the rule into two phases—Phase I addressing new facilities and Phase II addressing existing facilities—and extending the deadlines for proposal and final action. Plaintiffs opposed EPA's motion for an extension of the deadlines. On March 27, 2000, the Court amended the Consent Decree to provide among other things that EPA propose regulations addressing new facilities on or before July 20, 2000, and propose regulations addressing existing facilities on or before July 20, 2001. The Court declined to specify deadlines for final action with respect to regulations addressing new and existing facilities, stating that the parties should attempt to reach an agreement with respect to the deadlines in the Consent Decree. Today's proposal fulfills EPA's obligation under the Consent Decree to propose regulations addressing new facilities.

This proposed rule would apply to new facilities that use cooling water intake structures to withdraw water from waters of the U.S. and that have or require a National Pollutant Discharge Elimination System (NPDES) permit issued under section 402 of the CWA. New facilities subject to this proposed regulation would be those with a design intake flow of greater than two (2) million gallons per day (MGD).

If a new facility has or requires an NPDES permit and meets the 2 MGD flow threshold, it is subject to today's proposed regulations. The proposal would define the term ''new facility'' as any building, structure, facility, or installation that meets the definition of ''new source'' or ''new discharger'' in 40 CFR 122.2 and 122.29(b)(1), (2), and (4); commences construction after the effective date of this rule; and has a new or modified cooling water intake structure that withdraws cooling water from waters of the U.S.

Today's proposal would add language to EPA's NPDES permitting regulations at 40 CFR part 125, subpart I that establishes requirements applicable to cooling water intake structures for new facilities, and would reserve 40 CFR part 125, subpart J for requirements addressing existing facilities. Today's proposal also would amend EPA's regulations at 40 CFR 122.44(b)(3) to require the inclusion in EPA-issued NPDES permits of requirements applicable to cooling water intake structures at new facilities, in accordance with part 125, subpart I and would amend EPA's regulations establishing requirements for authorized State NPDES programs by reinstating references to 40 CFR part 125, subparts I and J in 40 CFR 123.25(a)(36). This would have the effect of mandating that States have legal authority to implement final regulations addressing cooling water intake structures at new and existing facilities. Subpart I currently reads in its entirety, ''Criteria Applicable to Cooling Water Intake Structures Under section 316(b) of the Act [Reserved].'' Subpart J currently reads in its entirety, ''Reserved.'' References to part 125, subparts I and J were included in § 123.25(a)(36) for many years. Recently, however, EPA's *Amendments to Streamline the National Pollutant Discharge Elimination System Program Regulations: Round Two* deleted the references to subparts I and J from 40 CFR 123.25(a)(36) along other with references to reserved subparts. 65 FR 30886, 30910 (May 15, 2000). Today's proposal would reinsert those references in light of the pending rulemaking proceedings addressing cooling water structures at new and existing facilities.

Proposed section 125.80(c) makes clear that nothing in today's proposal would preclude or deny the authority of States, their political subdivisions, and interstate agencies under section 510 of the CWA. States retain authority under section 510 to adopt or enforce any requirement respecting the control or abatement of pollution that is more stringent than the minimum requirements established in a final rule based on this proposal. Section 502(19) of the CWA defines ''pollution'' as including the man-made or man-induced alteration of the physical and biological integrity of water.

Today's proposed rule would also add proposed regulatory language at 40 CFR 122.2(q) to require that the information required under proposed § 125.86 regarding cooling water intake structure information and requests for alternative requirements under proposed § 125.85 be submitted at the time of permit application. Finally, EPA proposes to amend the public notification requirements at 40 CFR 124.10(d)(1) to require notification that a permit applicant is subject to the cooling water intake structure requirements of part 125 subpart I.

B. What Requirements Would Today's Proposed Regulation Establish?

At § 125.84(a)–(e), today's proposed rule would establish national performance requirements for the location, design, construction, and capacity of cooling water intake structures at new facilities to minimize adverse environmental impact. Under the proposed rule, EPA would establish minimum national location, design, construction, and capacity requirements for minimizing adverse environmental impact from cooling water intake structures based on the placement of the intake structure and the water body type. EPA has grouped surface waters into four categories and is proposing separate requirements for cooling water intake structures in each category. These categories are based on the location of a facility's cooling water intake structure on or within (1) a freshwater river or stream, (2) a lake or reservoir, (3) an estuary or tidal river, or (4) an ocean. Proposed § 125.84(f) provides that in certain circumstances Directors may impose additional site-specific requirements when in their judgment the national requirements are not sufficient to ensure that adverse environmental impact will be minimized. Section 125.84(g) would require the Director to impose any more stringent requirements needed to ensure attainment of water quality standards. Finally, § 125.85 would allow any interested person to request that the Director impose alternative best technology available (BTA) requirements by demonstrating that compliance with the requirements would result in compliance costs wholly out of proportion to the costs EPA considered in establishing the national standards proposed at § 125.84(a)–(e). The term ''Director'' means the State or Tribal Director where there is an approved NPDES State or Tribal program and means the Regional Administrator where EPA administers the NPDES program in the State. See 40 CFR 122.2.

C. How Does Today's Proposed Regulation Affect New Facilities Built Before Today's Proposal Is Finalized and Existing Facilities Subject to Section 316(b)?

In 1977 EPA issued draft guidance for determining the best technology available to minimize adverse environmental impact from cooling water intake structures. In the absence of section 316(b) regulations or final guidance, the 1977 draft guidance has served as applicable guidance for section 316(b) determinations. See *Draft Guidance for Evaluating the Adverse Impact of Cooling Water Intake Structures on the Aquatic Environment: Section 316(b) P.L. 92–500* (U.S. EPA, 1977). Administrative determinations in several permit proceedings also have served as de facto guidance.

Today, EPA proposes a national framework that would establish certain minimum requirements for the design, capacity, and construction of cooling water intake structures for new facilities based on the location of a cooling water intake structure in four categories of water bodies. In doing so, the Agency is proposing to revise the approach adopted in the 1977 draft guidance which was based on the judgment that ''[t]he decision as to best technology available for intake design location, construction, and capacity must be made on a case-by-case basis.'' Other important differences from the 1977 draft Guidance include today's proposed definition of a ''cooling water intake structure'' for new facilities. Today's proposal also would establish a cost test that is different from the ''wholly disproportionate'' test that has been in use since the 1970s (see section VIII C).

Although EPA's judgment is that the requirements proposed today would best implement section 316(b) for new facilities, the Agency is also inviting comment on a broad array of other alternatives, including, for example, a framework under which Directors would continue to evaluate adverse environmental impact and determine the best technology available for minimizing such impact on a wholly site-specific basis. Because the Agency is inviting comment on such a broad range of alternatives for potential promulgation, today's proposal is not intended as guidance for determining the best technology available to minimize the adverse environmental impact of cooling water intake structures at new facilities before the Agency promulgates final regulations based on today's proposal. In the interim, Directors should continue to make section 316(b) determinations, which may be more or less stringent than today's proposal, on a case-by-case basis applying best professional judgment.

Today's proposal does not apply to existing facilities. Although EPA has not yet closely examined the costs of technology options at facilities, the Agency anticipates that existing facilities would have less flexibility in designing and locating their cooling water intake structures than new facilities and that existing facilities might incur higher costs to comply with the proposed requirements than new facilities would incur. For example, existing facilities might need to upgrade or modify existing intake structures and cooling water systems to meet today's proposed requirements, which might impose greater costs than use of the same technologies at a new facility. Retrofitting technologies at an existing facility might also require brief shutdown periods during which the facility would lose both production and revenues, and certain retrofits could decrease the thermal efficiency of an electric generating facility. Existing facilities also might have site limitations, such as lack of undeveloped space, that might make certain technologies infeasible. The Agency anticipates that at the time it promulgates final requirements for cooling water intake structures at new facilities, it will have made substantial progress in its analyses to support section 316(b) regulations for existing facilities employing cooling water intake structures. Upon promulgation of final regulations based on today's proposal, the Agency will address the extent to which the final new facility regulation and preamble should serve as guidance for developing section 316(b) requirements for existing facilities prior to the promulgation of the section 316(b) regulations for existing facilities.

III. Legal Background

A. The Clean Water Act

The Federal Water Pollution Control Act, also known as the Clean Water Act (CWA), seeks to ''restore and maintain the chemical, physical, and biological integrity of the nation's waters.'' 33 U.S.C. section 1251(a). The CWA establishes a comprehensive regulatory program, key elements of which are (1) a prohibition on the discharge of pollutants from point sources to waters of the U.S., except as authorized by the statute; (2) authority for EPA or authorized States or Tribes to issue NPDES permits that regulate the discharge of pollutants; and (3) requirements for EPA to develop effluent limitations guidelines and standards and for States to develop water quality standards that are the basis for the pollutant discharge limits imposed in NPDES permits.

Today's proposed rule implements section 316(b) of the CWA as it applies to new facilities. Section 316(b) addresses the adverse environmental impact caused by the intake of cooling water, not discharges into water. Despite this special focus, the requirements of section 316(b) are closely linked to several of the core elements of the NPDES permit program established under section 402 of the CWA to control discharges of pollutants into navigable waters. For example, section 316(b) applies to facilities that use a cooling water intake structure and have a point source discharge that is NPDES-permitted or requires an NPDES permit. Conditions implementing section 316(b) are included in NPDES permits and would continue to be included in NPDES permits under this proposed rule.

Section 301 of the CWA prohibits the discharge of any pollutant by any person, except in compliance with specified statutory requirements. These requirements include compliance with technology-based effluent limitations guidelines and new source performance standards, water quality standards, NPDES permit requirements, and certain other requirements.

Section 402 of the CWA provides authority for EPA or an authorized State or Tribe to issue an NPDES permit to any person discharging any pollutant from a point source into waters of the U.S. Forty-three States and one U.S. territory are authorized under section 402(b) to administer the NPDES permitting program. NPDES permits restrict the types and amounts of pollutants, including heat, that may be discharged from various industrial, commercial, and other sources of wastewater. These permits control the discharge of pollutants primarily through the imposition of effluent limitations and other permit conditions. Effluent limitations may be based on promulgated effluent limitations guidelines, new source performance standards, or the best professional judgment of the permit writer. Limitations based on these guidelines, standards, or best professional judgment are known as technology-based effluent limits. Where technology-based effluent limits are inadequate to ensure compliance with water quality standards applicable to the receiving water, more stringent effluent limits based on applicable water quality standards are imposed. NPDES permits also routinely include monitoring and reporting requirements, standard conditions, and special conditions.

Sections 301, 304, and 306 of the CWA require that EPA develop technology-based effluent limitations guidelines and new source performance standards that are used as the basis for technology-based minimum discharge requirements in wastewater discharge permits. EPA issues these effluent limitations guidelines and standards for categories of industrial dischargers based on the pollutants of concern discharged by the industry, the degree of control that can be attained using various levels of pollution control technology, the economic achievability of meeting the level of control, and other factors identified in section 304 and 306 of the CWA. EPA has promulgated regulations setting effluent limitations guidelines and standards under sections 301, 304, and 306 of the CWA for more than 50 industries. See 40 CFR parts 405–471. Among these, EPA has established effluent limitations guidelines that apply to most of the industry categories that use cooling water intake structures (*e.g.,* steam electric power generation, iron and steel manufacturing, pulp and paper, petroleum refining, chemical manufacturing).

Section 306 of the CWA requires that EPA establish discharge standards for new sources. For purposes of section 306, new sources include any source that commenced construction after the promulgation of applicable new source performance standards, or after proposal of applicable standards of performance if the standards are promulgated in accordance with section 306 within 120 days of proposal. CWA section 306; 40 CFR 122.2. New source performance standards are similar to the technology-based limitations established for existing sources, except that new source performance standards are based on the best available demonstrated technology instead of the best available technology economically achievable. New facilities have the opportunity to install the best and most efficient production processes and wastewater treatment technologies. Therefore, Congress directed EPA to consider the best demonstrated process changes, in-plant controls, and end-of-process control and treatment technologies that reduce pollution to the maximum extent feasible. In addition, in establishing new source performance standards, EPA is required to take into consideration the cost of achieving the effluent reduction and any non-water quality environmental impact and energy requirements.

B. What Is Required Under Section 316 of the Clean Water Act?

Section 316(b) seeks to minimize the adverse environmental impact associated with cooling water intake structures. Section 316(b) provides, ''Any standard established pursuant to [CWA section 301] or [CWA section 306] and applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.''

Congress included section 316 in the CWA for the express purpose of regulating thermal discharges and addressing the environmental impact of cooling water intake structures. Sections 316(a) and (c) provide for relief in certain circumstances from the thermal effluent standards applicable to point source discharges of pollutants. Section 316(b) does not focus on controlling the discharge of pollutants; rather, it addresses the environmental impact of cooling water intake structures. Section 316(b) is the only provision in the CWA that focuses exclusively on water intake.

Today's proposal would establish requirements that focus on the location, design, construction, and capacity of cooling water intake structures at new facilities. For each of these features, today's proposed rule would establish minimum requirements that constitute the ''best technology available for minimizing adverse environmental impact.'' EPA notes that ''best technology available'' (BTA) is a distinct standard under the CWA. Although it is technology-based and similar to the standards used in the development of effluent limitations guidelines (*i.e.,* best available technology economically achievable), the BTA standard does not explicitly include any consideration of the costs of ensuring that cooling water intake structures reflect the best technology available, although based on legislative history EPA has long done so. In addition, the standards developed under section 316(b) focus on minimizing adverse environmental impact.

Today's proposal also would define a cooling water intake structure as the total physical structure and any associated constructed waterways used to withdraw water from waters of the U.S., provided that at least twenty-five (25) percent of the water withdrawn is used for cooling purposes. New facilities subject to this proposed regulation would be those with a design intake flow of greater than two (2) million gallons per day (MGD).

IV. History

A. Have Prior EPA Regulations Addressed Cooling Water Intake Structures?

In April 1976 EPA published a rule under section 316(b) that addressed cooling water intake structures. 41 FR 17387 (April 26, 1976), proposed at 38 FR 34410 (December 13, 1973). The rule added a new § 401.14 to 40 CFR Chapter I that reiterated the requirements of CWA section 316(b). It also added a new part 402, which included three sections: (1) § 402.10 (Applicability); (2) § 402.11 (Specialized definitions); and (3) § 402.12 (Best technology available for cooling water intake structures). Section 402.10 stated that the provisions of part 402 applied to ''cooling water intake structures for point sources for which effluent limitations are established pursuant to section 301 or standards of performance are established pursuant to section 306 of the Act.'' Section 402.11 defined the terms ''cooling water intake structure,'' ''location,'' ''design,'' ''construction,'' ''capacity,'' and ''Development Document.'' Section 402.12 included the following language:

> The information contained in the Development Document shall be considered in determining whether the location, design, construction and capacity of a cooling water intake structure of a point source subject to standards established under section 301 or 306 reflect the best technology available for minimizing adverse environmental impact.

In 1977 fifty-eight electric utility companies challenged these regulations, arguing that EPA had failed to comply with the requirements of the Administrative Procedure Act (APA) in promulgating the rule. Specifically, the utilities urged that EPA had neither published the Development Document in the **Federal Register** nor properly incorporated the document into the rule by reference. The United States Court of Appeals for the Fourth Circuit agreed and, without reaching the merits of the regulations themselves, remanded the rule. *Appalachian Power Co.* v. *Train,* 566 F.2d 451 (4th Cir. 1977). EPA later withdrew part 402. 44 FR 32956 (June 7, 1979). 40 CFR 401.14 remains in effect.

B. How Is Section 316(b) of the CWA Being Implemented Now?

Since the Fourth Circuit remanded EPA's section 316(b) regulations in 1977, decisions implementing section 316(b) have been made on a case-by-case, site-specific basis. EPA published guidance addressing section 316(b) implementation in 1977. See Draft Guidance for Evaluating the Adverse Impact of Cooling Water Intake Structures on the Aquatic Environment: Section 316(b) P.L. 92–500 (U.S. EPA, 1977). This guidance describes the studies recommended for evaluating the impact of cooling water intake structures on the aquatic environment, and it establishes a basis for determining the best technology available for minimizing adverse environmental impact. The 1977 Section 316(b) Draft Guidance states, ''The environmental-intake interactions in question are highly site-specific and the decision as to best technology available for intake design, location, construction, and capacity must be made on a case-by-case basis.'' (Section 316(b) Draft Guidance, U.S. EPA, 1977, p. 4). This case-by-case approach also is consistent with the approach described in the 1976 Development Document referenced in the remanded regulation.

The 1977 Section 316(b) Draft Guidance suggests the general process for developing information needed to support section 316(b) decisions and presenting that information to the permitting authority. The process involves the development of a site-specific study of the environmental effects associated with each facility that uses one or more cooling water intake structures, as well as consideration of that study by the permitting authority in determining whether the facility must make any changes to minimize adverse environmental impact. Where adverse environmental impact is present, the 1977 Draft Guidance suggests a ''stepwise'' approach that considers screening systems, size, location, capacity, and other factors.

Although the Draft Guidance describes the information that should be developed, key factors that should be considered, and a process for supporting section 316(b) determinations, it does not establish national standards based on the best technology available to minimize adverse environmental impact. Rather, the guidance leaves the decisions on the appropriate location, design, capacity, and construction of each facility to the permitting authority. Under this framework, the Director determines whether appropriate studies have been performed and whether a given facility has minimized adverse environmental impact.

V. Scope and Applicability of the Proposed Rule

A. Who Is Covered Under This Proposed Rule?

Today's proposed rule would apply to you if you are the owner or operator of a facility that meets all of the following criteria:

- Your facility is a new facility;
- Your new facility has a cooling water intake structure or structures;
- Your new facility's cooling water intake structure(s) withdraw(s) water from waters of the U.S. and at least twenty-five (25) percent of the water withdrawn is used for contact or noncontact cooling purposes;
- Your new facility has a design intake flow of greater than two (2) million gallons per day (MGD); and
- Your new facility has an NPDES permit or is required to obtain one.

B. What Is a ''New Facility''?

EPA is proposing to define the term ''new facility'' to mean any building, structure, facility or installation which

- Meets the definition of ''new source'' or ''new discharger'' in 40 CFR 122.2 and 122.29(b)(1), (2), and (4);
- Commences construction after the effective date of this rule; and
- Has a new or modified cooling water intake structure that withdraws water from waters of the U.S.

This proposal covers only ''greenfield'' and ''stand-alone'' facilities. A ''greenfield'' facility is a facility that is constructed at a site at which no other source is located, or that totally replaces the process or production equipment at an existing facility. A ''stand-alone'' facility is a new, separate facility that is constructed on property where an existing facility is located and whose processes are substantially independent of the existing facility at the same site. A modified cooling water intake structure is one that has some part of the intake, including the pumps, changed, replaced, or expanded to accommodate, in whole or in part, a new facility's water usage. Routine maintenance and repair to an intake structure which is currently withdrawing cooling water and does not result in an increase in design capacity is not considered a modification. Facilities that meet the conditions of 40 CFR 122.29(b)(3) would be considered to be undergoing a modification and would not be considered a ''new facility'' under these regulations. Such facilities will be addressed during the forthcoming existing facility rulemaking.

Examples of when a facility would be considered a new facility include, but are not limited to the following:

- Facility A is newly constructed on a property that has never been used for industrial or commercial activity, and a new cooling water intake structure is constructed for Facility A's use.
- Facility B, which produces widgets, is demolished and Facility C is constructed in its place. (Facility C might or might not produce widgets). Facility C uses the cooling water intake structure that Facility B used but modifies it in some way.
- Facility D is in commercial operation. Facility E, a separate and independent industrial operation, is constructed on the property that Facility D owns. The cooling water intake structure that Facility D uses is modified by constructing a new intake bay for Facility E's use.

Modifications to an existing facility would not be covered under this proposed rule. Rather, such modifications will be addressed during the existing facility rulemaking. Examples of when a facility undergoing a change or modification would be considered an existing facility might include the following:

- Facility F is in commercial or industrial operation. Facility F modifies its facility and either continues to use the original cooling water intake structure or a new or modified cooling water intake structure.
- Facility G has an existing intake structure. Facility H, a separate and independent industrial operation, is constructed on the property that Facility G owns and connects to Facility G's cooling water intake structure behind the intake pumps. In this case, the cooling water intake structure has not been modified for Facility H's use. This would remain true even if routine maintenance or repairs were performed on the structure.
- Facility J is in commercial or industrial operation. Facility J adds a new process unit consistent with 40 CFR 122.29(b)(3) that is directed toward the same general activity (*e.g.,* a new peaking unit at an electricity generation station) as facility J's existing operations. Facility J may or may not modify its intake structure to accommodate the new unit.

Today's proposal would define a facility as new based on the date the facility commences construction within the meaning of 40 CFR 122.29(b)(4). Under this approach, any facility that commences construction after the date on which the final rule is effective would have to comply with the new facility requirements. This approach to defining ''new facility'' is generally consistent with the definition of the terms ''new source'' and ''new discharger'' used in the NPDES permitting program (see 40 CFR 122.2 and 122.29), and it should provide adequate notice and time for the planning needed to implement the technological changes necessitated by the requirements.

C. What Is a ''Cooling Water Intake Structure''?

At § 125.83, EPA is proposing to define a ''cooling water intake structure'' as the total physical structure and any associated constructed waterways used to withdraw water from a water of the U.S., provided that at least twenty-five (25) percent of the water withdrawn is used for cooling purposes. The cooling water intake structure extends from the point at which water is withdrawn from the surface water source to the first intake pump or series of pumps. The intended use of the cooling water is to absorb waste heat rejected from processes employed or from auxiliary operations.

This definition differs from the definition included in the 1977 Draft Guidance. First, the proposed definition clarifies that the cooling water intake structure includes the physical structure and technologies that extend up to the first intake pump or series of pumps. This change is intended to define more clearly what EPA considers to constitute the cooling water intake structure. Second, the definition would apply to water being brought in for both contact and noncontact cooling purposes. This clarification is necessary because cooling water intake structures typically bring water into at a facility for numerous purposes, including industrial processes; use as circulating water, service water, or evaporative cooling tower makeup water; dilution of effluent heat content; equipment cooling; and air conditioning. Finally, the proposed definition includes intake structures if a facility uses twenty-five

(25) percent or more of the water drawn through the structure for cooling purposes. This also is a change from the current practice. (The 1976 final rule and 1977 Draft Guidance definition of a ''cooling water intake structure'' included intake structures if a facility used the major portion of water drawn through the structure for cooling purposes. In practice, many permitting authorities have interpreted that definition to apply to intake structures if a facility uses more than 50 percent of the water drawn through the structure for cooling.)

Based on experience since the late 1970s, the Agency included intake structures at new facilities in today's proposal if a facility uses twenty-five (25) percent or more of the withdrawn water for cooling purposes. It is well settled that section 316(b) applies to all categories of point sources. See *United States Steel Corp.* v. *Train*, 556 F.2d 822, 849–50 (7th Cir. 1977). In practice, however, section 316(b) has been implemented at few facilities other than steam electric generating plants, despite the fact that a number of other industries use significant amounts of cooling water. EPA chose twenty-five (25) percent as a reasonable threshold for the percent of flow used for cooling purposes in conjunction with the two MGD total flow threshold discussed at section V.D. below to ensure that almost all cooling water withdrawn from waters of the U.S. are addressed by the requirements in this proposal for minimizing adverse environmental impact. The Agency invites comment on this proposed approach to defining a cooling water intake structure. The Agency also invites comment on whether it should define a cooling water intake structure in a manner similar to the 1976 final rule and 1977 draft guidance. If EPA implemented the latter approach, language such as the following would be included in proposed § 125.83:

> Cooling water intake structure means the total structure used to direct water into the components of the cooling systems wherein the cooling function is designated to take place, provided that the intended use of the major portion of the water so directed is to absorb waste heat rejected from the process or processes employed or from auxiliary operations on the premises, including air conditioning.

The Agency also invites comment on an alternative where the Agency would define a cooling water intake structure to include intake structures if a facility uses five percent or more of the water drawn through the structure for cooling purposes. This alternative would further ensure that almost all cooling water withdrawn from waters of the U.S. is addressed by the requirements of this national regulation. This alternative also might minimize any potential that the proposed 25 percent threshold would discourage recycling of cooling water, or reuse of cooling water for process needs, by facilities that recycle or reuse cooling water at rates above 25 percent, and might choose to reduce their recycling/reuse rates to avoid meeting the requirements of the proposed rule. For similar reasons, the Agency is considering alternative definitions for a cooling water intake structure based on whether 20 percent, 15 percent, or 10 percent of the intake flow drawn through the structure is used for cooling. The Agency also invites comments on these alternative definitions.

D. Must My Facility Withdraw Water From Waters of the U.S.?

The requirements proposed today would apply to cooling water intake structures that withdraw amounts of water greater than the proposed flow threshold from ''waters of the U.S.'' Waters of the U.S. include the broad range of surface waters that meet the regulatory definition at 40 CFR 122.2, which includes lakes, ponds, reservoirs, nontidal rivers or streams, tidal rivers, estuaries, fjords, oceans, bays, and coves. These potential sources of cooling water may be adversely affected by impingement and entrainment.

Some facilities discharge heated water to cooling ponds, then withdraw water from the ponds for cooling purposes. Cooling ponds are considered ''waters of the U.S.'' if they meet the criteria in the definition of ''waters of the U.S.'' at 40 CFR 122.2. Therefore, facilities that withdraw cooling water from cooling ponds that are ''waters of the U.S.'' and that meet today's other proposed criteria for coverage (including the requirement that the facility have or be required to obtain an NPDES permit) would be subject to today's proposed rule. EPA invites comment on the applicability of today's proposal to new facilities that withdraw water from cooling ponds that are considered ''waters of the U.S.''

At § 125.81, EPA is proposing that national BTA requirements would apply to new facilities that have a cooling water intake structure with a design intake capacity of greater than or equal to two (2) MGD of source water. EPA chose the two MGD threshold in conjunction with the proposed threshold discussed in the immediately preceding section, that would define a cooling water intake structure as any structure withdrawing water from a water of the U.S. if more than twenty-five (25) percent of the water withdrawn through the structure is used for cooling purposes. EPA estimates that the two MGD threshold would subject approximately 90 percent of all cooling water flows from new facilities to the proposed rule. EPA based this estimate on: (1) EPA's projected universe of new facilities that would be subject to the proposed rule; and (2) review of a limited set of data on percent of intake flow used for cooling that EPA drew from responses to the detailed questionnaires mailed to existing facilities in January 2000.

EPA believes that cooling water intake structure withdrawals that are at or below a two MGD threshold would generally affect only a very small proportion of a water body or, if the water body is very small, would have a localized impact. EPA believes that facilities, which because of their small quantity of cooling water use, either are unlikely to cause or have limited potential to cause adverse environmental impact need not be subject to national regulation. This is especially so because the Agency has limited information on such facilities with respect to cooling water usage and their potential for adverse impact. The Director may consider whether to address new facilities that use lesser amounts of cooling water on a case-by-case basis using best professional judgment.

In addition to a two MGD flow threshold, the Agency is considering higher flow thresholds including 5, 10, 15, 20, 25, and 30 MGD. To evaluate the amount of cooling water that would be covered under these alternative thresholds, EPA used data from its screener questionnaire sent to existing industries that use the largest amounts of cooling water and made a number of important assumptions. First, EPA assumed that new and existing facilities would use similar amounts of cooling water. The Agency notes this assumption may overestimate the percentage of flows at new electricity generating facilities that would be covered by the proposed rule as many of these facilities, if they intend to use waters of the U.S. for cooling, also intend to use technologies to minimize cooling water flow. For example, only three of the seven specific, planned electricity generating facilities for which EPA has information on cooling water system design would use more than 10 MGD. Second, EPA assumed that data in the screener survey on total intake flow could be used to represent cooling water flows. Finally, the Agency assumed that none of the facilities included in the screener survey used less than 25% of their total intake flow for cooling. This last assumption should not affect statements about steam electric generating facilities as most of their intake flow is used for cooling. However, as manufacturing facilities in the screener survey may use significant amounts of process water, some portion of these facilities may not use 25% or more of their intake flow for cooling and, if they were new facilities, would not be within the scope of the proposed rule.

For comparison purposes, EPA first analyzed a two MGD threshold and estimated that it would subject up to 99.97 percent of all cooling water flows from these industries to the proposed rule. On an industry-specific basis, the percentage of flows covered by the rule would range from more than 99.99 percent in the electric utility industry to as much as 98 percent in the chemical industry.

Using a similar methodology, EPA estimates that a 10 MGD flow threshold would subject up to 99.67 percent of all cooling water flows in the industries that use the largest volumes of cooling water to the proposed rule. On an industry-specific basis, the percentage of flows covered by the rule would range from 99.95 percent in the electric utility industry to as much as 79 percent in the refining industry. EPA estimates that a twenty-five (25) MGD threshold would subject up to 99.1 percent of all cooling water flows from these industries to the proposed rule. On an industry-specific basis, the percentage of flows covered by the rule would range from 99.8 percent in the electric utility industry to as much as 65 percent in the chemical industry.

The Agency invites comment on the proposed two MGD flow threshold and the alternative flow thresholds discussed above. The Agency also invites comment on whether a higher threshold (such as 25 MGD) might be appropriate for a facility that uses 10 percent or less of a water body at critical low flow periods.

EPA is proposing to set the threshold at 2 MGD to ensure that almost all cooling water withdrawn from waters of the U.S. is covered by a national regulation. However, the Agency recognizes that there is little information currently available regarding the lower bound of withdrawals at which adverse environmental impact is likely to occur. Most case studies documenting impingement and entrainment from cooling water withdrawals in the past have focused on facilities withdrawing very large amounts of water (in most cases greater than 100 MGD). There is less information available on the impacts of withdrawals at any of the levels being considered for the MGD flow threshold. EPA is aware of impingement and entrainment studies at a facility in Michigan with a 20 MGD flow. EPA also is aware of at least one study of impingement and entrainment at a facility in New York State that proposed to withdraw 4.2 MGD. In this case, the Director estimated fish mortalities of 24,500 American Shad, 1.9 million river herring, 1200 striped bass and 23,000 white perch. The Agency invites commenters to provide any data they may have regarding impingement and entrainment rates associated with 2 MGD water withdrawals. The Agency also invites commenters to provide any data they may have regarding impingement and entrainment rates associated with an alternative flow threshold of 5 MGD. The Agency also invites commenters to provide any data they may have regarding impingement and entrainment rates associated with the alternative flow thresholds of 10 MGD, 15 MGD, 20 MGD, 25 MGD, and 30 MGD.

EPA invites comment on all aspects of using these proposed thresholds to establish the universe of facilities that would be subject to the BTA requirements of this proposed regulation.

In addition to the MGD flow threshold discussed above, EPA is considering whether it should add a flow threshold to address the potential for adverse environmental impact posed by facilities that withdraw less than 2 million gallons of water per day but are located on smaller water bodies. To provide an additional measure of protection for these water bodies, the Agency might also include facilities that withdraw less than 2 MGD in this rulemaking if they withdraw more than 1% of the mean annual flow of a freshwater river or stream; the mean annual volume of a lake or reservoir; or the volume of the water column within the area centered about the opening of the intake with a diameter defined by the distance of one tidal excursion at the mean low water level for an estuary or tidal river. If the Agency were to include this additional flow threshold, language such as the following would be added at the end of the proposed § 125.81:

> Or a design intake flow of greater than one (1) percent of the waterbody flow or volume (the mean annual flow of a freshwater river or stream; the mean annual volume of a lake or reservoir; or the volume of the water column within the area centered about the opening of the intake with a diameter defined by the distance of one tidal excursion at the mean low water level for tidal rivers and an estuaries.

The Agency invites comment on this alternative flow threshold. The Agency also invites comment on whether it should include a higher threshold based on a facility's withdrawal as a percentage of waterbody flow or volume, such as five percent, 10 percent or 20 percent.

Should EPA decide to include a flow threshold based on a facility's withdrawal as a percentage of waterbody flow or volume, the Agency requests comment on whether it should establish an absolute minimum flow threshold (such as 50,000 or 100,000 gallons of waters of the U.S. used on a daily basis for cooling purposes) in conjunction with the one (1) percent of the water body flow or volume threshold described above. An absolute minimum gallon per day threshold could ensure that very small new facilities located on very small streams are not captured by the national regulation and, instead, are addressed by the Director, as appropriate, using best professional judgment on a case-by-case basis. If EPA added a minimum flow threshold to the part of the applicability criteria that relates to withdrawal of water by the facility, language such as the following would be added at the end of proposed § 125.81, as modified by the alternate regulatory language described in the preceding paragraph: ''and greater than [100,000 gallons] per day.''

E. Must My Facility Have a Point Source Discharge Subject to an NPDES Permit?

Today's proposed rule would apply only to new facilities as defined in § 125.83 that have an NPDES permit or are required to obtain one because they discharge or might discharge pollutants, including storm water, from a point source to waters of the U.S. Requirements for minimizing the adverse environmental impact of cooling water intake structures would continue to be applied through NPDES permits.

Based on the Agency's review of existing facilities that employ cooling water intake structures, the Agency anticipates that most new facilities that would be subject to this rule will control the intake structure that supplies them with cooling water and discharge some combination of their cooling water and wastewater and storm water to a water of the U.S. through a point source regulated by an NPDES permit. In this scenario, the requirements for the cooling water intake structure would be applied in the facility's NPDES permit. In the event that a new facility's only NPDES permit is a general permit for storm water discharges, the Agency anticipates that the Director would write an individual NPDES permit containing requirements for the facility's cooling water intake structure. The Agency invites comment on this approach for applying cooling water intake structure requirements to the facility. Alternatively, requirements applicable to cooling water intake structures could be incorporated into general permits. The Agency also invites comment on this approach.

In addition to the scenario described above, based on the Agency's review of existing facilities that employ cooling water intake structures, the Agency anticipates that some new facilities that have or are required to have an NPDES permit will not directly control the intake structure that supplies their facility with cooling water. For example, a number of facilities operated by separate entities might be located on the same, adjacent, or nearby property; one of these facilities might take in cooling water and then transfer it to other facilities prior to discharge of the cooling water to a water of the U.S. As another example, some facilities might use municipal water that is withdrawn from a water of the U.S. as their source for cooling water. The Agency invites comment on whether and how to prescribe section 316(b) requirements in these instances. In particular, the Agency invites comment on the proposal to regulate an intake structure if more than one-half of the flow serves new facilities and whether the threshold should be higher or lower. In addition, as in the previous paragraph, the Agency invites comment on a scenario in which the Director would place cooling water intake requirements in the new facility's NPDES permit and in the NPDES permit of the entity that controls the intake to ensure compliance with the cooling water intake requirements proposed today. This scenario is analogous to the Agency's finding of law in General Counsel Opinion No. 43 (June 11, 1976) that industrial users of a privately owned wastewater treatment plant are jointly and severally responsible for compliance with the provisions of the NPDES permit issued for the treatment plant. Alternatively, the Director could place cooling water intake requirements only in the permit of the facility that operates the structure. This would be administratively simpler and would limit permit requirements to the facility with direct operational control of the structure. The Agency also requests comment on this approach. If the new facility or the entity that controls the intake would have or be required to have only a general permit for storm water discharges, the Director would issue individual NPDES permit requirements, unless appropriate cooling water intake requirements were included in the general permit.

Should the requirements proposed today apply to only new facilities that control their intake structure, the Agency recognizes the possibility that some new facilities that have or are required to have an NPDES permit might restructure their operations to place control of the cooling water intake structure in an entity separate from the new facility withdrawing water for cooling purposes. In these situations, the Agency proposes to examine the operation of the new facility and the cooling water intake structure together. Should the Agency determine that the structure would be within the scope of this proposed rule but for the fact that it is not directly controlled by the new facility using the water, the Agency is considering applying the new facility requirements to the cooling water intake structure. The Agency invites comment on the policy merits of this position and how the Agency should prescribe cooling water intake structure requirements in this scenario.

Today's proposal applies only to facilities that are required to have an NPDES permit for direct discharges to surface waters. However, because similar adverse environmental impact can be caused by cooling water intake structures used by new facilities not subject to the NPDES program, the Agency encourages the Director to closely examine scenarios in which a new facility withdraws significant amounts of cooling water but does not have an NPDES permit. As appropriate, the Director should apply other legal requirements, such as section 404 or 401 of the Clean Water Act, the Coastal Zone Management Act, the National Environmental Policy Act, or similar State authorities to address adverse environmental impact caused by cooling water intake structures at those new facilities.

New facilities that EPA does not propose to regulate today, but that might cause similar impact, include the following:

- New facilities that withdraw cooling water from a water of the U.S. and discharge it along with other flows to a POTW for treatment and discharge;
- New facilities that purchase cooling water from a second facility that owns and operates the cooling water intake structure and withdraws the water from a water of the U.S. The new facility discharges the cooling water along with other flows to a POTW for treatment and discharge;
- New facilities that purchase cooling water from a municipal utility. The municipal utility owns and operates the cooling water intake structure and withdraws water from a water of the U.S. The new facility uses a significant amount of the municipal water for cooling purposes and discharges its cooling water to a POTW for treatment and discharge.

The Agency's concern regarding the environmental impact caused by cooling water intake structures at new facilities that would not be regulated by today's proposal is tempered somewhat by the following considerations. In each of the three scenarios just described, cooling water discharges would be sent to a publically owned treatment works. Based on responses to the Agency's section 316(b) screener questionnaire, the Agency estimates that the average cooling water use by a large utility steam electric generating facility is approximately 700 MGD; average water use by a large nonutility steam electric generating facility (*i.e.*, a facility that owns electric generating capacity but typically sells its electricity to a utility for distribution) is approximately 85 MGD. In most circumstances, a POTW would not accept such large volumes of cooling water because the flows from these facilities would likely dilute the waste stream reaching the POTW to the point where the POTW could face significant difficulty meeting its secondary treatment standard requiring removal of a fixed percentage of incoming biological oxygen demand. POTWs also enforce pretreatment requirements to ensure that heat in wastewater discharged does not interfere with biological treatment processes. Such large volumes of cooling water could potentially be too hot for the POTW to accept. In the third scenario presented in the preceding paragraph, the cost of using water treated to meet drinking water standards as cooling water is an additional issue. (The Agency notes that some steam electric generating facilities do use treated municipal *effluent* for cooling water, a distinct practice that has the potential to reduce use of waters of the U.S. for cooling water.) For manufacturing facilities, the potential for indirect discharge of cooling water might be greater. For example, the pulp and paper industry is the largest industrial process water user in the United States. In 1990 EPA surveyed 565 mills that manufacture pulp, paper, and paperboard as part of the Agency's development of effluent limitation guidelines for this industry. Of the 565 pulp mills, 203 (36 percent) discharge a total volume of 680 MGD indirectly to municipal treatment works.

In order to address the potential concerns with cooling water intake by indirect dischargers, the Agency invites comment on an alternative where the Agency would regulate point sources that supply large volumes of cooling water to indirect dischargers (e.g., municipal utilities or other water suppliers) and place technology requirements to satisfy section 316(b) into the NPDES permit of the utility that controls the intake. The Agency is aware of the practical difficulties in requiring facilities that supply water to large numbers of customers to account for the specific end uses.

VI. Data Collection and Overview of Industries Potentially Subject to Proposed Rule

A. Overview

As discussed above, today's proposed rule would apply to new facilities with cooling water intake structures as defined in § 125.83 that are point sources requiring an NPDES permit. Generally, facilities that meet these criteria fall into two major groups, new steam electric generating facilities and new manufacturing facilities. These would include new facilities in the pulp and paper, chemical, petroleum, iron and steel, and aluminum manufacturing industries, which are known to be major users of cooling water.

B. New Steam Electric Generating Facilities

To identify planned utility and nonutility electric generating facilities that could potentially be affected by the section 316(b) new facility regulation, EPA used the NEWGen database, developed by Resource Data International (RDI). This database provides facility-level data on new power projects, including information on generating technology, plant capacity, electric interconnection, project status, date of initial commercial operation, and other operational details. The Agency evaluated each of the 466 facilities identified in the RDI database for the following criteria: ''new plant'' status, project status, location within the United States, plant type, anticipated date of initial commercial operation, and availability of cooling water intake structure information.

EPA's review identified 305 proposed new utility and nonutility electric generating facilities in the United States. Of these, 188 facilities will generate electricity using steam turbine or combined-cycle prime movers and would be potentially subject to regulation under section 316(b). (The term ''prime mover'' refers to the primary mechanism used by a facility to produce electricity.) To conduct various analyses required by statute and executive order (*e.g.*, Executive Order 12866), EPA examined facilities with a projected operational date of August 13, 2001, or later as potential new facilities that would be subject to this proposal. Ninety-four facilities meet this criterion. Fifty-six of the ninety-four facilities had reported information on their planned source and volume of cooling water to their permitting authorities. EPA based the analyses in support of this proposed regulation partially on those 56 facilities.

Eighty-eight percent of the 56 facilities examined plan to use combined-cycle [1] prime movers to generate electricity. Combined-cycle/cogeneration facilities are the second most common type of new facility, representing approximately 5 percent of the analyzed new facilities. In total, combined-cycle facilities represent more than 91 percent of the new capacity. The 56 facilities EPA identified will account for a total of 40,500 megawatts of additional generation capacity. On the basis of the capacity of these sample facilities and the total electric generation capacity forecasted by the Energy Information Administration (EIA), EPA predicts that 13 new facilities that will incur costs under this proposed regulation will be built over the next 10 years. For the period 2011 to 2020, EPA estimates that an additional 103 new facilities would be built but only 27 of these facilities would be in scope of today's proposed rule.

EPA further analyzed all 56 potential facilities to determine whether they would qualify as ''new facilities'' subject to this regulation as defined in § 125.83. Of the 56 facilities for which the source and volume of cooling water could be determined, only seven meet all of the proposed criteria for new facilities that are within the scope of this proposed regulation. Of these seven, one facility is proposing to locate a cooling water intake structure in a tidal river, four in nontidal rivers, and two in lakes. The remaining 49 facilities will either not withdraw cooling water from waters of the U.S. (45 facilities), will use cooling water withdrawn through an existing intake structure (three facilities), or are not expected to require an NPDES permit (one facility). These 49 facilities therefore would not be subject to the proposed section 316(b) new facility regulation. Forty-one of the 45 facilities that will not withdraw cooling water from a surface water source (approximately 91 percent) will use municipal water, ground water, or treated effluent, or a combination of the three, as a source of cooling water. The remaining four facilities are not expected to have a cooling water intake structure because they are air cooled. Based on the seven facilities that would be affected from the sample of 56 facilities and the Energy Information Administration forecast of total steam electric generation capacity additions, EPA projects 13 facilities would be affected over the next 10 years and an additional 27 facilities over the following 10 years. Therefore, the Agency's cost and regulatory impact analyses for the utility and non-utility electricity-producing industries focused on 40 electricity generating facilities over 20 years.

C. New Manufacturing Facilities

EPA identified prospective new facilities in the other industry sectors affected by today's proposed rule through a consultation process with the respective associations for those industries, review of independent market analyses, and projections based on the *Section 316(b) Industry Screener Questionnaire: Phase I Cooling Water Intake Structures.* EPA contacted the following industry associations: American Forest and Paper Association, American Petroleum Institute, National Petrochemical Refiners Association, American Iron and Steel Institute, Steel Manufacturers Association, Specialty Steel Industry of North America, the Aluminum Association of America, and the Chemical Manufacturers Association. The Agency questioned each of the associations about growth in its industry, including projections about construction of new facilities. EPA also reviewed independent forecasts for the major industry sectors likely to be affected by today's proposed rule to assess the number of new facilities likely to be built in the foreseeable future. Finally, EPA estimated the number of new manufacturing facilities likely to be within the scope of today's rule based on preliminary data addressing existing facilities.

EPA estimates that approximately 70 new manufacturing facilities that would be subject to today's proposed rulemaking will be built over the next 20 years (2001 to 2020). This number is

[1] Most of the electricity in the United States is produced by steam turbine generating units. A combined-cycle facility uses both a combustion turbine prime mover and a steam turbine prime mover to increase the efficiency of the generating unit.

generally consistent with the data EPA reviewed through industry consultations and forecast reviews.

The American Forest and Paper Association (AF&PA) reported the possibility of one new facility being built in the next few years. In addition, AF&PA indicated that a second new facility is under consideration. These are the only prospective new facilities in the pulp and paper industry. AF&PA reports that paper production in the United States has been declining and that if additional production is required, it will most likely come from expansion or full utilization of existing facilities. Review of independent industry projections supports AF&PA's information. EPA is projecting that no new facilities in the pulp and paper industry will be built in the next 20 years that would be within the scope of this rule. EPA requests comment on this projection and any relevant data commenters may have.

In the United States, steel is typically produced by either large integrated mills that convert iron ore into steel or by minimills that employ an electric arc furnace (EAF) process to fabricate scrap steel into new product. The American Iron and Steel Institute (AI&SI) represents primarily the integrated steel producers, and the Steel Manufacturers Association (SMA) represents chiefly the minimills. These associations report that there has been a significant expansion in the number of new minimills in the past few years but that much of the immediate expansion is over. A limited number of new minimills will come on line in the foreseeable future, but new integrated mills are unlikely to be built. Agency review of independent industry projections supports this assessment. According to these projections, new steelmaking capacity soon will result mostly from new minimills coming on line. This is in keeping with long-term industry trends: the EAF share of the U.S. steel market has risen from 12 percent to 50 percent in the past three decades. Although minimills generally require large amounts of cooling water, they typically use closed-cycle recirculating systems with cooling towers. Production increases by integrated producers will most likely occur as a result of capacity expansion or improved efficiencies at existing facilities rather than new construction of integrated mills. EPA estimates that eight new minimills, as well as one cold-rolled steel sheet strip and bar mill, that might incur costs under this proposed rule will be built over the next 20 years.

The Aluminum Association of America (AAA) reports it is unlikely that new primary aluminum smelters will be built in the foreseeable future. The growth area in the aluminum industry is in secondary aluminum manufacturing—facilities that recycle aluminum rather than use aluminum ore. Review of independent aluminum industry projections reveals that significant growth in demand is expected soon, but it is not certain whether this demand will be met through construction of new facilities, expansion of existing plants, or increased capacity utilization at existing facilities. EPA estimates that four new aluminum facilities that might incur costs under this proposed rule will be built over the next 20 years.

The majority of petroleum refiners are represented by two organizations, the American Petroleum Institute (API) and the National Petrochemical Refiners Association (NPRA). API represents many of the large refiners, and NPRA represents some large and many of the small refiners. Both organizations report that it is unlikely that a new refinery will be built in the foreseeable future and note that expansion of refinery capacity will occur exclusively through growth of existing facilities. Moreover, the number of refineries is declining and competitive pressures have led to consolidations and mergers in the petroleum industry. Review of independent industry projections supports this conclusion and shows that during the period between January 1990 and January 1997, the number of operable refineries in the United States declined from 205 to 164. EPA estimates that no new facilities in the petroleum and coal products sector with costs under this regulation will be built over the next 20 years.

The chemical industry is one of the more diverse industry sectors in the U.S. and includes the largest number of individual facilities of the industries subject to today's proposed rule. The Chemical Manufacturers Association (CMA) reports that there is likely to be little expansion or development of new facilities in the chemical industry in the near future. CMA expects that near term growth in industry output will occur through changes in product lines or expansion of existing facilities. Review of independent industry projections discloses that the near term picture is for considerable restructuring and consolidation with moderate growth in the number of new facilities for the longer term. However, because the chemical industry sector is so large, even moderate growth will result in the addition of a considerable number of facilities. Moreover, many of the new facilities are likely to be small businesses as CMA estimates that 40 to 60 percent of its members are small businesses and the expectation is that this ratio will remain approximately the same. EPA expects that 56 new facilities in the chemical industry sectors that are subject to the requirements of this rule will be constructed within the next 20 years.

EPA has estimated that the above industries (including the electricity generating industry) represent approximately 5,000 to 6,000 existing facilities nationwide and are responsible for almost 99 percent of all the cooling water use in the United States. Today's proposed rule would also affect other industry sectors, including textile mill products; lumber and wood products; rubber and miscellaneous plastic products; stone, clay, glass, and concrete products; and transportation equipment. EPA did not undertake outreach to or survey these industry sectors in part because the Agency has determined that all these other industries, although constituting a large number of individual facilities, in aggregate withdraw approximately 1 percent or less of all cooling water used in the United States. As a result, even if there is a substantial increase in the number of new facilities in these industry sectors, EPA projects that few would be subject to today's proposed rule. Based on the Engineering and Economic Analysis document that EPA prepared while developing this proposal, EPA projects it is unlikely that there will be new facilities in any sectors other than electricity generation, primary metals, and chemicals that would be subject to the requirements of this rule over the next 20 years. EPA requests comment on this projection and any relevant data commenters may be able to provide.

VII. Environmental Impact Associated With Cooling Water Intake Structure

A. Overview

Based on estimates cited in the record for the Agency's previous section 316(b) regulations and guidance, power plants and industrial facilities in the United States withdrew approximately 70 trillion gallons of water from U.S. waters each year for cooling water purposes. Power plants alone account for approximately 80 percent of the total cooling water withdrawals, or about 60 trillion gallons of cooling water per year.[2] The withdrawal of such large

[2] EPA anticipates updating these water usage estimates based on its survey questionnaire of

Continued

quantities of cooling water affects vast quantities of aquatic organisms annually, including phytoplankton,[3] zooplankton,[4] fish, shellfish, and many other forms of aquatic life. Aquatic organisms drawn into cooling water intake structures are either impinged on components of the cooling water intake structure or entrained in the cooling water system itself. In either case, a substantial number of these organisms are killed or subjected to significant harm as a result.

Currently, many cooling water intake structures use some type of intake control technology. In most cases these technologies prevent debris from entering the cooling water system but do not protect aquatic organisms. The most common intake devices used in the steam electric generating industry, as well as other industries, are front-end trash racks (generally fixed bars) to prevent large debris from entering the system, followed by single-entry, single-exit vertical traveling screens (conventional traveling screens). It is also noteworthy, however, that between 1955 and 1997 the number of new steam electric generating facilities using closed-cycle recirculating cooling water systems increased from 25 percent to 75 percent, with a corresponding decrease in facilities using once-through systems.[5] Between 1975 and 1984 the number of steam electric generating facilities using closed-cycle recirculating systems increased 31 percent. This trend toward the use of closed-cycle recirculating systems is projected to continue as new facilities are built. Of the seven new generating facilities that would potentially be covered by this proposed rule and for which EPA has planning information, all seven plan to use closed-cycle recirculating cooling water systems. There is also evidence of a trend among new facilities to use less cooling water. All of the seven new facilities in EPA's analysis are projected to use less than 20 MGD.

B. What Types of Environmental Impacts Are Caused by Cooling Water Intake Structures?

EPA's May 1977 *Draft Guidance for Evaluating the Adverse Impact of Cooling Water Intake Structures on the Aquatic Environment* describes two primary ways in which cooling water intake structures can cause adverse environmental impact. The first is entrainment, which occurs when organisms are drawn through the cooling water intake structure into the cooling system. Organisms that become entrained are normally relatively small benthic,[6] planktonic,[7] and nektonic[8] forms of fish and shellfish species. As entrained organisms pass through a plant's cooling system they are subject to mechanical, thermal, and toxic stress. Sources of such stress include physical impacts in the pumps and condenser tubing, pressure changes caused by diversion of the cooling water into the plant or by the hydraulic effects of the condensers, sheer stress, thermal shock in the condenser and discharge tunnel, and chemical toxemia induced by antifouling agents such as chlorine. The mortality rate of entrained organisms is high.

Another way in which intakes affect aquatic life is through the impingement of fish and other aquatic organisms on devices installed on the cooling water intake structure to prevent debris from entering the facility's cooling system. Organisms are trapped against these screening devices by the force of the water passing through the cooling water intake structure. Impingement can result in starvation and exhaustion (when organisms are trapped against an intake screen or other barrier at the entrance to the cooling water intake structure), asphyxiation (when organisms are forced against an intake screen or other barrier at the entrance to the cooling water intake structure by velocity forces that prevent proper gill movement or when organisms are removed from the water for prolonged periods of time), and descaling (when organisms are removed from an intake screen by a wash system).

In addition to impingement and entrainment losses associated with the operation of the cooling water intake structure, EPA is concerned about the overall degradation of the aquatic environment as a consequence of multiple intake structures operating in the same watershed or in the same reach or nearby reaches. EPA is also concerned about the potential impacts of cooling water intake structures located in or near habitat areas that support threatened or endangered species. Although limited data document the extent to which threatened or endangered species are harmed or killed due to impingement or entrainment, such impacts do occur. For example, EPA is aware that over a 9-year period more than 1,300 endangered sea turtles entered enclosed cooling water intake structure canals at one power plant[9] and that other plants impinge and entrain threatened delta smelt and endangered runs of chinook salmon and steelhead trout.[10]

Furthermore, EPA is concerned about adverse environmental impact associated with the construction of new cooling water intake structures. Such adverse impacts primarily result from three factors—displacement of populations and habitat resulting from the physical placement of a new cooling waste intake structure in an aquatic environment, the impact on the aquatic environment of increased levels of turbidity, and the effects on aquatic biota and habitat associated with disposal of materials excavated during construction. Unlike operational impacts, adverse impact associated with construction need not be recurring in nature. Even where construction of a new cooling water intake structure takes a number of months, such construction could cause significant adverse impact. For example, the construction of a new intake structure could destroy or harm habitat value through the physical destruction or degradation of submerged lands or banks, or by stirring up sediments. Today's proposed rule includes requirements at § 125.84(f) under which the Director could address these effects in certain circumstances. Moreover, existing programs, such as the CWA section 404 program and programs under State law, include requirements that address many of the environmental impact concerns associated with the construction of new intakes.

industrial facilities potentially subject to the section 316(b) regulation for existing facilities.

[3] Phytoplankton are tiny, free-floating photosynthetic organisms suspended in the water column.

[4] Zooplankton are small marine animals that consume phytoplankton and other zooplankton. Ichthyoplankton is a group of plankton composed of fish eggs and larvae.

[5] EPA estimates that 84 percent of existing steam electric generating facilities started operation between 1955 and 1985. An additional 7 percent of these facilities started operation between 1985 and 1997.

[6] Refers to bottom dwellers that are generally small and sessile (non-swimming), but can include certain large motile (able to swim) species. These species can be important members of the food chain.

[7] Refers to free floating microscoic plants and animals, including fish eggs and larval stages with limited ability to swim. Plankton are also an important source of food for other aquatic organisms and an essential components of the food chain in aquatic ecosystems.

[8] Refers to organisms with swimming abilities that permit them to move actively through the water column and to move against currents.

[9] The plant developed a capture-and-release program in response to these events. Most entrapped turtles were captured and released alive; however, some mortality has occurred.

[10] For example, Pittsburg and Contra Costa in the San Francisco Bay Delta area of California.

C. What Entrainment and Impingement Impacts Caused by Cooling Water Intake Structures Have Been Documented?

Research of the available literature and section 316(b) demonstration studies obtained from NPDES permit files has identified numerous documented cases of impacts associated with impingement and entrainment and the subsequent effects of these actions on populations of aquatic organisms. For example, specific losses associated with individual steam electric generating facilities include 3 billion to 4 billion larvae and postlarvae per year [11]; 23 tons of fish and shellfish of recreational, commercial, or forage value lost each year [12]; and 1 million fish lost during a 3-week study period.[13] Several studies estimating the impact of entrainment on populations of key commercial or recreational fish have predicted declines in population size. Studies of entrainment at five Hudson River power plants predicted year-class reductions ranging from 6 percent to 79 percent depending on the fish species.[14] A modeling effort looking at the impact of entrainment mortality on the population of a selected species in the Cape Fear estuarine system predicted a 15 to 35 percent reduction in the species' population.[15]

The following are among other more recent documented examples of impacts occurring in existing facilities as a result of cooling water intake structures. Also see the discussion of the benefits of today's proposed rule in Section X.B.

Brayton Point. PG&E Generating's Brayton Point plant (formerly owned by New England Power Company) is located in Mt. Hope Bay, in the northeastern reach of Narragansett Bay, Rhode Island. Due to problems with electric arcing caused by salt drift and lack of fresh water for the closed-cycle recirculating cooling water system, the company switched Unit 4 from a closed-cycle recirculating to a once-through cooling water system in 1985. The modification of Unit 4 resulted in a 45 percent increase in cooling water intake flow at the plant. Studies designed to evaluate whether the cooling water intake structure was affecting fish species abundance trends found that Mt. Hope Bay experienced a progressively steady rate of decline in finfish species of recreational, commercial, and ecological importance.[16] In contrast, species abundance trends were relatively stable in adjacent coastal areas and portions of Narragansett Bay that are not influenced by the cooling water intake structure. Further strengthening the evidence that the intake of cooling water was contributing to the documented declines was the finding that the rate of population decline increased substantially with the full implementation of the once-through cooling mode for Unit 4. The modification of Unit 4 is estimated to have resulted in an 87 percent reduction in finfish abundance based on a time series-intervention model. These impacts were associated with both impingement and entrainment, as well as the thermal discharge of cooling water. Data indicate that annual entrainment at Brayton Point averages 4.9 billion tautog eggs, 0.86 billion windowpane eggs, and 0.89 billion winter flounder larvae each year. Using adult equivalent analyses, the entrainment and impingement of fish eggs and larvae in 1994 translated to a loss of 30,885, 20,146, and 96,507 pounds of adult tautog, windowpane, and winter flounder, respectively.

San Onofre Nuclear Generating Station. The San Onofre Nuclear Generating Station (SONGS) is on the coastline of the Southern California Bight, approximately 2.5 miles southeast of San Clemente, California.[17] The marine portions of Units 2 and 3, which are once-through, open-cycle cooling systems, began commercial operation in August 1983 and April 1984, respectively. Since then, many studies have been completed to evaluate the impact of the SONGS facility on the marine environment.

Studies of kelp beds in nearshore waters in the vicinity of the SONGS facility determined that the operation of cooling water intake structures resulted in a 60 percent (80-hectare) reduction in the area covered by moderate-to high-density kelp.[18] Studies indicated that poor survival and lack of development of early life stages essential to the replenishment of the adult population resulted from increased turbidity of the waters in the vicinity of SONGS due to withdrawal of inshore turbid water for cooling purposes. The loss of kelp was also determined to be detrimental to fish communities associated with the kelp forests. For example, fish living close to the bottom of the San Onofre kelp bed experienced a 70 percent decline in abundance. Fish living in the water column in the impact areas had a 17 percent loss in abundance and a 33 percent decline in biomass relative to control populations. The abundance of large invertebrates in kelp beds also declined for many species, particularly snails.

In a normal (non-El Nino) year, some 110 tons of midwater fish (primarily northern anchovy, queenfish, and white croaker) [19] are entrained at SONGS, of which at least 41 percent are killed during plant passage. The fish lost include approximately 350,000 juveniles of white croaker, a popular sport fish; this number represents 33,000 adult individuals or 3.5 tons of adult fish. Within 3 kilometers of SONGS, the density of queenfish and white croaker in shallow-water samples decreased by 34 and 63 percent, respectively. Queenfish declined by 50 to 70 percent in deepwater samples.

Existing and historical studies like those described in this section provide only a partial picture of the severity of environmental impact associated with cooling water intake structures. Most important, the methodologies for evaluating adverse environmental impact used in the 1970s and 1980s, when most section 316(b) evaluations were performed, were often inconsistent and incomplete. For example, some studies reported only gross fish losses; others reported fish losses based on species and life stage; still others reported percent losses of the associated population or subpopulation (*e.g.*,

[11] EPA, "Brunswick Nuclear Steam Electric Generating Plant of Carolina Power and Light Company, Historical Summary and Review of Section 316(b) Issues," EPA Region IV, September 19, 1979.

[12] EPA, "Findings and Determination under 33 U.S.C. Section 1326, In the Matter of Florida Power Corporation Crystal River Power Plant Units 1, 2, and 3, NPDES Permit No. FL0000159," Environmental Protection Agency Region IV, December 2, 1986.

[13] Nancy J. Thurber, and David J. Jude, "Impingement Losses at the D.C. Cook Nuclear Power Plant during 1975–1982 with a Discussion of Factors Responsible and Possible Impact on Local Populations," Special Report No. 115 of the Great Lakes Research Division, Great Lakes and Marine Waters Center, The University of Michigan, 1985.

[14] John Boreman and Phillip Goodyear, "Estimates of Entrainment Mortality for Striped Bass and Other Fish Species Inhabiting the Hudson River Estuary," *American Fisheries Society Monograph* 4:152–160, 1988.

[15] EPA, Brunswick Nuclear Steam Electric Generating Plant of Carolina Power and Light Company, Historical Summary and Review of Section 316(b) Issues," Environmental Protection Agency Region IV, 1979.

[16] Mark Gibson, "Comparison of Trends in the Finfish Assemblages of Mt. Hope Bay and Narragansett Bay in Relation to Operations of the New England Power Brayton Point Station," Rhode Island Division Fish and Wildlife, Marine Fisheries Office, June 1995 and revised August 1996.

[17] Southern California Edison, "Report on 1987 Data: Marine Environmental Analysis and Interpretation, San Onofre Nuclear Generating Station," 1988.

[18] MRC, "Final Report of the Marine Review Committee to the California Coastal Commission," Marine Review Committee, Document No. 89–02, August 1989.

[19] S. Swarbrick and R.F. Ambrose, "Technical Report C: Entrapment of Juvenile and Adult Fish at SONGS," prepared for the Marine Review Committee, 1989.

young-of-year fish). Recent advances in environmental assessment techniques now provide better tools to monitor for impingement and entrainment and to detect impacts associated with the operation of cooling water intake structures.

D. What Constitutes Adverse Environmental Impact Under This Proposed Rule?

As discussed above, the 1977 section 316(b) draft guidance defined the term ''adverse environmental impact.'' It states that ''[a]dverse aquatic environmental impacts occur whenever there would be entrainment or impingement damage as a result of the operation of a specific cooling water intake structure.'' That definition also states, however, that ''[t]he critical question is the magnitude of any adverse impact.'' The guidance lists specific factors relevant for determining the long- and short-term magnitude of any adverse impacts.[20] The 1977 Draft Guidance established a process under which cooling water intake structures were evaluated on a case-by-case basis to determine the level of environmental impact occurring and the appropriate best technology available to minimize adverse environmental impact.[21]

The framework and definitions in the 1977 Draft Guidance recommend that facilities should initially determine the incremental environmental impact of each cooling water intake structure on the populations of affected species or organisms and that BTA be applied only where it is determined that such incremental impacts are deemed to constitute ''adverse environmental impact.'' However, both the decision process and the evaluation criteria contained in the guidance have proven very difficult to apply consistently. The initial determination of environmental impact has often relied on population modeling, which, given its inherent complexity, has yielded ambiguous or debatable results. One result has been that many section 316(b) permitting decisions have predominantly focused on determining whether a cooling water intake structure is causing an adverse environmental impact. Given that both the methods for making such determinations and the standard regarding what constitutes an ''adverse'' environmental impact were not precisely defined, permitting authorities have had to exercise significant judgment and focus significant time and effort to determine what requirements should be imposed under section 316(b).

In developing this proposal, EPA considered several alternatives for defining adverse environmental impact associated with the operation of cooling water intake structures. These alternatives are discussed below. EPA also considered whether a specific definition of adverse environmental impact should be included in the regulation or developed as guidance. The regulatory language in today's proposed rule does not include a definition of adverse environmental impact. However, the Agency is considering promulgating each of the alternatives discussed below as part of the final regulation and, thus, each should be viewed in a regulatory context. The Agency also might ultimately decide to publish one of these alternatives in guidance that supports the final rule. EPA is also considering taking no action regarding the definition of adverse environmental impact.

Though EPA is not proposing a definition of adverse environmental impact, the Agency did consider a number of alternatives for either defining adverse environmental impact or determining a threshold for the level of environmental impact deemed to be adverse. Consistent with this approach, EPA conceptualized adverse environmental impact in a manner that would not characterize the threshold for being considered ''adverse'' as the impingement or entrainment of a single organism, but also would not result in a threshold that is so high that it would allow for the impingement or entrainment of millions of organisms, larvae, or eggs. Thus, EPA considered adverse environmental impact as a level of impingement or entrainment of aquatic organisms that is recurring and nontrivial.

One approach EPA considered would be to define adverse environmental impact as the impingement or entrainment of one (1) percent or more of the aquatic organisms in the near-field area as determined in a 1-year study. Under this approach, the near field would be defined as that area immediately around the intake structure from which organisms are drawn onto the screens or into the cooling system. EPA considers the establishment of a one percent threshold a reasonable means to protect about 99 percent of the organisms in the water column under the influence of the cooling water intake structures. A threshold of one percent represents a reasonable approach for defining adverse impact and is consistent with the approach used by the water quality-based regulatory programs within EPA for developing the necessary levels of protection to safeguard aquatic communities. EPA seeks comment on this alternative. Regulatory language such as the following could be used to implement this approach:

> Adverse environmental impact means the impingement or entrainment of one (1) percent or more of the aquatic organisms from the area around the cooling water intake structure from which organisms are drawn onto screens or other barriers at the entrance to a cooling water intake structure or into the cooling system, as determined in the Source Water Baseline Biological Characterization.

(See Section IX.A.1 for a discussion of the Source Water Baseline Biological Characterization.)

A second alternative for defining adverse environmental impact for purposes of section 316(b) would use the definition of adverse environmental impact provided in the 1977 Draft Guidance, which is discussed above. Under this approach, adverse environmental impact would be defined as impingement and entrainment and the key inquiry would be an assessment of the magnitude of such effects. EPA could clarify through guidance when the magnitude of environmental impact is great enough to be deemed adverse.

Under a third alternative EPA is considering, adverse environmental impact would be deemed to occur whenever aquatic organisms are impinged or entrained as a result of the operation of a cooling water intake. Under this alternative, ''adverse environmental impact'' could be defined as ''any impingement or entrainment of aquatic organisms.'' This approach would be similar to the approach that the State of New York has taken in implementing its section 316(b) program, based on the State's judgment that both impingement and entrainment result in harmful environmental effects that diminish valuable public

[20] Under the 1977 Draft Guidance, the magnitude of any adverse impact should be estimated in terms of both short-term and long-term impact with reference to the following factors: (1) Absolute damage; (2) percent damage; (3) absolute and percentage damage to any endangered species; (4) absolute and percent damage to any critical aquatic organism; (5) absolute and percentage damage to commercially valuable and/or sport fisheries yield; and (6) whether the impact would endager (jeaopardize) the protection and propagation of a balanced population of shellfish and fish in and on the body of water from which the cooling water is withdrawn (long-term impact). (Draft Guidance, U.S. EPA, 1977, Definitions and Concepts p. 15).

[21] For example, the 1977 Draft Guidance states ''[t]he exact point at which adverse aquatic impact occurs at any given plant site or water body segment is highly speculative and can only be estimated on a case-by-case basis by considering the species involved, magnitude of the losses, years of intake operation remaining, ability to reduce losses, etc.'' (Draft Guidance, U.S. EPA, 1977, p. 11).

resources.[22] Such effects could have the potential to reduce the population of indigenous species; change the species mix because some species are more susceptible to impingement and entrainment than others; might increase nuisance species; harm and kill endangered and threatened species; damage critical aquatic organisms, including important elements of the food chain; and reduce commercial and sport fisheries. This approach also would provide a level of protection analogous to the level of protection provided by the Agency's criteria methodology for protecting aquatic life from toxic effects, particularly from acute lethality.[23 24]

Yet another alternative would be to define adverse environmental impact in relation to reference sites for the type of ecosystem in which the facility proposes to locate the intake structure and then to evaluate the projected impact of the intake structure on the abundance, diversity, and other important characteristics of the aquatic community that would be expected to inhabit the site. This approach would be analogous to the Agency's recommended approach for the adoption of biocriteria into State water quality standards.[25 26 27 28 29] The Agency invites comment on implementation issues that might be associated with determining the nexus between the projected impacts of the cooling water intake structure and the reference conditions.

The Agency also requests comment on a definition of adverse environmental impact that would focus on (1) the protection of threatened, endangered, or otherwise listed species; (2) protection of socially, recreationally, and commercially important species; and (3) protection of community integrity, including structure and function. EPA is aware that the Utility Water Action Group intends to develop, and submit to EPA following peer review, one or more practical definitions of adverse environmental impact and the measures for assessing when adverse environmental impact is occurring. The measures may vary depending on the waterbody type. EPA will consider the output of this effort, if available in time, and as appropriate, as it develops the final rule.

Each of the preceding definitions of adverse environmental impact addresses impact on the aquatic environment. The Agency invites comment on whether it should define adverse environmental impact more broadly and consider nonaquatic adverse environmental impact as well. For example, some of the technologies that may be used to reduce impingement and entrainment may result in air emissions such as the drift of salts, other minerals or chemicals onto vegetation, potentially with harmful effects. Some technologies may reduce the efficiency of an electricity generating or manufacturing facility, potentially leading to increased energy consumption and increased emission of carbon dioxide or other ''greenhouse'' gases, and increased resource extraction activities that may have a harmful effect on lands and natural resources. Should the Agency decide to consider nonaquatic impact, it could do so in conjunction with any of the potential definitions of adverse environmental impact described above that address impact on the aquatic environment.

Finally, it is important to clarify and invite comment on the Agency's current interpretation of the relationship of adverse environmental impact under section 316(b) and the objective of section 316(a) to ensure protection and propagation of a balanced indigenous population of shellfish, fish, and wildlife. The Agency considers the objective stated in section 316(b) to minimize adverse environmental impact from cooling water intake structures to be distinct from that of section 316(a) to ensure protection and propagation of a balanced indigenous population of shellfish, fish, and wildlife. The Agency has long maintained that adverse environmental impact from cooling water intake structures must be minimized to the fullest extent practicable,[30] even in cases where it can be demonstrated that the standard applicable under section 316(a) is being met.[31 32] Thus the objective of section 316(b) is more protective than that of section 316(a). However, EPA also requests comment on adapting the section 316(a) standard for purposes of section 316(b) and defining adverse environmental impact as impacts likely to interfere with the protection and propagation of a balanced indigenous population of fish, shellfish, and wildlife.

EPA invites comment on all aspects of these alternatives for defining adverse environmental impact associated with cooling water intake structures and whether such a definition should be included as part of the regulation or stated as guidance.

VIII. Best Technology Available for Minimizing Adverse Environmental Impact at New Facilities

A. What Is the Best Technology Available for Minimizing Adverse Environmental Impact at New Facilities?

1. What Are the Proposed and Alternative Regulatory Frameworks for Today's Proposed Rule?

Today's proposed rule would establish national minimum performance requirements for the location, design, construction, and capacity of cooling water intake structures at new facilities to minimize adverse environmental impact. Under the proposed rule, EPA would establish requirements for minimizing adverse environmental impact from cooling water intake structures based on the type of water body in which the intake structure is located, the location of the intake in the water body, the volume of water withdrawn, and the design intake velocity. EPA would also establish additional requirements or measures for location, design, construction, or capacity that might be necessary to minimize adverse environmental impact. The best technology available to minimize adverse environmental impact might constitute a technology suite, which would vary depending on the type of water body in which a cooling water intake structure is located as well as the location of the cooling water

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[22] NYDEC, ''Clean Water Act Section 316(b), statement provided to U.S. EPA at public meeting to discuss adverse environmental impacts resulting from cooling water intake structures,'' New York State Department of Environmental Conservation, Division of Fish, Wildlife, and Marine Resources, June 29, 1998.

[23] EPA, *Technical Support Document for Water Quality-based Toxics Control,* U.S. Environmental Protection Agency, Office of Water, EPA–823–B–94–005a, August 1994.

[24] Advanced Notice of Proposed Rulemaking: Water Quality Standards Program, 63 FR 3672, July 7, 1998.

[25] Michael T. Barbour *et al.*, ''Measuring the attainment of biological integrity in the USA: a critical element of ecological integrity,'' *Hydrobiologia* 422/423:453–464, 2000.

[26] EPA, *Biological Criteria: National Program Guidance for Surface Waters,* U.S. Environmental Protection Agency, Office of Water Regulations and Standards, EPA–440/5–90–004, April 1990.

[27] EPA, *Biological Criteria: Technical Guidance for Streams and Small Rivers,* U.S. Environmental Protection Agency, Office of Water, EPA 822–B–96–001, May 1996.

[28] EPA, *Lakes and Reservoir Bioassessment and Biocriteria: Technical Guidance Document,* U.S. Environmental Protection Agency, Office of Water, EPA 841–B–98–007, August 1998.

[29] EPA, *Draft Estuarine and Coastal Marine Waters Bioassessment and Biocriteria Technical Guidance,* U.S. Environmental Protection Agency, Office of Water, July, 2000.

[30] *In re Brunswick Steam Electric Plant,* Decision of the General Counsel No. 41, June 1, 1976.

[31] *In re Public Service Co. of New Hampshire,* (Seabrook Station Units 1 and 2) (Decision of the Administrator) 10 ERC 1257, 1262 (June 17, 1977).

[32] *In re Central Hudson Gas and Elec. Corp.,* Decision of the General Counsel No. 63, July 29, 1977.

intake structure within the water body. Under this proposal, EPA would set technology-oriented performance requirements; the Agency would not mandate the use of any specific technology.

Exhibit 1 displays the framework for EPA's proposed section 316(b) new facility rule. Previously, EPA solicited public comment on a three-tiered framework for existing facilities. The framework proposed today for new facilities has evolved from Tier 1 of that framework. Under the proposed rule, EPA would group water bodies into four categories: (1) freshwater rivers or streams, (2) lakes or reservoirs, (3) tidal rivers or estuaries; and (4) oceans. The Agency considers location to be the most important factor in addressing adverse environmental impact caused by cooling water intake structures. Today's proposed rule would define the term ''freshwater river or stream'' to mean a lotic (free-flowing) system that does not receive significant inflows of water from oceans or bays due to tidal action (see § 125.83). EPA proposes to define the term ''lake'' to mean any inland body of open water with some minimum surface area free of rooted vegetation and with an average hydraulic retention time of more than 7 days. Lakes may be natural water bodies or impounded streams, usually fresh, surrounded by land or by land and a man-made retainer (*e.g.*, a dam). Lakes may be fed by rivers, streams, springs, and/or local precipitation.

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EXHIBIT 1–SECTION 316(B) NEW FACILITY FRAMEWORK

STANDARDS FOR CWISs LOCATED IN A FRESHWATER RIVER OR STREAM

Where CWIS Is Located at Least 50 Meters Outside the Littoral Zone In a Freshwater River or Stream

Total design intake flow of no more than the more stringent of 5% of the source water mean annual flow or 25% of the source water 7Q10
and
Maximum design intake velocity no more than 0.5 ft/s
and
Other requirements as defined by the Director in accordance with § 125.84(f) and (g)

Where CWIS Is Located Less Than 50 Meters Outside the Littoral Zone In a Freshwater River or Stream

Total design intake flow of no more than the more stringent of 5% of the source water mean annual flow or 25% of the source water 7Q10
and
Maximum design intake velocity no more than 0.5 ft/s
and
Reduce intake flow to a level commensurate with that which could be attained by a closed-cycle recirculating cooling water system
and
Other requirements as defined by the Director in accordance with § 125.84(f) and (g)

Where CWIS Is Located Inside the Littoral Zone In a Freshwater River or Stream

Total design intake flow of no more than the more stringent of 5% of the source water mean annual flow or 25% of the source water 7Q10
and
Maximum design intake velocity no more than 0.5 ft/s
and
Reduce intake flow to a level commensurate with that which could be attained by a closed-cycle recirculating cooling water system
and
Implement additional technologies that minimize impingement and entrainment of fish eggs and larvae and maximize survival of impinged adult and juvenile fish
and
Other requirements as defined by the Director in accordance with § 125.84(f) and (g)

STANDARDS FOR CWISs LOCATED IN A LAKE OR RESERVOIR

Where CWIS Is Located at Least 50 Meters Outside the Littoral Zone In a Lake or Reservoir

Total design intake flow must not upset the natural stratification of the source water
and
Other requirements as defined by the Director in accordance with § 125.84(f) and (g)

Where CWIS Is Located Less Than 50 Meters Outside the Littoral Zone In a Lake or Reservoir

Total design intake flow must not upset the natural stratification of the source water
and
Maximum design intake velocity no more than 0.5 ft/s
and
Reduce intake flow to a level commensurate with that which could be attained by a closed-cycle recirculating cooling water system
and
Other requirements as defined by the Director in accordance with § 125.84(f) and (g)

Where CWIS Is Located Inside the Littoral Zone In a Lake or Reservoir

Total design intake flow must not alter the natural stratification of the source water
and
Maximum design intake velocity no more than 0.5 ft/s
and
Reduce intake flow to a level commensurate with that which could be attained by a closed-cycle recirculating cooling water system
and
Implement additional technologies that minimize impingement and entrainment of fish eggs and larvae and maximize survival of impinged adult and juvenile fish
and
Other requirements as defined by the Director in accordance with § 125.84(f) and (g)

STANDARDS FOR CWISs LOCATED IN AN ESTUARY OR TIDAL RIVER

Where CWIS Is Located Anywhere In an Estuary or Tidal River

Total design intake volume must be no more than 1% of the volume of the water column in the area centered about the opening of the intake with a diameter defined by the distance of one tidal excursion at the mean low water
and
Maximum design intake velocity no more than 0.5 ft/s
and
Reduce intake flow to a level commensurate with that which could be attained by a closed-cycle recirculating cooling water system
and
Implement additional technologies that minimize impingement and entrainment of fish eggs and larvae and maximize survival of impinged adult and juvenile fish
and
Other requirements as defined by the Director in accordance with § 125.84(f) and (g)

STANDARDS FOR CWISs LOCATED IN THE OCEAN

Where CWIS Is Located Outside the Littoral Zone In the Ocean

Maximum design intake velocity no more than 0.5 ft/s
and
Other requirements as defined by the Director in accordance with § 125.84(f) and (g)

Where CWIS Is Located Inside the Littoral Zone In the Ocean

Maximum design intake velocity no more than 0.5 ft/s
and
Reduce intake flow to a level commensurate with that which could be attained by a closed-cycle recirculating cooling water system
and
Implement additional technologies that minimize impingement and entrainment of fish eggs and larvae and maximize survival of impinged adult and juvenile fish
and
Other requirements as defined by the Director in accordance with § 125.84(f) and (g)

KEY TERMS

Cooling water intake structure means the total physical structure and any associated constructed waterways used to withdraw water from waters of the U.S., provided that at least 25 percent of the water withdrawn is used for cooling purposes. The cooling water intake structure extends from the point at which water is withdrawn from the surface water source to the first intake pump or series of pumps.

Littoral zone means any nearshore area in a freshwater river or stream, lake or reservoir, or estuary or tidal river extending from the level of highest seasonal water to the deepest point at which submerged aquatic vegetation can be sustained (i.e., the photic zone extending from shore to the substrate receiving one (1) percent of incident light); where there is a significant change in slope that results in changes to habitat and/or community structure; and where there is a significant change in the composition of the substrate (e.g., cobble to sand, sand to mud). In oceans, the littoral zone encompasses the photic zone of the neritic region. The photic zone is that part of the water that receives sufficient sunlight for plants to be able to photosynthesize. The neritic region is the shallow water or nearshore zone over the continental shelf.

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EPA is proposing to define the term ''reservoir'' to mean a natural or constructed basin where water is collected and stored (see § 125.83). Consistent with CWA section 104(n)(4), EPA is proposing to define the term ''estuary'' as all or part of the mouth of a river or stream or other body of water having unimpaired natural connection with open sea and within which seawater is measurably diluted with fresh water derived from land. As estuaries are strongly affected by tidal action, EPA's proposing to specify further that the salinity of an estuary exceeds 0.5 part per thousand (by mass), but is less than 30 parts per thousand (by mass) (see § 125.83). EPA is proposing to define the term ''tidal river'' to mean the most seaward reach of a river or stream where the salinity is less than or equal to 0.5 parts per thousand (by mass) at a time of annual low flow and whose a surface elevation responds to the effects of coastal lunar tides (see § 125.83). Finally, EPA proposes to define the term ''ocean'' to mean marine open coastal waters with salinity greater than or equal to 30 parts per thousand (by mass) (see § 125.83).[33] The Agency is not using the definition of ''ocean'' found at CWA 502(10) because that definition refers to the high seas beyond the contiguous zone and the marine environment within the contiguous zone. Impacts from cooling water intake structures are most likely to occur in ocean waters in the near coastal areas.

The design and capacity of the intake structure are important factors that affect the velocity or speed at which the water passes through the screen or other barrier at the entrance to the cooling water intake structure.

Under today's proposed rule, minimum flow and velocity requirements would be applied based on the actual placement of the cooling water intake structure within the particular water body types. Because different water body types have different potential for adverse environmental impact, the requirements proposed to minimize adverse environmental impact would vary by water body type. Some would include minimum requirements in addition to flow and velocity. For example, estuaries and tidal rivers have the highest potential for adverse impact because they contain essential habitat and nursery areas for many species. Therefore, these areas require the most stringent minimum controls including measures in addition to flow and velocity requirements. In contrast to estuaries and tidal rivers, some lakes have low productive areas such as the profundal zone, which would have low potential for adverse environmental impact, thus requiring lesser minimum controls to minimize adverse environmental impact.

Under some scenarios, depending on the type of water body or where the intake structure is located within the water body, EPA is proposing to require additional design and construction technologies that would increase the survival rate of impinged biota or to further reduce the amount of entrained biota.

In general, the capacity requirement would restrict the maximum flow a facility may withdraw to a percentage of the annual mean flow or volume of the water body. For rivers, an additional requirement would limit the capacity of the cooling water intake structure so that it withdraws no more than a certain percentage of the lowest average seven-consecutive-day low flow with an average frequency of once in 10 years (7Q10). In some circumstances, EPA would also restrict the capacity of the cooling water intake structure to a level commensurate with that which could be attained by a closed-cycle recirculating system using minimized make-up and blowdown flows. After location, the flow or capacity of a cooling water intake structure is the primary factor affecting the entrainment of organisms, which is often considered the most difficult impact to control. Organisms entrained include small species of fish and immature life stages (eggs and larvae) of many species that lack sufficient mobility to move away from the area of the intake structure. Limiting the volume of the water withdrawn (flow) from a source can limit the potential for these organisms to be entrained.

Section 316(b) authorizes EPA to impose limitations on the volume of the flow of water withdrawn through a cooling water intake structure as a means of addressing ''capacity.'' *In re Brunswick Steam Electric Plant,* Decision of the General Counsel No. 41 (June 1, 1976). Such limitations on the volume of flow are consistent with the dictionary definition of ''capacity'' [34], the legislative history of the Clean Water Act [35], and the 1976 regulations.[36] *Id.* Indeed, as Decision of the General Counsel No. 41 points out, the major environmental impacts of cooling water intake structures are those affecting aquatic organisms living in the volumes of water withdrawn through the intake structure. Therefore, regulation of the volume of the flow of water withdrawn also advances the objectives of section 316(b).

Today's proposed rule would also establish requirements that address velocity. For most locations, a design intake velocity requirement would restrict the through-screen or through-technology velocity to 0.5 ft/s. Intake velocity is one of the key factors that affects the impingement of fish and other aquatic biota. Velocity is easily addressed during the design and construction phase of a cooling water intake structure. The appropriate design of the intake structure relative to intake flow can minimize velocity. Alternatively, the facility can install certain hard technologies (*e.g.*, wedge wire screens and velocity caps) to change the configuration of the structure so that the effects of velocity on aquatic organisms are minimized. However, EPA is aware that some stakeholders have expressed concern with generally imposing national requirements on velocity and have argued that this may even restrict a facility's flexibility in designing an intake structure that minimizes adverse environmental impact while meeting the needs of the facility. EPA requests comment on its proposed velocity limitation of 0.5 fps, including information on specific situations or technologies for which this limit would pose a problem.

When the intake structure is located within the littoral zone, EPA would broaden the suite of technologies a facility would be required to employ, as well as increase the stringency of the requirements. This would improve the survivability of impinged organisms and reduce the rate of entrained organisms, thus furthering the statutory objective of minimizing adverse environmental impact. In these situations the additional minimal controls are necessary to minimize adverse environmental impact because the littoral zone is generally the area where aquatic organisms are the most abundant and most susceptible to impingement and entrainment.

[33] Salinity values are based on the Venice System, a well-known estuarine zonation system. See EPA, *Draft Estuarine and Coastal Marine Waters Bioassessment and Biocriteria Technical Guidance,* U.S. Environmental Protection Agency, Office of Water, July, 2000.

[34] ''Cubic contents; volume; that which can be contained.'' Random House Dictionary of the English Language, cited in Decision of the General Counsel No. 41.

[35] Legislative History of the Water Pollution Control Act Amendments of 1972, 93d Cong., 1st Sess., at 196–7 (1973).

[36] 40 CFR 402.11(c) (definition of ''capacity''), 41 FR 17390 (April 26, 1976).

Today's proposed rule would provide sound direction to permit writers that specifies minimum technology requirements, targeted to particular types of water bodies, for use in section 316(b) determinations. This would help the Directors implement consistent, protective decisions. The requirements proposed in today's proposed rule are protective on a national level. However, as further discussed at VIII.A.7., EPA recognizes that an individual facility might have a unique or site-specific environmental characteristic such that the national requirements might not achieve the objective of minimizing adverse environmental impact. For example, a migratory species traveling past a particular cooling water intake structure at a facility that does not cause adverse environmental impact in the absence of such migrations.

It is the Agency's intent that permitting authorities familiar with the unique situation in their areas have the flexibility, on a case-by-case basis, to implement additional measures under this proposal to achieve the core requirement of section 316(b), which is to minimize adverse environmental impact. Measures that the Agency deems appropriate would include, but not be limited to, seasonal flow restrictions that result in short term plant shutdowns during spawning or migration periods. Additional control measures also might be needed to address multiple intakes on a water body or the presence of regionally important species (*e.g.*, commercially and recreationally valuable species or aquatic organisms ecologically significant to the structure and function of local aquatic communities). See proposed § 125.84(f). In addition, consistent with existing NPDES program requirements, EPA also proposes that the Director must include permit requirements relating to the location, design, construction or capacity of a cooling water intake structure at a new facility necessary to ensure attainment of water quality standards. See proposed § 125.84(g).

EPA invites comments on all aspects of the proposed regulatory framework to implement section 316(b) so as to ensure that individual permit decisions result in the minimization of adverse environmental impact and attainment of water quality standards.

EPA recognizes that the foregoing approach differs significantly from the site-specific approaches used in the past in implementing section 316(b). For example, EPA has not previously attempted to establish minimum flow or velocity requirements for broad classes of water bodies. However, based in large measure on the Agency's experience in attempting to implement section 316(b) on a wholly site-specific basis, the Agency is today proposing this new approach.

The existing case-by-case approach to section 316(b) decision-making has proven difficult to implement for several reasons. A variety of different types of steam electric generating facilities and many different categories of manufacturing facilities (including pulp and paper manufacturers, chemicals and allied products manufacturers, petroleum and coal products manufacturers, primary metals manufacturers, and 14 additional categories) use cooling water and may potentially have cooling water intake structures.

The historical case-by-case approach requires significant resources on the part of the regulatory authorities that must implement section 316(b) requirements. The historical decision-making process requires that each regulated facility must develop, submit, and refine studies that characterize or estimate potential adverse environmental impact. Such studies can take several years to complete and require the support of a multi-disciplinary team. In addition, given the iterative nature of the assessment process, industry as well as EPA regional and State regulatory authorities must expend significant resources assessing study plans and methods for characterizing the environmental impact occurring at each facility and evaluating those data to determine what constitutes BTA for each specific facility. For example, the assessment of data needs and sufficiency might involve site visits, inspections, follow-up information gathering, and study review and modification. The resource requirements of the historical approach have also served as a disincentive to revisiting section 316(b) permit conditions during each renewal (typically every 5 years). Given that most facilities that use cooling water intake structures became operational before 1980, EPA believes this reluctance to fully reconsider permit conditions in light of new technologies is a significant concern. On the other hand, EPA also recognizes that some stakeholders believe that there are advantages to a site-specific approach. These stakeholders believe that the potential for a cooling water intake structure to cause adverse environmental impact, and the specific technology that would best minimize such impacts at reasonable cost is highly dependent on site-specific factors. These include waterbody characteristics, the specific locations of the structure, which species are present, weather, and other relevant factors. These stakeholders believe a site-specific approach such as that which has been used historically may allow stakeholders and permitting authorities to identify technology options for minimizing adverse environmental impact at a particular site at significantly less cost than would be possible through implementation of consistent requirements, within broad environmental categories, stringent enough to minimize adverse environmental impact at all sites. Many industry stakeholders have indicated that in their view the costs of producing comprehensive site-specific studies in support of 316(b) regulatory compliance, while significant, has been money well spent.

The historical case-by-case approach to section 316(b) decision-making also might result in permitting decisions that are less consistent than they would be if national requirements were in place. The case-by-case approach results in less predictability regarding what is or may be required for a particular facility, which makes planning difficult for industry and leaves regulatory agencies uncertain about the appropriate requirements for particular water bodies or facilities. Without Federal regulations, Directors and States must look to Agency guidance and past permit actions to inform their decisions. Absent national requirements, State officials often lack authoritative guidance for their own regulatory efforts. Only a few NPDES-authorized States have specifically addressed cooling water intake structure technology in statutes or regulations. Some States and EPA regions have required significant section 316(b) studies to be performed by facilities, whereas in other cases determinations have been based on limited actual background and ecological data. Some stakeholders believe that the need for consistency and guidance for State officials need not be addressed only through binding regulations. These stakeholders believe that comprehensive guidance, that provides needed technical and methodological support to permit writers and facilities alike can, to a large extent, fulfill the same function while at the same time preserving flexibility to adopt cost effective approaches to minimize adverse environmental impact at a particular site.

EPA has already received suggestions from Stakeholders that the Agency adopt a more case-by-case approach to this proposed rule. Therefore, the

Agency also invites comment on a rule framework that would resemble the framework the Agency proposed in the 1970s. EPA would implement section 316(b) on a case-by-case, site specific basis, but the Agency would establish specific decision criteria that the Director would have to consider when determining the appropriate BTA for minimizing adverse environmental impact. First the Director would determine whether an adverse environmental impact is or is not occurring. If an impact is occurring, the Director would consider a number of factors in determining what would constitute BTA and whether the facility is minimizing adverse environmental impact from cooling water intake structures. Regulatory language like the following could be used to implement this approach:

The director must determine whether a cooling water intake structure is minimizing adverse environmental impact based on the consideration of:

(1) The composition and vulnerability of the biological communities within the cooling water intake structure's zone of influence;

(2) The importance of the source water body to the surrounding biological community, including the presence of spawning sites, nursery/forage areas, and areas necessary for critical stages in the life cycle of aquatic organisms;

(3) Potential impingement of aquatic organisms based on the design intake velocity;

(4) Potential entrainment of small aquatic organisms based on the intake water flow;

(5) Existing or potential recreational, commercial, and subsistence fishing, including finfishing and shellfishing;

(6) Other factors relating to the adverse environmental impact of the intake, as may be appropriate.

EPA invites comment on the case-by-case approach to determine BTA for minimizing adverse environmental impact.

One variation on this approach that might well balance the need to provide clarity and consistency with the need to allow for some site-specific flexibility would be to establish a rebuttable presumption that the requirements of the proposed rule (or some other set of uniform national requirements based on this proposal) reflect BTA, but then allow a new facility, at its option and with the full burden of proof resting on the facility, to provide a demonstration that due to site-specific conditions at the site some alternative technology or suite of technologies would minimize adverse environmental impact. Under this approach, the facility would be required to demonstrate during the permit proceeding that the facility will minimize adverse environmental impact without complying with some or all of the proposed requirements relating to flow, intake velocity, and additional design and construction technologies. Requests for alternate technology requirements would need to be accompanied by data and information that demonstrate clearly and conclusively that the facility will minimize adverse environmental impact without complying with the proposed requirements. If EPA were to adopt this approach, EPA would provide guidance to facilities and permit writers on available alternative technology requirements and the type of site-specific conditions under which they may be appropriate to minimize adverse environmental impact, and on factors to consider in determining whether a proposed set of alternative requirements would minimize adverse environmental impact. EPA would also address the type of documentation facilities would need to provide in order to support a request for alternative technology requirements based on site-specific conditions.

If EPA adopted such an approach, language such at the following would be added to the regulation:

It shall be presumed that the requirements of § 125.84(a) through (e) reflect the best technology available for minimizing adverse environmental impact for all facilities to which this regulation applies. However, any new facility subject to these regulations may request that alternative technology-based requirements be imposed in the permit based on site-specific conditions. Alternative requirements shall be approved only if:

(1) There is an applicable requirement under § 125.84(a) through (e);

(2) Data and information specific to the facility and the affected environment demonstrate clearly and convincingly that the facility will minimize adverse environmental impact by complying with the alternative requirements; and

(3) The alternative requirements will ensure compliance with sections 208(e) and 301(b)(1)(C) of the Clean Water Act.

The burden is on the facility requesting the alternative requirements to demonstrate clearly and convincingly that they will minimize adverse environmental impact and that the other requirements of (1) through (3) above are met.

This rebuttable presumption framework might also be integrated with components of the other options for site-specific flexibility as suggested by some stakeholders and discussed in this preamble, including the option of allowing some kind of balancing of costs with environmental benefits as part of the demonstration that an alternative technology would minimize adverse environmental impact and/or allow restoration or mitigation as part of a site-specific BTA determination. EPA requests comment on the rebuttable presumption approach and how it might best be implemented. Specifically, EPA requests comment on types of site-specific conditions under which alternative technology requirements may be appropriate to minimize adverse environmental impact, factors that should be considered in determining whether a proposed set of alternative requirements would minimize adverse environmental impact, and specific methodologies for assessing adverse environmental impact.

In addition to today's proposal, EPA is considering an alternative based in whole or in part on a zero-intake flow (or nearly zero, extremely low-flow) requirement commensurate with levels achievable through the use of dry cooling systems. Under this alternative, a zero or nearly zero-intake flow requirement based on the use of dry cooling systems would be the primary regulatory requirement in either (1) all waters of the U.S.; (2) within tidal rivers, estuaries, and the littoral zone of freshwater rivers, lakes reservoirs and oceans; or (3) within tidal rivers, estuaries, and within or near the littoral zone of freshwater rivers, lakes, reservoirs and oceans. The Agency is also considering subcategorizing the new facility regulation based on types or sizes of new facilities and location within regions of the country since climate may be one factor affecting the viability of dry cooling technologies. In this scenario, the Agency would require flow rates commensurate with use of dry cooling systems for certain types or sizes of new facilities, and/or new facilities in certain locations, based on the costs, efficiency, and consumption of energy that may be associated with reducing withdrawals from waters of the U.S. to a level commensurate with those achieved by dry cooling systems.

Dry cooling systems (towers) use either a natural or mechanical air draft to transfer heat from condenser tubes to air. In wet cooling systems that employ conventional wet cooling towers, cooling water that has been used to cool the condensers is pumped to the top of a cooling tower; as the heated water falls, it cools through an evaporative process and warm, most air rises out of the tower, often creating a vapor plume. Hybrid wet-dry cooling towers employ both a wet section and dry section and reduce or eliminate the visible plumes associated with wet cooling towers.

Dry cooling towers have several advantages over wet cooling towers. They do not consume water through evaporation, have no wastewater discharge to affect water quality, do not cause drift of salt or other minerals, do not require the use and subsequent treatment of water conditioning chemicals or biocides, and do not create a vapor plume. Further, as plants employing dry cooling systems have no cooling water needs, they can be located near or in cities and other areas with great demand for electricity irrespective of the availability of large supplies of cooling water, thereby reducing costs and power losses associated with transmitting electricity over long distances. Dry cooling systems reduce the impingement and entrainment of aquatic organisms associated with cooling water use. For example, the State of New York estimates that compared to a wet/dry hybrid cooling system, use of a dry cooling system at a recently permitted 1,080 MW electricity generating facility would reduce projected annual fish mortality at the facility from 24,500 to 1,000 American Shad, from 1.9 million to 76,000 River Herring, from 1,200 to 50 Striped Bass, and from 23,000 to 950 White Perch.[37]

On the other hand, as dry cooling systems use air rather than water for cooling, dry cooling systems are generally less efficient than wet cooling systems. Dry cooling systems perform most efficiently in colder climates, where the temperature differential is greater between the process water and the air used for cooling, and are generally less efficient in warmer climates, though EPA is aware that such systems are currently operating under desert conditions where air temperatures frequently exceed 100°F for extended periods. Because dry cooling systems exhibit lower cooling efficiencies than wet systems, a dry cooling system would be larger than a wet system with a comparable cooling capacity. For example, a recent application filed with the State of New York for a 1000 MW power plant indicated that two air-cooled condensers would be needed to meet the cooling needs of the proposed project, each one approximately 160 feet by 430 feet and approximately 105 feet tall. For a wet-dry hybrid cooling system, two cooling towers would be needed, each one approximately 50 feet by 300 feet and 60 feet tall.[38]

[37] NYDEC, Interim Decision, Athens Generating Company, State of New York Department of Environmental Conservation, No: 4–1922–00055/00001, SPDES No: NY–0261009, June 2, 2000.

[38] Astoria Energy LLC Queens, New York Facility, Application for Certification of a Major Electric Generating Facility Under Article X of the New York State Public Service Law, Volume 1, June 2000.

Dry cooling systems can cost as much as three times more to install than a comparable wet cooling system. Dry cooling system operating costs have been reported to range from less than or comparable to wet systems to two or more times higher. For example, the Astoria Energy LLC Queens application filed with the State of New York indicated that a dry cooling system would cost $32 million more to install than a hybrid wet-dry cooling system and $29 million more than a once-through cooling system for a proposed 1000 MW plant. Operating costs would be $30 million less for the dry cooling system than the hybrid wet-dry system, and $19 million more than for a once-through cooling system.[39] The State of New York estimates that use of a dry cooling system at the recently permitted 1,080 MW Athens Generating Company facility would cost approximately $1.9 million more per year, over 20 years, than a hybrid wet-dry cooling system for a project with a total projected cost of approximately $500 million. In addition, dry systems generally are perceived to impose an energy penalty as compared to wet cooling systems. However, there is some uncertainty regarding the precise energy costs or penalty associated with the different types of cooling systems. For example, at the Athens Generating Company facility, New York State officials estimate a 1.4 to 1.9 percent reduction in overall plant electrical generating capacity as a consequence of using a dry cooling system versus a hybrid wet-dry system.[40] By contrast, the Astoria Energy Queens facility application estimates that a dry cooling system would save approximately 0.5 percent in energy costs as compared to a hybrid wet-dry cooling system. Other factors, including climatic conditions, may affect energy costs associated with a particular type of cooling system. It has been reported that plants using wet cooling systems in warm climates export more power than comparably sized plants using dry cooling systems. Likewise, a study of a pulverized coal plant in Denmark found net heat conversion efficiencies of 45.9 percent and 44.5 percent for the plant configured with a wet cooling tower and dry cooling tower respectively. This corresponds to an average energy penalty of about 3 percent for the dry cooling tower relative to the wet cooling towers.[41] Changes in energy consumption associated with dry cooling would result in changed fuel consumption and therefore may result in changed emissions of greenhouse gases.

[39] Astoria Energy LLC Queens Facility Application.

[40] NYDEC, Initial Post Hearing Brief, Athens Generating Company, L.P., State of New York, Department of Environmental Conservation, Case No. 97–F–1563, June 28, 1999.

The Agency is aware that at this time dry cooling systems are currently in use at over 60 electrical generation facilities world wide; over 50 of these facilities are in North America. Moreover, plants using dry cooling demonstrate a considerable variety in prime mover technology including combined cycle, co-generation, and steam turbine, as well as diversity in fuels used including coal, wood, methanol, natural gas and waste. The operational facilities range in size from 1 MW to a 645 MW facility. In addition, two facilities using dry cooling have been recently permitted but are not yet operational, one with a 580 MW capacity, the other (Athens Generating Company) with a 1,080 MW capacity. Further, EPA has information that applications for nine additional plants using dry cooling systems are pending. These plants range in capacity from 170 MW to 1,100 MW.

At this time the Agency does not have sufficient information to make a decision on whether to implement a zero or near zero intake-flow requirement that would effectively require the use of dry cooling technology. EPA is inviting comment on factors which may favor or disfavor the use of dry cooling systems including any cost information associated with any of these factors. The Agency also invites comment on whether and how dry cooling could be a basis for BTA requirements. In particular, the Agency invites comment on whether the Agency should consider subcategorizing facilities proposed for regulation today and requiring flows based on dry cooling for those facilities of a certain size or in certain locations where dry cooling is a viable technology at an economically practicable cost. For example, for the types and sizes of facilities in areas where dry cooling has been employed at facilities in operation, permitted, or slated for construction, the Agency might determine that dry cooling is the best technology available to minimize adverse environmental impact. EPA also invites comment on regulatory approaches of this type based on hybrid wet-dry cooling rather than dry cooling.

In developing the regulatory framework proposed today, EPA considered an alternative under which

[41] Gordon R. Couch, ''Coal-fired Power Generation—Trends in the 1990s,'' IEA Coal Research, London, UK, 1997.

facility operators might have the flexibility to ''trade'' among components of BTA to potentially achieve equivalent reductions in adverse environmental impact at lower cost. For example, a facility operator who reduced flow below the requirements specified in today's proposal might then have the opportunity not to reduce velocity as specified, or to install fewer additional design technologies. The Agency invites comment on all aspects of an approach that would allow trading among the components of BTA.

EPA also is considering a regulatory framework that would apply the BTA requirements proposed for estuaries and tidal rivers to all facilities, regardless of their location. This would ensure that the same stringent controls are the nationally applicable minimum for all water body types. In addition, all facilities would have to implement technologies that maximize the survival of impinged adult and juvenile fish and minimize the entrainment of eggs and larvae, and comply with additional requirements established by the Director. Some stakeholders assert that an approach that establishes a uniform, stringent set of national BTA requirements is the only one permissible under section 316(b) as all parts of all waters of the U.S. require stringent BTA requirements in order to minimize adverse environmental impact. These stakeholders believe that section 316(b) is wholly technology-based, that cooling towers are the best technology available for minimizing adverse environmental impact, and that therefore, cooling towers must be the basis for BTA requirements nationally.

EPA invites comment on all aspects of the regulatory framework and the other approaches discussed herein.

Some stakeholders have suggested an alternative regulatory framework in which section 316(b) implementation is accomplished through site-specific examination of the risk of adverse environmental impact and (assuming the cooling water intake structure poses some reasonable risk of adverse environmental impact) site-specific evaluation of potential BTA technologies.

Under one approach, the framework of the site-specific alternative would consist of three tiers. In Tiers 1 and 2, the facility, in consultation with the Director, would assess the potential for risk of adverse environmental impact associated with the proposed cooling water intake structure. Tier 1 would be both a screening and an assessment tier that relies on existing information that is site-specific or relevant to the adverse environmental impact determination. Tier 2 would focus on collection and analysis of additional information collection activities, as necessary, to make the adverse environmental impact determination. In Tier 3, which would assume that the Director has found that the cooling water intake structure is reasonably likely to pose risk of adverse environmental impact, the facility would assess BTA alternatives, including an evaluation of costs and benefits. In each tier, the facility would bear the burden of generating data and analyses.

In Tier 1, the facility would examine the risk of adverse environmental impact using certain types of existing information, such as fisheries management data, multimetric biocriteria results, operational and design specifications for the proposed cooling water intake structure, or other pertinent and reliable information. The initial steps in the Tier 1 analysis would be (1) review of cooling water intake structure design and proposed operations, (2) selection of ''designated important species,'' (3) definition of a study population of designated important species, and (4) identification of existing or readily available information sources.

Selection of designated important species would be site-specific, taking into consideration such factors as the species' likely involvement with the cooling water intake structure and the representativeness of the species in relation to the aquatic community. Selection of designated important species would consider commercially and recreationally important species, listed threatened and endangered species, species otherwise identified for protection or management, and food web species.

Based on existing information (where existing information is scientifically valid and adequate to evaluate the potential effects of the cooling water intake structure), including an assessment of the planned cooling water intake structure's characteristics, its geographic/hydrological setting, the nature of the biological community, or other factors, the facility would make an initial determination as to whether the information is adequate, representative, and indicative of a low risk of adverse environmental impact. If the Director agrees that there is a low risk, the proposed cooling water intake structure would be BTA. If the Director finds the existing information insufficient or finds that the risk of adverse environmental impact is not low, the facility would proceed to Tier 2.

In determining whether there is a risk of adverse environmental impact, the Director would consider the appropriate level of biological significance to the individual species, which would generally be the population level. The Director would consider whether the cooling water intake structure effects pose a risk to the viability of the designated important species populations and their ability to support existing ecosystem functions. This would include adequate protection of (1) the structure and function of the aquatic community, (2) commercially and recreationally important species, and (3) threatened or endangered species.

In Tier 2, the facility would conduct field studies for one of two purposes, following two separate tracks. In Track A, a facility might conduct special studies to provide adequate information to make a Tier 1 determination of its reasonable potential to cause adverse environmental impact. In Track B, the facility might conduct information collection activities (such as population modeling), as necessary, to make a Tier 2 determination as to whether the cooling water intake structure is reasonably likely to cause adverse environmental impact. The facility would have primary responsibility for study design and implementation, subject to securing approval of the Director prior to commencing any study. The facility would have the option of volunteering to perform restoration measures and having those measures taken into account in evaluating the risk of adverse environmental impact.

If a facility completes Tier 2 and the Director determines that the proposed cooling water intake structure is not reasonably likely to cause adverse environmental impact, the cooling water intake structure would reflect BTA. If, on the other hand, a facility completes Tier 2 and the Director determines that the proposed cooling water intake structure is reasonably likely to cause adverse environmental impact, in Tier 3 the facility would assess a reasonable range of BTA alternatives. Facilities would have the opportunity to evaluate potentially feasible cooling water intake structure technologies to address the specific adverse environmental impact, and also would have the opportunity to develop new cooling water intake structure technologies. At its option, a facility could perform a benefit/cost analysis of the BTA candidate technologies. Otherwise, it could decide to offer a cooling water intake structure technology or technologies as BTA based on an initial performance assessment of their characteristics. If a facility proceeds with the cost/benefit analysis, BTA would be determined through application of a ''reasonably proportional'' standard. Also, the facility could propose restoration measures to address the adverse environmental impact that could be used in place of, or as a supplement to, BTA.

Another site-specific approach suggested by stakeholders would allow new facilities applying for NPDES permits to have the option of performing studies necessary to make a site-specific BTA determination. This approach is comparable to the ''rebuttable presumption'' approach described above. The extent and nature of such studies would be determined by the proposed location of the cooling water intake structure vis-a-vis the location factors EPA has proposed as indicative of sensitivity. Proponents of this approach suggest that general study design requirements appropriate for different types of water bodies (*i.e.*, freshwater rivers, lakes, reservoirs, estuaries and tidal rivers, oceans, and the Great Lakes) and EPA could develop proposed intake structure locations, using information provided by state-of-the-art studies as conducted by the regulated community, research and academic institutions, government agencies, and others.

Under this alternative suggested by stakeholders, studies would be designed to predict likely entrainment and impingement effects, along with other environmental effects associated with a proposed cooling water intake structure configuration. The study would assess whether those predicted effects are of a magnitude such that the Director can conclude, after considering guidance that EPA would prepare, that the effects are not reasonably likely to be ''adverse'' to the affected aquatic population or community. In situations where the Director is unable to conclude, with reasonable certainty, that there is no reasonable likelihood of adverse environmental impact from the proposed cooling water intake structure configuration, he or she would compare the performance of the proposed alternative to the predicted performance of other reasonably available technologies relative to the design, location, construction, and capacity of the cooling water intake structure. The Director would also assess the costs and benefits (including the costs and benefits associated with other environmental effects) of those alternatives whose performance is comparable to that of the proposed alternative and would select as ''BTA'' that technology or technologies whose costs and benefits are reasonably related, taking into account the level of uncertainty in the available data. Consistent with this approach, EPA could develop guidelines for performing cost/benefit analyses that would minimize the need to collect extensive new data to characterize the value of resources for which there is not an existing market. These guidelines would facilitate reasonably consistent, cost-effective decisions under this approach.

This approach is premised on the conclusion that national standards and locational attributes alone cannot properly account for biological factors, which are inherently site-specific and that the best technology available for minimizing adverse environmental impact location also is site-specific. The stakeholders advocating this approach point out that among the factors that differ from site to site are the risk of entrainment and impingement posed by a given cooling water intake structure to different aquatic species and different life stages; site-and species-specific factors that affect the sensitivity of aquatic populations and communities to entrainment and impingement; the need to balance the possible benefits, at the population or community level, of reducing entrainment or impingement of a given species or life stage versus possible adverse effects of the same technology on other species or life stages; the need to consider and balance potential benefits (and costs) of the proposed cooling water intake structure technologies to aquatic resources versus potentially adverse (or beneficial) effects of those technologies on other aspects of the environment; and the possibility that the specific performance requirements imposed by EPA would preclude use of the most environmentally and economically cost-effective technology in some cases. It has also been suggested that today's proposed framework contains unnecessarily redundant measures for minimizing impingement and entrainment, and that in the past, including in previous rules and in guidance, EPA recognized the necessity of considering these factors on a site-specific basis.

Finally, it has been suggested that such an alternative will neither delay permitting of new facilities nor impose an undue burden on State and Federal permit writers, especially if EPA develops national guidance on the key issues (*e.g.*, the nature of adverse environmental impact, the nature and extent of site-specific effects studies, and cost/benefit analytical issues) that will ensure timely decisions and an appropriate level of consistency.

EPA requests comment on all aspects of the foregoing alternatives, and will give full consideration to each as it develops the final rule.

2. Location

EPA has long recognized that the location of a cooling water intake structure is one of the key factors that affects the environmental impact caused by the intake structure. When cooling water is withdrawn from sensitive biological areas, there is a heightened potential for adverse environmental impact and therefore a heightened concern. EPA has attempted in this proposal to identify the areas that are most biologically productive or otherwise sensitive and to ensure that the appropriate suite of technologies is applied to minimize adverse environmental impact in those areas.

The optimal design requirement for location is to place the inlet of the cooling water intake structure in an area of the source water body where impingement and entrainment effects on organisms are minimized (taking into account the location of the shoreline, the depth of the water body, and the presence and quantity of aquatic organisms or sensitive habitat). Although the most effective way to minimize adverse environmental impact associated with cooling water intake structures is to locate intakes away from areas with the potential for high productivity, the Agency recognizes that this is not always possible. Cooling water intake structures at new facilities located inside these sensitive areas would generally require controls to minimize adverse environmental impact.

EPA is proposing to require expansive BTA requirements in tidal rivers, estuaries, and the ''littoral zone'' of freshwater rivers, lakes, and reservoirs. In oceans, EPA is using the term ''littoral zone'' broadly to include the ''euphotic'' areas of ''neritic'' waters. These areas are the most productive of ocean environments. Neritic waters are those over the continental shelf, and they include the areas of marine fish and mammal migration. The euphotic zone of neritic waters includes those areas that are sufficiently shallow and clear to allow for light penetration sufficient to support primary productivity. The Agency proposes to define the term ''littoral zone'' to mean any nearshore area in a freshwater river or stream, lake or reservoir, or estuary or tidal river extending from the level of highest seasonal water to the deepest point at which submerged aquatic vegetation can be sustained (*i.e.*, the photic zone extending from shore to the substrate receiving one (1) percent of incident light); where there is a significant change in slope that results in changes to habitat and/or community structure; and where there is a significant change in the composition of the substrate (*e.g.*, cobble to sand, sand to mud). In oceans, the littoral zone encompasses the photic zone of the neritic region. The photic zone is that part of the water that receives sufficient sunlight for plants to be able to photosynthesize. The neritic region is the shallow water or nearshore zone over the continental shelf (see § 125.83). In general, the littoral zone defines the area where the physical, chemical, and biological attributes of aquatic systems promote the congregation, growth, and propagation of individual aquatic organisms, including egg, larvae, and juvenile life history stages. Appendix 1 illustrates a littoral zone defined by the deepest point at which submerged aquatic vegetation can be sustained.

Adverse environmental impact from entrainment can for many species be controlled or minimized in part by addressing factors associated with the location of the intake structure. Placement (horizontal and vertical) in the water body to avoid areas where these species or life stages occur would limit the number of organisms taken into the cooling water intake structure. Placing the intake structure where ambient flows or water body volume are sufficiently large in proportion to the proposed cooling water intake structure to minimize impact also addresses these factors.

For freshwater rivers, the littoral zone is the area along the shoreline that serves as the principal spawning and nursery area for many, but not all, species of freshwater fish. The shoreline habitat typically features both living and abiotic structures and a diverse community of invertebrates and fish. Most of the reproductive strategies of shoreline fish populations are similar to those found in the littoral zone of lakes and reservoirs. The fish of this zone typically follow a spawning strategy wherein the eggs are deposited in prepared nests, on the bottom, and attached to submerged substrate, where they incubate and hatch. As the larvae mature into fry and early juveniles, some species disperse to open water, while most others complete their life cycle in the littoral zone. Because these species do not employ a pelagic reproductive strategy, the eggs and larvae are not readily integrated into the drift component of the water column; this reduces the potential for entrainment. To minimize adverse environmental impact, the deepest open-water channel region of a river that is available for location of an intake structure should generally be used as a source of cooling water except where this area intersects with fish migratory routes.

For lakes and reservoirs, the littoral zone is the portion of the body of water extending from the shoreline lakeward to the deepest point at which submerged aquatic vegetation can be sustained (fringe of existing rooted plants). To minimize adverse environmental impact, the deepest open region of a lake that is available for location of an intake structure would often be the optimal location for cooling water intake, and the cooling water intake flow should not alter the natural thermal stratification of the lake. Natural thermal stratification means the naturally occurring division of a waterbody into horizontal layers of differing densities as a result of variations in temperature at different depths.[42] (Note, however, that such location is not the only mechanism for minimizing adverse environmental impact.)

For estuaries and tidal rivers, the most stringent minimum requirements would apply to the entire water body. The abundance and diversity of aquatic life within the estuarine and tidal river environment (composed of protected bays, sounds, and lagoons) are generally richer than those in any other water body type. These areas provide an abundance of habitat, food, and refuge for the development of the early life stages of the inshore and nearshore aquatic communities, including communities of meroplankton and holoplankton. The vast majority of commercially and recreationally important species of finfish and shellfish caught in the United States use and depend on estuaries and tidal rivers for completing their life cycles. Estuaries and tidal rivers are among the most complex of aquatic habitats, especially with respect to the environmental factors that affect the distribution patterns of fish eggs, larvae, and juvenile life stages. Many estuarine species have pelagic or planktonic larvae whose movement in and around the estuary, as well as vertically within the water column, is affected by the hydrodynamic characteristics of the estuary, environmental factors, and the evolved behavior of the organisms. Factors that affect the location and movement of aquatic organisms within estuaries and tidal rivers include tides and currents, salinity, dissolved oxygen, temperature, and suspended solids. Additionally, weather patterns, both short- and long-term, can influence the movement and location of aquatic organisms in estuaries and tidal rivers. As a consequence, the Agency is proposing, at a national level, to establish the most stringent requirements to minimize adverse environmental impact for all areas within estuaries and tidal rivers. The Agency developed cost estimates for this proposal, using the most comprehensive suite of technologies in all parts of tidal rivers and estuaries and, as discussed below, estimated that these costs would be economically practicable.

For oceans, the littoral zone (which is being defined as the photic zone of the neritic region) is the area outward from the shoreline beyond the low tide level including waters over the continental shelf. Where islands occur in the ocean, a littoral zone would extend out from the low tide level of the island shoreline. In the near and offshore areas, aquatic life is concentrated in convergence zones of major oceanic currents, within reefs, rocky bottoms, hard bottom ledges, and kelp beds.

EPA is proposing requirements based on the proximity of the intake structure to the littoral zone. For freshwater rivers (or streams) and lakes (or reservoirs), the Agency would specify three categories of requirements based on location criteria. The first category would establish requirements for a cooling water intake structure located at least 50 meters outside the littoral zone. Cooling water intake structures that meet this location criterion would have to meet the least stringent set of minimum requirements. The second category would establish minimum requirements for a cooling water intake structure located less than 50 meters outside the littoral zone. The third category would establish minimum requirements for a cooling water intake structure located in the littoral zone. EPA would establish only one set of minimum requirements for cooling water intake structures located in estuaries and tidal rivers. As discussed above, all parts of estuaries and tidal rivers have the potential for high biological productivity; therefore, the most stringent set of requirements and broadest suite of technologies would apply to cooling water intake structures located in these sensitive water body types. For oceans, the Agency is proposing two categories of requirements based on location criteria. One category addresses cooling water intake structures located outside the littoral zone; the other category addresses cooling water intake

[42] Extrapolated from *Academic Press Dictionary of Science and Technology,* ed, Christopher Morris, Academic Press, Inc., San Diego, CA, 1992.

structures located inside the littoral zone.

EPA decided to propose at least 50 meters outside the littoral zone as the location in which the least stringent set of requirements would apply. The Agency has concluded this is appropriate because the greatest numbers of aquatic organisms and their habitat are not typically present 50 meters outside the littoral zone and therefore will not be vulnerable to impingement and entrainment. EPA recognizes that some important species have critical life stage areas at various distances outside of a littoral zone, and solicits public comment on how best to deal with this species and site-specific variability. EPA also is considering distance criteria of 200 meters, 100 meters, and just outside the littoral zone. EPA solicits comment on these alternative distance criteria.

To address concerns about potential implementation issues associated with basing the regulatory requirements on site-specific determinations of the littoral zone, the Agency also is considering establishing a fixed distance from the shoreline instead of a fixed distance from the littoral zone to define the area in which the most stringent minimum requirements would be applicable. EPA solicits comment on the following criteria for distance from the shoreline: (1) 30 percent of the distance from shoreline to the opposing shore (*i.e.,* 30 percent of the water body width) for streams, rivers, lakes, and reservoirs and (2) 500 meters offshore for tidal rivers, estuaries, and oceans. Regulatory language such as the following could be used to implement this approach:

Littoral zone in a freshwater river or stream, lake, or reservoir means the nearshore area that extends 30 percent of the distance from one shoreline to the opposite shoreline (*i.e.,* 30 percent of the width of the waterbody at the point of measurement) and in a tidal river, estuary, or ocean means the nearshore area extending 500 meters from the shoreline.

3. Flow and Volume

As stated previously, flow is one component of capacity and capacity includes the maximum volume of water that can be withdrawn through a cooling water intake structure. Flow and volume are parameters that can be regulated to minimize adverse environmental impact. In particular, the magnitude of entrainment impacts is directly related to the capacity or intake flow (or volume) of cooling water intake structures. The adverse impact that results from entrainment of organisms occurs after the organism has entered the cooling water system, where it may be exposed to elevated temperatures, shearing forces, impact from mechanical equipment, swift changes in pressures, lack of dissolved oxygen, and chemicals. Once organisms are entrained, mortality and injury rates can be high.

One way to minimize the adverse environmental impact from entrainment is to minimize the flow or volume a facility withdraws. Therefore, today's proposed rule includes requirements that would limit cooling water intake design flow or volume at new facilities.

a. Flow Requirements for New Facilities With Cooling Water Intake Structures Located in Freshwater Rivers and Streams

Total design intake flow from all cooling water intake structures at a facility located in a freshwater river or stream must be no more than the lower of five (5) percent of the source water body mean annual flow or 25 percent of the source water 7Q10.

New facilities that have cooling water intake structures located in freshwater rivers or streams would have to meet a flow requirement that would limit the proportion of the design intake flow withdrawn by the facility compared to the flow of the water body in which the intake is located. Proposed § 125.84(b). Two proportional requirements are being proposed, and facilities would be required to meet the more stringent of the two.

The first of these requirements would limit the total design intake flow from all cooling water intake structures at the facility to five (5) percent of the annual mean flow of the water body. As previously noted, entrainment impacts of cooling water intake structures are closely linked to the amount of water passing through the intake structure because the eggs and larvae of many aquatic species are free-floating and may be drawn with the flow of cooling water into an intake structure. The five percent requirement would establish a maximum level for entrainment effects that, in all areas within 50 meters of the littoral zone, would be further reduced by additional requirements (such as requirements to reduce cooling water withdrawals, and additional design and construction technologies to further reduce impingement and entrainment). EPA estimates that the combination of these requirements (and the design intake velocity limitation for reducing impingement in almost all waterbody types) should result in protection of greater than 99 percent of the aquatic community from impingement and entrainment. This combination of requirements to establish a minimum level of protection for aquatic communities is analogous to the process employed by EPA's water quality-based regulatory programs for developing the necessary levels of protection to protect aquatic communities within the water body as a whole where impacts may occur. These requirements provide the minimum level of protection for designated uses that reflect the goals in section 101(a) of the CWA, *i.e.,* ''protection and propagation of fish and shellfish and wildlife and recreation in and on the water.'' As described elsewhere, the Director would have authority under this proposal to impose additional requirements on a site-specific basis in certain circumstances should the requirements proposed today not protect aquatic life from adverse environmental impact.

The Agency has considered other design intake flow levels in developing this proposal, including 1 percent, 10 percent, and 15 percent of the mean annual flow of the waterbody. With the exception of the 1 percent level, EPA concludes these levels would result in decreased protection. EPA solicits comment on these alternatives to five percent of the annual mean flow.

The second part of the flow requirement would limit the proportion of the total design intake flow to 25 percent of the source water body's 7Q10 flow. The 7Q10 is the lowest average seven-consecutive-day low flow with an average recurrence frequency of once in 10 years determined hydrologically. EPA estimates that limiting the proportion of a river or stream to 25 percent of the 7Q10, in conjunction with the other requirements proposed today, also should protect more than 99 percent of aquatic communities from adverse environmental impact. As explained above, this flow requirement, in combination with other requirements, would establish a minimum level of protection for aquatic communities analogous to that employed by EPA's water quality-based regulatory programs. The Agency invites comment on the use of other low-flow protection requirements, including a requirement that would limit cooling water intake structure capacity to 10 percent, 15 percent, 25 percent, or 35 percent of the 7Q10 low flow.

EPA has analyzed the potential siting implications of the proposed flow requirements and has determined that within the United States approximately 104,000 river miles have sufficient flow to support the water usage needs of large manufacturing facilities withdrawing up to 18 million gallons of water per day (MGD). Approximately 47,000 river miles could support a large nonutility power-producing facility withdrawing 85 MGD, and approximately 18,000 river miles could support a large utility plant requiring 700 MGD. Under today's proposed rule, large new facilities needing additional cooling water in other areas would need to supplement withdrawals from waters of the U.S. with other sources of cooling water, or redesign their cooling systems to use less water.

As another gauge of the siting impacts of the proposed flow requirement for new facilities, the Agency determined that 89 percent of existing non-nuclear utility facilities (from a 1997 database of the Energy Information Agency and a 1994 Edison Electric Institute database) would be able to be sited at their current location under today's proposed requirements if they also operated in compliance with the flow reduction requirements proposed today. (Please note that the Agency does not intend to prejudge or signal in any way whether its proposed rule for existing facilities will or will not include capacity limitations commensurate with a level that could be attained by a recirculating cooling water system. The purpose of the analysis was to determine whether today's proposed flow requirements would unreasonably limit siting alternatives for new facilities only.)

Finally, to further examine the potential siting implications of today's proposal for new facilities, the Agency reviewed data on water use by existing facilities in arid regions of the country. The Agency found that 80 percent of the existing facilities in Arizona, California, Nevada, New Mexico, Oklahoma, and Texas do not use waters of the U.S. in their operations, suggesting that new facilities in these areas would similarly use waters other than waters of the U.S. in their operations. Therefore, they would not be affected by today's proposal if they were being constructed as new facilities subject to the rule.

Based on these analyses, the Agency is proposing flow requirements as an economically practicable component of requirements for BTA to minimize adverse environmental impact.

b. Flow Requirements for New Facilities With Cooling Water Intake Structures Located in Lakes and Reservoirs

Total design intake flow from all cooling water intake structures at a facility located in a lake or reservoir must not alter the natural thermal stratification of the water body.

EPA is proposing that cooling water intake structures located in lakes or reservoirs not alter the natural thermal stratification of the water body. Proposed § 125.84(c). Under natural conditions the water in lakes and reservoirs is seasonally stratified: The coldest water is on the bottom, and the warmest water is at the surface. EPA proposes to limit the facility's design intake flow to a threshold below which it will not cause the alteration of the thermal (and hence the dissolved oxygen) structure of the lake or reservoir.

EPA is not proposing a proportional flow requirement for these facilities because the volume of the lakes and reservoirs on which they are located typically must be sufficient to accept their heated discharge and still maintain the efficiency of their cooling system. Because lakes and reservoirs typically do not have a strong current or flow, the volume of the water body must be great enough to dissipate the heat so that it is not recirculated back to the facility in its cooling water intake. However, EPA is proposing a requirement to protect the water body from alteration of the natural stratification, which can be caused by withdrawing large amounts of lower-temperature cooling water generally with low dissolved oxygen during the summer months. This would limit the intake flow of facilities that are located on a lake or reservoir to a capacity appropriate for the size of the water body, thus limiting the number of aquatic organisms impinged or entrained from the same water body.

The flow requirements specified in today's proposal are adequate to protect most lakes and reservoirs. However, EPA recognizes that there are unique situations, such as the Great Lakes, in which there are site-specific factors that may warrant more stringent requirements (as determined by the Director) to minimize adverse environmental impact. One of the primary concerns with lakes and reservoirs is that the withdrawal of cooling water should not alter the natural thermal stratification of the water body. Since the volume of water in the Great Lakes is quite large compared to the amount of water withdrawn for cooling purposes, it is highly unlikely that the thermal structure of these lakes would be influenced by cooling water withdrawals. However, the Great Lakes, like estuaries, have areas of high productivity and sensitive critical habitats that could be adversely affected by cooling water intake structures. The Agency recognizes that new facilities with cooling water intake structures in such water bodies might need more stringent requirements than those generally proposed here for lakes and reservoirs. Section 125.84(f) would provide the Director the authority under this proposal to address important site-specific factors that lead to the need for additional control measures.

c. Flow Requirements for New Facilities With Cooling Water Intake Structures Located in Estuaries and Tidal Rivers

The total design intake flow from all cooling water intake structures at a facility must be no greater than one (1) percent of the volume of the water column in the area centered about the opening of the intake with a diameter defined by the distance of one tidal excursion at the mean low water level.

EPA is proposing a proportional flow requirement for cooling water intake structures located in estuaries and tidal rivers that limits the total design intake flow to no greater than one (1) percent of the volume of the water column in an area centered about the opening of the intake with a diameter defined by the distance of one tidal excursion at the mean low water level. Proposed § 125.84(d).

The basis for this proposal is similar to that underlying the proposed requirements for new facilities with cooling water intake structures located in freshwater rivers and streams. EPA selected a one (1) percent threshold for estuaries and tidal rivers because they are extremely productive and sensitive biological areas. A more conservative approach is necessary to protect these types of water bodies. However, because estuary volumes are very large, allowing a withdrawal of one (1) percent of an entire estuary would potentially allow for the impingement and entrainment of a very large number of aquatic organisms. Limiting the withdrawal to one (1) percent of a volume defined using the tidal excursion is a more appropriate and conservative approach to minimize adverse environmental impact and would protect 99 percent of the organisms in the area influenced by the cooling water intake structure. As noted above, this requirement in combination with the other requirements would establish a minimum level of protection analogous to water quality protection levels in other EPA programs.

In addition, in natural systems species and populations that are impinged and entrained might not inhabit the entire estuary, or different species might inhabit different parts of the estuary. Therefore, EPA is proposing to use a smaller volume that relates more specifically to the cooling water intake structure and the area it influences. The volume being proposed for comparison to the intake volume is determined using the tidal excursion in the area of the cooling water intake structure. Tidal excursion is a measurement of the distance that a particle travels during one tidal cycle (see proposed definition at § 125.83). It would include the total of the distance upstream of the cooling water intake structure the particle would travel during the flood tide and the distance downstream it would travel during the ebb tide. By defining distances using the tidal excursion, the requirement would allow for a volume to be delineated by using the tidal excursion distance and drawing a radius (using the midpoint of the excursion distance) from one end of the excursion distance to the other. (See Appendix 2 to Preamble.) EPA invites comment on this approach.

d. Flow Requirements for New Facilities With Cooling Water Intake Structures Located in Estuaries and Tidal Rivers or the Littoral Zone in Other Water Body Types

You must reduce your intake flow to a level commensurate with that which could be attained by a closed-cycle recirculating cooling water system.

The reduction of the cooling water intake structure's capacity is one of the most effective means to reduce adverse environmental impact, especially in or near sensitive biological areas. EPA is proposing that facilities with intakes located in tidal rivers and estuaries; in the littoral zone of lakes, freshwater rivers, or oceans; or less than 50 meters outside the littoral zone of lakes, freshwater rivers, or oceans limit their flow to a level commensurate with that which could be attained by a closed-cycle recirculating cooling water system. Proposed §§ 125.84(b) through (e).

EPA concludes these facilities would require this additional level of control because of their proximity to potentially sensitive and highly productive biological areas. Closed-cycle recirculating cooling water systems are known to reduce the amount of cooling water needed and in turn to directly reduce the number of aquatic organisms taken into the cooling water intake structure. For the traditional steam electric utility industry, facilities located in fresh water areas that have closed-cycle recirculating cooling water systems can, depending on the quality of the makeup water, reduce water use by 96 to 98 percent from the amount they would use if they had once-through cooling water systems. Steam electric generating facilities that have closed-cycle recirculating cooling water systems using salt water can reduce water usage by about 70 to 96 percent when makeup and blowdown flows are minimized.[43]

Today's proposal would require that the intake flow withdrawn by a cooling water intake structure be reduced to a level commensurate with that which can be attained by a closed-cycle recirculating cooling water system by all cooling water intake structures at the facility. That level, in conjunction with the other requirements proposed today, would minimize adverse environmental impact and be economically practicable. Such flow reductions are a necessary component of the technology for minimizing adverse environmental impact in highly productive areas. In addition, EPA cost estimates show that this requirement is available to new facilities on a national level. EPA realizes that makeup water would be required because of losses within the system, including blowdown, evaporation, windage, and drift. The Agency invites comment on the use of a flow reduction requirement that requires the reduction of intake flow to level commensurate with that which can be attained by a closed-cycle recirculating cooling water system that has minimized makeup and blowdown flows.

To examine the extent to which new facilities are likely to reuse and recycle cooling water, the Agency reviewed the engineering databases that support the effluent limitations guidelines for several categories of industrial point sources. In general, this review identified extensive use of recycle or reuse of cooling water in documents summarizing industrial practices in the late 1970s and early 1980s, as well as increased recycling and reuse of cooling water in the 1990s. For example, the reuse of cooling water in the manufacturing processes was identified in the pulp and paper and chemicals industries, in some cases as part of the basis for an overall zero discharge requirement (inorganic chemicals). Other facilities reported reuse of a portion of the cooling water that was eventually discharged as process wastewater, with some noncontact cooling water discharged through a separate outfall or after mixing with treated process water.

This review has documented that recycle and reuse of noncontact cooling water is a common industrial practice to reduce both cooling water usage and overall water usage by manufacturing facilities. Facilities that reuse 100 percent of the water withdrawn from waters of the U.S. for cooling purposes would be considered to have achieved the flow reduction requirements (*i.e.,* reduce intake flow to a level commensurate with that which can be attained by a closed-cycle recirculation cooling water system that has minimized makeup and blowdown flows). In implementing today's proposed rule, EPA would consider reuse to be equivalent to a closed-cycle recirculating system. The Agency invites comment on the proposed approach for considering reuse of cooling water at manufacturing plants in lieu of recirculation as an alternative to meet the flow reduction requirement in today's proposal.

4. Velocity

The velocity of water entering a cooling water intake structure exerts a direct physical force against which fish and other organisms must act to avoid impingement or entrainment. EPA considers velocity to be one of the more important factors that can be controlled to minimize adverse environmental impact at cooling water intake structures.

To develop an appropriate, nationally protective minimum velocity requirement at cooling water intake structures, EPA reviewed available literature, State and Federal guidance, and regulatory requirements and found that a velocity of 0.5 ft/s has been used as guidance in at least three Federal documents.[44][45][46] The 0.5 ft/s threshold recommended in the Federal documents is based on a study of fish swimming speeds and endurance performed by Sonnichsen et al. (1973).[47] This study concluded that appropriate velocity thresholds should be based on the fishes' swimming speeds (which are

[43] The lower range would be appropriate where State water quality standards limit chloride to a maximum increase of 10 percent over background and therefore require a 1.1 cylce of concentration. The higher range may be attained where cycles of concentration up to 2.0 are used for the design.

[44] John Boreman, *Impacts of Power Plant Intake Velocities on Fish,* Power Plant Team, U.S. Fish and Wildlife Service, 1977.

[45] A.G. Christianson, F.H. Rainwater, M.A. Shirazi, and B.A. Tichenor, *Reviewing Environmental Impact Statements: Power Plant Cooling Systems, Engineering Aspects,* U.S. Environmental Protection Agency (EPA), Pacific Northwest Environmental Research Laboratory, Corvallis, Oregon, Technical Series Report EPA–660/2–73–016, October 1973.

[46] Willis King, ''Instructional Memorandum RB–44: Review of NPDES (National Pollutant Discharge Elimination System) Permit Applications processed by the EPA (Environmental Protection Agency) or by the State with EPA oversight,'' *Navigable Waters Handbook,* U.S. Fish and Wildlife Service, February 1973.

[47] John C. Sonnichsen, Jr., B.W. Bentley, G.F. Bailey, and R.E. Nakatani, *A Review of Thermal Power Plant Intake Structure Designs and Related Environmental Considerations,* Hanford Engineering Development Laboratory, Richland, Washington, HEDL–TME 73–24, UC–12, 1973.

related to the length of the fish) and endurance (which varies seasonally and is related to water quality). The data presented showed that the species and life stages evaluated could endure a velocity of 1.0 ft/s. To develop a threshold that could be applied nationally and would be protective of most species of fish and their different life stages, EPA applied a safety factor of two to the 1.0 ft/s threshold to derive a threshold of 0.5 ft/s. EPA recognizes that there are specific circumstances and species for which the 0.5 ft/s requirement might not be sufficiently protective and is aware that alternative requirements have been developed for these situations. For example, the National Marine Fisheries Service and the California Department of Fish and Game have developed fish screening criteria (velocity requirements) for anadromous salmonids that range from 0.33 ft/s to 0.40 ft/s.[48] [49] [50] There are also species for which a velocity of greater than 0.5 fps would still be protective.

Two velocities are of importance in the design of cooling water intake structures: the approach velocity and the through-screen or through-technology velocity. The approach velocity is the velocity measured just in front of the screen face or at the opening of the cooling water intake structure in the surface water source. This velocity has the most influence on an aquatic organism and its ability to escape from being impinged or entrained by the cooling water intake structure. The through-screen or through-technology velocity is the velocity measured through the screen face or just as the organisms are passing through the opening into another device (*e.g.,* entering the opening of a velocity cap). This velocity is always greater than the approach velocity because the net open area is smaller.

EPA is proposing to use the design intake velocity as a requirement relating to the design and capacity of a cooling water intake structure. The use of a design intake velocity requirement in this manner would ensure that intake structures have a velocity that contributes to minimizing adverse environmental impact. The Agency is proposing that head loss across the screens (or other appropriate measurements for technologies other than intake screens) be monitored and correlated with intake velocity to ensure that the facility is continually maintained and operated to minimize adverse environmental impact. Proposed § 125.87(b).

EPA is proposing to set the velocity requirement at 0.5 ft/s as a design through-screen or through-technology requirement. The Agency is proposing this requirement reflects BTA for the maximum design intake velocity of the cooling water intake structure. The Agency has reviewed the NewGen database and of those facilities potentially in the scope of today's proposed rule, the majority have design intake velocities of 0.5 ft/s or less. Moreover, EPA has determined that a considerable number of facilities that have commenced commercial operation in the past few years have design intake velocities of 0.5 ft/s or less. These currently operating facilities demonstrate that a design intake velocity of 0.5 ft/s is achievable and provides for sufficient cooling water withdrawal. EPA is not proposing the more stringent criteria of 0.33 ft/s and 0.40 ft/s, developed by NMFS and the State of California, respectively, because they would be overly protective for a national BTA requirement; however, they might be appropriate for more sensitive species or if required by the Director for a specific case. The Agency is also concerned that on a national basis a design intake velocity of less than 0.5 ft/s might not be achievable for large-volume withdrawals. In addition to a design intake velocity requirement, EPA would require new facilities to monitor the head loss across the screens or other technology on a quarterly basis. Proposed § 125.87(b). EPA is proposing that head loss across the screens (or other appropriate measurements for technologies other than intake screens) be monitored and correlated with intake velocity once the facility is operating.

The proposed regulation would require that the maximum design intake velocity at each cooling water intake structure at a facility be no more than 0.5 ft/s. Proposed §§ 125.84(b)–(e). The design intake velocity would be defined as the value assigned during the design phase of a cooling water intake structure to the average speed at which intake water passes through the open area of the intake screen or other device against which organisms might be impinged or through which they might be entrained. This is equivalent to the through-screen or through-technology velocity.

Some stakeholders suggest that mandatory, uniform velocity performance requirements are inappropriate as a means of minimizing adverse environmental impact because many site- and species-specific factors influence both the rate at which a given cooling water intake structure impinges aquatic life and the significance of any such impingement.

In particular, these stakeholders suggest that there are sound biological reasons why uniform velocity requirements are not appropriate. For example, these stakeholders point out that fish swim speed varies greatly by species and age of the individual and can also be affected by water temperature. Swimming speed is an important factor in determining the likelihood of impingement because it is a measure of the fishes' ability to escape from the area of the intake. They also point out that vertical and horizontal distribution of organisms in the water column (which might be linked to natural habitat preferences) might influence rates of impingement, as might levels of physiological stress that organisms experience before exposure to the cooling water intake structure.

In addition, stakeholders offer that there are hydrological and locational reasons why uniform velocity performance standards are not appropriate and why velocity standards should be established on a site-specific basis. For example, the risk of impingement at some locations, such as a riverine system, may exhibit a correlation to flow. Moreover, the risk of impingement may vary according to seasonal variations in flow, which may or may not coincide with the spawning/nursery seasons or other times of vulnerability for the potentially affected species. Thus, these stakeholders suggest that case-by-case velocity standards, that take into account the issues identified above, as opposed to mandatory, uniform velocity performance standards, may be a sounder approach for limiting impingement.

The Agency solicits comment on the proposed design intake velocity requirement, as well as on the relationship of swimming speed, other biological factors, and other elements (in addition to velocity) that relate to the risk of impingement. EPA is also considering and requests comment on a less stringent requirement such as 1.0 ft/s, and whether the requirement should be set based on an approach velocity or the through-screen or through-technology velocity. Finally, the Agency requests comment on allowing site-specific determinations of velocity without establishing a uniform national requirement, as discussed above.

[48] NMFS, *Juvenile Fish Screen Criteria,* National Marine Fisheries Service Northwest Region, 1995.

[49] NMFS, *Fish Screening Criteria for Anadromous Salmonids,* National Marine Fisheries Service, Southwest Region, April 14, 1997. Published on the Internet at http://swr.ucsd.edu/hcd/fishscrn.htm.

[50] California Department of Fish and Game, *Fish Screening Criteria,* April 14, 1997.

5. Additional Design and Construction Technologies

EPA is proposing that facilities whose cooling water intake structures are located in the littoral zone implement additional design and construction technologies that minimize impingement and entrainment of fish, eggs, and larvae and maximize survival of impinged adult and juvenile fish. Proposed §§ 125.84(b)–(e). The technologies that would need to be implemented are those that (1) minimize impingement and entrainment of fish, eggs, and larvae and (2) maximize survival of impinged adult and juvenile fish. However, EPA does not propose to mandate the use of any specific technology. Although EPA refers to those technologies as additional design and construction technologies, they are part of the suite of technologies proposed to minimize adverse environmental impact and are additional only in the sense that they would be required in some circumstances in addition to the technologies used to meet the velocity, flow, capacity, or other requirements.

Technologies that maximize survival of impinged organisms include but are not limited to fish-handling systems such as bypass systems, fish buckets, fish baskets, fish troughs, fish elevators, fish pumps, spray wash systems, and fish sills. These technologies either divert organisms away from impingement at the intake structure or collect impinged organisms and protect them from further damage so that they can be transferred back to the source water at a point removed from the facility intake and discharge.

Technologies that minimize impingement and entrainment of fish, eggs, and larvae might include, but are not limited to, technologies that reduce intake velocities so that ambient currents can carry the organisms past the opening of the cooling water intake structure; intake screens, such as fine mesh screens and Gunderbooms, that exclude smaller organisms from entering the cooling water intake structure; passive intake systems such as wedge wire screens, perforated pipes, porous dikes, and artificial filter beds; and diversion and/or avoidance systems that guide fish away from the intake before they are impinged or entrained.

EPA is proposing to require additional design and construction technologies to protect fish, eggs, and larvae when the cooling water intake structure is located inside the littoral zone because this is considered a sensitive area where spawning takes place and critical habitat is present. Such technologies are available to new facilities and further reduce environmental impact resulting from impingement and entrainment.

Because site-specific factors greatly influence the selection among various additional design and construction technologies, EPA proposes that permit applicants subject to this requirement because of the location of their intake structure perform a baseline assessment of the biological community at the proposed location of the cooling water intake structure and submit to the Director for approval a plan for installation and operation of appropriate additional design and construction technologies. Proposed § 125.86(b)(6).

EPA also solicits comment on whether certain minimum technologies might be appropriate in virtually all circumstances and should be required in final section 316(b) regulations. EPA realizes that this approach is a departure from other parts of today's proposal in which the Agency specifically refrains from mandating the use of a specific technology. However, EPA considers comment on this approach to be beneficial. For example, it might be possible to specify that all new facilities install additional design and construction technologies, such as fine-mesh screens, that in conjunction with the proposed velocity requirement would effectively reduce impingement at virtually all locations within or near the littoral zone. Alternatively, the Agency could establish performance standards based on the use of these technologies.

6. What Is the Role of Restoration Measures?

Restoration measures, as used in the context of section 316(b) determinations, include practices that seek to conserve fish or aquatic organisms, compensate for the fish or aquatic organisms killed, or enhance the aquatic habitat harmed or destroyed by the operation of cooling water intake structures. Such measures have been employed in some cases in the past as one of several means of fulfilling the requirements imposed by section 316(b). Examples of restoration measures that have been included as conditions of permits include creating, enhancing, or restoring wetlands; developing or operating fish hatcheries or fish stocking programs; removing impediments to fish migration; enhancing natural resources in an impacted watershed; and other projects designed to replace fish or restore habitat.

Restoration measures have been used, however, on an inconsistent and somewhat limited basis. Their role under section 316(b) has never been explicitly addressed in EPA regulations or guidance. Restoration projects have been undertaken as part of section 316(b) determinations predominantly at existing facilities and in permitting actions where the cost of the proposed technology was considered to be wholly disproportionate to the demonstrated environmental benefits to be achieved. Often such cases have involved situations where retrofitting with a technology such as cooling towers was under consideration.

Given the limits on the ability of direct control technologies (location, flow, velocity, and other requirements) to eliminate environmental harm in all circumstances, EPA is considering a variety of mandatory, discretionary, and voluntary regulatory approaches involving restoration measures. On the other hand, EPA also is considering specifying that restoration measures may not be part of a section 316(b) determination. EPA invites comment on the appropriate role of restoration, in any, under section 316(b).

a. Mandatory Restoration Approaches

Under the first approach that the Agency is considering, the use of restoration measures would be required as an element of a section 316(b) determination in all cases except where a new facility's cooling water intake structure is located at least 50 meters outside the littoral zone in a freshwater river or stream, or outside the littoral zone in a lake or reservoir. Locating cooling water intake structures in these less productive areas, in conjunction with other applicable requirements, generally would minimize adverse environmental impact. All other new facilities with cooling water intake structures would be required to implement some form of restoration measures in addition to implementing direct control technologies to minimize adverse environmental impact. Under this approach, new facilities would first implement the direct control technologies as specified in this proposed rule. They would then develop and implement, in coordination with the Director, a restoration plan that would further reduce and offset unavoidable impacts that remain after the implementation of direct control technologies. This is similar to the mitigation sequence used under CWA section 404, wherein environmental impacts are avoided and minimized prior to consideration of compensatory mitigation measures. The development of restoration measures applicable to a cooling water intake structure would focus on the unique situation faced by each facility and would allow for review and comment by the permitting agency and the public.

Under this approach, the permit application would define and quantify the need for restoration measures by estimating the adverse environmental impact that would remain after application of the location, design, construction, and capacity requirements specified for the type of water body in which the particular cooling water intake structure would be located. The permit would contain conditions, including a compliance schedule, that would require the permittee to develop and implement the approved restoration plan. Applicants would then assess alternatives for addressing these impacts and develop a draft restoration and monitoring plan for approval by the Director.

If EPA implemented this approach, it would add language to proposed sections 125.84(b)(2), (b)(3), (c)(2), (c)(3), (d)(1), (e)(1), and (e)(2) specifying, ''You must implement restoration measures''. Language such as the following also would be added to proposed section 125.86:

Restoration Measures. If you are required to comply with the requirements in § 125.84(b)(2), (b)(3), (c)(2), (c)(3), (d)(1), (e)(1), or (e)(2) to implement a restoration measure, you must develop a plan based on the results of the Source Water Baseline Biological Characterization required by § 125.86(a) and submit the plan to the Director for review and approval. The plan should document how you propose to implement restoration measures to replace organisms or enhance the habitat for the species that will be most susceptible to impingement and entrainment by the cooling water intake structures. The plan must contain the following:

(i) A narrative description of proposed restoration measures, the impacts from impingement and entrainment expected to remain after the measures have been implemented, and the technical basis for choosing those restoration measures. Include a discussion of the nexus between the estimated impingement and entrainment impacts from the cooling water intake structure and the proposed measures.

(ii) Design and engineering calculations, drawings, maps, and costs supporting the proposed restoration measures.

Beyond this framework, EPA invites comment on the process for developing and implementing the restoration plan or the content of a plan. The following example illustrates one possible process and set of substantive contents. The draft plan could be required to include an evaluation component and study that would be submitted to the permitting agency and natural resource agencies, and be made available to the public, before permit issuance. This draft plan would then be distributed to other agencies with relevant expertise for review and comment. The public also would be informed of the availability of the plan for review and comment. After considering comments provided by relevant agencies and the public, the applicant would develop a final plan and a response to comment document, which would be submitted to the Director for approval. Upon approval, the applicant would implement the restoration plan, including providing regular reports to the permitting agency and periodically verifying progress toward achieving the specific restoration goals included in the plan. The duty to develop and implement a restoration plan would be the permit applicant's.

Alternatively, EPA could require facilities to study the extent of impingement and entrainment after the actual implementation of direct control technologies, and require the development of a draft plan that addressed the study results in a manner similar to the approach described above.

b. Discretionary Restoration Approaches

A second approach would provide the Director with the discretion to specify appropriate restoration measures under section 316(b), but would not require that he or she do so. Under one version of this approach, restoration measures would be allowed in permitting new facilities only where the facility could demonstrate that the costs incurred to implement direct controls exceed a specified cost test. (See section VIII.C for discussion of the cost tests that are under consideration.) This approach is consistent with several precedents in which the permitting authority allowed the use of restoration measures where the cost to retrofit an existing facility's cooling water intake structures with control technologies was determined to be wholly disproportionate to the benefits the control technology would provide (*e.g.*, John Sevier, Crystal River, Chalk Point, Salem).[51]

A second version of this approach would allow, but not require, the Director to specify restoration measures to reduce the net level of impingement and entrainment so that adverse environmental impact caused by cooling water intake structures would be minimized. Under this approach, the use of restoration measures would supplement the imposition of performance requirements and direct controls. The performance requirements and direct controls would need to be implemented before restoration measures would be imposed.

c. Voluntary Restoration Approaches

Stakeholders have suggested a third type of restoration approach, under which the Director could consider restoration measures proposed voluntarily by permit applicants in the context of determining the extent to which location, design, and capacity requirements could be modified to reflect site-specific conditions while still ensuring that adverse environmental impact is minimized. Under this alternative, restoration measures could substitute for location, design, and capacity requirements, partially or completely, in appropriate cases. The need for restoration measures would be determined based on the magnitude of the environmental impact associated with the cooling water intake structure and the optimal balance between the use of direct controls and restoration measures to minimize the impact. Appropriate conditions relating to the voluntary restoration measures would be included in the permit. Such an approach would be designed to provide flexibility to the Director, the regulated community, and other interested parties to address the issues posed by cooling water intake structures on a site-specific, priority basis. This approach might result in incentives for permittees to develop more far-reaching projects, potentially providing benefits to a larger portion of a watershed and a broader range of aquatic and other species, and for longer periods of time.

Finally, stakeholders also have suggested that voluntary restoration measures should be applied to mitigate the effects of cooling water intake structures so that there is no basis for a determination of adverse environmental impact. They suggest that likewise, the statute does not preclude the consideration of the anticipated benefits from proposed restoration measures in evaluating the extent to which additional technology may be necessary, nor does it preclude the consideration of benefits associated with restoration measures implemented pursuant to previous permits, together with other relevant data, in evaluating whether adverse environmental impact currently exists.

Under any approach, there would be a nexus between the restoration measures employed and the adverse

[51] In re Tennessee Valley Authority John Sevier Steam Plant, NPDES Permit No. TN0005436 (1986); In re Florida Power Corp. Crystal River Power Plant Units 1, 2 & 3, NPDES Permit FL0000159 (1988); Chalk Point, MDE, State of Maryland, Discharge Permit, Potomac Electric Power Co., State Discharge Permit No. 81–DP–0627B, NPDES Permit No. MD0002658B (1987, modified 1991); Draft NJDEP Permit Renewal Including Section 316(a) Variance Determination and Section 316(b) BTA Decision: NJDEP Permit No. NJ0005622 (1993).

environmental impact caused by a cooling water intake structure. For example, if after implementation of direct control technologies an important species in the vicinity of the cooling water intake structure continues to be adversely affected by a cooling water intake structure, appropriate restoration measures would address the adverse effects on that species, perhaps through enhancement of other factors that affect the target species' ability to thrive or as a last resort, replacement of the fish killed or harmed.

Restoration plans could potentially use a ''banking'' mechanism similar to that used in the CWA section 404 program, that would allow the permittee to meet restoration requirements by purchasing ''credits'' from an approved ''bank.'' For example, should wetlands restoration be an appropriate mechanism for offsetting the adverse impact from the cooling water intake structure, the permittee could purchase credits from an existing wetlands mitigation bank. As in the section 404 program, public or private entities could establish and operate the banks. EPA views the use of ''banking'' for the purposes of this proposed rule as one way to facilitate compliance and reduce the burden on the permit applicant, while at the same time potentially enhancing the ecological effectiveness of the required restoration activities.

EPA also is considering an approach under which the use of restoration measures would not be allowed in section 316(b) permitting for new facilities. Critics of mitigation or restoration measures argue, among other things, that they are not effective in compensating for the specific impingement and entrainment losses caused by cooling water intake structures.

EPA requests comment on all aspects of the restoration approaches described in this notice. The Agency does not intend the foregoing discussion of restoration measures to affect any existing statutory, regulatory, or other legal authorities with respect to the use of restoration measures. The Agency also does not intend the foregoing discussion to affect any ongoing permit proceedings or previously issued permits, which should continue to be governed by existing legal authorities. The Agency will address the issue of restoration further as it develops the final rule.

7. Additional and Alternative BTA Requirements

At § 125.84(f), EPA is proposing that the Director have limited, discretionary authority to examine certain enumerated site-specific or unique characteristics and impose additional section 316(b) requirements. Such site-specific conditions would include location of multiple cooling water intake structures in the same body of water, seasonal variations in the aquatic environment affected by the cooling water intake structure controlled by the permit (*e.g.*, seasonal spawning or migration of anadromous fishes such as west coast salmonids), or the presence of regionally important species (*e.g.*, commercially and recreationally valuable species, and fish ecologically important to the structure and function of local fish assemblage such as important forage species).

At § 125.84(g), EPA is proposing that the Director must include any more stringent requirements relating to the location, design, construction, and capacity of a cooling water intake structure at a new facility that are necessary to ensure attainment of water quality standards, including designated uses, criteria, and antidegradation requirements. This proposal is based on section 301(b)(1)(C) of the CWA.

Finally, in developing the nationally applicable minimum requirements that are being proposed today, EPA has taken into account all the information that it was able to collect, develop, and solicit regarding the location, design, construction, and capacity of cooling water intake structures at new facilities. EPA concludes that these requirements reflect the best technology available for minimizing adverse environmental impact on a national level. In some cases, however, data that could affect these requirements might not have been available or might not have been considered by EPA during the development of this proposal. Therefore, the lack of any provision for deviation from nationally applicable BTA requirements could lead to large numbers of petitions requesting EPA to amend the rule as it applies to individual facilities or classes of facilities. This would be an extremely time consuming process for EPA, the regulated community, and other interested parties. Accordingly, EPA is proposing procedures that would allow for adjustment, during permit proceedings, of the requirements of § 125.84 as they apply to certain cooling water intake structures at new facilities.

Proposed § 125.85 would allow the Director, in the permit development process, to set alternative BTA requirements that are less stringent than the nationally applicable requirements. Under § 125.85(a), any interested person may request that alternative requirements be imposed in the permit. The Director also may propose alternative requirements in the draft permit upon making the findings indicated. Proposed § 125.85(a)(2) provides that alternative requirements that are less stringent than the requirements of § 125.84 would be approved only if compliance with the requirement at issue would result in compliance costs wholly out of proportion to the costs considered during development of the requirement at issue, the request is made in accordance with 40 CFR part 124, the alternative requirement requested is no less stringent than necessary, and the alternative requirement will ensure compliance with sections 208(e) and 301(b)(1)(C) of the Clean Water Act.

Because new facilities have a great degree of flexibility in their siting, in how their cooling water intake structures are otherwise located, and in the design, construction and sizing of the structure, cost is the only factor that would justify the imposition of less stringent requirements as part of the proposed alternative requirements approach. This is because other factors affecting the location, design, construction, and capacity of cooling water intake structures at new facilities can be addressed by modifications that may have cost implications. The Agency notes that in the somewhat analogous case of the new source performance standards that EPA establishes for the discharge of effluent from new facilities in particular industrial categories, alternate discharge standards are not allowed. However, because this proposed rule would establish requirements for cooling water intake structures at any type of facility in any industrial category above the flow threshold proposed today, it might be possible, in some instances, that the costs of complying with today's proposed requirements would be wholly out of proportion to the costs EPA considered and determined to be economically practicable. (See Section VIII.C. below, the economic and technical support document, and the economic and financial portions of the record for this proposal.) As discussed at Section VIII.C., EPA has analyzed the cost of compliance with today's proposed requirements for all facilities projected to be built in the reasonably foreseeable future, as well as other types of facilities that might be built at later dates (such as large base-load steam electric generating facilities that do not use combined-cycle technology) and concludes that these compliance costs would be economically practicable for all types of facilities the Agency considered. However, should an individual new facility demonstrate that costs of compliance for a new facility would be wholly out of proportion to the costs EPA considered and determined to be economically practicable, the Director would have authority to adjust BTA requirements accordingly.

Under proposed § 125.85(a), alternative requirements would not be granted on any grounds other than the cost of compliance, nor would they be granted based on a particular facility's ability to pay for technologies that would result in compliance with the requirements of § 125.84. Thus, so long as the costs of compliance are not wholly out of proportion to the costs EPA considered and determined to be economically practicable, the ability of an individual facility to pay to attain compliance would not support the imposition of alternative requirements. EPA invites comment on whether other factors should be added to proposed § 125.85(a). EPA also requests comment on an additional basis for establishing alternative, less stringent requirements, namely that the costs of compliance would be wholly disproportionate to projected environmental benefits. The 1977 Draft Guidance includes a similar provision. This wholly disproportionate cost test could be provided either instead of, or in addition to, the cost test being proposed today as part of § 125.85(a) (*i.e.*, costs wholly out of proportion to the costs EPA considered in the rule development).

Proposed § 125.85(a) would specify procedures to be used in the establishment of alternative requirements. The burden is on the person requesting the alternative requirement to demonstrate that alternative requirements should be imposed and that the appropriate requirements of § 125.85(a) have been met. The person requesting the alternative requirements should refer to all relevant information, including the support documents for this rulemaking, all associated data collected for use in developing each requirement, and other relevant information that is kept on public file by EPA.

EPA invites comment on all aspects of this proposal for establishing alternative BTA requirements.

Under an alternative approach, EPA would not provide for any deviation from the nationally applicable requirements. Some stakeholders have stated that the Clean Water Act requires that uniform BTA requirements be applicable nationally. Opponents of deviation from uniform national BTA requirements also believe that alternative requirements are especially inappropriate for new facilities, which they believe can be designed and sited to take the requirements of the new facility rule into account. EPA also invites comment on this alternative approach.

8. Other Approaches Being Considered by EPA

In addition to or in lieu of today's proposal for alternative BTA requirements (discussed above), EPA also is considering an approach that would require the Director to consider whether individual facilities might have site-specific characteristics that make one or more of these national BTA requirements insufficient to minimize adverse environmental impact. Such site-specific characteristics might include location of multiple cooling water intake structures in the same body of water, seasonal variations in the aquatic environment affected by the cooling water intake structure controlled by the permit (such as seasonal spawning or migration), the presence of regionally important aquatic organisms, or other relevant characteristics. If the Director determined that one or more of the national requirements does not minimize adverse environmental impact, the Director would be required to impose such additional measures as might be needed to ensure that the facility employs the best technology available for minimizing adverse environmental impact. Regulatory language such as the following could be used to implement this approach:

> The Director must consider whether individual facilities have site-specific characteristics that make one or more of the cooling water intake structure BTA requirements in § 125.84(a)–(e) insufficient to minimize adverse environmental impact. If the Director finds that the requirements of § 125.84(a)–(e) are insufficient to ensure that adverse environmental impact caused by a cooling water intake structure at a new facility will be minimized, he may impose additional requirements in the permit that are reasonably necessary to minimize adverse environmental impact.

EPA also is considering an approach under which the Director would have broad, discretionary authority to include permit conditions under section 316(b), in addition to the minimum requirements specified in today's proposal, that are reasonably necessary to minimize adverse environmental impact caused by a cooling water intake structure. The Director would not impose additional requirements if none are considered necessary; however, if a Director determines that the minimum requirements described above are not sufficient to minimize the specific adverse environmental impact associated with a particular cooling water intake structure, he or she would be authorized to include appropriate additional conditions in the permit or to deny the permit as warranted. This differs from the previous alternative in that under this alternative the Director would not be required to impose more stringent conditions. Also, in comparison to the proposed § 125.84(f), this approach would not provide a permit applicant with as much information to judge whether the Director is likely to impose additional requirements because the list of conditions the Director could consider would not be limited and enumerated. On the other hand, this approach would provide the Director with authority under this proposed rule to consider other unique and/or site-specific characteristics that might be important at a particular location to ensure that adverse environmental impact is minimized.

Finally, EPA is considering an approach under which the Director would have no section 316(b) authority to examine site-specific conditions and impose additional section 316(b) requirements. The Agency invites comment on each of these approaches to today's proposal and on the characteristics that a Director would consider in determining whether to impose additional section 316(b) requirements.

As discussed in item 7 above, today's proposal would allow the Director to specify alternative BTA requirements in limited circumstances. In addition, EPA is considering a variance alternative based on the use of innovative cooling water intake structure design and operation to minimize adverse environmental impact. The Agency is aware that existing and new facilities are using various designs for cooling water intake structures, which consist of passive and other innovative intake systems that use natural flow, gravity, some type of natural or artificial barrier, or some other feature to reduce impingement and entrainment. Examples include artificial filter beds, radial wells, porous dikes, and perforated pipes. (Because of inherent limitations, these designs might not work effectively at all facilities, such as high-flow facilities.) In some cases facilities that use these types of intakes can minimize their rates of impingement and entrainment to levels commensurate with those achieved under this proposed rule at a lower cost than conventional technologies would allow, yet these facilities might not meet all of the minimum requirements EPA is proposing. This approach would encourage the use of innovative technologies provided that such technologies minimize adverse environmental impact. If EPA implemented this approach, language such as the following could be added to the regulation:

In the case of any new facility that proposes to design or operate a cooling water intake structure in an innovative manner (for example, by using natural flow, gravity, a natural or artificial barrier, or other innovative feature to reduce impingement and entrainment), the Director may impose requirements in the permit based on the use of the innovative design feature or method of operation in place of the requirements specified in § 125.84(a)–(e), if the Director determines (1) that the alternative requirements will minimize impingement and entrainment of aquatic organisms to a level commensurate with the level that would be attained if the facility were subject to the requirements specified in § 125.84(a)–(e), and (2) that the innovative design feature or method of operation has the potential for industry-wide operation.

This option could also include a requirement for consultation with, or approval by, the Administrator.

EPA requests comment on these approaches. In particular, EPA requests comment on (1) whether the new facility rule should provide for any type of variance from the national BTA requirements or the proposed, limited opportunity to specify alternative BTA requirements; (2) the factors that should be considered in any such variance; (3) how BTA requirements based on the use of innovative technologies could be structured to encourage technological innovation and ensure that qualifying facilities would minimize adverse environmental impact; and (4) whether there is a design intake volume above which a variance for use of innovative technologies should not be available.

B. What Technologies Can Be Used To Meet the Regulatory Requirements?

EPA has identified a number of intake technologies available for installation at cooling water intake structures to minimize adverse environmental impact. The intake technologies identified include some that are currently in use at facilities with cooling water intake structures in the United States and some that are still being evaluated or simply not in use at any facilities in the United States. The intake technologies can be classified into four categories:

- Intake Screen Systems: single-entry, single-exit vertical traveling screens; modified traveling screens (ristroph screens); single-entry, single-exit inclined traveling screens; single-entry, double-exit vertical traveling screens; double-entry, single-exit vertical traveling screens (dual-flow screens); horizontal traveling screens; fine mesh screens mounted on traveling screens; horizontal drum screens; vertical drum screens; rotating disk screens; and fixed screens.
- Passive Intake Systems: wedge-wire screens, perforated pipes, perforated plates, porous dikes, artificial filter beds, and leaky dams.
- Diversion or Avoidance Systems: louvers, velocity caps, barrier nets, air bubble barriers, electrical barriers, light barriers, sound barriers, cable and chain barriers, and water jet curtains.
- Fish Handling Systems: fish pumps, lift baskets, fish bypasses, fish baskets, fish returns, fish troughs, and screen washes.

Under the proposed rule, facilities would be required to submit a plan that contains information on the technologies they propose to implement based on the result of a *Source Water Baseline Characteristics* study (see Section IX.A.1). Each of the methods identified above is discussed in further detail below. Technologies other than bar racks and traveling screens are typically used only by traditional steam electric utility power plants. For a more detailed description of the following technologies, refer to *Preliminary Regulatory Development Section 316(b) of the Clean Water Act, Background Paper 3: Cooling Water Intake Technologies (April 1994) and Supplement to Background Paper 3: Cooling Water Intake Technologies (September 30, 1996)* in the docket for today's proposed rule.

1. Intake Screen Systems

The technologies classified as intake screen systems are mainly devices that screen debris mechanically. Passive intake systems discussed in the next section, require little or no mechanical activity.

EPA has classified the following intake technologies as intake screen systems: single-entry, single-exit vertical traveling screens; modified traveling screens (ristroph screens); single-entry, single-exit inclined traveling screens; single-entry, double-exit vertical traveling screens; double-entry, single-exit vertical traveling screens (dual-flow screens); horizontal traveling screens; fine mesh screens mounted on traveling screens; horizontal drum screens; vertical drum screens; rotating disk screens; and fixed screens.

Intake screen systems have been found to be limited in their ability to minimize adverse aquatic impact. This does not mean that they do not aid in reducing some impingement and entrainment of adult and juvenile fish. However, conventional traveling screens (the most widely used screening device in the United States) and most of the other types of traveling screens have been installed mainly for their ability to prevent debris from entering the cooling system. Fish impinged on those screens often suffocate or are injured when washed off the screen. They may or may not even be returned to the water body. In many cases, many of the fish are lost; in some cases, all of the fish are lost.

Conventional through-flow traveling screens have been modified so that fish impinged on the screens can be removed with reduced stress and mortality. These modified traveling screens have been shown to be more effective than conventional screens at lowering fish impingement and mortality at several locations. Some facilities have used fine mesh mounted on traveling screens to minimize entrainment. However, the amount of reduction attributable to any of these devices has been found to depend on the species involved, the water body type, and the age or size of the species present.

2. Passive Intake Systems (Physical Exclusion Devices)

Passive intake systems are devices that screen out debris and biota with little or no mechanical activity required. Most of these systems are based on achieving very low withdrawal velocities at the screening media so that all but free-floating organisms avoid the intake altogether.

EPA considers the following intake technologies to be passive intake systems (i.e., physical exclusion devices): wedge-wire screens, perforated pipes, perforated plates, porous dikes, artificial filter beds, Gunderbooms, and leaky dams.

Wedge-wire screens appear to offer a potentially effective means of reducing fish losses. Testing of wedge-wire screens has demonstrated that fish impingement is virtually eliminated and that entrainment of fish eggs and larvae is reduced. However, the application of wedge-wire screens is limited to cooling water intake structures that withdraw lower volumes because of size limitations of the screens themselves. In fact, physical size is the limiting factor of most passive systems, thus requiring the clustering of a number of screening units. Siltation, biofouling, and frazil ice also limit locations where passive intake systems can be used. In addition, most of the research for the reduction of entrainment has concentrated on the intake of relatively small quantities of water, in the range of 28 to 56 million gallons per day, typical of the make-up water supply of large closed-cycle recirculating cooling water systems and of nuclear power plant service water systems.

3. Diversion or Avoidance Systems

Diversion or avoidance devices are also called behavioral barriers. These devices are designed to take advantage of the natural behavioral patterns of fish so that the fish will not enter an intake structure. Diversion devices either guide aquatic organisms such as fish, crabs, and shrimp away from an intake structure or guide them into a bypass system so that they are directed or physically removed from the intake area. An example of a diversion device is the louver. Avoidance devices, on the other hand, are used to make the intake unattractive to aquatic organisms so that they avoid the area of the intake altogether. Sound barriers are a typical avoidance device. They create sounds that the aquatic organisms do not like, forcing them to avoid the intake area. Unlike the screening and physical exclusion devices already discussed, behavioral barriers are used specifically to keep fish and other motile organisms from entering the intake system. Like the technologies discussed above, these devices are not always used to protect fish and organisms. They might be used to protect equipment at the facility that could become fouled and require more maintenance if aquatic organisms are allowed to enter the intake.

EPA considers the following intake technologies to be fish diversion and avoidance systems: louvers, velocity caps, barrier nets, air bubble barriers, electrical barriers, light barriers, sound barriers, cable and chain barriers, and water jet curtains.

Diversion or avoidance systems do not protect organisms or fish that are nonmotile (i.e., those that are free-floating or cannot move themselves about) or in early life stages because they rely on behavioral characteristics. Therefore, the effectiveness and performance of the devices are species-specific. In addition, many of the diversion or avoidance devices are appropriate only for seasonal entrainment problems. To evaluate the applicability of these technologies, site-specific testing would be required at most sites where these devices are to be used.

4. Fish-Handling Systems and Other Technologies

Fish-handling systems and other technologies are used alone or in conjunction with screening systems for the protection of aquatic life. EPA considers the following intake technologies to be fish-handling systems: fish pumps, lift baskets, fish bypasses, fish baskets, fish returns, fish troughs, and screen washes. These technologies can be used alone or in a series such as fish buckets, fish troughs, and a spray wash system. Fish-handling technologies are used to remove fish that congregate in front of a screen system or to divert them to holding areas. Fish that congregate near screens are removed from the area by fish pumps, lift baskets, fish troughs, and fish returns and are returned to open waters, reducing impacts on the aquatic community.

C. How Is Cost Being Considered in Establishing BTA for New Facilities?

For today's proposed rule, EPA has considered four cost tests that could be used to evaluate the costs that would be associated with this proposal are reasonable in relation to the environmental benefits to be derived. The Agency used one of these tests as a basis for determining on a national level that the proposed requirements would be economically practicable.

Although section 316(b) does not explicitly state that costs must be considered in determining appropriate cooling water intake structure controls, EPA has long recognized that there should be some reasonable relationship between the cost of cooling water intake structure control technology and the environmental benefits associated with its use. As the preamble to the 1976 final rule implementing section 316(b) stated, neither the statute nor the legislative history requires a formal or informal cost-benefit assessment. 41 FR 17387 (April 26, 1976). The 1976 preamble also noted that the legislative history of section 316(b) indicates that the term "best technology available" should be interpreted as "best technology available commercially at an economically practicable cost." [52] This position reflects congressional concern that the application of best technology available should not impose an impracticable and unbearable economic burden.

EPA concludes that a formal cost test is appropriate in determining "best technology available commercially at an economically practicable cost." In determining the most appropriate cost test, the Agency considered (1) the wholly disproportionate cost test, (2) the compliance cost/revenue test, (3) the compliance cost/construction cost test, and (4) the compliance cost/discounted cash flow test. EPA also considered two methods for implementing these cost tests: a case-by-case or a national determination.

Under the wholly disproportionate cost test, a cooling water intake structure technology would not be deemed to reflect BTA if the incremental costs of requiring the use of that technology are wholly disproportionate to the environmental benefits to be gained through its use. Several section 316(b) administrative decisions have stated that this test is the most appropriate for determining economic burden.[53] This is also the approach adopted discussed in the 1977 Draft Guidance.

Historically, the cases in which costs have been determined to be wholly disproportionate have involved existing facilities that have been required to retrofit their cooling water intake structures to implement BTA. Given the characteristics of the regulated industries, such retrofitting to meet BTA often meant requiring the installation of cooling towers along with necessary modifications to the plant and significant capital expenditures and down time required for installation. In contrast, new facilities would not incur retrofit costs. Rather, new facilities would incur only the cost of any incremental difference between their planned cooling water intake structure technology and that required under a rule based on today's proposal. Given that many new facilities are designing their cooling water intake structures in a manner consistent with today's proposed BTA requirements, EPA concludes that these incremental costs are unlikely to be large.

A limitation of using the wholly disproportionate test for new facilities, on either a national or case-by-case basis, is that the impingement and entrainment estimated before a facility is built can be very imprecise. There are numerous documented cases among existing facilities in which the rates of

[52] *See* 118 CONG. REC 33,762 (1972), *reprinted in* 1 Legislative History of the Water Pollution Control Act Amendments of 1972, at 264 (1973) (Statement of Representative Don H. Clausen).

[53] See, *In the Matter of Public Service Company of New Hampshire,* 10 MRC 1257 (6/10/77)(The Seabrook II Decision); Brunswick I, Region IV, EPA 3 (Nov. 7, 1977) (Initial Decision re: Permit No. NC007064); *In re* Tennessee Valley Authority, John Sevier Steam Plant: NPDES Permit No. TN0005436 (Jan. 23, 1986); *In re* Florida Power Corp., Crystal River Power Plant Units 1, 2, & 3:NPDES Permit No. FL0000159 (Sept. 1, 1988).

impingement and entrainment rates predicted by the facility were substantially lower than the impingement and entrainment that actually occurred during operation. Brayton Point is an example of the underestimation of impacts that can occur.[54] Because of the difficulty in prospectively estimating impingement and entrainment rates at new facilities, EPA has chosen not to use the wholly disproportionate cost test to estimate the impact of today's proposal.

EPA also considered three economic achievability tests. First, EPA considered a compliance cost/revenue test to assess economic achievability by comparing the magnitude of annualized compliance costs with the revenues the facility is expected to generate. This is an appealing test because it compares the cost of reducing adverse environmental impact from the operation of the facility with the economic value (i.e., revenue) the facility creates. Under this alternative, EPA would establish a threshold to identify when annual compliance costs constitute a disproportionate percentage of projected annual income. This test could be implemented on a national or case-by-case basis because a firm should have an estimate of expected revenues when it applies for a loan to build a new facility.

EPA also considered a compliance cost/construction cost test to assess economic impacts associated with complying with this proposed rule. This test compares compliance costs with the capital costs of building the facility. Compliance costs would include all those costs incurred by new facilities to meet the requirements of the proposed rule. The compliance cost/construction test is appealing because it shows the percentage increase in the total cost of getting the facility operational as a result of the section 316(b) regulations, providing a perspective on the relative magnitude of compliance requirements. Under this alternative EPA would establish standards that identify when initial section 316(b) compliance costs constitute a disproportionate percentage of total facility construction costs. This test has the advantage of being easy to perform on a case-by-case basis because it is based on engineering and construction costs and therefore is more precise than the other tests such as the discounted cash flow test. On the other hand, there are drawbacks to applying this test nationally. Information on average construction costs of new electric generating facilities is available from the Energy Information Administration (EIA), but this information is not available for other industries nor is it transferable across industries. Additional site-specific information on construction costs for planned cooling water intake structure generators is available from public sources. However, there are considerable inconsistencies in what components of capital costs are reported. As with Energy Information Administration-reported average construction costs, this information is generally available only for new steam electric generating facilities, not for other manufacturing facilities.

The final alternative EPA considered is a compliance cost/discounted cash flow test to determine economic achievability. Discounted cash flow is present discounted value of future cash flow. This test is useful because it examines the effects of compliance with today's proposed rule on the facility's cash flow. Although a discounted cash flow test can be performed for existing facilities, on both a national and case-by-case basis, this test is not appropriate for new facilities because of a lack of available data and the analytic requirements it would impose. Because new facilities do not have a cash flow prior to operations, this test would require more estimation and would be far less precise than the other tests.

EPA used the compliance cost/revenue test to determine whether today's proposed section 316(b) requirements are economically practicable. This test uses the ratio of annualized compliance costs to estimated annual revenues to assess impacts on new facilities. The Agency is proposing this as the most appropriate test to evaluate economic practicability for several reasons. First, EPA has extensive experience using this test. For example, under the Regulatory Flexibility Act, the Agency uses this test as a screening tool (along with the number of facilities expected to be affected) to determine whether a detailed analysis of impacts on small entities is necessary. EPA also frequently uses this test to evaluate economic impacts in the effluent guidelines program. Second, the data needed to perform the test are available or can be readily projected, whereas the data required to conduct the compliance cost/construction cost test and the compliance cost/discounted cash flow test are not available or are more difficult to obtain. Third, this test provides a reliable measure of whether costs are ''economically practicable.''

EPA calculated compliance costs for projected new steam electric generating and manufacturing facilities and applied screening tests to assess the impacts of those costs on the economic viability of the new facilities. The results of EPA's economic impact analysis indicate that the compliance costs of this proposal are generally small compared with the estimated revenues of the affected facilities, ranging from 0.1 percent to 4.2 percent of revenues for steam electric generating facilities and less than 0.1 percent to 8.8 percent of revenues for manufacturing facilities. Only two of the 35 projected new manufacturing facilities were estimated to incur annualized compliance costs greater than one percent of annual revenues. For steam electric generating facilities, EPA also found that compliance costs as a percent of construction costs are small. The total capital costs and cost of initial permitting for steam electric generating facilities ranged between less than 0.1 percent to 0.3 percent of the overall cost of plant construction. These results indicate that the proposed requirements are economically practicable, and are achievable by the affected new facilities.

The Agency also has determined that the proposed rule would not have an adverse economic impact on industry as a whole. EPA finds that the proposed rule is economically practicable and achievable nationally because a very small percentage of facilities are expected to be affected by the regulation and the impact on those that would be affected would be small.

The electricity generating industry would not be significantly affected by today's proposal. Today's proposed rule only affects electric generating facilities that generate electricity with a steam prime mover. Although these facilities constitute approximately 75 percent of the total electric generating industry, approximately 88 percent of the new facilities that do have a steam-electric prime mover and for which EPA was able to obtain cooling water information would not be subject to this regulation because they do not withdraw cooling water from waters of the U.S. or because they are not required to have an NPDES permit. In general, the Agency concludes that economic impacts on the electric generating industry from this proposed rule would be economically practicable because facilities required to comply with the proposed requirements would have the opportunity to be redesigned to avoid or minimize costs.

The costs to new manufacturing facilities also would not be significantly

[54] Mark Gibson, ''Comparison of Trends in the Finfish Assemblages of Mt. Hope Bay and Narragansett Bay in Relation to Operations of the New England Power Brayton Point Station,'' Rhode Island Division Fish and Wildlife, Marine Fisheries Office, June 1995 and revised August 1996.

affected by today's proposed regulation also would be economically practicable. An analysis of the data collected using the Agency's section 316(b) Industry Screener Questionnaire indicates that in the industry sectors with at least one new facility that is subject to this proposed rule, only 364 of the 2,037 existing facilities targeted, or 17.8 percent, have an NPDES permit and directly withdraw cooling water from waters of the U.S. Of these 364 facilities, only 232 facilities are estimated to withdraw more than two (2) MGD. In addition, new facilities can be expected to have less costly alternatives for complying with the proposed rule than would existing facilities for which location, design, construction, and capacity decisions have already been made . Existing facilities might require retrofitting if subject to the same requirements proposed today.

As discussed above, the Agency evaluated the costs and impacts of the section 316(b) requirements proposed today on a national level. The Agency has determined that the incremental costs of installing the BTA requirements proposed today are economically practicable at a national level, although EPA recognizes that costs could be significant for individual facilities. EPA believes that evaluating costs and impacts on a national level is most appropriate for a proposed rule that establishes minimum section 316(b) requirements for large numbers of new facilities nationally. This approach at a national level would significantly reduce the burden on permit writers because they would then not be required to implement a cost test when developing appropriate permit conditions to implement the proposed national requirements on a facility-specific basis. However, as noted above, EPA is also requesting comment on several regulatory options under which costs and benefits could be considered on a case-by-case basis in determining BTA.

EPA invites comment on all aspects of the proposed cost test and the Agency's proposal to assess the impact of today's proposed rule on a national level.

IX. Implementation

Under the proposed rule, section 316(b) requirements would be implemented in an NPDES permit. The regulations would establish application, monitoring, recordkeeping, and reporting requirements for new facilities. The proposed rule would also include requirements for Directors in developing NPDES permits for new facilities. The proposed rule states that the Director, at a minimum, must include in the permit the cooling water intake structure requirements at § 125.84, monitoring conditions at § 125.87, and recordkeeping and reporting requirements at § 125.88.

EPA will develop a model permit and permitting guidance to assist Directors in implementing these requirements. In addition, the Agency will develop implementation guidance for owners and operators that will address how to comply with the application requirements, the sampling and monitoring requirements, additional technology plans, and the recordkeeping and reporting requirements in these regulations.

A. What Information Must I Submit to the Director When I Apply for My New or Reissued NPDES Permit?

The NPDES application process under 40 CFR 122.21 requires that facilities submit information and data 180 days prior to the commencement of a discharge. If you are the owner or operator of a facility that meets the new facility definition, you would be required to submit the information required under § 125.86 of today's proposed rule with your initial permit application and with subsequent applications for permit reissuance. The Director would review the information you provide and, based on the approach discussed in Section IX.B, would determine whether your facility is a new facility and establish the appropriate requirements to be applied to the cooling water intake structure(s).

Today's proposal would require you to submit four categories of information when you apply or reapply for your NPDES permit: (1) Results of the Source Water Baseline Biological Characterization study; (2) source water physical data; (3) cooling water intake structure velocity and flow data; and (4) data to show compliance with the flow requirements, velocity requirement, flow reduction requirement, and additional technology requirements. In addition, if you are seeking an alternative requirement under § 125.85, you must submit a fifth item: Data that demonstrate that your compliance costs are wholly out of proportion to the costs considered by EPA in establishing by EPA in establishing the requirements of § 125.84(a) through (e). You must begin to collect data for the Source Water Baseline Biological Characterization study at least 1 year prior to submitting your application to the Director. If you are required to submit a sample plan (*i.e.,* your cooling water intake structure is located inside or less than 50 meters outside the littoral zone of the water body), you must submit your sample plan for review and approval or disapproval to the Director at least 90 days before any sampling activities are scheduled to begin. An example schedule of when the activities associated with a facility's permit application might be performed is provided in Exhibit 2.

EXHIBIT 2.—EXAMPLE OF SCHEDULE FOR PERMIT APPLICATION ACTIVITY

NPDES permit application activity	Days prior to commencement of operation
Submit sampling plan for Source Water Baseline Biological Characterization.	635
Begin sampling for Source Water Baseline Biological Characterization.	545
Submit permit application	180

1. Source Water Baseline Biological Characterization Data

Proposed § 125.86(a) would require baseline ambient biological data in the form of a Source Water Baseline Biological Characterization. This study would establish an initial baseline for evaluating potential impact from the cooling water intake structure before the start of operation. In addition, you would be required to reevaluate the study and perform additional ambient monitoring before submitting an application for the reissuance of the permit to establish or reestablish the baseline for the next permit term. The Director would use the study to identify the species most susceptible to impingement and entrainment, their life stages, their abundance in the source water, and their environmental requirements and habitat.

Proposed § 125.86(a) also would require you to submit the results of a Source Water Baseline Biological Characterization at the time of your NPDES permit application. As part of the Source Water Baseline Biological Characterization, if you must implement additional design and construction technologies, you would be required to collect data over a period of one year. Before you start any sampling for the study, you would be required to submit a sampling plan to the Director for review and approval. The proposed rule would require you to submit the sampling plan 90 days before you intend to start the study. You are encouraged to make the sampling plan available to the following entities for review and comment: Federal agencies such as the U.S. Fish and Wildlife Service, the National Marine Fisheries

Service, and the U.S. Army Corps of Engineers; appropriate State fish and wildlife agencies; local fish and wildlife organizations or advocacy groups; and the public. If such coordination and public involvement is conducted, you should identify and indicate the results of this effort in your application submission to the Director. Public involvement in developing the sampling plan would facilitate the Director's review and approval of the plan.

In addition, § 125.86(a)(3) would require that you identify all threatened and endangered species that might be susceptible to impingement and entrainment. The Director might coordinate a review of your list with the U.S. Fish and Wildlife Service and/or National Marine Fisheries Service staff to ensure that potential impacts to threatened and endangered species have been addressed.

The study would begin with a site-specific, preoperational baseline assessment to determine the presence of fish and shellfish (eggs, larvae, post larvae, juveniles, and adults) in the surface water serving the cooling water intake structure. Their presence during the course of a year would need to be documented in terms of the kinds, numbers, life stages, and duration of occurrence in the source water in close proximity to the proposed location of the cooling water intake structure. This information would identify the community of fish and shellfish that would potentially be subject to impingement and entrainment effects. Information supporting this documentation would likely be derived from new, site-specific studies and possibly from historical records applicable to the water body serving the proposed cooling water intake structure. In all cases, the data to be used would need to be appropriately certified through established quality assurance procedures.

The Source Water Baseline Biological Characterization would serve two purposes. First, the Director would use the study to identify species and their relative numbers potentially subject to intake effects following implementation of the location, flow, and velocity requirements. Then during each permit reissuance cycle, the Director would compare the preoperational ambient data with the post operational data to evaluate the efficacy of the location, flow, and velocity requirements. Second, when the cooling water intake structure is located in the more sensitive area of a water body, the Director would use the findings of the Source Water Baseline Biological Characterization study to define the need for additional design and construction technologies.

One source of information is past entrainment and impingement assessments prepared by other facilities using the same water source for cooling purposes. These studies can potentially provide a wealth of information regarding sampling strategies, species that might already be affected by intake effects, and trends in species mix and relative abundance. In the *Economic and Engineering Analysis of the proposed § 316 New Facility Rule,* EPA has estimated a cost of approximately $32,000 per facility for all activities, including monitoring and capital and O & M costs associated with the Source Water Baseline Biological Characterization. EPA is aware that facilities have typically spent considerably more than this on studies to support site-specific section 316(b) determinations in the past. However, EPA expects that the Baseline Characterization Study required in the proposed rule would generally be less comprehensive (and thus less expensive) that section 316(b) studies that have been conducted in the past because the scope and level of detail required in the Baseline Characterization Study is more limited that studies typically submitted. EPA requests comment on its projected costs for the Baseline Characterization.

2. Source Water Physical Data

Proposed section 125.86(b)(1) would require you to provide source water information to the Director. The Director would use the source water data to evaluate the potential impact on the water body in which the intake structure is located. Depending on its location in the source water and the source water type, the intake structure would affect different species or life stages. For example, intakes located in the littoral zone are more likely to affect spawning and nursery areas, whereas intakes located offshore are more likely to affect migratory routes. In addition, the proximity of the intake structures to sensitive aquatic ecological areas might result in potential adverse environmental impact. Source water information that you would be required to submit includes a description and a drawing of the physical configurations of the source water body where the cooling water intake structure is located, source water flow or volume data, and documentation delineating the littoral zone, such as submerged vegetation and substrate data, for the water body in relation to each cooling water intake structure.

Your documentation supporting the littoral zone determination should include light penetration and hydromorphological data, submerged aquatic vegetation data, and substrate data. You may measure littoral zones through transects perpendicular to shore to identify the point of transition between the littoral and deeper (e.g., profundal) portions of the waterbody. A minimum of three transects would be established, with one at the proposed intake location, one upstream within the area of influence, and one downstream of the proposed intake in the area of influence. The first, and most important, criterion of the littoral zone boundary is where light penetration is not sufficient to support submerged aquatic vegetation. A photometer to measure incident light or a Secchi disk to make visual observations can provide rapid measurements along the transects. Depth can be readily measured with a fathometer or weighted line calibrated in meters. These two measurements will provide information on whether light reaches the bottom to support vegetation growth and whether the slope of the bottom changes dramatically enough to indicate an abrupt end to the littoral zone. A change in substrate composition sometimes occurs as the littoral zone ends. Therefore, grab samples can be taken along the transects and evaluated for substrate composition (e.g., gravel, sand, silt, clay). After you delineate the littoral zone, the last step in this process is to determine where the cooling water intake structure is located in relation to the littoral zone.

3. Cooling Water Intake Structure Velocity and Flow Data

Proposed section 125.86(b)(2) would require you to submit information on the intake structure and to provide a water balance diagram for your facility. The Director would use this information to evaluate the potential for impingement and entrainment of aquatic organisms. The design of the intake structure and the location in the water column would allow the Director to evaluate which of the requirements in today's proposed rule apply to the facility (for example, design intake velocity, flow rate, and location relative to the littoral zone). The water balance diagram provides the Director with a complete accounting of the flow in and out of the facility. A water balance diagram is the most effective tool to evaluate the water use patterns at a facility and to determine water used for cooling purposes, makeup, and processes.

To demonstrate your design velocity, you would need to provide to the

Director the engineering calculations you used to calculate your velocity.

If your facility is located on a freshwater river or stream, you would need to provide calculations that demonstrate that you meet the flow requirements for both the mean annual flow and the 7Q10 flow. The 7Q10 flow is the lowest average seven-consecutive-day low flow with an average recurrence frequency of once in 10 years determined hydrologically. If your facility is located on an estuary or a tidal river, you would need to calculate the tidal excursion and provide the flow data for your facility and the supporting calculations.

The tidal excursion distance can be computed using three different methods ranging from simple to complex. The simple method involves using available tidal velocities that can be obtained from the Tidal Current Tables formerly published by the National Ocean Service of the National Oceanic and Atmospheric Administration (NOAA) and currently printed and distributed by private companies (available at book stores or marine supply stores). The mid-range method involves computing the tidal excursion distance using the Tidal Prism Method.[55] The complex method involves the use of a 2-dimensional or 3-dimensional hydrodynamic model. The simplest method to use is the following:

(1) Locate the facility on either a NOAA nautical chart or a base map created from the USGS 1:100,000 scale Digital Line Graph (DLG) data available from the USGS Internet web site. These DLG Data can be imported into a computer-aided design (CAD)-based program or geographic information system (GIS). If these tools are unavailable, 1:100,000 scale topographic maps (USGS) can be used.

(2) Obtain maximum flood and ebb velocities (in meters per second) for the water body in the area of the cooling water intake structure from NOAA Tidal Current Tables.

(3) Calculate average flood and ebb velocities (in meters per second) over the entire flood or ebb cycle using the maximum flow and ebb velocities from 2 above.

$$\text{Velocity}_{\text{Average Flood}} = \text{Velocity}_{\text{Maximum Flood}} * \tfrac{2}{\pi} \qquad \text{(Equation 1)}$$

$$\text{Velocity}_{\text{Average Ebb}} = \text{Velocity}_{\text{Maximum Ebb}} * \tfrac{2}{\pi} \qquad \text{(Equation 2)}$$

(4) Calculate the flood and ebb tidal excursion distance using the average flood and ebb velocities from 3 above.

$$\text{Distance}_{\text{Flood Tidal Excursion}} = \text{Velocity}_{\text{Average Flood}} * 6.2103 * 3600 \ \tfrac{s}{hr} \qquad \text{(Equation 3)}$$

$$\text{Distance}_{\text{Ebb Tidal Excursion}} = \text{Velocity}_{\text{Average Ebb}} * 6.2103 * 3600 \ \tfrac{s}{hr} \qquad \text{(Equation 4)}$$

(5) Using the total of the flood and ebb distances from above, define the diameter of a circle that is centered over the opening of the cooling water intake structure.

(6) Define the area of the water body that falls within the area of the circle (see Appendix 3 to Preamble). The area of the water body, if smaller than the total area of the circle might be determined either by using a planimeter or by digitizing the area of the water body using a CAD-based program or GIS.

For cooling water intake structures located offshore in large water bodies, the area of the water body might equal the entire area of the circle (see D in Appendix 3 to Preamble). For cooling water intake structures located flush with the shoreline, the area might be essentially a semicircle (see C in Appendix 3 to Preamble). For cooling water intake structures located in the upper reaches of a tidal river, the area might be some smaller portion of the area of the circle (see A in Appendix 3 to Preamble).

(7) Calculate the average depth of the water body area defined in 6 above. Depths can easily be obtained from bathymetric or nautical charts available from NOAA. In many areas, depths are available in digital form.

(8) Calculate a volume by multiplying the area of the water body defined in 5 by the average depth from 7. Alternatively, the actual volume can be calculated directly with a GIS system using digital bathymetric data for the defined area.

The Director would use the facility's water balance diagram to identify the proportion of intake water used for cooling, makeup, and process water. A simplified water balance diagram that gives a complete picture of the total flow in and out of the facility would allow the Director to evaluate compliance with the flow reduction requirements.

4. Data To Show Compliance With the Flow Requirements, Velocity Requirement, Flow Reduction Requirement, and Additional Design and Construction Technology Requirement

Today's proposal at § 125.86(b) (3) through (6) would require you to provide information on additional operating procedures, technologies, and plans to demonstrate compliance with the applicable requirements set forth in today's proposed rule. You would be required to provide to the Director a plan containing narrative descriptions and engineering design calculations of the technologies the facility proposes to implement to demonstrate compliance with the flow, velocity, flow reduction, and additional design and construction technology requirements. If your facility will meet the flow reduction requirement through reuse of 100 percent of the cooling water withdrawn from a source water, you must provide a demonstration that 100 percent of the cooling water is reused in one or more unit processes at the facility.

EPA requests comment on all aspects of the proposed data provision requirements.

5. Data To Support a Request for Alternative Requirements

If you request an alternative requirement, today's proposal at § 125.86(b)(7) would require that you submit all data showing that your

[55] E. Diana, A.Y. Kuo. B.J. Neilson, C.F. Cerco, and P.V. Hyer. *Tidal Prism Model Manual,* Virginia Institute of Marine Science, Gloucester Point, VA, January 1987.

compliance costs are wholly out of proportion to the costs EPA considered during development of the requirements at issue. Compliance costs that EPA considered were sub-divided into one-time costs and recurring costs. Examples of one-time costs include capital and permit application costs. Examples of recurring costs include operation and maintenance costs, permit renewal costs, and monitoring, recordkeeping and reporting costs.

B. How Would the Director Determine the Appropriate Cooling Water Intake Structure Requirements?

The Director's first step would be to determine whether the facility is covered by the requirements in these proposed regulations for new facilities. If the answer is ''yes'' to all the following questions, the facility would be required to meet the requirements of this proposed regulation:

(1) Is the facility a ''new facility'' as defined in § 125.83?

(2) Does the new facility have a ''cooling water intake structure'' as defined in § 125.83?

• Is at least 25 percent of the water withdrawn by the facility used for cooling purposes?

• Is the cooling water withdrawn from waters of the U.S.?

(3) Does the new facility have a design intake flow of greater than 2 million gallons per day? [56]

(4) Does the new facility discharge pollutants to waters of the U.S., including storm water-only discharges?

If these proposed regulations are applicable to the new facility, the second step would be to determine the locational factors associated with the new facility's cooling water intake structure. The Director would first review the information that the new facility provided to validate the source water body type in which the cooling water intake structure is located (freshwater stream or river, lake or reservoir, estuary or tidal river, or ocean). (As discussed above, the new facility would need to identify the source water body type in the permit application and provide the appropriate documentation to support the water body type classification.) After validating the water body type, the Director's next task would be to verify the facility's delineation of the littoral zone boundaries. The Director would review the supporting material the facility provided in the permit application. The Director would also review the engineering drawings and the locational maps the new facility provided, documenting the physical placement of the cooling water intake structure.

The Director's third step would be to review the design requirements for intake flow and velocity. The proposed velocity requirement is based on the design through-screen or through-technology velocity as defined in § 125.83. The maximum design velocity would always be 0.5 ft/s (except for cooling water intake structures located 50 meters outside the littoral zone in a lake or reservoir). However, pursuant to proposed section 125.84(f) and (g), the Director might determine, based on site-specific characteristics, that a more stringent design velocity (*e.g.,* 0.3 ft/s) is required to minimize adverse environmental impact. To determine whether the new facility meets the maximum design velocity requirement, the Director would review the narrative description of the design, structure, equipment, and operation used to meet the velocity requirement. The Director would also review the design calculations that demonstrate that the maximum design velocity would be met. In reissuing permits, the Director would review velocity monitoring data to confirm that the facility is maintaining the initial design velocity calculated at the start of commercial service.

The proposed flow requirement is based on the water body type and the physical placement of the cooling water intake structure in relation to the littoral zone. To determine whether the new facility meets the proposed flow requirement, the Director would first verify the new facility's determination of the water body flow for the respective water body type (*e.g.,* annual mean flow and low flow for freshwater river or stream). The Director would review the source water flow data the facility provided in the permit application. The Director might want to use available U.S. Geological Survey (USGS) data (for freshwater rivers and streams) to verify the flow data the facility provided in its permit application. Then the Director would review any supporting documentation and engineering calculations that demonstrate that the new facility would meet the proposed flow requirements. To verify the flow data the new facility provides for an estuary or a tidal river, the Director would review the facility's calculation of the tidal excursion. In particular, if the new facility is required to reduce its intake flow to a level commensurate with that which could be attained by a closed-cycle recirculating cooling water system, the Director would review the narrative description or the closed-cycle recirculating cooling water system design and any engineering calculations to ensure that the new facility is complying with the requirement and that the makeup and blowdown flows have been minimized.

The fourth step for the Director would be to review the applicant's Source Water Baseline Biological Characterization study and to determine whether additional design and construction technologies are required. In those instances where additional design and construction technologies (*e.g.,* fish handling devices) are required, the Director would review and approve, approve with comment, or disapprove the applicant's proposed plans to meet these requirements. In some instances, the applicant might assert that its Source Water Baseline Biological Characterization demonstrates that no impingement or entrainment is occurring (*e.g.,* in a shipping canal). The Director would need to carefully evaluate the data and determine whether these additional requirements are appropriate for a facility located in a heavily industrialized water body. During each permit renewal, the Director would then review supporting data to evaluate whether the site-specific conditions have changed such that the facility needs to implement these additional design and construction technologies.

In reviewing the application information, the Director would determine if the new facility meets the appropriate requirements in proposed § 125.84(a) through (e) based on its location on and in the water body, including the flow requirements, intake velocity requirements, and additional design and construction technology requirements. The proposed regulations at § 125.84(f) allow Directors to impose more stringent requirements if it is determined that they are reasonably necessary to minimize adverse environmental impacts. However, the Director may require more stringent requirements under proposed § 125.84(f) only where they are reasonably necessary as a result of the effects of multiple intakes on a waterbody, seasonal variations in the aquatic environment affected by the cooling water intake structure controlled by the permit (such as seasonal migration), or the presence of regionally important species. The proposed regulations at § 125.84(g) require Directors to impose more stringent requirements on cooling water intake structures where they are reasonably necessary to ensure the

[56] If the answer is ''no'' to the flow parameter and the answer is ''yes'' to all the other questions, the Director would use best professional judgment on a case-by-case basis to establish permit conditions that ensure compliance with section 316(b).

attainment of water quality standards, including designated uses, criteria, and antidegredation.

The Agency is aware that the determination of appropriate requirements would require expertise in aquatic biology. The Agency encourages consultation with, and input from, EPA, State, or Tribal staff who have the appropriate expertise. In addition, the Agency encourages coordination with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service.

C. What Would I Be Required To Monitor?

The monitoring requirements in today's proposed rule at § 125.87 include biological monitoring of impingement and entrainment, monitoring of the screen head loss and velocity, and visual inspections.

Impingement and entrainment monitoring would be used to assess the presence, abundance, and life stages (eggs, larvae, post larvae, juveniles, and adults) of aquatic organisms (fish and shellfish) impinged or entrained during operation of the cooling water intake structure. The purpose of the site-specific monitoring is to determine whether the representative species list established in the Source Water Baseline Biological Characterization remains representative of the water body with the operation of the cooling water intake structure and to establish the level of impingement and entrainment. Monitoring would include sampling of organisms trapped on the outer part of intake structures or against screening devices and sampling of organisms entering or passing through the cooling water intake structure and into the cooling water system. Moreover, because ambient water and biological conditions might change over time, sustained monitoring is necessary to identify those species affected post operationally by the cooling water intake structure.

In proposed § 125.87(b), EPA would require monitoring of the head loss across the intake screens to obtain a correlation of those values with the design intake velocity at minimum ambient source water surface elevation and maximum head for each cooling water intake structure. The data collected by monitoring this parameter would provide the Director with additional information after the design and construction of the cooling water intake structure to demonstrate that the facility is operating and maintaining the cooling water intake structure in a manner that the velocity requirement continues to be met. The Agency considers this the most appropriate parameter to monitor because although the facility might be designed to meet the requirement, proper operation and maintenance is necessary to maintain the open area of the screen and intake structure, ensuring that the design intake velocity is maintained. Head loss can easily be monitored by measuring and comparing the height of the water in front of and behind the screen and/or other technology. Facilities that use devices other than screens would be required to measure the actual velocity at the point of entry through the device. Velocity can be measure using velocity meters placed at the entrance into the device.

The Agency considered requiring annual monitoring of either the screen- or through-technology velocity or actual approach velocity at each cooling water intake structure to demonstrate that they are being operated and maintained properly. EPA seeks comment on these and other parameters that could be monitored to ensure that the design intake velocity is not exceeded once the facility is built and operating.

Weekly visual inspections would be required to provide a mechanism for both the new facility and the Director to ensure that any technologies that have been implemented to minimize adverse environmental impact are being maintained and operated in a manner that ensures that they function as designed. EPA has proposed this requirement so that facilities could not develop plans and install technologies only to let them fall into disrepair or to operate them differently so that adverse environmental impact is not minimized to the extent expected. The Director would determine the actual scope and implementation of the visual inspections based on the types of technologies installed at your facility. For example, they could be as simple as observing bypass and other fish handling system to ensure that debris has not clogged the system rendering them inoperable.

The facility would be required to monitor at a frequency specified in proposed § 125.87. For biological monitoring required in proposed § 125.87(a), after two years, the Director may approve a request for less frequent monitoring if the facility desires it and provides data to support the request. The Director would consider a request for reduced frequency in the impingement or entrainment monitoring only if the supporting data show that less frequent monitoring would still allow for the detection of any seasonal and daily variations in the species and numbers of individuals that are impinged or entrained. With each permit renewal, the applicant would continue to monitor individual aquatic organisms that are impinged or entrained. Based on the monitoring results, species might need to be added or removed from the most representative species list. The monitoring results would provide current, site-specific knowledge of impingement/entrainment effects. EPA requests comment on all aspects of the proposed monitoring requirements.

D. How Would Compliance Be Determined?

In today's proposed rule, § 125.89 specifies what the Director must do to comply with the proposed rule. Consistent with these provisions, the Director would determine compliance with the requirements of the proposed rule based on the following:

- Data submitted with the NPDES permit application to show that the facility is in compliance with location, design, construction, and capacity requirements (§ 125.86).
- Compliance monitoring data and records, including impingement and entrainment monitoring, to show that impingement and entrainment impacts are being minimized (§ 125.87(a)).
- Through-screen or through-technology velocity monitoring data and records to show that the facility is being operated and maintained as designed to continue to meet the velocity requirement (§ 125.87(b)).
- Visual inspection to show that technologies installed are being operated properly and function as they were designed (§ 125.87(c)).

Facilities would be required to keep records and report the above information in a yearly status report as proposed in § 125.88. EPA requests comment on this requirement. In addition, Directors may perform their own compliance inspections as deemed appropriate in accordance with 40 CFR 122.41.

E. What Are the Respective Federal, State, and Tribal Roles?

Section 316(b) requirements are implemented through NPDES permits. As discussed in Section II.A., today's proposed regulations would amend 40 CFR 123.25(a)(36) to add a requirements that authorized State programs have sufficient legal authority to implement today's proposed requirements (40 CFR part 125, subpart I). Therefore, today's proposed rule potentially affects authorized State and Tribal NPDES permit programs. Under 40 CFR 123.62(e), any existing approved section 402 permitting program must be revised to be consistent with new program requirements within one year from the date of promulgation, unless the NPDES-authorized State or Tribe must amend or enact a statute to make the required revisions. If a State or Tribe must amend or enact a statute to conform with today's proposed rule, the revision must be made within two years of promulgation. States and Tribes seeking new EPA authorization to implement the NPDES program must comply with the requirements when authorization is requested.

In addition to updating their programs to be consistent with today's rule, States and Tribes authorized to implement the NPDES program would be required to implement the cooling water intake structure requirements following promulgation of the final regulations. The requirements proposed must be implemented upon permit issuance and reissuance. Duties of an authorized State or Tribe under this regulation would include:

• Verification of a permit applicant's determination of source water body classification and the flow or volume of certain water bodies at the point of the intake;
• Verification that the intake structure maximum flow rate is less than the maximum allowable as a proportion of water body flow for certain water body types;
• Verification that a permit applicant's design intake velocity calculations meet applicable regulatory requirements;
• For certain locations in certain water body types, verification that a permit applicant's intake design and reduction in capacity are commensurate with a level that can be attained by a closed-cycle recirculating cooling water system that has minimized makeup and blowdown flows;
• Review and approval or disapproval of a permit applicant's plan for the required Source Water Baseline Biological Characterization study;
• For certain locations in certain water body types, review and approval or disapproval of a permit applicant's plan for installation of additional design and construction technologies to maximize the survival of impinged fish and minimize entrainment of eggs and larvae;
• Development of draft and final NPDES permit conditions for the applicant implementing applicable section 316(b) requirements pursuant to the proposed regulation; and
• Ensuring compliance with permit conditions based on section 316(b) requirements.

Once the proposed requirements are promulgated as final regulations, EPA will implement them where States or Tribes are not authorized to implement the NPDES program.

F. Are Permits for New Facilities Subject to Requirements Under Other Federal Statutes?

EPA's NPDES permitting regulations at 40 CFR 122.49 contain a list of Federal laws that might apply to federally issued NPDES permits. These include the Wild and Scenic Rivers Act, 16 U.S.C. 1273 *et seq.*; the National Historic Preservation Act of 1966, 16 U.S.C. 470 *et seq.*; the Endangered Species Act, 16 U.S.C. 1531 *et seq.*; the Coastal Zone Management Act, 16 U.S.C. 1451 *et seq.*; and the National Environmental Policy Act, 42 U.S.C. 4321 *et seq.* See 40 CFR 122.49 for a brief description of each of those laws. In addition, the provisions of the Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. 1801 *et seq.*, relating to essential fish habitat might be relevant. Nothing in this proposed rulemaking authorizes activities that are not in compliance with these or other applicable Federal laws.

X. Cost/Benefit Analysis

A. Cost

Total annualized compliance cost of this proposed rule is estimated to be $12.1 million.

Facilities not already meeting section 316(b) requirements would incur several types of costs under the proposed regulation. One-time costs of the rule would include capital technology costs and costs for the initial permit application. Recurring costs would include operating and maintenance costs, permit renewal costs, and costs for monitoring, record keeping, and reporting.

Facilities generally would have several alternatives for complying with the proposed rule's requirements. Alternative compliance responses might include (1) changing the cooling system design so the facility would no longer be subject to the proposed section 316(b) New Facility Rule; (2) changing the facility location, and making alterations to meet requirements based on the new water body type and the distance from the littoral zone; (3) changing the distance from the littoral zone and making alterations to meet requirements based on water body type and the new distance from the littoral zone; and (4) making alterations to facility plans to meet requirements based on the baseline water body type and distance from the littoral zone.

The specific compliance response of each facility would be highly site-specific. For example, it may not be possible for a facility to locate on a different water body type because a suitable site may not be available, or a facility may need to address other cost factors that might support a decision not to relocate despite the opportunity for lower compliance costs. EPA does not have data on which to estimate the potential costs of choosing alternative locations. EPA therefore considered a set of compliance strategies that are most common among existing facilities with cooling water intake structures. Costed compliance actions include widening the intake structure or installing a velocity cap or passive screens to reduce velocity; switching to a recirculating system to reduce intake flow; and implementing additional technologies to reduce impingement and entrainment.

EPA estimated the unit costs associated with these potential regulatory responses. The unit costs were assigned to the 98 new facilities based on their projected baseline characteristics and their requirements under the proposed rule. EPA estimated costs incurred by facilities beginning operations between 2001 and 2020. All capital costs estimates are amortized over 30 years. Since EPA was only able to project new facilities for the first 20 years, the annualized costs based on a 30-year amortization period are somewhat less than they would have been if EPA were able to project new facilities over a long time horizon (30 to 40 years). Moreover, since most of the capital costs for installing closed-cycle recirculating cooling systems are not projected to be incurred until after 2010, these costs are significantly discounted in this analysis.

1. Electric Generation Sector

For the period 2001 through 2010, EPA estimates that 13 new electric generation facilities would be subject to the proposed section 316(b) New Facility Rule.[57] Seven of these facilities are actual planned facilities identified from the NEWGen database. For these facilities, EPA was able to obtain some facility-specific cooling water intake structure information. The remaining six facilities are hypothetical facilities for which no information was available. For the period 2011 through 2020, information on specific, planned facilities is not available. The Agency

[57] See Section VI.B above or Chapter 5 of the *Economic and Engineering Analyses of the Proposed § 316(b) New Facility Rule* for assumptions and methodologies used for this estimate.

used Energy Information Administration forecasts for electric generation capacity for combined-cycle and coal steam electric facilities. Based on this information, EPA projected that an additional 27 facilities would be subject to this proposed rule, for a total of 40 new electric generation facilities over the 20-year period.

For the period 2001 through 2010, EPA estimated facility-level costs for the seven NEWGen facilities found to be within the scope of this regulation. EPA compared each facility's baseline characteristics with the requirements of the rule. If a planned facility already fulfilled any of the applicable requirements, no cost was included in the estimates for meeting that requirement. For example, EPA estimates that 33 of the 40 proposed new generating facilities already plan to build a cooling tower, so 7 facilities are assumed to incur costs for complying with the recirculation requirement of the rule. EPA used the average compliance costs of the seven NEWGen facilities for the six extrapolated facilities. For the period 2011 through 2020, EPA used assumptions described in the *Economic and Engineering Analyses of the Proposed § 316(b) New Facility Rule* to project which facilities would be subject to this proposed rule and whether they would be required to install a cooling tower. For example, based on Energy Information Administration information on the proportion of new generating facilities employing cooling towers in recent years, the Agency estimated that four coal steam electric generating facilities and three combined-cycle facilities would be required to install cooling towers.

Total annualized costs for the 40 new electric generators are estimated to be $6.4 million using a seven percent discount rate and a 30-year analysis period. The lowest annual compliance cost for any electric generator is estimated to be approximately $73,000 or $97 per megawatt of generating capacity; the highest cost is estimated to be $4.1 million or $5,088 per megawatt of generating capacity. Thirty-three facilities are expected to have relatively low compliance costs while 7 facilities will have relatively high costs.[58]

2. Manufacturing Sector

For the period 2001 through 2020, EPA projected that 58 new manufacturing facilities with costs under the proposed rule would begin operation during the next 20 years.[59] All of these facilities are hypothetical facilities estimated based on industry growth rates and responses to the Section 316(b) Industry Screener Questionnaire. Facility-specific operational characteristics of cooling water intake structures and economic and financial characteristics of the projected new facilities were not available. Therefore, EPA used information from screener respondents to project economic and technical characteristics of the new manufacturing facilities.

Based on the projected facility characteristics, EPA estimated facility-level compliance costs using the same unit costs and methodology as for new electric generators. Total annualized costs for the 58 new manufacturing facilities are estimated to be $5.7 million. The lowest annual compliance cost for any facility was approximately $73,000; the highest cost was $0.6 million.

Exhibit 3 provides a summary of the compliance costs for the rule. Details on methods, assumptions and unit costs used to develop engineering compliance costs for steam electric generating and manufacturing facilities are presented in Chapter 6 of the *Economic and Engineering Analyses of the Proposed § 316(b) New Facility Rule.*

EXHIBIT 3.—NATIONAL PRE-TAX COSTS OF COMPLIANCE WITH THE SECTION 316(B) NEW FACILITY REGULATION

Industry category (number of facilities affected)	One-time costs		Recurring costs			Total
	Capital	Permit application	O&M	Permit renewal	Monitoring, record keeping & reporting	
Total Compliance Costs (present value, in millions $1999)						
Electric Generators (40)	$22.5	$1.0	$39.9	$1.5	$15.3	$79.6
Manufacturing Facilities (58)	12.2	1.4	34.3	2.1	20.7	70.7
Total (98)	34.7	2.4	73.6	3.6	36.0	150.9
Annualized Compliance Costs (in $1999)						
Electric Generators (40)	1,809,266	84,401	3,169,779	123,526	1,239,345	6,426,317
Manufacturing Facilities (58)	984,524	111,383	2,761,176	172,307	1,671,369	5,700,759
Total (98)	2,793,790	195,784	5,930,955	295,833	2,910,714	12,127,076

3. Cost Impacts

Exhibit 4 shows that the estimated compliance costs would represent a small portion of the estimated revenues for most of the facilities. Costs as a percentage of baseline revenues would be less than one percent for all the facilities with the exception of eight facilities.[60]

In addition to low impacts at the facility level, impacts at the industry level are expected to be very limited because the projected number and total size of the new facilities that would be within the scope of the proposed rule are generally small compared to the industry as a whole. EPA therefore does not expect the proposed rule to cause significant changes in industry productivity, competition, prices, output, foreign trade, or employment.

In summation, the proposed rule is expected to be economically practicable

[58] The higher costs facilities are expected to come on line in the years 2011, 2014, 2015, 2018, 2019.

[59] See Section VI.B above or Chapter 5 of the *Economic and Engineering Analyses of the Proposed § 316(b) New Facility Rule* for information on assumptions and methodologies used for this estimate.

[60] One steel works facility and one industrial gases facility would have annualized costs equal to 8.8 and 2.4 percent of revenues, respectively. Three electric generators would have annualized costs equal to 4.2% of revenues and another 3 would have annualized costs equal to 1.0% of revenues.

at both the facility and national level for all sectors. Only a small percent of the total number of facilities in each of the manufacturing sectors would be affected by the proposed rule. EPA, therefore, concludes that this rule would not result in a significant impact on industries or the economy.

EXHIBIT 4.—PRE-TAX COMPLIANCE COSTS AND ECONOMIC IMPACTS BY SECTOR

Sector	Number of projected in-scope facilities	Total annualized compliance costs ($mill 1999)	Annualized compliance cost as a percent of facility revenues	
			Lowest	Highest
SIC 49 Steam electric generating	40	6.4	0.07	4.2
SIC 26 Pulp & paper	0	0	NA	NA
SIC 28 Chemicals	48	4.5	0.01	2.4
SIC 29 Petroleum	0	0	NA	NA
SIC 331 Iron & steel	8	1.1	0.01	8.8
SIC 333/335 Aluminum	2	0.07	0.02	0.02
Total	98	12.1		

4. Cost Impacts of Other Alternatives

In addition to today's proposed rule, EPA costed the impacts of two alternative regulatory options. The first alternative option that EPA considered is to apply the BTA requirements proposed for estuaries and tidal rivers to all facilities, regardless of location. Under this option, the definition and number of new facilities subject to the rule would not change, but some facilities would incur more stringent compliance requirements. EPA estimates the total annualized compliance costs for this alternative would be $16.4 million. The second alternative option considered by EPA would impose more stringent compliance requirements on the electric generating segment of the industry. It is based in whole or in part on a zero intake-flow (or nearly zero, extremely low-flow) requirement commensurate with levels achievable through the use of dry cooling systems. New manufacturing facilities would not be subject to these stricter requirements but would have to comply with the standards of the proposed rule. EPA estimated costs for this alternative assuming that the dry cooling standard would apply to electric generators on all waters of the U.S. The costs of this option is estimated to be $193 million per year.

Both alternative regulatory options considered by EPA would have higher total costs than this proposed rule. A regulatory framework based on dry cooling towers for some or all electric generators is the most expensive option. Compared to the proposed rule, this option would impose an additional cost of $181 million, or $20,720 per megawatt of generating capacity, on the electric generating sector. As with the proposed option, the majority of capital costs for these options are projected to occur after 2010, and so are significantly discounted in the analysis.

B. Discussion of Cooling Water Intake Structure Impacts and Potential Benefits

To provide an indication of the potential benefits of adopting BTA for cooling water intake structures, this section presents information from existing sources on impingement and entrainment losses associated with cooling water intake structures, and the economic benefits associated with reducing these losses. Examples are drawn from existing sources because the information needed to quantify and value potential reductions in losses at new facilities is not yet available. In most cases, there is only general information about facility locations, and details of intake characteristics and the ecology of the surrounding water body are unavailable. Such information is critical because studies at existing facilities demonstrate that benefits are highly variable across facilities and locations. Even similar facilities on the same water body can have very different impacts depending on the aquatic ecosystem in the vicinity of the facility, and intake-specific characteristics such as location, design, construction, and capacity.

In general, the probability of impingement and entrainment depends on intake and species characteristics that influence the intensity, time, and spatial extent of interactions of aquatic organisms with a facility's cooling water intake structure and the physical, chemical, and biological characteristics of the source water body. Closed-cycle cooling systems (which are one part of the basis for BTA for all but the least sensitive areas) withdraw water from a natural water body, circulate the water through the condensers, and then send it to a cooling tower or cooling pond before recirculating it back through the condensers. Because cooling water is recirculated, closed-cycle systems generally reduce the water flow from 72 percent to 98 percent, thereby using only 2 percent to 28 percent of the water used by once-through systems. It is generally assumed that this would result in a comparable reduction in impingement and entrainment.

Fish species with free-floating, early life stages are those most susceptible to CWIS impacts. Such planktonic organisms lack the swimming ability to avoid being drawn into intake flows. Species that spawn in nearshore areas, have planktonic eggs and larvae, and are small as adults experience even greater impacts because both new recruits and reproducing adults are affected (*e.g.*, bay anchovy in estuaries and oceans). In general, higher impingement and entrainment are observed in estuaries and near coastal waters due to the presence of spawning and nursery areas. Additionally, tidal currents in estuaries can carry organisms past intakes multiple times, increasing their probability of impingement and entrainment. These observations would tend to support EPA's decision to establish requirements for minimizing adverse environmental impact according to water body type and the placement of the intake structure in relation to biologically productive zones.

The proposed regulatory framework also recognizes that for any given species and cooling water intake structure location, the proportion of the source water flow supplied to the cooling water intake structure is a major factor affecting the potential for impingement and entrainment. In general, if the quantity of water withdrawn is large relative to the flow of the source water body, water withdrawal would tend to concentrate organisms and increase numbers impinged and entrained. Thus, the proposed flow requirements seek to minimize impingement and entrainment by limiting the proportion of the water body flow that can be withdrawn.

The following five examples from studies at existing facilities offer some indication of the relative magnitude of monetary damages associated with cooling water intake structures at some existing facilities. These examples exhibit the magnitude of impingement and entrainment, on a per facility basis, that could be significantly reduced in the future for similar steam electric facilities under this proposed rule. In the following discussion, the potential benefits of lowering intake flows to a level commensurate with closed-cycle recirculating cooling water system (for the projected 25 percent of facilities not already planning to use such systems) is illustrated by comparisons of once-through and closed-cycle cooling systems (*e.g.*, the Brayton Point and Hudson River facilities). The potential benefits of additional requirements defined by regional permit directors is demonstrated by operational changes implemented to reduce impingement and entrainment (*e.g.*, the Pittsburg and Contra Costa facilities). The Ludington example demonstrates how impingement and entrainment losses of forage species can lead to reductions in economically valuable species. Finally, the potential benefits of implementing additional design and construction technologies to increase survival of organisms impinged or entrained is illustrated by the application of modified intake screens and fish return systems (*e.g.*, the Salem Nuclear Generating Station).

The first example of the potential benefits of minimizing intake flow and associated impingement and entrainment is provided by data for the Brayton Point facility, located on Mt. Hope Bay in Massachusetts.[61] [62] In the mid-1980s, the operation of Unit 4 was changed from closed-cycle to once-through cooling. Although conversion to once-through cooling increased intake flow by 45%, the facility requested the change because of electrical problems associated with salt contamination from Unit 4's salt water spray cooling system. The lower losses expected under closed-cycle operation can be estimated by comparing losses before and after this modification. On this basis, EPA estimates that the average annual reduction in entrainment losses of adult-equivalents of catchable fish resulting from closed cycle operation of a single unit at Brayton Point (reducing the flow of that unit from 1,045 MGD to 703 MGD) ranges from 207,254 Atlantic menhaden (*Brevoortia tyrannus*) and 155,139 winter flounder (*Pleuronectes americanus*) to 20,198 tautog (*Tautoga onitis*) and 7,250 weakfish (*Cynoscion regalis*) per year. Assuming a proportional change in harvest, the lower losses associated with a closed cycle system may be expected to result in an increase of 330,000 to 2 million pounds per year in commercial landings and 42,000 to 128,000 pounds per year in recreational landings.

The second example of the potential benefits of low intake flow is provided by an analysis of impingement and entrainment losses at five Hudson River power plants. Estimated fishery losses under once-through compared to closed-cycle cooling indicate that an average reduction in intake flow of about 95 percent at the three facilities responsible for the greatest impacts would result in a 30 percent to 80 percent reduction in fish losses depending on the species involved.[63] An economic analysis estimated monetary damages under once-through cooling based on the assumption that annual percent reductions in year classes of fish result in proportional reductions in fish stocks and harvest rates.[64] A low estimate of damages was based on losses at all five facilities, and a high estimate was based on losses at the three facilities that account for most of the impacts. Damage estimates under once-through cooling ranged from about $1.3 million to $6.1 million annually in 1999 dollars. Over the next 20 years, EPA projects that seven out of 40 new power plants would be built without recirculating systems in the absence of this rule. Most of the costs projected for the proposed rule are associated with installing recirculating systems as a result of this proposed rule.

The third example demonstrates how impingement and entrainment losses of forage species can lead to reductions in economically valued species. A random utility model (RUM) was used to estimate fishery impacts of impingement and entrainment by the Ludington Pumped-Storage plant on Lake Michigan.[65] [66] This method estimates changes in demand as a function of changes in catch rates. The Ludington facility is responsible for the loss of about 1 percent to 3 percent of the total Lake Michigan production of alewife, a forage species that supports valuable trout and salmon fisheries. It was estimated that losses of alewife result in a loss of nearly 6 percent of the angler catch of trout and salmon each year. On the basis of RUM analysis, the study estimated that if Ludington operations ceased, catch rates of trout and salmon species would increase by 3.3 to 13.7 percent annually, amounting to an estimated recreational angling benefit of $0.95 million per year (in 1999 dollars) for these species alone.

The fourth example indicates the potential benefits of operational BTA that might be required by regional permit Directors. Two plants in the San Francisco Bay/Delta, Pittsburg and Contra Costa in California have made changes to their intake operations to reduce impingement and entrainment of striped bass (*Morone saxatilis*). These operational changes have also reduced incidental take of several threatened and endangered fish species, including the delta smelt (*Hypomesus transpacificus*) and several runs of chinook salmon (*Oncorhynchus tshawytscha*) and steelhead trout (*Oncorhynchus mykiss*). According to technical reports by the facilities, operational BTA reduced striped bass losses by 78 percent to 94 percent, representing an increase in striped bass recreational landings of about 15,000 fish each year. A local study estimated that the consumer surplus of an additional striped bass caught by a recreational angler is $8.87 to $13.77.[67] This implies a benefit to the recreational fishery, from reduced impingement and entrainment of striped

[61] New England Power Company and Marine Research, Inc., *Final Environmental Impact Report and Section 316(a) and 316(b) Demonstrations Made in Connection with the Proposed Conversion of Generating Unit No. 4 from Closed-Cycle Cooling to Once-Through Cooling.* 1981.

[62] Gibson, M. *Comparison of Trends in the Finfish Assemblages of Mt. Hope Bay and Narragansett Bay in Relation to Operations of the New England Power Brayton Point Station.* Rhode Island Division Fish and Wildlife, Marine Fisheries Office, June 1995 and revised August 1996.

[63] Boreman, J. and C.P. Goodyear. ''Estimates of entrainment mortality for striped bass and other fish species inhabiting the Hudson River Estuary.'' *American Fisheries Society Monograph* 4:152–160. 1988.

[64] Rowe, R.D., C.M. Lang, L.G. Chestnut, D.A. Latimer, D.A. Rae, S.M. Bernow, and D.E. White. *The New York Electricity Externality Study, Volume 1.* Empire State Electric Energy Research Corporation. 1995.

[65] Jones, C.A., and Y.D. Sung. *Valuation of Environmental Quality at Michigan Recreational Fishing Sites: Methodological Issues and Policy Applications.* Prepared under EPA Contract No. CR–816247 for the U.S. EPA, Washington, DC. 1993.

[66] Pumped storage facilities do not use cooling water and are therefore would not subject to this proposed rule. However, the concept of economic valuation of losses in forage species is transferable to other types of stressors, including cooling water intake structures.

[67] Huppert D.H. ''Measuring the value of fish to anglers: application to central California anadromous species.'' *Marine Resource Economics* 6:89–107. 1989.

bass alone, in the range of $131,000 to $204,000 annually. The monetary benefit of reduced impingement and entrainment of threatened and endangered species might be substantially greater.

The final example indicates the benefits of technologies that can be applied to maximize survival. At the Salem Nuclear Generating Station in Delaware Bay, the facility's original intake screens were replaced with modified screens and improved fish return baskets that reduce impingement stress and increase survival of impinged fish.[68] The changes resulted in an estimated 51 percent reduction in losses of weakfish. Assuming similar reductions in losses of other recreational and commercial species, this represents an increase in recreational landings of 13,000 to 65,000 fish per year and an increase in angler consumer surplus of as much as $269,000 annually in 1999 dollars. The estimated increase in commercial landings of 700 to 28,000 pounds per year represents an increase in producer surplus of up to $25,000 annually. Assuming that nonuse benefits are at least 50 percent of recreational use benefits, nonuse benefits associated with the screens might be expected to amount to up to $134,000 per year.

A more detailed discussion of cooling water intake structure impacts and potential benefits can be found Chapter 11 of the *Economic and Engineering Analyses of the Proposed § 316(b) New Facility Rule.*

The Agency recognizes that limited data, if any, are available on impingement and entrainment rates at facilities with intake flows at or near the flow threshold proposed today or the alternative flow thresholds discussed in Section V.D. above. The Agency specifically invites commenters to provide any data they may have on impingement and/or entrainment rates at facilities with total intake flows at or below 30 MGD.

XI. Administrative Requirements

A. Paperwork Reduction Act

The information collection requirements in this proposed rule have been submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.* EPA has prepared an Information Collection Request (ICR) document (ICR No. 1973.01) and you may obtain a copy from Sandy Farmer by mail at Collection Strategies Division; U.S. Environmental Protection Agency (2822); 1200 Pennsylvania Ave., NW., Washington, DC 20007, by e-mail at farmer.sandy@epamail.epa.gov, or by calling (202) 260–2740. You also can download a copy off the Internet at http://www.epa.gov/icr.

The total burden of the information collection requirements associated with today's rule is estimated at 46,849 hours. The corresponding cost for costs other than labor (labor costs are included in the total cost of the rule discussed in section X of this preamble) is estimated at $1.03 million for 22 facilities and 44 States and Territories for the first three years after promulgation of the rule. Non-labor costs, include activities such as laboratory services, photocopying, and the purchase of supplies. The burden and costs are for the information collection, reporting, and record keeping requirements for the three-year period beginning with the assumed effective date of today's rule. Additional information collection requirements will occur after this initial three-year period and will be counted in a subsequent information collection request. EPA does not consider the specific data that would be collected under this proposed rule to be confidential business information. However, if a respondent does consider this information to be confidential, the respondent may request that such information be treated as confidential. All confidential data will be handled in accordance with 40 CFR 122.7, 40 CFR part 2, and EPA's Security Manual Part III, Chapter 9, dated August 9, 1976.

Compliance with the applicable information collection requirements imposed under this proposed rule (see §§ 125.86,125.87, and 125.88) is mandatory. Before new facilities can begin operation, they would be required first to perform several data-gathering activities as part of the permit application process. Today's proposal would require several distinct types of information collection as part of the NPDES application. In general, the information would be used to identify which of the requirements in today's proposed rule apply to the new facility, how the new facility would meet those requirements, and whether the new facility's cooling water intake structure reflects the best technology available for minimizing adverse environmental impact. Specific data requirements proposed are the following:

- Source water data for evaluation of potential impacts to the water body in which the intake structure is placed.
- Intake structure data, consisting of intake structure design and facility water balance diagram, to evaluate the potential for impingement and entrainment of aquatic organisms.
- Baseline ambient biological data, in the form of a Source Water Baseline Biological Characterization study, for evaluating potential impacts from the cooling water intake structure prior to the start of operation.
- Information on additional design and construction technologies implemented to ensure compliance with the applicable requirements set forth in today's proposed rule.

In addition to the information requirements of the NPDES permit application, NPDES permits normally specify monitoring and reporting requirements to be met by the permitted entity. New facilities that fall within the scope of this rule would be required to perform biological monitoring of impingement and entrainment, monitoring of the screen or through-technology velocity, and visual inspections of the cooling water intake structure and any additional technologies. Additional ambient water quality monitoring may also be required of facilities depending on the specifications of their permit. The facility would be expected to analyze the results its monitoring efforts and then provide these results in an annual status report to the permitting authority. Finally, facilities would be required to maintain records of all submitted documents, supporting materials, and monitoring results for at least three years (the director may require that records be kept for a longer period to coincide with the life of the NPDES permit) .

All the impacted facilities would have to carry out the specific activities necessary to fulfill the general information requirements. The estimated burden to comply with these requirements is associated with describing and drawing the physical configurations of the source water body where the cooling water intake structures are located and documenting the delineation of the littoral zone, submerged vegetation, and substrate characteristics of the water body in relation to each cooling water intake structure. The activities costed out also include sampling, analyzing, and reporting the results in a Source Water Baseline Biological Characterization Study before the operation of the cooling water intake structures and developing a water balance diagram that

[68] Ronafalvy, J.P., R.R. Cheesman, and W.M. Matejek. ''Circulating water traveling screen modifications to improve impinged fish survival and debris handling at Salem Generating Station.'' Presentation at Power Generation Impacts on Aquatic Resources Conference, Atlanta Georgia, April 12–15, 1999.

can be used to identify the proportion of intake water used for cooling, make-up, and process water. Some of the facilities would need to perform additional activities in relation to velocity and flow reduction requirements. The estimates also incorporate the cost of preparing a narrative description of the design, structure, equipment, and operation to meet the velocity, flow, and flow reduction requirements.

In addition to the activities mentioned above, some facilities would need to prepare and submit a plan describing the design and characteristics of additional technologies to be installed to maximize the survival of aquatic organisms, and to minimize the impingement and entrainment of organisms. The estimates for some facilities also incorporate the cost of the sampling, analyzing, and reporting of the impinged and entrained organisms during a biological cycle, and velocity monitoring and biweekly inspections of the operation of the installed technologies.

Exhibit 5 presents a summary of the maximum burden estimates for a facility to prepare a permit application, along with the monitoring and reporting of cooling water intake structures operations.

EXHIBIT 5.—MAXIMUM BURDEN AND COSTS PER FACILITY FOR NPDES PERMIT APPLICATION AND MONITORING AND REPORTING ACTIVITIES

Activities	Burden (hr)	Labor cost	Other direct costs [a]
Start-up activities	43	$1,330	$50
General information activities	252	6,512	500
Source water baseline biological characterization activities [b]	404	11,655	1,250
Flow standard activities	104	2,495	100
Velocity standard activities	138	3,690	1,000
Flow reduction commensurate with closed-cycle recirculating	98	2,478	400
Additional design and construction technology implementation plan	85	2,372	50
Subtotal	1,124	30,532	3,350
Maximum Burden and Costs per Facility for Annual Monitoring and Reporting Activities			
Biological monitoring (impingement)	238	$6,736	$2,000
Biological monitoring (entrainment)	530	14,675	4,000
Velocity monitoring	163	4,169	100
Visual inspection	253	6,831	100
Yearly status report activities	340	10,634	750
Subtotal	1,524	43,045	6,950

[a] Cost of supplies, filing cabinets, photocopying, boat renting, etc.
[b] The Source Water Baseline Biological Characterization Study also has contracted service costs associated with it.

The proposed changes to the NPDES permit process would require States to devote time and resources to reviewing and responding to the NPDES permit applications, implementation plans, and annual status reports submitted to them. EPA assumed that all 43 States and one territory with NPDES permitting authority will undergo start-up activities in preparation for administering the provisions of the New Facility Rule. As part of these start-up activities States are expected to train junior technical staff on how to review materials submitted by facilities, and then use these materials to determine the specific conditions of each facility's NPDES permit with regard to the facility's cooling water intake structure.

Each State's actual burden associated with reviewing submitted materials, writing permits, and tracking compliance depends on the number of new in-scope facilities that will be built in the State during the ICR approval period. EPA expects that State senior technical, junior technical, and clerical staff will spend time gathering, preparing, and submitting the various documents. EPA's burden estimates reflect the general staffing and level of expertise that is typical in States that administer the NPDES permitting program. EPA considered the time and qualifications necessary to complete various tasks such as reviewing submitted documents and supporting materials, verifying data sources, planning responses, determining specific permit requirements, writing the actual permit, and conferring with facilities and the interested public. Exhibit 6 provides a summary of the burden estimates for States performing various activities associated with the proposed rule.

EXHIBIT 6.—ESTIMATING STATE BURDEN AND COSTS FOR ACTIVITIES

Activities	Burden (hrs)	Labor cost	ODC ($)
State start-up activities (per State)	100	$3,004	$50
State permit issuance activities (per facility)	116	3,182	300
Annual State activities (per facility)	50	1,419	50

Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing procedures to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information.

An Agency may not conduct or sponsor, and a person is not required to respond to a collection of information, unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations are listed in 40 CFR part 9 and 48 CFR Chapter 15.

EPA requests comments on the Agency's need for this information, the accuracy of the provided burden estimates, and any suggested methods for minimizing respondent burden, including through the use of automated collection techniques. Send comments on the ICR to the Director, Collection Strategies Division; U.S. Environmental Protection Agency (2822); 1200 Pennsylvania Ave., NW.; Washington, DC 20460; and to the Office of Information and Regulatory Affairs; Office of Management and Budget; 725 17th Street; NW., Washington, DC 20503, marked ''Attention: Desk Officer for EPA.'' Include the ICR number in any correspondence. Because OMB is required to make a decision concerning the ICR between 30 and 60 days after August 10, 2000, a comment is most likely to have its full effect if OMB receives it by September 11, 2000. The final rule will respond to any OMB or public comments on the information collection requirements contained in this proposal.

B. Unfunded Mandates Reform Act

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), Pub. L. 104–4, establishes requirements for Federal agencies to assess the effects of their regulatory actions on State, local, and Tribal governments and the private sector. Under section 202 of UMRA, EPA generally must prepare a written statement, including a cost-benefit analysis, for proposed and final rules with ''Federal mandates'' that might result in expenditures to State, local, and Tribal governments, in the aggregate, or to the private sector, of $100 million or more in any one year. Before promulgating an EPA rule for which a written statement is needed, section 205 of UMRA generally requires EPA to identify and consider a reasonable number of regulatory alternatives and adopt the least costly, most cost-effective, or least burdensome alternative that achieves the objectives of the rule. The provisions of section 205 do not apply when they are inconsistent with applicable law. Moreover, section 205 allows EPA to adopt an alternative other than the least costly, most cost-effective, or least burdensome alternative if the Administrator publishes with the final rule an explanation why that alternative was not adopted. Before EPA establishes any regulatory requirements that might significantly or uniquely affect small governments, including Tribal governments, it must have developed under section 203 of the UMRA a small government agency plan. The plan must provide for notifying potentially affected small governments, enabling officials of affected small governments to have meaningful and timely input in the development of EPA regulatory proposals with significant intergovernmental mandates, and informing, educating, and advising small governments on compliance with regulatory requirements.

EPA has determined that this rule does not contain a Federal mandate that might result in expenditures of $100 million or more for State, local, and Tribal governments, in the aggregate, or the private sector in any one year. Total annualized compliance and implementation costs are estimated to be $12.2 million. Of the total, the private sector accounts for $11.9 million and the government sector (includes direct compliance costs for facilities owned by government entities) accounts for $0.26 million. EPA calculated annualized costs by estimating initial and annual expenditures by facilities and regulatory authorities over the 30-year period (2001–2031), calculating the present value of that stream of expenditures using a 7 percent discount rate. EPA estimates that the highest undiscounted costs incurred by the private sector and government sector in any one year are approximately $36.2 million and $0.29 million, respectively. Thus, today's rule is not subject to the requirements of sections 202 and 205 of UMRA.

This rule is not expected to impact small governments. A municipality that owns or operates a electric generation facility is the primary category of small government operations that might be affected by a rule, regulating cooling water intake structures. Existing data indicates that no new municipal electric generation facilities are going to be constructed in the next ten years. In addition, to minimize cost, this proposed rule excludes facilities that take in less than two (2) million gallons per day. Details and methodologies used for these estimations are included in the *Economic and Engineering Analysis of the Proposed Section 316(b) New Facility Rule,* which is in the docket for today's proposal.

EPA has determined that this proposed rule contains no regulatory requirements that might significantly or uniquely affect small governments. The proposal, if promulgated, would not establish requirements that would affect small governments. Thus, today's proposed rule is not subject to the requirements of section 203 of UMRA.

C. Regulatory Flexibility Act (RFA) as Amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), 5 U.S.C. 601 et seq.

The RFA generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions.

Today's proposed rule is intended to minimize the adverse environmental impact from cooling water intake structures and regulates industries that use cooling water withdrawn directly from waters of the U.S. The primary impact would be on steam electric generating facilities (SIC 4911); however, a number of other industries might also be regulated, including but not limited to paper and allied products (primary SIC 26), chemical and allied products (primary SIC 28), petroleum and coal products (primary SIC 29), and primary metals (primary SIC 33).

For the purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) A small business according to SBA size standards; (2) a small governmental jurisdiction that is a government of a city, county; town, school district or special district with a population of less than 50,000; and (3) a small organization that is not-for-profit enterprise which is independently owned and operated and is not dominant in its field. This proposed rule is expected to regulate only a small absolute number of facilities owned by small entities, that represent a very small percentage of all facilities owned by small entities in their respective industries. EPA has estimated that 20 facilities owned by small entities would be regulated by this proposed rule. Of the 20 facilities owned by small entities, 14 are projected to be steam electric generating facilities and 6 to be manufacturing facilities. EPA does not anticipate that today's proposed rule would regulate any small governments or nonprofit entities.

After considering the economic impacts of today's proposed rule on small entities, the Agency certifies that this action will not have a significant economic impact on a substantial number of small entities for reasons explained below.

1. Electric Generation Sector

EPA has described the process by which prospective new steam electricity generating facilities were identified and how EPA determined whether such facilities are subject to today's proposed rule elsewhere in this preamble and in Chapter 5 of the *Economic and Engineering Analysis of the Proposed § 316(b) New Facility Rule.* As described in Chapter 8 of the economic and engineering support document, EPA then identified those facilities subject to the rule whose parent firm or government owner would qualify as a small entity pursuant to the SBA size standard for electrical utilities. The Small Business Administration defines a small steam electric generator as a firm whose facilities generated 4 million megawatt-hours output or less in the proceeding year. From that analysis, EPA has determined that 14 facilities owned by small businesses within the steam electric generating industry are likely to be regulated by today's proposed rule. The only government-owned facility that met the SBA criteria was owned by a State and States are not considered small governments.

The estimated annualized compliance costs that facilities owned by small entities would likely incur represent between 0.07 to 0.15 percent of estimated facility annual sales revenue.[69] In addition, EPA was able to assess impacts based on the ratio of initial costs to plant construction costs. The results of both screening analyses indicated very low impacts at the facility level. Consequently, the costs to the parent small entity would be even lower.

The absolute number of small entities potentially subject to this rule is low. This is not unexpected since the total number of facilities subject to this rule is also low. This is the case, even though the electric power industry is currently experiencing a rapid expansion and transition due to deregulation and new Clean Air Act requirements for emissions controls, and a large number of generating plants are under construction or planned for the early years after promulgation of the proposed rule. First, there is a trend toward construction of combined-cycle technologies using natural gas, which use substantially less cooling water than other technologies. Second, there has been a decline in the use of surface water as the source of cooling water. The NEWGen sample data shows a trend away from the use of surface cooling water. It is indicated that 80 percent of the sampled facilities use alternative sources of cooling water (e.g., grey water, ground water, and municipal water). EPA believes this trend reflects the increased competition for water, an increasing awareness of the need for water conservation, and increased local opposition to the use of surface water for power generation. Taken together, the trend toward combined-cycle generating technologies, which have small cooling water requirements per unit of output, and the trend away from the use of surface cooling water result in a low projected number of regulated facilities, despite the expected expansion in new generating capacity.

2. Manufacturing Sector

Chapter 5 of the *Economic and Engineering Analysis of the Proposed § 316 (b) New Facility Rule* shows that 58 new manufacturing facilities are expected to incur compliance costs under the proposed section 316(b) New Facility Rule. Since EPA's estimate of new manufacturing facilities is based on industry growth forecasts and not on specific planned facilities, actual parent firm information was not available. EPA therefore developed profiles of representative facilities based on the characteristics of existing facilities identified in the screener survey EPA used to identify an appropriate sample of existing facilities for detailed analysis as part of § 316(b) rulemaking for existing facilities.[70]

On the basis of the comparison of each representative facility's parent firm employment with the SBA small entity size standard for the firm's SIC code (the small entity size standards are expressed in terms of employees (500 to 1000 employees)), only 6 of the 58 new manufacturing facilities are projected to be owned by a small entity. Four of the 6 facilities are in the chemicals sector and 2 are in the metals sector. EPA used annualized costs as a percentage of annual sales revenue to assess impacts for manufacturing firms. Again, the test was applied at the facility rather than the firm level, which provides a conservative estimate of the impacts because the ratio of costs to revenues generally would be lower at the firm level than at the individual facility level. Once again, the impact analysis showed a negligible impact on small entities, because the effect on facility sales revenue was so low (0.02 to 0.31 percent). Although EPA was able to assess impacts for only a limited number of plants owned by small entities, the Agency believes that the results for these plants would be representative of other plants owned by small entities.

EPA has conducted extensive outreach to industry associations and organizations representing small government jurisdictions to identify small-entity manufacturing facilities. Based on the outreach effort and a review of the relevant industry trade literature, EPA concludes that although the exact number of facilities owned by small entities that would be subject to the proposed rule is difficult to quantify, it is evident that for the foreseeable future few, if any, small entities would be affected. EPA estimates that only 1.9 percent of all future facilities owned by small entities will use cooling water at levels that would bring them within the scope of this regulation.

The small number of small entities subject to this rule in the manufacturing sector is not surprising because the facilities likely to be subject to the proposed rule are large industrial facilities that are not generally owned by small entities. There are multiple reasons for the limited projected number of in-scope new facilities owned by small entities. The major factors responsible, depending on which

[69] In addition to 7 known planned facilities, EPA estimated that additional hypothetical facilities potentially regulated by this proposed rule will begin operating during the next 20 years. Based on information on the known facilities and expected characteristics of the projected facilities, EPA estimates that impacts on other facilities owned by small firms would also be low.

[70] For each SIC code that included one projected new facility, EPA sorted screener respondents in that SIC code by the number of employees at a facility. EPA selected the facility with the median employment value as the representative facility and used that facility's reported firm characteristics (employment and sales revenues) for this small entity analysis. Data from the Dun & Bradstreet database were used where information on the firm was not available in the screener. In cases where more than one new facility is projected in an SIC code, EPA again sorted the screener respondents by number of employees at a facility. EPA then divided the screener respondents into as many subcategories as the projected number of new facilities in the SIC code. Finally, EPA used employment and sales revenue data from the median employment facility in each subcategory to represent the projected new facility for this small entity analysis. Data from the Dun & Bradstreet database were used where information on the firm was not available in the screener survey. The document, *Economic and Engineering Analysis of the Proposed § 316(b) New Facility Rule,* provides more detailed information on how facility and firm characteristics for the 58 new manufacturing facilities were determined.

industry sector is considered, include industry downsizing; expansion of capacity at existing facilities as a means of meeting increased demand; mergers and acquisitions that reduce the overall number of firms; and addition of a significant number of new facilities in at least one industry sector as part of a recently completed expansion cycle so that additional new facilities are not expected for the foreseeable future. The segments of the industries that are the primary users of cooling water are mostly large, capital intensive enterprises with few, if any, small businesses within their ranks. Moreover, these industries are particularly subject to the impacts of globalization, including competitive pressures from low-cost foreign producers, providing a strong incentive for domestic industry to consolidate to secure the market share and realize production efficiencies. In addition, startup or expansion of the type of industrial facilities subject to today's proposed rule requires significant capital, which small businesses cannot easily secure. The nature of manufacturing enterprises using cooling water at the levels addressed by today's proposed rule is generally inconsistent with small business activity.

Finally, a minimum flow cutoff of 2 MGD is likely to exempt a significant number of small facilities from the requirements of the proposed rule. Therefore, EPA believes it is reasonable to conclude that in the foreseeable future there will be a negligible increase in the number of in-scope small facilities in these manufacturing industries.

Exhibit 7 summarizes the results of Regulatory Flexibility Act/Small Business Regulatory Enforcement Fairness Act analysis. From the small absolute number of facilities owned by small entities that would be affected by the proposed rule, and the very low impacts at the facility level, EPA concludes that the proposed rule will not have a significant economic impact on a substantial number of small entities.

EXHIBIT 7.—SUMMARY OF RFA/SBREFA ANALYSIS

Type of facility	Number of facilities owned by small entities	Annual compliance costs/annual sales revenue	Initial compliance cost/ construction cost
Steam electric generating facilities	14	0.07% to 0.15%.	0.01% to 0.01%.
Manufacturing facilities	6	0.02% to 0.31%.	Data not available.
Total	20	0.02% to 0.31%.	0.01% to 0.01%.

One reason why this proposed rule would not have a significant economic impact on a substantial number of small entities is that EPA has established a flow level of greater than 2 MGD as the level below which facilities would be exempt from the requirements of the proposed rule. This minimum flow level exempts many facilities using small amounts of water, including facilities owned by small entities, while covering approximately 90% of the total cooling water withdrawn from the waters of the U.S. EPA also conducted extensive outreach to industry associations and organizations that represent small entities, to determine how this rule would affect their small entity constituents.

We continue to be interested in the potential impacts of the proposed rule on small entities and welcomes comments on issues related to such impacts.

D. Executive Order 12866: Regulatory Planning and Review

Under Executive Order 12866, (58 FR 51735, October 4, 1993) the Agency must determine whether the regulatory action is ''significant'' and therefore subject to OMB review and the requirements of the Executive Order. The order defines a ''significant regulatory action'' as one that is likely to result in a rule that may:

- Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or Tribal governments or communities;
- Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
- Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
- Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

Pursuant to the terms of Executive Order 12866, it has been determined that this proposed rule is a ''significant regulatory action.'' As such, this action was submitted to OMB for review. Changes made in response to OMB suggestions or recommendations will be documented in the public record.

E. Executive Order 13132: Federalism

Executive Order 13132 (64 FR 43255, August 10, 1999) requires EPA to develop an accountable process to ensure ''meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications.'' ''Policies that have federalism implications'' is defined in the Executive Order to include regulations that have ''substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.''

Under section 6 of Executive Order 13132, EPA may not issue a regulation that has federalism implications, that imposes substantial direct compliance costs, and that is not required by statute unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by State and local governments or EPA consults with State and local officials early in the process of developing the proposed regulation. EPA also may not issue a regulation that has federalism implications and that preempts State law, unless the Agency consults with State and local officials early in the process of developing the proposed regulation.

This proposed rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. Rather, this proposed rule would result in minimal administrative costs on States that have an authorized NPDES program. EPA expects an annual burden of 2,339 hours with an annual cost of $3,200 (non-labor costs) for States to collectively administer this proposed rule. Also, based on meetings and subsequent discussions with local government representatives from municipal utilities, EPA believes that the proposed new facility rule may affect, at most, only two large municipalities that own steam electric generating facilities. The annual impacts on these facilities is not expected to exceed 1,304 burden hours and $36,106 (non-labor costs) per facility.

The proposed national cooling water intake structure requirements would be implemented through permits issued under the NPDES program. Forty-three States and the Virgin Islands are currently authorized pursuant to section 402(b) of the CWA to implement the NPDES program. In States not authorized to implement the NPDES program, EPA issues NPDES permits. Under the CWA, States are not required to become authorized to administer the NPDES program. Rather, such authorization is available to States if they operate their programs in a manner consistent with section 402(b) and applicable regulations. Generally, these provisions require that State NPDES programs include requirements that are as stringent as Federal program requirements. States retain the ability to implement requirements that are broader in scope or more stringent than Federal requirements. (See section 510 of the CWA.)

Today's proposed rule would not have substantial direct effects on either authorized or nonauthorized States or on local governments because it would not change how EPA and the States and local governments interact or their respective authority or responsibilities for implementing the NPDES program. Today's proposed rule establishes national requirements for new facilities with cooling water intake structures. NPDES-authorized States that currently do not comply with the final regulations based on today's proposal might need to amend their regulations or statutes to ensure that their NPDES programs are consistent with Federal section 316(b) requirements. See 40 CFR 123.62(e). For purposes of this proposed rule, the relationship and distribution of power and responsibilities between the Federal government and the States and local governments are established under the CWA (*e.g.*, sections 402(b) and 510); nothing in this proposed rule would alter that. Thus, the requirements of section 6 of the Executive Order do not apply to this rule.

Although section 6 of Executive Order 13132 does not apply to this rule, EPA did consult with State governments and representatives of local governments in developing the proposed rule. During the development of the proposed Section 316(b) rule for new facilities, EPA conducted several outreach activities through which State and local officials were informed about this proposal and they provided information and comments to the Agency. The outreach activities were intended to provide EPA with feedback on issues such as adverse environmental impact, BTA, and the potential cost associated with various regulatory alternatives.

EPA held two public meetings in the summer of 1998 to discuss issues related to the section 316(b) rulemaking effort. Representatives from New York and Maryland attended the meetings and provided input to the Agency. The 316(b) workgroup also contacted Pennsylvania and Virginia to exchange information on this issue. In addition, EPA Regions 1, 3, 4, and 9 served as conduits for transmittal of section 316(b) information between the Agency and several States. More recently, EPA met with industry, environmental, and State and Federal government representatives, during May, June, and July of this year to discuss regulatory alternatives for the new facility proposal. Comments from these meetings helped EPA to evaluate and revise draft regulatory framework alternatives.

In the spirit of this Executive Order and consistent with EPA policy to promote communications between EPA and State and local governments, EPA specifically solicits comment on this proposed rule from State and local officials.

F. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 requires that, to the greatest extent practicable and permitted by law, each Federal agency must make achieving environmental justice part of its mission. E.O. 12898 provides that each Federal agency must conduct its programs, policies, and activities that substantially affect human health or the environment in a manner that ensures that such programs, policies, and activities do not have the effect of excluding persons (including populations) from participation in, denying persons (including populations) the benefits of, or subjecting persons (including populations) to discrimination under such programs, policies, and activities because of their race, color, or national origin.

Today's proposed rule would require that the location, design, construction, and capacity of cooling water intake structures at new facilities reflect the best technology available for minimizing adverse environmental impact. For several reasons, EPA does not expect that this proposed rule would have an exclusionary effect, deny persons the benefits of the NPDES program, or subject persons to discrimination because of their race, color, or national origin. The proposed rule applies only to new facilities with cooling water intake structures that withdraw waters of the U.S. As discussed previously, EPA anticipates that this proposed rule would not affect a large number of new facilities; therefore, any impacts of the proposed rule would be limited. The proposed rule does include location criteria that would affect siting decisions made by new facilities, these criteria are intended to prevent deterioration of our nation's aquatic resources. EPA expects that this proposed rule would preserve the health of aquatic ecosystems located in reasonable proximity to new cooling water intake structures and that all populations, including minority and low-income populations, would benefit from such improved environmental conditions. In addition, because the proposed rule would help prevent decreases in populations of fish and other aquatic species, it is likely to help maintain the welfare of subsistence and other low-income fishermen or minority low-income populations.

G. Executive Order 13045: Protection of Children From Environmental Health Risks and Safety Risks

Executive Order 13045 (62 FR 19885, April 23, 1997) applies to any rule that (1) is determined to be ''economically significant'' as defined under Executive Order 12866, and (2) concerns an environmental health or safety risk that EPA has reason to believe might have a disproportionate effect on children. If the regulatory action meets both criteria, the Agency must evaluate the environmental health and safety effects of the planned rule on children, and explain why the planned regulation is preferable to other potentially effective and reasonably feasible alternatives considered by the Agency. This proposed rule is not an economically significant rule as defined under Executive Order 12866 and does not involve an environmental health or safety risk that would have a disproportionate effect on children. Therefore, it is not subject to Executive Order 13045. Further, this rule does not concern an environmental health or safety risk that EPA has reason to believe may disproportionately affect children.

H. Executive Order 13084: Consultation and Coordination With Indian Tribal Governments

Under Executive Order 13084, EPA may not issue a regulation that is not required by statute, that significantly or uniquely affects the communities of Indian Tribal governments, and that imposes substantial direct compliance costs on those communities unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by the Tribal governments or EPA consults with those governments. If EPA complies by consulting, Executive Order 13084 requires EPA to provide to the Office of Management and Budget, in a separately identified section of the preamble to the rule, a description of the extent of EPA's prior consultation with representatives of affected Tribal governments, a summary of the nature of their concerns, and a statement supporting the need to issue the regulation. In addition, Executive Order 13084 requires EPA to develop an effective process permitting elected and other representatives of Indian Tribal governments ''to provide meaningful and timely input in the development of regulatory policies on matters that significantly or uniquely affect their communities.''

Today's proposed rule does not significantly or uniquely affect the communities of Indian Tribal governments. Given the available data on new facilities and the applicability thresholds in the proposed rule, EPA estimates that no new facilities subject to the rule will be owned by Tribal governments. This rule does not affect Tribes in anyway in the foreseeable future. Accordingly, the requirements of section 3(b) of Executive Order 13084 do not apply to this rule.

I. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act (NTTAA) of 1995, Pub L. No. 104–113, Sec. 12(d) directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (*e.g.*, materials specifications, test methods, sampling procedures, and business practices that are developed or adopted by voluntary consensus standard bodies. The NTTAA directs EPA to provide Congress, through the Office of Management and Budget (OMB), explanations when the Agency decides not to use available and applicable voluntary consensus standards.

This proposed rule does not involve such technical standards. Therefore, EPA is not considering the use of any voluntary consensus standards. EPA welcomes comments on this aspect of the proposed rule and , specifically, invites the public to identify potentially applicable voluntary consensus standards and to explain why such standards should be used in this proposed rule.

J. Plain Language Directive

Executive Order 12866 and the President's memorandum of June 1, 1998, require each agency to write all rules in plain language. We invite your comments on how to make this proposed rule easier to understand. For example: Have we organized the material to suit your needs? Are the requirements in the rule clearly stated? Does the rule contain technical language or jargon that isn't clear? Would a different format (grouping and order of sections, use of headings, paragraphing) make the rule easier to understand? Would more (but shorter) sections be better? Could we improve clarity by adding tables, lists, or diagrams? What else could we do to make the rule easier to understand?

K. Executive Order 13158: Marine Protected Areas

Executive Order 13158 (65 FR 34909, May 31, 2000) requires EPA to ''expeditiously propose new science-based regulations, as necessary, to ensure appropriate levels of protection for the marine environment.'' EPA may take action to enhance or expand protection of existing marine protected areas and to establish or recommend, as appropriate, new marine protected areas. The purpose of the executive order is to protect the significant natural and cultural resources within the marine environment, which means ''those areas of coastal and ocean waters, the Great Lakes and their connecting waters, and submerged lands thereunder, over which the United States exercises jurisdiction, consistent with international law.''

This proposed rule recognizes that there are sensitive biological areas within tidal rivers, estuaries, oceans, and the Great Lakes that are more susceptible to adverse environmental impact from cooling water intake structures. The location of cooling water intake structures is a key factor in minimizing adverse environmental impact. This proposal provides incentives for facilities to locate their cooling water intake structures outside these sensitive biological areas. In those cases where a facility does locate a cooling water intake structure inside these sensitive areas, EPA is proposing that the facility meet the most stringent requirements to minimize adverse environmental impact. This proposed rule would improve the survivability of impinged organisms and reduce the rate of entrained organisms. Therefore, EPA expects this proposal will advance the objective of the executive order to protect marine areas. However, because Executive Order 13158 is new as of May 26, 2000 and EPA has not yet developed implementing regulations, it may be necessary to change the requirements for marine protected areas under this proposal to comply with any future EPA regulations developed to further the objectives of this executive order (*e.g.*, it may be necessary to prohibit or severely limit cooling water withdrawals from marine protected areas).

XII. Solicitation of Comments and Data

A. Specific Solicitation of Comment and Data

As noted in the above sections, EPA solicits comments and data on many individual topics throughout this preamble. The Agency incorporates all such requests for comment here and reiterates its interest in receiving comments and data on the issues addressed by those requests. In addition, EPA particularly requests comments and data on the following issues:

1. EPA solicits comment on the proposed section 316(b) requirements and the methods used to determine the benefit and cost impact values supporting this proposed regulation.

2. EPA solicits comment on the potential impact of the proposed rule on

small entities and on issues related to such impacts.

3. EPA solicits comment on the scope and applicability of the proposed rule, including how EPA has proposed to define ''new facility,'' ''cooling water intake structure,'' the various thresholds that determine the scope of the rule, and the alternative BTA provisions considered by the Agency.

4. EPA solicits data and comment on the number and types of new facilities potentially subject to today's proposed rule.

5. EPA solicits data and comment on the environmental impacts caused by cooling water intake structures at new facilities.

6. EPA solicits comment on appropriate definitions of ''adverse environmental impact'' for purposes of the proposed rule, including whether EPA should include a definition of adverse environmental impact in the final rule or guidance.

7. EPA solicits comment on the frameworks proposed and considered for BTA, including but not limited to the proposed requirements for flow, velocity, location (distance from the littoral zone), and use of additional design and construction technologies.

8. EPA solicits comment on whether it should allow site-specific flexibility in the determination of BTA, and if so, under which of the regulatory approaches discussed in this preamble.

9. EPA solicits comment on the possible use of restoration measures.

10. EPA solicits comment on how the Agency has considered the cost for new facilities to comply with the proposed BTA requirements.

11. EPA solicits comment on how the proposed cooling water intake structure requirements would be implemented, including the need for and burden associated with monitoring, recordkeeping, reporting, and study requirements.

12. EPA solicits comment on how endangered and threatened species are considered under the proposed rule.

13. EPA solicits comment on the monitoring requirement and other approaches that could be used to ensure that the design intake velocity is not exceeded once the facility is built and operating.

14. EPA solicits comment on whether additional procedural provisions are necessary to establish or clarify the permitting process for new facilities employing cooling water intake structures.

B. General Solicitation of Comment

EPA encourages public participation in this rulemaking. EPA asks that comments address any perceived deficiencies in the record supporting this proposal and that suggested revisions or corrections be supported by data.

EPA invites all parties to coordinate their data collection activities with the Agency to facilitate mutually beneficial and cost-effective data submissions. Please refer to the **FOR FURTHER INFORMATION** section at the beginning of this preamble for technical contacts at EPA.

To ensure that EPA can properly respond to comments, the Agency prefers that commenters cite, where possible, the paragraph(s) or sections in the document or supporting documents to which each comment refers. Please submit an original and two copies of your comments and enclosures (including references).

List of Subjects

40 CFR Part 9

Environmental protection, Reporting and recordkeeping requirements.

40 CFR Part 122

Administrative practice and procedure, Confidential business information, Hazardous substances, Reporting and recordkeeping requirements, Water pollution control.

40 CFR Part 123

Administrative practice and procedure, Confidential business information, Hazardous substances, Indians-lands, Intergovernmental relations, Penalties, Reporting and recordkeeping requirements, Water pollution control, .

40 CFR Part 124

Administrative practice and procedure, Air pollution control, Hazardous waste, Indians-lands, Reporting and recordkeeping requirements, Water pollution control, Water supply.

40 CFR Part 125

Cooling water intake structures, Reporting and recordkeeping requirements, Waste treatment and disposal, Water pollution control.

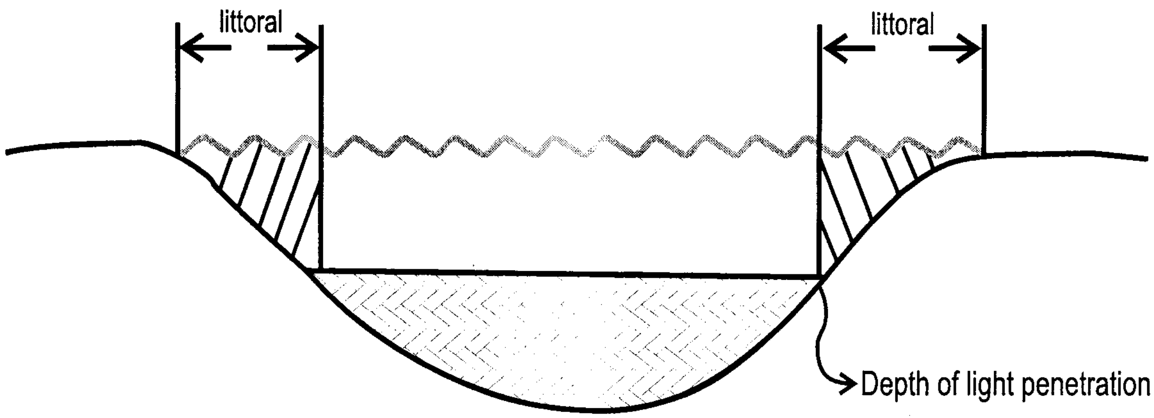
Dated: July 20, 2000.

Carol M. Browner,

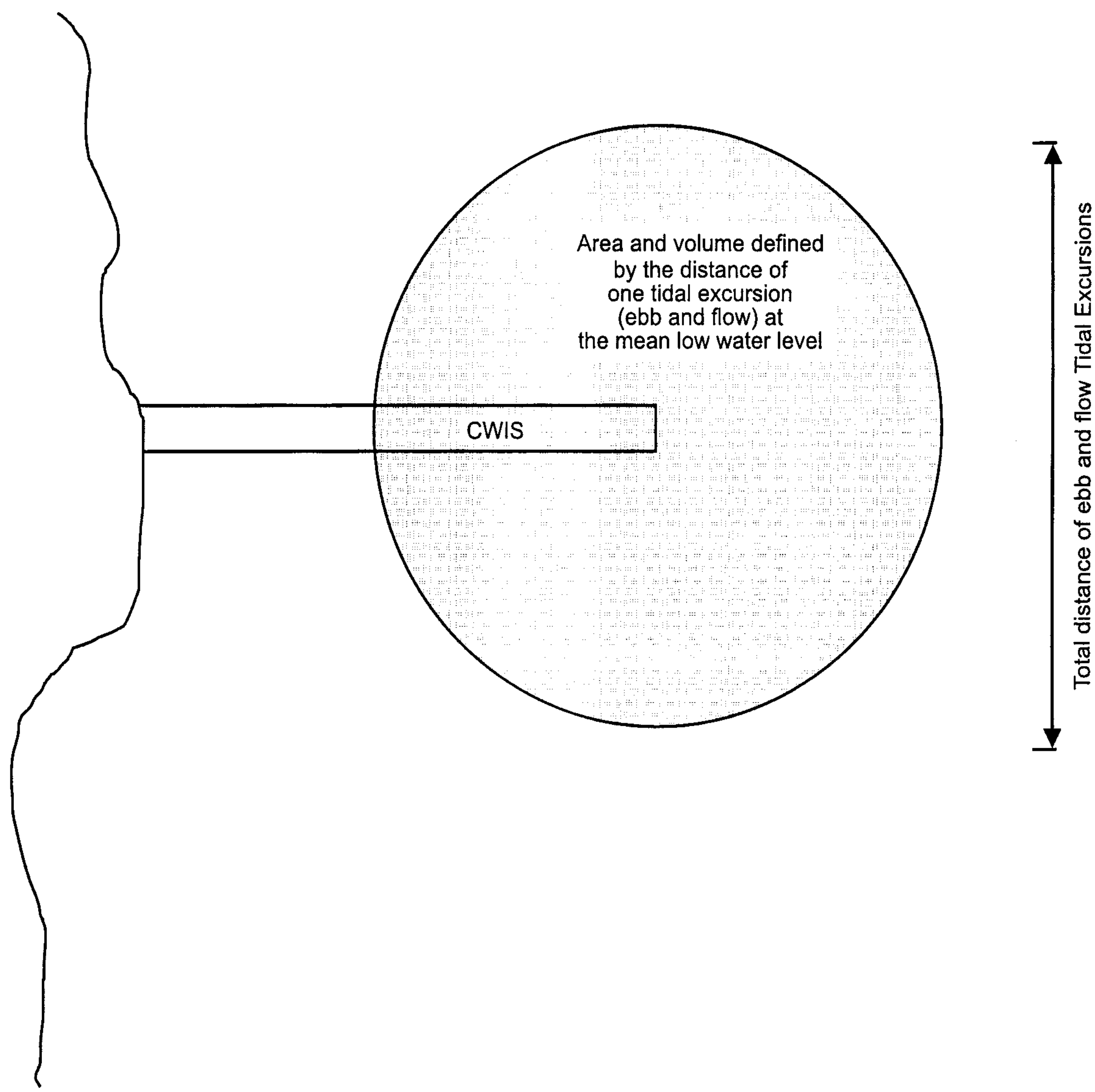
Adminstrator.

BILLING CODE 6560–50–P

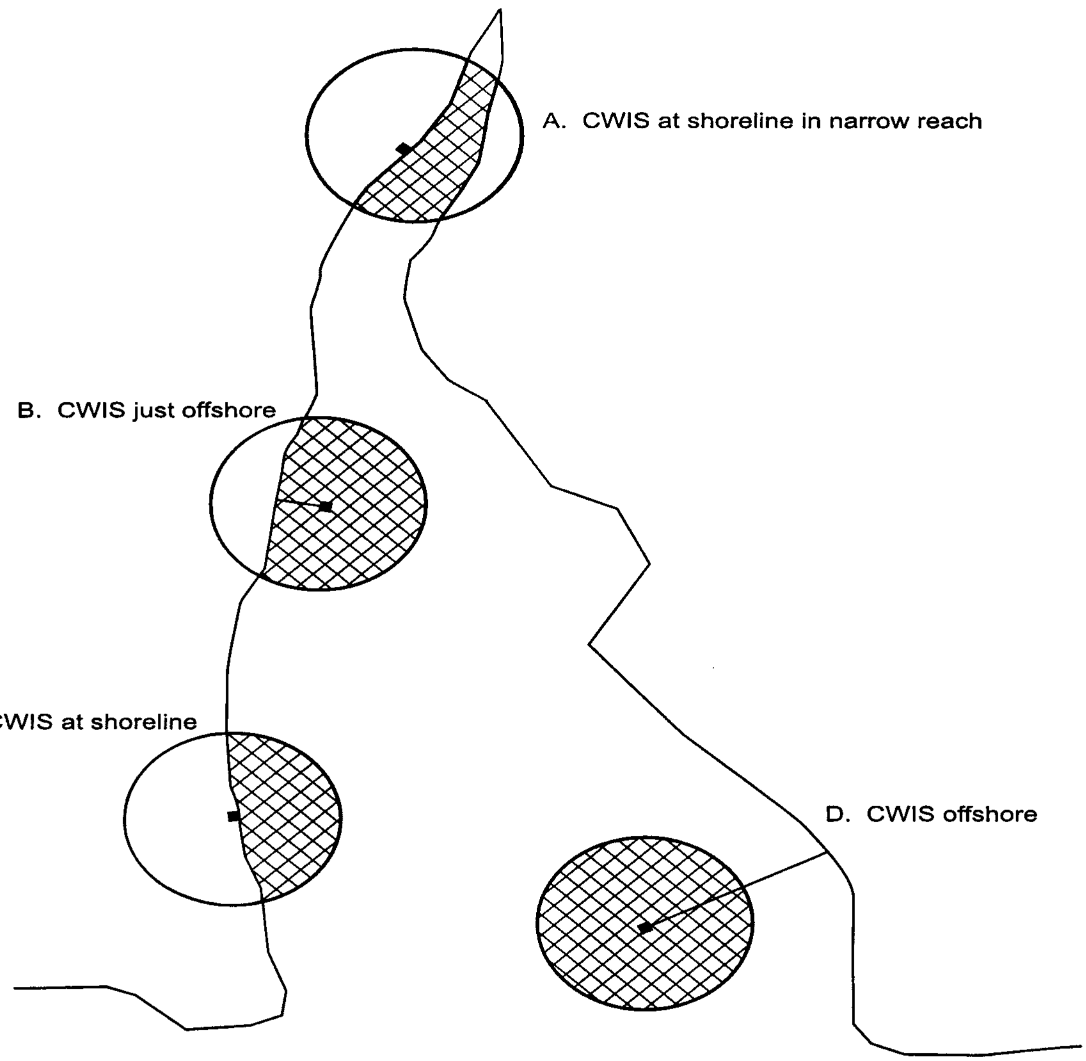
Appendix 1 to Preamble—Littoral Zone Example



Appendix 2 to Preamble—Illustration of Flow Requirement for Estuaries and Tidal Rivers



APPENDIX 3 TO PREAMBLE—EXAMPLES OF AREAS AND VOLUMES DEFINED IN ESTUARIES OR TIDAL RIVERS BY THE TIDAL EXCURSION DISTANCE



CWIS = Cooling Water Intake Structure

BILLING CODE 6560–50–C

For the reasons set forth in the preamble, chapter I of title 40 of the Code of Federal Regulations is proposed to be amended as follows:

PART 9—OMB APPROVALS UNDER THE PAPERWORK REDUCTION ACT

1. The authority citation for part 9 continues to read as follows:

Authority: 7 U.S.C. 135 *et seq.*, 136–1136y; 15 U.S.C. 2001, 2003, 2005, 2006, 2601–2671, 21 U.S.C. 331j, 346a, 348; 31 U.S.C. 9701; 33 U.S.C. 1251 *et seq.*, 1311, 1313d, 1314, 1318, 1321, 1326, 1330, 1342, 1344, 11345 (d) and (e), 1361; E.O. 11735, 38 FR 21243, 3 CFR, 1971–1975 Comp. p. 973; 42 U.S.C. 241, 242b, 243, 246, 300f, 300g, 300g–1, 300g–2, 300g–3, 300g–4, 300g–5, 300g–6, 300j–1, 300j–2, 300j–3, 300j–4, 300j–9, 1857 *et seq.*, 6901–6992k, 7401–7671q, 7542, 9601–9657, 11023, 11048.

2. In § 9.1 the table is amended by adding entries in numerical order under the indicated heading to read as follows:

§ 9.1 OMB approvals under the Paper Work Reduction Act.

* * * * *

40 CFR citation	OMB control no.
* * *	* *
Criteria and Standards for the National Pollutant Discharge Elimination System	
* * *	* *
125.85	2040–
125.87	2040–
* * *	* *

PART 122—EPA ADMINISTERED PERMIT PROGRAMS: THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

1. The authority citation for part 122 continues to read as follows:

Authority: The Clean Water Act, 33 U.S.C. 1251 *et seq.*

2. Amend § 122.21 by adding a new paragraph (r)(1) to read as follows:

§ 122.21 Application for a permit (applicable to State programs, see § 123.25)

* * * * *

(r) *Applications for facilities with cooling water intake structures*—(1) *New facilities with new or modified cooling water intake structures.* New facilities with cooling water intake structures as defined in part 125, subpart I of this chapter must report the information required under § 125.86 of this chapter. Requests for alternative requirements under § 125.85 of this chapter must be submitted with your permit application.

(2) [Reserved].

3. Amend § 122.44 to add paragraph (b)(3) to read as follows:

§ 122.44 Establishing limitations, standards, and other permit conditions (applicable to State NPDES programs, see § 123.25).

* * * * *

(b) * * *

(3) Requirements applicable to cooling water intake structures at new facilities under section 316(b) of the CWA, in accordance with part 125, subpart I of this chapter.

* * * * *

PART 123—STATE PROGRAM REQUIREMENTS

1. The authority citation for part 123 continues to read as follows:

Authority: The Clean Water Act, 33 U.S.C. 1251 *et seq.*

2. Amend § 123.25 to revise paragraph (a)(36) to read as follows:

§ 123.25 Requirements for permitting.

(a) * * *

(36) Subparts A, B, D, H, and I of part 125 of this chapter.

* * * * *

PART 124—PROCEDURES FOR DECISIONMAKING

1. The authority citation for part 124 continues to read as follows:

Authority: Resource Conservation and Recovery Act, 42 U.S.C. 6901 *et seq.*; Clean Water Act, 33 U.S.C. 1251 *et seq.*; and Clean Air Act, 42 U.S.C. 1857 *et seq.*

2. Amend § 124.10 to redesignate paragraph (d)(1)(ix) as paragraph (d)(1)(x) and to add a new paragraph (d)(1)(ix) to read as follows:

§ 124.10 Public notice of permit actions and public comment period.

* * * * *

(d) * * *

(1) * * *

(ix) Requirements applicable to cooling water intake structures at new facilities under section 316(b) of the CWA, in accordance with part 125, subpart I of this chapter.

* * * * *

PART 125—CRITERIA AND STANDARDS FOR THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

1. The authority citation for part 125 continues to read as follows:

Authority: Clean Water Act, as amended by the Clean Water Act of 1977, 33 U.S.C. 1251 *et seq.*, unless otherwise noted.

2. Add subpart I to part 125 to read as follows:

Subpart I—Requirements Applicable to Cooling Water Intake Structures for New Facilities under Section 316(b) of the Act

Sec.

125.80 What are the purpose and scope of this subpart?
125.81 Who is subject to this subpart?
125.82 When must I comply with this subpart?
125.83 What special definitions apply to this subpart?
125.84 As an owner or operator of a new facility, what must I do to comply with this subpart?
125.85 May alternative requirements be imposed?
125.86 As an owner or operator of a new facility, what must I collect and submit when I apply for my new or reissued NPDES permit to show that I am complying with this subpart?
125.87 As an owner or operator of a new facility, must I perform monitoring?
125.88 As an owner or operator of a new facility, must I keep records and report?
125.89 As the Director, what must I do to comply with the requirements of this subpart?

Subpart I—Requirements Applicable to Cooling Water Intake Structures for New Facilities under Section 316(b) of the Act

§ 125.80 What are the purpose and scope of this subpart?

(a) This subpart establishes requirements that apply to the location, design, construction, and capacity of cooling water intake structures at new facilities. The purpose of these requirements is to minimize adverse environmental impact associated with the use of cooling water intake structures. These requirements must be implemented through National Pollutant Discharge Elimination System (NPDES) permits issued under section 402 of the Clean Water Act (CWA).

(b) This subpart implements section 316(b) of the CWA for new facilities. Section 316(b) of the CWA provides that any standard established pursuant to sections 301 or 306 of the CWA and applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.

(c) Nothing in this subpart shall be construed to preclude or deny the right of any State or political subdivision of a State or any interstate agency under section 510 of the CWA to adopt or enforce any requirement with respect to control or abatement of pollution that is more stringent than those required by Federal law.

§ 125.81 Who is subject to this subpart?

This subpart applies to all new facilities that propose to use a cooling water intake structure; that are, or will be, subject to a National Pollutant Discharge Elimination System (NPDES) permit; and that have a design intake flow of greater than two (2) million gallons per day (MGD).

§ 125.82 When must I comply with this subpart?

New facilities subject to this subpart must comply with this subpart before they begin to withdraw cooling water.

§ 125.83 What special definitions apply to this subpart?

When used in this subpart:

7Q10 means the lowest average seven-consecutive-day low flow with an average recurrence frequency of once in 10 years determined hydrologically.

Annual mean flow means the average of daily flows over a calendar year. Historical data (up to 10 years) should be used where available.

Closed-cycle recirculating system means a system designed, using minimized makeup and blowdown flows, to withdraw water from a natural or other water source to support contact and noncontact cooling uses within a facility. The water is usually sent to a cooling canal or channel, lake, pond, or tower to allow waste heat to be dissipated and then is returned to the system. (Some facilities divert the waste heat to other process operations.) New source water (makeup water) is added to the system to replenish losses that have occurred due to blowdown, drift, and evaporation.

Cooling water means water used for contact or noncontact cooling, including water used for air conditioning, equipment cooling, evaporative cooling tower makeup, and dilution of effluent heat content. The intended use of the cooling water is to absorb waste heat rejected from the process or processes used, or from auxiliary operations on the facility's premises.

Cooling water intake structure means the total physical structure and any associated constructed waterways used to withdraw water from waters of the U.S., provided that at least 25 percent of the water withdrawn is used for cooling purposes. The cooling water intake structure extends from the point at which water is withdrawn from the surface water source to the first intake pump or series of pumps.

Design intake flow means the value assigned (during the facility's design) to the total volume of water withdrawn from a source water body over a specific time period.

Design intake velocity means the value assigned (during the design of a cooling water intake structure) to the average speed at which intake water passes through the open area of the intake screen (or other device) against which organisms might be impinged or through which they might be entrained.

Entrainment means the incorporation of fish, eggs, larvae, and other plankton with intake water flow entering and passing through a cooling water intake structure and into a cooling water system.

Estuary means all or part of the mouth of a river or stream or other body of water having an unimpaired natural connection with open seas and within which the seawater is measurably diluted with fresh water derived from land drainage. The salinity of an estuary exceeds 0.5 parts per thousand (by mass) but is less than 30 parts per thousand (by mass).

Existing facility means any facility that is not a new facility.

Freshwater river or stream means a lotic (free-flowing) system that does not receive significant inflows of water from oceans or bays due to tidal action.

Impingement means the entrapment of aquatic organisms on the outer part of an intake structure or against a screening device during periods of intake water withdrawal.

Lake means any inland body of open water with some minimum surface area free of rooted vegetation and with an average hydraulic retention time of more than 7 days. Lakes might be natural water bodies or impounded streams, usually fresh, surrounded by land or by land and a man-made retainer (*e.g.,* a dam). Lakes might be fed by rivers, streams, springs, and/or local precipitation.

Littoral zone means any nearshore area in a freshwater river or stream, lake or reservoir, or estuary or tidal river extending from the level of highest seasonal water to the deepest point at which submerged aquatic vegetation can be sustained (*i.e.*, the photic zone extending from shore to the substrate receiving one (1) percent of incident light); where there is a significant change in slope that results in changes to habitat and/or community structure; and where there is a significant change in the composition of the substrate (*e.g.*, cobble to sand, sand to mud). In oceans, the littoral zone encompasses the photic zone of the neritic region. The photic zone is that part of the water that receives sufficient sunlight for plants to be able to photosynthesize. The neritic region is the shallow water or nearshore zone over the continental shelf.

Maximize means to increase to the greatest possible amount, extent, or degree.

Minimize means to reduce to the smallest possible amount, extent, or degree.

Natural thermal stratification means the naturally occurring division of a waterbody into horizontal layers of differing densities as a result of variations in temperature at different depths.

New facility means any building, structure, facility, or installation that meets the definition of a ''new source'' or ''new discharger;'' in 40 CFR 122.2 and 122.29(b)(1), (2), and (4); commences construction after [the effective date of the final rule]; and has a new or modified cooling water intake structure.

Ocean means marine open coastal waters with a salinity greater than or equal to 30 parts per thousand (by mass).

Reservoir means any natural or constructed basin where water is collected and stored.

Source water means the water body (waters of the U.S.) from which the cooling water is withdrawn.

Tidal excursion means the horizontal distance along the estuary that a particle moves during one tidal cycle of ebb and flow.

Tidal river means the most seaward reach of a river or stream where the salinity is less than or equal to 0.5 parts per thousand (by mass) at a time of annual low flow and whose surface elevation responds to the effects of coastal lunar tides.

§ 125.84 As an owner or operator of a new facility, what must I do to comply with this subpart?

(a) If your new facility's cooling water intake structure is located in any of the types of water bodies in the first column of the following table, you must comply with the requirements in the second column.

If your cooling water intake structure is located in a[n] . . .	Then . . .
(1) Freshwater river or stream.	You must comply with paragraphs (b), (f), and (g) of this section and applicable requirements in § 125.86 (application requirements), § 125.87 (monitoring requirements), and § 125.88 (recordkeeping requirements).
(2) Lake or reservoir	You must comply with paragraphs (c), (f), and (g) of this section and applicable requirements in § 125.86 (application requirements), § 125.87 (monitoring requirements), and § 125.88 (recordkeeping requirements).
(3) Estuary or tidal river.	You must comply with paragraphs (d), (f), and (g) of this section and applicable requirements in § 125.86 (application requirements), § 125.87 (monitoring requirements), and § 125.88 (recordkeeping requirements).
(4) Ocean	You must comply with paragraphs (e), (f), and (g) of this section and applicable requirements in § 125.86 (application requirements), § 125.87 (monitoring requirements), and § 125.88 (recordkeeping requirements).

(b) If your new facility has one or more cooling water intake structures located in a freshwater river or stream, you must comply with the requirements of paragraphs (b)(1), (b)(2), or (b)(3) of this section. A table summarizing the applicable requirements follows.

TABLE-SUMMARY OF REQUIREMENTS FOR FRESHWATER RIVERS OR STREAMS BASED ON THE LOCATION OF THE COOLING WATER INTAKE STRUCTURE

Requirements	Location of Cooling Water Intake Structure Opening		
	≧ 50 Meters Outside Littoral Zone [§ 125.84(b)(1)]	< 50 Meters Outside Littoral Zone [§ 125.84(b)(2)]	Inside Littoral Zone [§ 125.84(b)(3)]
1. Design intake flow ≦5% source water annual mean flow or ≦25% of source water 7q10	✔	✔	✔
2. Design intake velocity ≦0.5 ft/s	✔	✔	✔
3. Reduce intake flow to a level commensurate with a closed cycle recirculating cooling water system		✔	✔
4. Implement additional design and construction technologies			✔

(1) If the opening to your cooling water intake structure is located at least 50 meters outside the littoral zone in a freshwater river or stream, you must meet all of the following requirements:

(i) The total design intake flow from all cooling water intake structures at your facility must be no more than the more stringent of 5 percent of the source water annual mean flow or 25 percent of the source water 7Q10;

(ii) The maximum design intake velocity at each cooling water intake structure at your facility must be no more than 0.5 ft/s.

(2) If the opening to your cooling water intake structure is located less than 50 meters outside the littoral zone in a freshwater river or stream, you must meet all of the following requirements:

(i) The total design intake flow from all cooling water intake structures at your facility must be no more than the more stringent of 5 percent of the source water annual mean flow or 25 percent of the source water 7Q10;

(ii) The maximum design intake velocity at each cooling water intake structure at your facility must be no more than 0.5 ft/s;

(iii) You must reduce your intake flow to a level commensurate with that which can be attained by a closed-cycle recirculating cooling water system;

(3) If the opening to your cooling water intake structure is located inside the littoral zone in a freshwater river or stream, you must meet all of the following requirements:

(i) The total design intake flow from all cooling water intake structures at your facility must be no more than the more stringent of 5 percent of the source water annual mean flow or 25 percent of the source water 7Q10;

(ii) The maximum design intake velocity at all cooling water intake structures at your facility must be no more than 0.5 ft/s;

(iii) You must reduce your intake flow to a level commensurate with that which can be attained by a closed-cycle recirculating cooling water system;

(iv) You must implement additional design and construction technologies that minimize impingement and entrainment of fish, eggs, and larvae and maximize survival of impinged adult and juvenile fish;

(c) If your new facility has one or more cooling water intake structures located in a lake or reservoir, you must comply with the requirements of paragraphs (c)(1), (c)(2), or (c)(3) of this section. A table summarizing the applicable requirements follows.

TABLE-SUMMARY OF REQUIREMENTS FOR LAKES OR RESERVOIRS BASED ON THE LOCATION OF THE COOLING WATER INTAKE STRUCTURE

Requirements	Location of Cooling Water Intake Structure Opening		
	≧50 Meters Outside Littoral Zone [§ 125.84(c)(1)]	≦50 Meters Outside Littoral Zone [§ 125.84(c)(2)]	Inside Littoral Zone [§ 125.84(c)(3)]
1. Design intake flow must not alter the natural thermal stratification	✔	✔	✔
2. Design intake velocity ≦0.5 ft/s		✔	✔
3. Reduce intake flow to a level commensurate with a closed cycle recirculating cooling water system		✔	✔
4. Implement additional design and construction technologies			✔

(1) If the opening to your cooling water intake structure is located at least 50 meters outside the littoral zone in a lake or reservoir, you must meet all of the following requirements: The total design intake flow at your facility must not alter the natural thermal stratification of the source water.

(2) If the opening to your cooling water intake structure is located less than 50 meters outside the littoral zone in a lake or reservoir, you must meet all of the following requirements:

(i) The total design intake flow at your facility must not alter the natural thermal stratification of the source water;

(ii) The maximum design intake velocity at each cooling water intake structure at your facility must be no more than 0.5 ft/s;

(iii) You must reduce your intake flow to a level commensurate with that which can be attained by a closed-cycle recirculating cooling water system;

(3) If the opening to your cooling water intake structure is located inside the littoral zone in a lake or reservoir, you must meet all of the following requirements:

(i) The total design intake flow at your facility must not alter the natural thermal stratification of the source water;

(ii) The maximum design intake velocity at each cooling water intake structure at your facility must be no more than 0.5 ft/s;

(iii) You must reduce your intake flow to a level commensurate with that which can be attained by a closed-cycle recirculating cooling water system;

(iv) You must implement additional design and construction technologies that minimize impingement and entrainment of fish, eggs, and larvae and maximize survival of impinged adult and juvenile fish;

(d) If your new facility has one or more cooling water intake structures located in an estuary or a tidal river, you must comply with the requirements of paragraph (d)(1) of this section. A table summarizing the applicable requirements follows.

TABLE-SUMMARY OF REQUIREMENTS FOR ESTUARIES OR TIDAL RIVERS BASED ON THE LOCATION OF THE COOLING WATER INTAKE STRUCTURE

Requirements for estuaries or tidal rivers	Location of Cooling Water Intake Structure Opening
	Anywhere in Estuary or Tidal River [§ 125.84(d)(1)]
1. Design intake flow ≦1% of the volume of the water column (see 125.84(d)(1))	✔
2. Design intake velocity ≦0.5 ft/s	✔
3. Reduce intake flow to a level commensurate with a closed cycle recirculating cooling water system	✔
4. Implement additional design and construction technologies	✔

(1) If the opening to your cooling water intake structure is located anywhere in an estuary or a tidal river, you must meet all of the following requirements:

(i) The total design intake flow from all cooling water intake structures at your facility must be no greater than one (1) percent of the volume of the water column within the area centered about the opening of the intake with a diameter defined by the distance of one tidal excursion at the mean low water level;

(ii) The maximum design intake velocity at all cooling water intake structures at your facility must be no more than 0.5 ft/s;

(iii) You must reduce your intake flow to a level commensurate with that which can be attained by a closed-cycle recirculating cooling water system;

(iv) You must implement additional design and construction technologies that minimize impingement and entrainment of fish, eggs, and larvae and maximize survival of impinged adult and juvenile fish;

(e) If your new facility has one or more cooling water intake structures located in an ocean, you must comply with the requirements of paragraphs (e)(1) or (2) of this section. A table summarizing the applicable requirements follows.

TABLE-SUMMARY OF REQUIREMENTS FOR OCEANS BASED ON THE LOCATION OF THE COOLING WATER INTAKE STRUCTURE

Requirements	Location of cooling water intake structure opening	
	Outside littoral zone [§ 125.84(e)(1)]	Inside littoral zone [§ 125.84(e)(2)]
1. Design intake velocity ≤ 0.5 ft/s	✔	✔
2. Reduce intake flow to a level commensurate with a closed cycle recirculating cooling water system		✔
3. Implement additional design and construction technologies		✔

(1) If the opening to your cooling water intake structure is located outside the littoral zone in an ocean, you must meet all of the following requirements:

(i) The maximum design intake velocity at each cooling water intake structure at your facility must be no more than 0.5 ft/s.

(2) If the opening to your cooling water intake structure is located inside the littoral zone in an ocean, you must meet all of the following requirements:

(i) The maximum design intake velocity at each cooling water intake structure at your facility must be no more than 0.5 ft/s;

(ii) You must reduce your intake flow to a level commensurate with that which can be attained by a closed-cycle recirculating cooling water system;

(iii) You must implement additional design and construction technologies that minimize impingement and entrainment of fish, eggs, and larvae and maximize survival of impinged adult and juvenile fish;

(f) The Director may include more stringent requirements in the permit than those specified in paragraphs (a) through (e) of this section if he or she determines that they are reasonably necessary to minimize impingement and entrainment as a result of the effects of multiple cooling water intake structures in the same body of water; seasonal variations in the aquatic environment affected by the cooling water intake structures controlled by the permit; or the presence of regionally important species.

(g) The Director must include any more stringent requirements relating to the location, design, construction, and capacity of a cooling water intake structure at a new facility that are reasonably necessary to ensure attainment of water quality standards, including designated uses, criteria, and antidegradation requirements.

§ 125.85 May alternative requirements be imposed?

(a) Any interested person may request that alternative requirements less stringent than those specified in § 125.84(a) through (e) be imposed in the permit. The Director also may propose alternative requirements in the draft permit. A request for the establishment of alternative requirements less stringent than the requirements of § 125.84(a) through (e) may be approved only if:

(1) There is an applicable requirement under § 125.84(a) through (e);

(2) Data specific to the facility indicate that compliance with the requirement at issue would result in compliance costs wholly out of proportion to the costs EPA considered in establishing the requirement at issue;

(3) The alternative requirement requested is no less stringent than justified by the wholly out of proportion cost; and

(4) The alternative requirement will ensure compliance with sections 208(e) and 301(b)(1)(C) of the Clean Water Act.

(b) The burden is on the person requesting the alternative requirement to demonstrate that alternative requirements should be imposed. The requester should refer to all relevant information, including the support documents for this rulemaking, all associated data collected for use in developing each requirement, and other relevant information that is kept on public file by EPA to demonstrate that the appropriate requirements of paragraph (a) of this section have been met.

§ 125.86 As an owner or operator of a new facility, what must I collect and submit when I apply for my new or reissued NPDES permit to show that I am complying with this subpart?

(a) *Source water baseline biological characterization.* As an owner or operator of a new facility, you must begin to collect source water baseline biological characterization data at least 1 year before you must submit your permit application to the Director.

(1) This information is required to evaluate the condition of the biological community and to identify potential (and/or to minimize actual) entrainment and impingement impacts from each cooling water intake structure. The Director will use the information to determine compliance with requirements involving additional design and construction technology requirements and the need for more stringent requirements under § 125.84(f) and (g). As part of this evaluation, you must collect data on both nekton and meroplankton to determine the abundance of relevant species or taxa, and life stages in the water column in the vicinity of each proposed or actual cooling water intake structure. Based on the available life history information and collected data, you also must determine which species and life stages would be most susceptible to impingement or entrainment. With the Director's approval, you may use existing data instead of actual field studies. You must comply with the following requirements and document them in a report submitted to the Director.

(2)(i) If you are required to comply with the requirements in § 125.84(b)(3), (c)(3), (d)(1), or (e)(2), you must develop a sampling plan that documents all methods and quality assurance procedures for data collection, sampling, and analysis. You must submit this plan to the Director for review and approval before any sampling activities begin.

(ii) If you are required to comply with the requirements in § 125.84(b)(1), (b)(2), (c)(1), (c)(2), or (e)(1), you must develop a sampling plan that documents all methods and quality assurance procedures for data collection, sampling, and analysis and maintain the plan at your facility. You are *not* required to submit this plan to the Director.

(iii) The sampling and data analysis methods you propose must be appropriate for a quantitative survey and based on a consideration of methods used in other biological studies performed in the source water body. The study area should include, at a minimum, the area of influence of the cooling water intake structure. The sampling plan must include a description of the study area (which must include the area of influence of the cooling water intake structure and at least 100 meters beyond); a list and description of other relevant studies; a proposal to use data in lieu of actual sampling (if applicable); identification of the biological assemblages to be sampled (both nekton and meroplankton); data collection, sampling, and analysis methods; and any public participation or consultation with Federal or State agencies undertaken in development of the plan.

(3) All owners or operators of new facilities must comply with the following requirements:

(i) Identify up to ten (10) species most important in terms of significance to commercial and recreational fisheries and the forage base.

(ii) Identify all threatened and endangered species that might be susceptible to impingement and entrainment.

(iii) Conduct a sampling program covering at least a 1-year cycle of biological activity in the vicinity of the cooling water intake structure. If you are required to submit a sampling plan to the director in paragraph (a) (2)(i) of this section, the sampling must be based on the Director's approved sampling plan.

(iv) Determine which species are most susceptible to impingement or entrainment based on the information collected and the primary period of reproduction, larval recruitment, and peak meroplankton abundance.

(b) As an owner or operator of a new facility, you must submit the following information to the Director when you apply for a new or reissued NPDES permit in accordance with 40 CFR 122.21:

(1) *Source water physical data.* As an owner or operator of a new facility, you must submit the following source water information that demonstrates and supports a determination of the appropriate requirements to apply to your cooling water intake structures.

(i) A narrative description and scaled drawings showing the physical configuration of all source water bodies, including areal dimensions, depths, salinity regimes, and other documentation that supports your determination of the water body type where each cooling water intake structure is located;

(ii) A narrative description of the configuration of each cooling water intake structure and where it is located in the water body and in the water column;

(iii) Documentation delineating the littoral zone of the water body in the vicinity of each cooling water intake structure, including light penetration and hydromorphological data, submerged aquatic vegetation, substrate data, and a demonstration of where the cooling water intake structure is located in relation to the littoral zone; and

(iv) Latitude and longitude in degrees, minutes, and seconds for each of your cooling water intake structures;

(v) Engineering drawings and locational maps to illustrate the information required by paragraphs (b)(1)(i), (ii), and (iii) of this section.

(vi) A report documenting the results of the Source Water Baseline Characterization required in paragraph (a) of this section.

(2) *Cooling water intake structure flow data.* As an owner or operator of a new facility, you must submit the following information that demonstrates and supports a determination of the appropriate requirements to apply to your cooling water intake structures.

(i) A narrative description of the operation of all cooling water intake structures, including design intake flows, daily hours of operation, and seasonal changes, if applicable; and

(ii) A flow distribution and water balance diagram that includes all sources of water to the facility, recirculating flows, and discharges.

(3) *Flow requirements.* If you must comply with the cooling water intake structure flow requirements in § 125.84(b)(2)(iii), (b)(3)(iii), (c)(2)(iii), (c)(3)(iii), (d)(1)(iii), (e)(1)(ii), or (e)(2)(iii), you must submit the following information to the Director:

(i) If your cooling water intake structure is located in a freshwater river or stream, you must provide the annual mean and 7Q10 flows and any supporting documentation and engineering calculations to show that your cooling water intake structure meets the flow requirements.

(ii) If your cooling water intake structure is located in an estuary or tidal river, you must provide the mean low water tidal excursion distance and any supporting documentation and engineering calculations to show that your cooling water intake structure facility meets the flow requirements.

(iii) If your cooling water intake structure is located in a lake or reservoir, you must provide a narrative description of the water body stratification, and any supporting documentation and engineering calculations to show that the stratification will not be upset by the design intake flow.

(4) *Velocity requirement.* If you must comply with the cooling water intake structure velocity requirement in § 125.84(b)(1)(ii), (b)(2)(ii), (b)(3)(ii), (c)(2)(ii), (c)(3)(ii), (d)(1)(ii), (e)(1)(i), or (e)(2)(i), you must submit the following information to the Director:

(i) A narrative description of the design, structure, equipment, and operation used to meet the velocity requirement; and

(ii) Design calculations showing that the velocity requirement will be met at minimum ambient source water surface elevation and maximum head loss across the screens or other device.

(5) *Flow reduction requirement.* If you must comply with the requirement to reduce your flow to a level commensurate with that which can be attained by a closed-cycle recirculating cooling water system in § 125.84(b)(2)(iii), (b)(3)(iii), (c)(2)(iii), (c)(3)(iii), (d)(1)(iii), (e)(1)(ii), or (e)(2)(ii), you must submit a narrative description of the closed-cycle recirculating cooling water system design and any engineering calculations, including documentation demonstrating that your make-up and blowdown have been minimized. If you meet the flow reduction requirement by reusing 100 percent of the cooling water withdrawn from a source water, you must provide a demonstration that 100 percent of the cooling water is reused in one or more unit processes at the facility.

(6) *Additional design and construction technology requirement.* If you must comply with the requirement in § 125.84(b)(3)(iv), (c)(3)(iv), (d)(2)(iv), or (e)(2)(iii) to implement additional design and construction technologies that maximize the survival of impinged adult and juvenile fish and minimize the entrainment of fish, eggs, and larvae, you must submit to the Director for review and approval a plan that contains information on the technologies you propose to implement based on the results of the Source Water Baseline Biological Characterization required by § 125.86(a). The plan must contain the following information:

(i) A narrative description of the design and operation of any additional design and construction technologies, including fish-handling and return systems, that you will use to maximize the survival of those species expected to be most susceptible to impingement. Provide species-specific information that demonstrates the efficacy of the technology.

(ii) A narrative description of the design and operation of any additional design and construction technologies that you will use to minimize entrainment of those species expected to be the most susceptible to entrainment. Provide species-specific information that demonstrates the efficacy of the technology.

(iii) Design calculations, drawings, and estimates to support the descriptions provided in paragraphs (b)(6)(i) and (ii) of this section.

(7) *Data to support alternative requirements.* If you are seeking alternative requirements under § 125.85, you must submit data that demonstrate that your compliance costs are wholly out of proportion to the costs considered by EPA in establishing the requirements in § 125.84 (a) through (e).

(8) *Other data.* As an owner or operator you must submit other information required by the Director to determine appropriate requirements and other permit conditions to minimize adverse environmental impact.

§ 125.87 As an owner or operator of a new facility, must I perform monitoring?

As an owner or operator of a new facility, you will be required to perform monitoring to demonstrate your compliance with the velocity requirement specified in § 125.84, perform visual inspection of the technologies installed, and assess the need for additional design and construction technologies to minimize entrainment and maximize impingement survival. This section contains monitoring requirements, including how often you must monitor.

(a) *Biological monitoring.* You must monitor both impingement and entrainment of the commercial and recreational fisheries and the forage base species identified in the Source Water Baseline Biological Characterization required by § 125.86(a). The monitoring methods used must be consistent with those used for the Source Water Baseline Biological Characterization required under § 125.86(a). You must follow the monitoring frequencies identified below for at least two (2) years after the initial permit issuance. After that time, the Director may approve a request for less frequent sampling in the remaining years of the permit term and when the permit is reissued, if supporting data show that less frequent monitoring would still allow for the detection of any seasonal and daily variations in the species and numbers of individuals that are impinged or entrained.

(1) *Impingement.* You must collect samples to monitor impingement rates for each species over a 24-hour period and no less than once per month.

(2) *Entrainment.* You must collect samples to monitor entrainment rates for each species over a 24-hour period and no less than biweekly during the primary period of reproduction, larval recruitment, and peak meroplankton abundance identified during the Source Water Baseline Biological Characterization required by § 125.86(a).

(b) *Velocity monitoring.* If your facility uses intake screen systems, you must monitor head loss across the screens and correlate the measured value with the design intake velocity. The head loss across the intake screen must be measured at the minimum ambient source water surface elevation and maximum head loss for each cooling water intake structure. If your facility uses devices other than intake screens, you must monitor velocity at the point of entry through the device. You must monitor head loss or velocity during initial facility startup, and thereafter, at the frequency specified in your NPDES permit, but no less than once per quarter.

(c) *Visual inspections.* You must conduct visual inspections at least weekly to ensure that any additional design and construction technologies implemented under the plan required by § 125.86(b)(6), and other technologies to minimize entrainment and maximize impingement survival are maintained and operated so as to ensure that they will continue to function as designed.

§ 125.88 As an owner or operator of a new facility, must I keep records and report?

As an owner or operator of a new facility you are required to keep records and to report information and data to the Director as follows:

(a) You must keep records of all the data used to complete the permit application and show compliance with the requirements, any supplemental information developed under § 125.86, and any compliance monitoring data submitted under § 125.87, for a period of at least three (3) years from the date of permit issuance. The Director may require that these records be kept for a longer period.

(b) You must provide the following to the Director in a yearly status report:

(1) Biological monitoring records for each cooling water intake structure as required by § 125.87(a);

(2) Velocity and head loss monitoring records for each cooling water intake structure as required by § 125.87(b); and

(3) Records of visual inspections as required in § 125.87(c).

§ 125.89 As the Director, what must I do to comply with the requirements of this subpart?

(a) *Sampling plan for source water baseline biological characterization.* As the Director, you must review and approve, approve with comments, or disapprove, the sampling plan required by § 125.86(a)(2)(i) within 90 days.

(b) *Permit application.* As the Director, you must review materials submitted by the applicant under § 125.86(b) at the time of the initial permit application and before each permit renewal or reissuance to determine whether there have been any changes in facility operations or physical and biological attributes of the source water body. You must evaluate any changes to determine the need for additional or more stringent conditions in the permit.

(c) *Permitting requirements.* Section 316(b) requirements are imposed on facilities through NPDES permits. As the Director, you must determine, based on the information submitted by the new facility in its permit application, the appropriate requirements and conditions to include in the permit based on the location of the cooling water intake structure and the water body type. You must also review and approve, approve with comments, or disapprove any plan submitted under § 125.86(a) or (b)(6). The following requirements must be included in each permit:

(1) *Cooling water intake structure requirements.* At a minimum, the permit conditions must include conditions that implement the requirements of § 125.84. In addition, you must consider whether more stringent conditions are reasonably necessary in accordance with § 125.84(f) and (g).

(2) *Monitoring conditions.* At a minimum, the permit must require the permittee to perform the monitoring required by § 125.87. You may modify the monitoring program when the permit is reissued and during the term of the permit based on changes in physical or biological conditions in the vicinity of the cooling water intake structure.

(3) *Recordkeeping and reporting.* At a minimum, the permit must require the permittee to report and keep records as required by § 128.88.

3. Revise the subpart heading for subpart J to read as follows:

Subpart J—Criteria and Standards Applicable to Cooling Water Intake Structures for Existing Facilities Under Section 316(b) of the Act—[Reserved]

[FR Doc. 00–19373 Filed 8–9–00; 8:45 am]

BILLING CODE 6560–50–P

ATTACHMENT 7

Federal Register

Friday,
July 9, 2004

Part II

Environmental Protection Agency

40 CFR Parts 9, 122 et al.
National Pollutant Discharge Elimination System—Final Regulations To Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities; Final Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 9, 122, 123, 124, and 125

[FRL–7625–9]

RIN 2040–AD62

National Pollutant Discharge Elimination System—Final Regulations to Establish Requirements for Cooling Water Intake Structures at Phase II Existing Facilities

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: Today's final rule implements section 316(b) of the Clean Water Act (CWA) for certain existing power producing facilities that employ a cooling water intake structure and are designed to withdraw 50 million gallons per day (MGD) or more of water from rivers, streams, lakes, reservoirs, estuaries, oceans, or other waters of the United States for cooling purposes. This final rule constitutes Phase II of EPA's section 316(b) regulation development and establishes national requirements, and procedures for implementing those requirements, applicable to the location, design, construction, and capacity of cooling water intake structures at these facilities. The rule applies to existing facilities that, as their primary activity, both generate and transmit electric power or generate electric power but sell it to another entity for transmission. The national requirements, which will be implemented through National Pollutant Discharge Elimination System (NPDES) permits, are based on the best technology available to minimize the adverse environmental impact associated with the use of cooling water intake structures.

Today's final rule establishes performance standards that are projected to reduce impingement mortality by 80 to 95 percent and, if applicable, entrainment by 60 to 90 percent. With the implementation of today's final rule, EPA intends to minimize the adverse environmental impact of cooling water intake structures by reducing the number of aquatic organisms lost as a result of water withdrawals associated with these structures.

DATES: This regulation is effective September 7, 2004. For judicial review purposes, this final rule is promulgated as of 1 p.m. Eastern Standard Time (EST) on July 23, 2004, as provided in 40 CFR 23.2.

ADDRESSES: The docket for today's final rule is available for public inspection at the Water Docket in the EPA Docket Center, (EPA/DC) EPA West, Room B102, 1301 Constitution Ave., NW., Washington, DC.

FOR FURTHER INFORMATION CONTACT: For additional technical information contact Martha Segall at (202) 566–1041 or Debra Hart at (202) 566–6379. The e-mail address for the above contacts is *rule.316b@epa.gov.*

SUPPLEMENTARY INFORMATION:

I. General Information

A. What Entities Are Regulated by This Action?

This final rule applies to Phase II existing facilities that are point sources; as their primary activity both generate and transmit electric power or generate electric power for sale to another entity for transmission; use or propose to use one or more cooling water intake structures with a total design intake flow of 50 million gallons per day (MGD) or more to withdraw water from waters of the United States; and use 25 percent of water withdrawn exclusively for cooling water purposes. This rule defines ''existing facility'' as any facility that commenced constructions on or before January 17, 2002, and any modification of, or any addition of a unit at such a facility that does not meet the definition of a new facility at § 125.83.

This rule defines the term ''cooling water intake structure'' to mean the total physical structure and any associated constructed waterways used to withdraw cooling water from waters of the United States. The cooling water intake structure extends from the point at which water is withdrawn from the surface water source up to, and including, the intake pumps.

Category	Examples of regulated entities	Standard Industrial Classification (SIC) codes	North American Industry Classification System (NAICS) codes
Federal, State, and Local Government	Steam electric generating point source dischargers that employ cooling water intake structures.	4911 and 493	221112, 221113, 221119, 221121, 221122
Industry	Steam electric generating industrial point source dischargers that employ cooling water intake structures (this includes utilities and nonutilities).	4911 and 493	221112, 221113, 221119, 221121, 221122

This exhibit is not intended to be exhaustive, but rather provides a guide for readers regarding entities likely to be regulated by this action. This exhibit lists the types of entities that EPA is now aware could potentially be regulated by this action. Other types of entities not listed in the exhibit could also be regulated. To determine whether your facility is regulated by this action, you should carefully examine the applicability criteria in § 125.91 of the rule. If you have questions regarding the applicability of this action to a particular entity, consult the person listed for technical information in the preceding **FOR FURTHER INFORMATION CONTACT** section.

B. How Can I Get Copies of This Document and Other Related Information?

1. Docket

EPA has established an official public docket for this action under Docket ID No. OW 2002–0049. The official public docket consists of the documents specifically referenced in this action, any public comments received, and other information related to this action. Although a part of the official docket, the public docket does not include information claimed as Confidential Business Information (CBI) or other information the disclosure of which is restricted by statute. The official public docket is the collection of materials that is available for public viewing at the Water Docket in the EPA Docket Center, (EPA/DC) EPA West, Room B102, 1301 Constitution Ave., NW., Washington, DC. The EPA Docket Center Public Reading Room is open from 8:30 a.m. to 4:30 p.m., Monday through Friday, excluding legal holidays. The telephone number for the Public Reading Room is (202) 566–1744, and the telephone number for the Water Docket is (202) 566–2426. To view docket materials, please call ahead to schedule an appointment. Every user is entitled to copy 266 pages per day before incurring a charge. The Docket may charge 15 cents for each page over the 266-page limit plus an administrative fee of $25.00.

2. Electronic Access

You may access this **Federal Register** document electronically through the EPA Internet under the ''**Federal Register**'' listings at *http://www.epa.gov/fedrgstr/*.

An electronic version of the public docket is available through EPA's electronic public docket and comment system, EPA Dockets. You may use EPA Dockets at *http://www.epa.gov/edocket/* to view public comments, access the index listing of the contents of the official public docket, and to access those documents in the public docket that are available electronically. Although not all docket materials may be available electronically, you may still access any of the publicly available docket materials through the docket facility identified in section I.B.1. Once in the system, select ''search,'' then key in the appropriate docket identification number.

C. Supporting Documentation

The final regulation is supported by three major documents:

1. Economic and Benefits Analysis for the Final Section 316(b) Phase II Existing Facilities Rule (EPA–821–R–04–005), hereafter referred to as the Economic and Benefits Analysis. This document presents the analysis of compliance costs, closures, energy supply effects, and benefits associated with the final rule.

2. Regional Analysis for the Final Section 316(b) Phase II Existing Facilities Rule (EPA–821–R–04–006), hereafter referred to as the Regional Analysis Document or the Regional Study(ies) Document. This document examines cooling water intake structure impacts and regulatory benefits at the regional level.

3. Technical Development Document for the Final Section 316(b) Phase II Existing Facilities Rule (EPA–821–R–04–007), hereafter referred to as the Technical Development Document. This document presents detailed information on the methods used to develop unit costs and describes the set of technologies that may be used to meet the final rule's requirements.

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II. Scope and Applicability of the Final Rule

This rule applies to owners and operators of existing facilities, as defined in § 125.93 of today's rule that meet all of the following criteria:

• The facility's primary activity is to generate electric power. The facility either transmits the electric power itself, or sells the electric power to another entity for transmission;

• The facility is a point source that uses or proposes to use one or more cooling water intake structures, including a cooling water intake structure operated by an independent supplier that withdraws water from waters of the United States and provides cooling water to the facility by any sort of contract or other arrangement;

• The cooling water intake structure(s) withdraw(s) cooling water from waters of the United States and at least twenty-five (25) percent of the water withdrawn is used exclusively for cooling purposes measured on an average annual basis;

• The facility is a point source; and

• The cooling water intake structures have a total design intake flow of 50 million gallons per day (MGD) or greater.

In the case of a Phase II existing facility that is co-located with a manufacturing facility, only that portion of the cooling water flow that is used by the Phase II facility to generate electricity for sale to another entity will be considered when determining whether the 50 MGD and 25 percent criteria are met. Facilities subject to this final rule are referred to as ''Phase II existing facilities.'' Existing facilities with design flows below the 50 MGD threshold, as well as most existing manufacturing facilities, offshore seafood processors, and offshore and coastal oil and gas extraction facilities are not subject to this rule. Those facilities have different characteristics as compared to the large, power-generating facilities subject to today's rule. If an existing facility is a point source and has or is required to have an NPDES permit, but does not meet the applicability thresholds in today's rule, it is subject to permit conditions implementing section 316(b) of the CWA set by the permit director on a case-by-case basis, using best professional judgment. EPA expects to address at least some of these facilities in a separate rulemaking, referred to as Phase III.

In the preamble to the proposed rule EPA indicated that its intent was to exclude from regulation under the Phase II rule existing facilities whose primary business is manufacturing. See, *e.g.,* 67 FR 17124 (April 9, 2002). At the same time, in § 125.91(a)(3) of the proposed rule, the applicability criteria covered facilities that both generate and transmit electric power, or generate electric power but sell it to another entity for transmission. Numerous commenters indicated concerns that, as proposed, § 125.91(a)(3) would not clearly exclude all existing manufacturing facilities from the Phase II rule since some facilities generate electric power primarily for their own use, but transmit or sell any surplus. Therefore, for the final rule, EPA revised § 125.91 so that it reaches only those existing facilities that generate and transmit or sell electric power as their primary activity. The final rule does not apply to existing manufacturing facilities, including manufacturing facilities that generate power for their own use and transmit any surplus power, or sell it for transmission, provided the primary activity of the facility is not electric power generation.

A. What Is an ''Existing Facility'' for Purposes of the Section 316(b) Phase II Rule?

In today's rule, EPA is defining the term ''existing facility'' to include any facility that commenced construction as described in 40 CFR 122.29(b)(4) [1] on or before January 17, 2002. EPA established January 17, 2002 as the date for distinguishing new facilities from existing ones because that is the effective date of the Phase I new facility rule. In addition, EPA is defining the term ''existing facility'' in this rule to include modifications and additions to such facilities, the construction of which commences after January 17, 2002, that do not meet the definition of a new facility at 40 CFR 125.83, the definition used to define the scope of the Phase I rule. That definition states:

> ''*New facility* means any building, structure, facility, or installation that meets the definition of a 'new source' or 'new discharger' in [other NPDES regulations] and is a greenfield or stand-alone facility; commences construction after January 17, 2002; and uses either a newly constructed cooling water intake structure, or an existing cooling water intake structure whose design capacity is increased to accommodate the intake of additional cooling water. New facilities include only 'greenfield' and 'stand-alone' facilities. A greenfield facility is a facility that is constructed at a site at which no other source is located or that totally replaces the process or production equipment at an existing facility (see 40 CFR 122.29(b)(1)(i) and (ii). A stand-alone facility is a new, separate facility that is constructed on property where an existing facility is located and whose processes are substantially independent of the existing facility at the same site (see 40 CFR 122.29(b)(1)(iii). New facility does not include new units that are added to a facility for purposes of the same general industrial operation (for example, a new peaking unit at an electrical generating station).'' [2]

The preamble to the final Phase I rule discusses this definition at 66 FR 65256; 65258–65259; 65285–65287, December 18, 2001.

EPA included in its Phase II proposed rule a freestanding definition of ''existing facility.'' That definition read as follows:

''Existing facility means any facility that commenced construction before January 17, 2002; and

(1) Any modification of such a facility;

(2) Any addition of a unit at such a facility for purposes of the same industrial operation;

(3) Any addition of a unit at such a facility for purposes of a different industrial operation, if the additional unit uses an existing cooling water intake structure and the design capacity of the intake structure is not increased; or

(4) Any facility constructed in place of such a facility, if the newly constructed facility uses an existing cooling water intake structure whose design intake flow is not increased to accommodate the intake of additional cooling water.'' 67 FR 17221.

Upon further consideration, EPA has decided that it would be clearest to define existing facility primarily by stating that any facility that is not a new facility under 40 CFR 125.83 is an existing facility for purposes of this subpart. Accordingly, the language in this final rule is intended to be clear and consistent with EPA's definition of new facility in the Phase I rule at 40 CFR 125.83. In addition, the definition in today's regulation is also intended to ensure that sources excluded from the definition of new facility in the Phase I rule are captured by the definition of existing facility for the purposes of today's rule. At the same time, EPA believes that the approach taken in

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[1] Construction is commenced if the owner or operator has undertaken certain installation and site preparation activities that are part of a continuous on-site construction program, and it includes entering into certain specified binding contractual obligations as one criterion (40 CFR 122.29(b)(4)).

[2] The Phase I rule also listed examples of facilities that would be ''new'' facilities and facilities that would ''not be considered a 'new facility' in two numbered paragraphs. These read as follows:

''(1) Examples of 'new facilities' include, but are not limited to: the following scenarios:

(i) A new facility is constructed on a site that has never been used for industrial or commercial activity. It has a new cooling water intake structure for its own use.

(ii) A facility is demolished and another facility is constructed in its place. The newly-constructed facility uses the original facility's cooling water intake structure, but modifies it to increase the design capacity to accommodate the intake of additional cooling water.

(iii) A facility is constructed on the same property as an existing facility, but is a separate and independent industrial operation. The cooling water intake structure used by the original facility is modified by constructing a new intake bay for the use of the newly constructed facility or is otherwise modified to increase the intake capacity for the new facility.

(2) Examples of facilities that would not be considered a 'new facility' include, but are not limited to, the following scenarios:

(i) A facility in commercial or industrial operation is modified and either continues to use its original cooling water intake structure or uses a new or modified cooling water intake structure.

(ii) A facility has an existing intake structure. Another facility (a separate and independent industrial operation), is constructed on the same property and connects to the facility's cooling water intake structure behind the intake pumps, and the design capacity of the cooling water intake structure has not been increased. This facility would not be considered a 'new facility' even if routine maintenance or repairs that do not increase the design capacity were performed on the intake structure.''

today's rule is identical in terms of effect to the approach in the proposed rule. Thus, the approach taken in today's final rule is in no way intended to change the scope of the rule as compared with the proposal as far as the facilities treated as ''existing'' facilities under the rule. The change is in drafting technique, not in meaning.

The facility encompassed by today's regulation is the point source that uses a cooling water intake structure to generate electric power. This is because the requirements of CWA section 316(b) are implemented through NPDES permits, which are issued only to point source dischargers of pollutants to waters of the United States. A point source generating electric power would be subject to Phase I or Phase II even if the cooling water intake structure it uses is located elsewhere. Similarly, modifications or additions to the cooling water intake structure (or even the total replacement of an existing cooling water intake structure with a new one) does not convert an otherwise unchanged existing facility into a new facility, regardless of the purpose of such changes (*e.g.*, to comply with today's rule or to increase capacity). Rather, the determination as to whether a facility is new or existing focuses on the power-generating point source itself, *i.e.*, whether it is a greenfield facility or a stand-alone facility. This focus on the point source discharger is consistent with section 316(b), which by its express terms applies only to point sources.

Under this rule, an existing power generating facility that uses a cooling water intake structure and repowers by either replacing or modifying an existing generating unit would remain subject to regulation as a Phase II existing facility, unless the existing facility were completely demolished and another facility constructed in its place that used either a new intake structure or the existing structure with an increased design capacity. For example, the following facility modifications or additions would result in a facility being characterized as an existing facility under today's rule:

- An existing power generating facility undergoes a modification of its process short of total replacement of the process and concurrently increases the design capacity of its existing cooling water intake structures;
- An existing power generating facility builds a new process at its site for purposes of the same industrial operation and concurrently increases the design capacity of its existing cooling water intake structures;
- An existing power generating facility completely rebuilds its process but uses the existing cooling water intake structure with no increase in design capacity.

Phase II existing facilities subject to today's rule include point sources that do not presently use, but propose to use, cooling water intake structures and do not meet the definition of new facility at § 125.83. This is appropriate because there may be some cases in which an existing facility historically withdrew its cooling water from a municipal or other source, but then decides to withdraw cooling water from a water of the United States. In these cases, the facility may not previously have met all of the criteria applicable to an existing facility under today's rule (*i.e.*, the facility did not previously withdraw cooling waters from a water of the United States) but may make changes that would place the facility within the scope of today's rule. A comparable situation would be when a facility previously relied on units that do not require cooling water, and then adds or modifies a unit for purposes of the same industrial operation (*i.e.*, power generation) such that cooling water is subsequently required. For example, an existing power generating facility that adds a new generating unit at the same site for purposes of repowering and concurrently increases the design capacity of its existing cooling water intake structure(s), or adds a new intake structure where it did not previously need one, for example when converting a gas turbine to a combined cycle unit, would be considered an existing facility.

In the preamble to the Phase I rule, EPA noted that it had defined ''existing facility'' in a manner consistent with existing NPDES regulations with a limited exception. EPA noted that it had generally deferred regulation of new sources constructed on a site at which an existing source is located until the Agency had completed analysis of its survey data on existing facilities. 66 FR 65286. Accordingly, the Phase I rule treated almost all changes to existing facilities for purposes of the same industrial operation as existing facilities. These included the addition of new generating units at the same site, even where they required an increase in cooling water intake structure design capacity or the construction of a new cooling water intake structure, as well as the complete demolition of an existing facility and its replacement with a new facility, so long as it did not increase the design capacity of the cooling water intake structure. The only exception was the demolition of an existing facility and its replacement with a new facility accompanied by an increase in design capacity of the cooling water intake structure. As the preamble explained: ''The definition of a new facility in the final rule applies to a facility that is repowered only if the existing facility has been demolished and another facility is constructed in its place, and modifies the existing cooling water intake structure to increase the design intake capacity.'' *Id.*[2a] By contrast, the Phase I rule treated the addition of a new unit for purposes of a different industrial operation as an existing facility only if it used an existing cooling water intake structure whose design intake flow was not increased.

The Phase II proposed rule continued this approach in its definition of ''existing facility.'' It continued to treat all changes to existing facilities for purposes of the same industrial operation as an existing facility unless the change was a complete demolition and replacement of the facility accompanied by an increase in cooling water intake design capacity. It also continued to treat the addition of new units for purposes of a different industrial operation differently, only allowing them to be ''existing facilities'' if they used an existing cooling water intake structure and did not increase its design intake flow. 67 FR 17221. In putting forth this proposed definition, EPA noted that it had collected data from a variety of sources, including survey data, specifically relating to repowering facilities. *Id.* at 17131–17135. It also made a point of explaining the wide variety of repowering activities that an existing facility could undertake under the proposed rule—anything short of demolition of an existing facility and its replacement with a new facility combined with increasing the design capacity of a cooling water intake structure—while still being regulated as an ''existing facility'' rather than a ''new facility.'' *Id.* at 17128.

On the basis of the analysis of the survey data and other information in the record, the Agency now has concluded that it should adhere to its provisional

[2a] Because they are part of the same ''industrial operation,'' such units are not ''stand-alone'' facilities for purposes of the ''new facility'' definition. As the fifth sentence of the definition of ''new facility'' explains, they are categorically treated as ''existing facilities'' regardless of any other considerations unless they completely replace an existing facility and its cooling water design intake capacity is increased. Accordingly, there is thus no need to make a determination whether they are ''substantially independent'' of the existing facility at the same site under the fourth sentence of the definition in order to determine whether they are ''existing'' or ''new facilities.'' The fifth sentence alone controls that question.

decision generally giving wide latitude to existing facilities to make changes or additions to their facilities at the same site. In particular, new units that are added to a facility for purposes of the same general industrial operation should be treated as existing facilities because limitations associated with an existing site make it inappropriate to subject such units to new facility requirements. These limitations include space, existing location on a waterbody, location in already congested areas which could affect (if Phase 1 requirements were applied) visibility impairment, highway and airport safety issues, noise abatement issues, salt drift and corrosion problems and additional energy requirements. Moreover, power generation facilities should not be discouraged from making any upgrade, modification, or repowering that would increase energy efficiency or supply out of concern that they would be considered a new facility for purposes of section 316(b). Additional benefits will be realized in terms of reducing industrial sprawl if incremental power generation is not discouraged at existing power generation sites. These considerations counsel in favor of treating new units locating at existing sites as existing rather than new facilities. EPA also noted when it promulgated the Phase I rule (*see* 66 FR 65286) that it is not feasible for the permit authority to judge whether the facility could have been located elsewhere for the purpose of determining whether the facility is subject to the new facility rules. Accordingly, EPA has decided to retain the Phase I definition's provision that a new facility does not include new units that are added to a facility for purposes of the same general industrial operation. As noted above, this decision is fully consistent with the approach to this issue laid out in the proposed Phase II rule.

The final rule definition of ''existing facility'' is sufficiently broad that it encompasses facilities that will be addressed under the Phase III rule (*e.g.*, existing power generating facilities with design flows below the 50 MGD threshold, certain existing manufacturing facilities, seafood processors, and offshore and coastal oil and gas extraction facilities). EPA notes, however, that these facilities are not covered under this rule because they do not meet the requirements of § 125.91.

B. What Is ''Cooling Water'' and What Is a ''Cooling Water Intake Structure?''

Today's rule adopts for Phase II existing facilities the same definition of a ''cooling water intake structure'' that applies to new facilities. A cooling water intake structure is defined as the total physical structure and any associated constructed waterways used to withdraw cooling water from waters of the United States. Under the definition in today's rule, the cooling water intake structure extends from the point at which water is withdrawn from the surface water source up to, and including, the intake pumps. Today's rule adopts the new facility rule's definition of ''cooling water'': Water used for contact or noncontact cooling, including water used for equipment cooling, evaporative cooling tower makeup, and dilution of effluent heat content. The definition specifies that the intended use of cooling water is to absorb waste heat rejected from the processes used, or auxiliary operations on the facility's premises. The definition also indicates that water used in a manufacturing process either before or after it is used for cooling is process water for both cooling and non-cooling purposes and would not be considered cooling water for purposes of determining whether 25 percent or more of the flow is cooling water. This clarification is necessary because cooling water intake structures typically bring water into a facility for numerous purposes, including industrial processes; use as circulating water, service water, or evaporative cooling tower makeup water; dilution of effluent heat content; equipment cooling; and air conditioning. EPA notes that this clarification does not change the fact that only the intake water used exclusively for cooling purposes is counted when determining whether the 25 percent threshold in § 125.91(a)(4) is met.

This definition of ''cooling water intake structure'' differs from the definition provided in the 1977 Draft Guidance for Evaluating the Adverse Impact of Cooling Water Intake Structures on the Aquatic Environment: Section 316(b) P.L. 92–500 (U.S. EPA, 1977). The final rule definition clarifies that the cooling water intake structure includes the physical structure that extends from the point at which water is withdrawn from the surface water up to and including the intake pumps. Inclusion of the term ''associated constructed waterways'' in today's rule is intended to clarify that the definition includes those canals, channels, connecting waterways, and similar structures that may be built or modified to facilitate the withdrawal of cooling water. The explicit inclusion of the intake pumps in the definition reflects the key role pumps play in determining the capacity (*i.e.*, dynamic capacity) of the intake. These pumps, which bring in water, are an essential component of the cooling water intake structure since without them the intake could not work as designed.

C. Is My Facility Covered if It Withdraws From Waters of the United States?

The requirements finalized today apply to cooling water intake structures that have the design capacity to withdraw amounts of water equal to or greater than the specified intake flow threshold from ''waters of the United States.'' Waters of the United States include the broad range of surface waters that meet the regulatory definition at 40 CFR 122.2, which includes lakes, ponds, reservoirs, nontidal rivers or streams, tidal rivers, estuaries, fjords, oceans, bays, and coves. These potential sources of cooling water may be adversely affected by impingement and entrainment.

Some facilities discharge heated water to cooling ponds, then withdraw water from the ponds for cooling purposes. EPA recognizes that cooling ponds may, in certain circumstances, constitute part of a closed-cycled cooling system. See, *e.g.*, 40 CFR 125.83. However, EPA does not intend this rule to change the regulatory status of cooling ponds. Cooling ponds are neither categorically included nor categorically excluded from the definition of ''waters of the United States'' at 40 CFR 122.2. EPA interprets 40 CFR 122.2 to give permit writers discretion to regulate cooling ponds as ''waters of the United States'' where cooling ponds meet the definition of ''waters of the United States.'' The determination whether a particular cooling pond is or is not a water of the United States is to be made by the permit writer on a case-by-case basis, informed by the principles enunciated in Solid Waste Agency of Northern Cook County (SWANCC) v. U.S. Army Corps of Engineers, 531 U.S. 159 (2001). Therefore, facilities that withdraw cooling water from cooling ponds that are waters of the United States and that meet today's other criteria for coverage (including the requirement that the facility has or will be required to obtain an NPDES permit) are subject to today's rule. The EPA and the U.S. Army Corps of Engineers have jointly issued jurisdictional guidance concerning the term ''waters of the United States'' in light of the Supreme Court's decision in Solid Waste Agency of Northern Cook County v. U.S. Army Corps of Engineers, 531 U.S. 159 (2001) (SWANCC). A copy of that guidance was published as an Appendix to an Advanced Notice of Proposed

Rulemaking on the definition of the phrase ''waters of the U.S.,'' see 68 FR 1991 (January 15, 2003), and may be obtained at (*http://www.epa.gov/owow/wetlands/ANPRM-FR.pdf*). Section 125.91(d) also provides, similar to the new facility rule, that facilities that obtain cooling water from a public water system or use treated effluent are not deemed to be using a cooling water intake structure for purposes of this rule.

D. Is My Facility Covered if It Is a Point Source Discharger?

Today's rule applies only to facilities that are point sources (*i.e.*, have an NPDES permit or are required to obtain one) because they discharge or might discharge pollutants, including storm water, from a point source to waters of the Unites States. This is the same requirement EPA included in the Phase I new facility rule at 40 CFR 125.81(a)(1). Requirements for complying with section 316(b) will continue to be applied through NPDES permits.

Based on the Agency's review of potential Phase II existing facilities that employ cooling water intake structures, the Agency anticipates that most existing power generating facilities that will be subject to this rule will control the intake structure that supplies them with cooling water, and discharge some combination of their cooling water, wastewater, and storm water to a water of the United States through a point source regulated by an NPDES permit. In this scenario, the requirements for the cooling water intake structure will be specified in the facility's NPDES permit. In the event that a Phase II existing facility's only NPDES permit is a general permit for storm water discharges, the Agency anticipates that the Director would write an individual NPDES permit containing requirements for the facility's cooling water intake structure. Alternatively, requirements applicable to cooling water intake structures could be incorporated into general permits. If requirements are placed into a general permit, they must meet the criteria set out at 40 CFR 122.28.

The Agency also recognizes that some facilities that have or are required to have an NPDES permit might not own and operate the intake structure that supplies their facility with cooling water. For example, electric power-generating facilities operated by separate entities might be located on the same, adjacent, or nearby property(ies); one of these facilities might take in cooling water and then transfer it to other facilities prior to discharge of the cooling water to a water of the United States. Section 125.91(c) of today's rule addresses such a situation. It provides that use of a cooling water intake structure includes obtaining cooling water by any sort of contract or arrangement with one or more independent suppliers of cooling water if the supplier or suppliers withdraw water from waters of the United States but that is not itself a Phase II existing facility. This provision is intended to prevent facilities from circumventing the requirements of today's rule by creating arrangements to receive cooling water from an entity that is not itself a Phase II existing facility.

In addressing facilities that have or are required to have an NPDES permit that do not directly control the intake structure that supplies their facility with cooling water, section 125.91(d) also provides, similar to the new facility rule, that facilities that obtain cooling water from a public water system or use treated effluent are not deemed to be using a cooling water intake structure for purposes of this rule.

As EPA stated in the preamble to the final Phase I rule (66 FR 65256 December 18, 2001), the Agency encourages the Director to closely examine scenarios in which a facility withdraws significant amounts of cooling water from waters of the United States but is not required to obtain an NPDES permit. As appropriate, the Director should apply other legal requirements, such as section 404 or 401 of the Clean Water Act, the Coastal Zone Management Act, the National Environmental Policy Act, the Endangered Species Act, or similar State or Tribal authorities to address adverse environmental impact caused by cooling water intake structures at those facilities.

E. What Cooling Water Use and Design Intake Flow Thresholds Result in an Existing Facility Being Subject to This Rule?

This final rule applies to existing facilities that are point sources and use cooling water intake structures that (1) withdraw cooling water from waters of the United States and use at least twenty-five (25) percent of the water withdrawn exclusively for cooling purposes, and (2) have a total design intake capacity of 50 MGD or more measured on an average annual basis (see § 125.91). Today's rule further provides that where a Phase II existing facility is co-located with a manufacturing facility, only that portion of the cooling water intake flow that is used by the Phase II facility to generate electricity for sale to another entity will be considered for purposes of determining whether the 50 MGD and 25 percent criteria have been exceeded.

EPA chose the 50 MGD threshold to focus the rule on the largest existing power generating facilities. EPA estimates that the 50 MGD threshold will subject approximately 543 of 902 (60 percent) existing power generating facilities to this final rule and will address approximately 90 percent of the total flow withdrawn by these facilities. EPA established the 50 MGD threshold because the regulation of existing facilities with flows of 50 MGD or greater in Phase II will address those existing power generating facilities with the greatest potential to cause or contribute to adverse environmental impact. In addition, EPA has limited data on impacts at facilities withdrawing less than 50 MGD. Deferring regulation of such facilities to Phase III provides an additional opportunity for the Agency to collect impingement and entrainment data for these smaller facilities.

Similarly, because Phase II existing facilities typically use far more than 25 percent of the water they withdraw for cooling purposes, EPA established the 25 percent threshold to ensure that nearly all cooling water and the largest existing facilities using cooling water intake structures are addressed by today's requirements. As in the Phase I rule, water used for both cooling and non-cooling purposes does not count towards the 25 percent threshold. Thus, the rule does not discourage the reuse of cooling water as process water or vice versa. Water that serves as cooling water but is either previously or subsequently used as process water is not considered cooling water for purposes of determining the percentage of the water withdrawn that is used for cooling and whether that percentage equals or exceeds 25 percent. Water withdrawn for non-cooling purposes includes water withdrawn for warming by liquified natural gas facilities and water withdrawn for public water systems by desalinization facilities.

III. Legal Authority, Purpose, and Background of Today's Regulation

A. Legal Authority

Today's final rule is issued under the authority of sections 101, 301, 304, 308, 316, 401, 402, 501, and 510 of the Clean Water Act (CWA), 33 U.S.C. 1251, 1311, 1314, 1318, 1326, 1341, 1342, 1361, and 1370. This rule partially fulfills the obligations of the U.S. Environmental Protection Agency (EPA) under a consent decree in *Riverkeeper, Inc.* v. *Leavitt,* No. 93 Civ. 0314, (S.D.N.Y).

B. Purpose of Today's Regulation

Section 316(b) of the CWA provides that any standard established pursuant to section 301 or 306 of the CWA and applicable to a point source must require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available (BTA) for minimizing adverse environmental impact. Today's rule establishes requirements reflecting the best technology available for minimizing adverse environmental impact, applicable to the location, design, construction, and capacity of cooling water intake structures at Phase II existing power generating facilities that have the design capacity to withdraw at least fifty (50) MGD of cooling water from waters of the United States and use at least twenty-five (25) percent of the water they withdraw exclusively for cooling purposes.

C. Background

1. The Clean Water Act

The Federal Water Pollution Control Act, also known as the Clean Water Act (CWA), 33 U.S.C. 1251 *et seq.*, seeks to ''restore and maintain the chemical, physical, and biological integrity of the nation's waters.'' 33 U.S.C. 1251(a). The CWA establishes a comprehensive regulatory program, key elements of which are (1) a prohibition on the discharge of pollutants from point sources to waters of the United States, except as authorized by the statute; (2) authority for EPA or authorized States or Tribes to issue National Pollutant Discharge Elimination System (NPDES) permits that regulate the discharge of pollutants; (3) requirements for limitations in NPDES permits based on effluent limitations guidelines and standards and water quality standards.

Today's rule implements section 316(b) of the CWA as it applies to ''Phase II existing facilities'' as defined in this rule. Section 316(b) addresses the adverse environmental impact caused by the intake of cooling water, not discharges into water. Despite this special focus, the requirements of section 316(b) are closely linked to several of the core elements of the NPDES permit program established under section 402 of the CWA to control discharges of pollutants into navigable waters. For example, while effluent limitations apply to the discharge of pollutants by NPDES-permitted point sources to waters of the United States, section 316(b) applies to facilities subject to NPDES requirements that withdraw water from waters of the United States for cooling and that use a cooling water intake structure to do so.

Section 402 of the CWA provides authority for EPA or an authorized State or Tribe to issue an NPDES permit to any person discharging any pollutant or combination of pollutants from a point source into waters of the United States. Forty-five States and one U.S. territory are authorized under section 402(b) to administer the NPDES permitting program. NPDES permits restrict the types and amounts of pollutants, including heat, that may be discharged from various industrial, commercial, and other sources of wastewater. These permits control the discharge of pollutants primarily by requiring dischargers to meet effluent limitations established pursuant to section 301 or section 306. Effluent limitations may be based on promulgated Federal effluent limitations guidelines, new source performance standards, or the best professional judgment of the permit writer. Limitations based on these guidelines, standards, or best professional judgment are known as technology-based effluent limits. Where technology-based effluent limits are inadequate to ensure attainment of water quality standards applicable to the receiving water, section 301(b)(1)(C) of the Clean Water Act requires permits to include more stringent limits based on applicable water quality standards. NPDES permits also routinely include monitoring and reporting requirements, standard conditions, and special conditions. In addition, NPDES permits contain conditions to implement the requirements of section 316(b). Section 301 of the CWA prohibits the discharge of any pollutant by any person, except in compliance with specified statutory requirements, including section 402.

Section 510 of the Clean Water Act provides, that except as provided in the Clean Water Act, nothing in the Act shall (1) preclude or deny the right of any State or political subdivision thereof to adopt or enforce any requirement respecting control or abatement of pollution; except that if a limitation, prohibition or standard of performance is in effect under the Clean Water Act, such State or political subdivision may not adopt or enforce any other limitation prohibition or standard of performance which is less stringent than the limitation prohibition or standard of performance under the Act. EPA interprets this to reserve for the States authority to implement requirements that are more stringent than the Federal requirements under state law. *PUD No. 1 of Jefferson County. Washington Dep't of Ecology,* 511 U.S. 700, 705 (1994).

Sections 301, 304, and 306 of the CWA require that EPA develop technology-based effluent limitations guidelines and new source performance standards that are used as the basis for technology-based minimum discharge requirements in wastewater discharge permits. EPA issues these effluent limitations guidelines and standards for categories of industrial dischargers based on the pollutants of concern discharged by the industry, the degree of control that can be attained using various levels of pollution control technology, consideration of various economic tests appropriate to each level of control, and other factors identified in sections 304 and 306 of the CWA (such as non-water quality environmental impacts including energy impacts). EPA has promulgated regulations setting effluent limitations guidelines and standards under sections 301, 304, and 306 of the CWA for more than 50 industries. See 40 CFR parts 405 through 471. EPA has established effluent limitations guidelines and standards that apply to most of the industry categories that use cooling water intake structures (*e.g.*, steam electric power generation, iron and steel manufacturing, pulp and paper manufacturing, petroleum refining, and chemical manufacturing).

Section 316(b) states, in full:

> Any standard established pursuant to section 301 or section 306 of [the Clean Water] Act and applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.

The phrase ''best technology available'' in CWA section 316(b) is not defined in the statute, but its meaning can be understood in light of similar phrases used elsewhere in the CWA. See *Riverkeeper* v. *EPA,* slip op. at 11 (2nd Cir. Feb. 3, 2004) (noting that the cross-reference in CWA section 316(b) to CWA section 306 ''is an invitation to look to section 306 for guidance in discerning what factors Congress intended the EPA to consider in determining the 'best technology available' '' for new sources).

In sections 301 and 306, Congress directed EPA to set effluent discharge standards for new sources based on the ''best available demonstrated control technology'' and for existing sources based on the ''best available technology economically achievable.'' For new sources, section 306(b)(1)(B) directs EPA to establish ''standards of performance.'' The phrase ''standards of performance'' under section 306(a)(1) is defined as being the effluent reduction that is ''achievable through application of the best available demonstrated control technology, processes, operating methods or other alternatives * * *.'' This is commonly referred to as ''best available demonstrated technology'' or ''BADT.'' For existing dischargers, section 301(b)(1)(A) requires the establishment of effluent limitations based on ''the application of best practicable control technology currently available.'' This is commonly referred to as ''best practicable technology'' or ''BPT.'' Further, section 301(b)(2)(A) directs EPA to establish effluent limitations for certain classes of pollutants ''which shall require the application of the best available technology economically achievable.'' This is commonly referred to as ''best available technology'' or ''BAT.'' Section 301 specifies that both BPT and BAT limitations must reflect determinations made by EPA under Clean Water Act section 304. Under these provisions, the discharge of pollutants from point sources is based not on the impact of the discharge on the receiving waters, but instead upon the capabilities of the equipment or ''control technologies'' available to control those discharges.

The phrases ''best available demonstrated technology''; and ''best available technology''—like ''best technology available'' in CWA section 316(b)—are not defined in the statute. However, section 304 of the CWA specifies factors to be considered in establishing the best practicable control technology currently available, and best available technology.

For best practicable control technology currently available, the CWA directs EPA to consider

the total cost of application of technology in relation to the effluent reduction benefits to be achieved from such application, and shall also take into account the age of the equipment and facilities involved, the process employed, the engineering aspects of the application of various types of control techniques, process changes, non-water quality environmental impact (including energy requirements), and such other factors as [EPA] deems appropriate.

33 U.S.C. 1314(b)(1)(b).

For ''best available technology,'' the CWA directs EPA to consider:

the age of equipment and facilities involved, the process employed, the engineering aspects * * * of various types of control techniques, process changes, the cost of achieving such effluent reduction, non-water quality environmental impacts (including energy requirements), and such other factors as [EPA] deems appropriate.

33 U.S.C. 1314(b)(2)(B).

Section 316(b) expressly refers to section 301, and the phrase ''best technology available'' is very similar to ''best technology available'' in that section. These facts, coupled with the brevity of section 316(b) itself, prompted EPA to look to section 301 and, ultimately, section 304 for guidance in determining the ''best technology available to minimize adverse environmental impact'' of cooling water intake structures for existing Phase II facilities.

By the same token, however, there are significant differences between section 316(b) and sections 301 and 304. See *Riverkeeper, Inc.* v. *United States Environmental Protection Agency,* slip op. at 13, (2nd Cir. Feb. 3, 2004) (''not every statutory directive contained [in sections 301 and 306] is applicable'' to a section 316(b) rulemaking). Section 316(b) requires that cooling water intake structures reflect the best technology available for minimizing adverse environmental impact. In contrast to the effluent limitations provisions, the object of the ''best technology available'' is explicitly articulated by reference to the receiving water: To minimize adverse environmental impact in the waters from which cooling water is withdrawn. This difference is reflected in EPA's past practices in implementing sections 301, 304, and 316(b). While EPA has established effluent limitations guidelines based on the efficacy of one or more technologies to reduce pollutants in wastewater in relation to cost without necessarily considering the impact on the receiving waters, EPA has previously considered the costs of technologies in relation to the benefits of minimizing adverse environmental impact in establishing 316(b) limits which historically have been done on a case-by case basis. *In Re Public Service Co. of New Hampshire,* 10 ERC 1257 (June 17, 1977); *In Re Public Service Co. of New Hampshire,* 1 EAD 455 (Aug. 4, 1978); *Seacoast Anti-Pollution League* v. *Costle,* 597 F. 2d 306 (1st Cir. 1979).

For this Phase II rulemaking, EPA therefore interprets CWA section 316(b) as authorizing EPA to consider not only technologies but also their effects on and benefits to the water from which the cooling water is withdrawn. Based on these two considerations, EPA has established in today's rule national requirements for facilities to install technology that is technically available, economically practicable, and cost-effective while at the same time authorizing a range of technologies that achieve comparable reductions in adverse environmental impact.

2. Consent Decree

Today's final rule partially fulfills EPA's obligation to comply with a consent decree, as amended. The Second Amended Consent Decree, which is relevant to today's rule, was filed on November 25, 2002, in the United States District Court, Southern District of New York, in *Riverkeeper, Inc.* v. *Leavitt,* No. 93 Civ 0314, a case brought against EPA by a coalition of individuals and environmental groups. The original Consent Decree, filed on October 10, 1995, provided that EPA was to propose regulations implementing section 316(b) by July 2, 1999, and take final action with respect to those regulations by August 13, 2001. Under subsequent interim orders, the Amended Consent Decree filed on November 22, 2000, and the Second Amended Consent Decree, EPA has divided the rulemaking into three phases and is working under new deadlines. As required by the Second Amended Consent Decree, on November 9, 2001, EPA took final action on a rule governing cooling water intake structures used by new facilities (Phase I). 66 FR 65255 (December 18, 2001). The Second Amended Consent Decree requires that EPA take final action by February 16, 2004, with respect to Phase II regulations that are ''applicable to, at a minimum: (1) Existing utilities (*i.e.*, facilities that both generate and transmit electric power) that employ a cooling water intake structure, and whose intake flow levels exceed a minimum threshold to be determined by EPA during the Phase II rulemaking process; and (2) existing nonutility power producers (*i.e.*, facilities that generate electric power but sell it to another entity for transmission) that employ a cooling water intake structure, and whose intake flow levels exceed a minimum threshold to be determined by EPA during the Phase II rulemaking process.'' The consent decree further requires that EPA propose regulations governing cooling water intake structures used, at a minimum, by smaller-flow power plants and facilities in four industrial sectors (pulp and paper making, petroleum and coal products manufacturing, chemical and allied manufacturing, and primary metal manufacturing) by November 1, 2004, and take final action by June 1, 2006 (Phase III).

3. What Other EPA Rulemakings and Guidance Have Addressed Cooling Water Intake Structures?

In April 1976, EPA published a final rule under section 316(b) that addressed cooling water intake structures. 41 FR

17387 (April 26, 1976), see also the proposed rule at 38 FR 34410 (December 13, 1973). The rule added a new § 401.14 to 40 CFR Chapter I that reiterated the requirements of CWA section 316(b). It also added a new part 402, which included three sections: (1) § 402.10 (Applicability), (2) § 402.11 (Specialized definitions), and (3) § 402.12 (Best technology available for cooling water intake structures). Section 402.10 stated that the provisions of part 402 applied to ''cooling water intake structures for point sources for which effluent limitations are established pursuant to section 301 or standards of performance are established pursuant to section 306 of the Act.'' Section 402.11 defined the terms ''cooling water intake structure,'' ''location,'' ''design,'' ''construction,'' ''capacity,'' and ''Development Document.'' Section 402.12 included the following language:

> The information contained in the Development Document shall be considered in determining whether the location, design, construction, and capacity of a cooling water intake structure of a point source subject to standards established under section 301 or 306 reflect the best technology available for minimizing adverse environmental impact.

In 1977, fifty-eight electric utility companies challenged those regulations, arguing that EPA had failed to comply with the requirements of the Administrative Procedure Act (APA) in promulgating the rule. Specifically, the utilities argued that EPA had neither published the Development Document in the **Federal Register** nor properly incorporated the document into the rule by reference. The United States Court of Appeals for the Fourth Circuit agreed and, without reaching the merits of the regulations themselves, remanded the rule. *Appalachian Power Co.* v. *Train,* 566 F.2d 451 (4th Cir. 1977). EPA later withdrew part 402. 44 FR 32956 (June 7, 1979). The regulation at 40 CFR 401.14, which reiterates the statutory requirement, remains in effect.

Since the Fourth Circuit remanded EPA's section 316(b) regulations in 1977, NPDES permit authorities have made decisions implementing section 316(b) on a case-by-case, site-specific basis. EPA published draft guidance addressing section 316(b) implementation in 1977. See *Draft Guidance for Evaluating the Adverse Impact of Cooling Water Intake Structures on the Aquatic Environment: Section 316(b) P.L. 92–500* (U.S. EPA, 1977). This draft guidance described the studies recommended for evaluating the impact of cooling water intake structures on the aquatic environment and recommended a basis for determining the best technology available for minimizing adverse environmental impact. The 1977 section 316(b) draft guidance states, ''The environmental-intake interactions in question are highly site-specific and the decision as to best technology available for intake design, location, construction, and capacity must be made on a case-by-case basis.'' (Section 316(b) Draft Guidance, U.S. EPA, 1977, p. 4). This case-by-case approach was also consistent with the approach described in the 1976 Development Document referenced in the remanded regulation.

The 1977 section 316(b) draft guidance suggested a general process for developing information needed to support section 316(b) decisions and presenting that information to the permitting authority. The process involved the development of a site-specific study of the environmental effects associated with each facility that uses one or more cooling water intake structures, as well as consideration of that study by the permitting authority in determining whether the facility must make any changes for minimizing adverse environmental impact. Where adverse environmental impact is present, the 1977 draft guidance suggested a stepwise approach that considers screening systems, size, location, capacity, and other factors.

Although the draft guidance described the information that should be developed, key factors that should be considered, and a process for supporting section 316(b) determinations, it did not establish uniform technology-based national standards for best technology available for minimizing adverse environmental impact. Rather, the guidance left the decisions on the appropriate location, design, capacity, and construction of cooling water intake structures to the permitting authority. Under this framework, the Director determined whether appropriate studies have been performed, whether a given facility has minimized adverse environmental impact, and what, if any, technologies may be required.

4. Phase I New Facility Rule

On November 9, 2001, EPA took final action on regulations governing cooling water intake structures at new facilities. 66 FR 65255 (December 18, 2001). On December 26, 2002, EPA made minor changes to the Phase I regulations. 67 FR 78947. The final Phase I new facility rule (40 CFR Part 125, Subpart I) establishes requirements applicable to the location, design, construction, and capacity of cooling water intake structures at new facilities that withdraw at least two (2) million gallons per day (MGD) and use at least twenty-five (25) percent of the water they withdraw solely for cooling purposes. In the new facility rule, EPA adopted a two-track approach. Under Track I, for facilities with a design intake flow more than 10 MGD, the intake flow of the cooling water intake structure is restricted, at a minimum, to a level commensurate with that which could be attained by use of a closed-cycle, recirculating cooling system. For facilities with a design intake flow more than 2 MGD, the design through-screen intake velocity is restricted to 0.5 ft/s and the total quantity of intake is restricted to a proportion of the mean annual flow of a freshwater river or stream, or to maintain the natural thermal stratification or turnover patterns (where present) of a lake or reservoir except in cases where the disruption is beneficial, or to a percentage of the tidal excursions of a tidal river or estuary. If certain environmental conditions exist, an applicant with intake capacity greater than 10 MGD must select and implement appropriate design and construction technologies for minimizing impingement mortality and entrainment. (Applicants with 2 to 10 MGD flows are not required to reduce intake flow to a level commensurate with a closed-cycle, recirculating cooling system, but must install technologies for reducing impingement mortality at all locations.) Under Track II, the applicant has the opportunity to demonstrate that impacts to fish and shellfish, including important forage and predator species, within the watershed will be comparable to the reduction in impingement mortality and entrainment it would achieve were it to implement the Track I intake flow and velocity requirements.

With the new facility rule, EPA promulgated national minimum requirements for the design, capacity, and construction of cooling water intake structures at new facilities. EPA believes that the final new facility rule establishes a reasonable framework that creates certainty for permitting of new facilities, while providing significant flexibility to take site-specific factors into account.

5. Proposed Rule for Phase II Existing Facilities

On April 9, 2002, EPA published proposed requirements for cooling water intake structures at Phase II existing facilities to implement section 316(b) of the Clean Water Act. EPA proposed to establish requirements that gave facilities three different compliance options for meeting performance standards that vary based on waterbody type, the percentage of the source waterbody withdrawn, and the facility capacity utilization rate. 67 FR 17122. EPA received numerous comments and data submissions concerning the proposal.

6. Notice of Data Availability

On Wednesday, March 19, 2003, EPA published a Proposed Rule Notice of Data Availability (NODA). 68 FR 13522. This notice presented a summary of the data EPA had received or collected since proposal, an assessment of the relevance of the data to EPA's analysis, revisions to EPA's estimate of the costs and benefits of the proposed rule, new proposed compliance alternatives, and potential modifications to EPA's proposed regulatory approach. As part of the NODA, EPA also reopened the comment period on the complete contents of the proposed rule.

7. Public Participation

EPA has worked extensively with stakeholders from the industry, public interest groups, State agencies, and other Federal agencies in the development of this final rule. These public participation activities have focused on various section 316(b) issues, including issues relevant to development of the Phase I rule and Phase II rule.

EPA conducted outreach to industry groups, environmental groups, and other government entities in the development, testing, refinement, and completion of the section 316(b) survey, which has been used as a source of data for the Phase II rule. The survey is entitled ''Information Collection Request, Detailed Industry Questionnaires: Phase II Cooling Water Intake Structures & Watershed Case Study Short Questionnaire,'' September 3, 1999. In addition, EPA conducted two public meetings on section 316(b) issues. In June of 1998, in Arlington, Virginia, EPA conducted a public meeting focused on a draft regulatory framework for assessing potential adverse environmental impact from impingement and entrainment. 63 FR 27958 (May 21, 1998). In September of 1998, in Alexandria, Virginia, EPA conducted a public meeting focused on technology, cost, and mitigation issues. 63 FR 40683 (July 30, 1998). In addition, in September of 1998, and April of 1999, EPA staff participated in technical workshops sponsored by the Electric Power Research Institute on issues relating to the definition and assessment of adverse environmental impact. EPA staff have participated in other industry conferences, met upon request on numerous occasions with representatives of industry and environmental groups.

In the months leading up to publication of the proposed Phase I rule, EPA conducted a series of stakeholder meetings to review the draft regulatory framework for the proposed rule and invited stakeholders to provide their recommendations for the Agency's consideration. EPA managers have met with the Utility Water Act Group, Edison Electric Institute, representatives from an individual utility, and with representatives from the petroleum refining, pulp and paper, and iron and steel industries. EPA conducted several meetings with environmental groups attended by representatives from 15 organizations. EPA also met with the Association of State and Interstate Water Pollution Control Administrators (ASIWPCA) and, with the assistance of ASIWPCA, conducted a conference call in which representatives from 17 States or interstate organizations participated. After publication of the proposed Phase I rule, EPA continued to meet with stakeholders at their request. Summaries of these meetings are in the docket.

EPA received many comments from industry stakeholders, government agencies, and private citizens on the Phase I proposed rule 65 FR 49059 (August 10, 2000). EPA received additional comments on the Phase I Notice of Data Availability (NODA) 66 FR 28853 (May 25, 2001). These comments informed the development of the Phase II proposal.

In January, 2001, EPA also attended technical workshops organized by the Electric Power Research Institute and the Utilities Water Act Group. These workshops focused on the presentation of key issues associated with different regulatory approaches considered under the Phase I proposed rule and alternatives for addressing section 316(b) requirements.

On May 23, 2001, EPA held a day-long forum to discuss specific issues associated with the development of regulations under section 316(b) of the Clean Water Act. 66 FR 20658 (April 24, 2001). At the meeting, 17 experts from industry, public interest groups, States, and academia reviewed and discussed the Agency's preliminary data on cooling water intake structure technologies that are in place at existing facilities and the costs associated with the use of available technologies for reducing impingement and entrainment. Over 120 people attended the meeting.

In August 21, 2001, EPA staff participated in a technical symposium sponsored by the Electric Power Research Institute in association with the American Fisheries Society on issues relating to the definition and assessment of adverse environmental impact under section 316(b) of the CWA.

During development of the Phase I final rule and Phase II proposed rule, EPA coordinated with the staff from the Nuclear Regulatory Commission (NRC) to ensure that there would not be a conflict with NRC safety requirements. NRC staff reviewed the proposed Phase II rule and did not identify any apparent conflict with nuclear plant safety. NRC licensees would continue to be obligated to meet NRC requirements for design and reliable operation of cooling systems. NRC staff recommended that EPA consider adding language which states that in cases of conflict between an EPA requirement under this rule and an NRC safety requirement, the NRC safety requirement take precedence. EPA added language to address this concern in this final rule.

In a concerted effort to respond to a multitude of questions concerning the data and analyses that EPA developed as part of the Phase II proposal, EPA held a number of conference calls with multiple stakeholders to clarify issues and generally provide additional information. To supplement these verbal discussions, EPA drafted three supporting documents: one that explained the methodology EPA used to calculate entrainment rates; and two others that provided specific examples of how EPA applied this methodology to calculate benefits for the proposed rule. In addition, EPA prepared written responses to all questions submitted by the stakeholders involved in the initial conference calls.

Finally, EPA sponsored a *Symposium on Cooling Water Intake Technologies to Protect Aquatic Organisms,* held on May 6–7, 2003, at the Hilton Crystal City at National Airport in Arlington, Virginia. This symposium brought together professionals from Federal, State, and Tribal regulatory agencies; industry; environmental organizations; engineering consulting firms; science and research organizations; academia; and others concerned with mitigating harm to the aquatic environment by cooling water intake structures. Efficacy and costs of various technologies to mitigate impacts to aquatic organisms from cooling water intake structures, as well as research and other future needs, were discussed.

These coordination efforts and all of the meetings described in this section are documented or summarized in the docket established for this rule.

IV. Environmental Impacts Associated With Cooling Water Intake Structures

With the implementation of today's final rule, EPA intends to minimize the adverse environmental impacts of cooling water intake structures by minimizing the number of aquatic organisms lost as a result of water withdrawals associated with these structures or through restoration measures that compensate for these losses. In the Phase I new facility rule and proposed Phase II existing facility rule, EPA provided an overview of the magnitude and type of environmental impacts associated with cooling water intake structures, including several illustrative examples of documented environmental impacts at existing facilities (see 65 FR 49071–4; 66 FR 65262–5; and 67 FR 17136–40).

For the same reasons set forth in the preamble to the Phase I rule (66 FR 65256, 65291–65297), EPA has determined that there are multiple types of undesirable and unacceptable environmental impacts that may be associated with Phase II existing facilities, depending on conditions at the individual site. These types of impacts include entrainment and impingement; reductions of threatened and endangered species; damage to critical aquatic organisms, including important elements of the food chain; diminishment of a population's compensatory reserve; losses to populations including reductions of indigenous species populations, commercial fisheries stocks, and recreational fisheries; and stresses to overall communities and ecosystems as evidenced by reductions in diversity or other changes in system structure and function. Similarly, based on the analyses and for the same reasons set forth in the preamble to the new facility rule (66 FR 65256, 65291–65297), EPA has selected reductions in impingement and entrainment as a quick, certain, and consistent metric for determining performance at Phase II existing facilities. Further, EPA considered the non-impingement and entrainment environmental impacts for this rule and found them to be acceptable at a national level. This section describes the environmental impacts associated with cooling water withdrawals and why they are of concern to the Agency.

EPA estimates that facilities under the scope of today's final rule withdraw on average more than 214 billion gallons of cooling water a day from waters of the United States.[2] A report by the U.S. Geological Survey estimates that the use of water by the thermoelectric power industry accounted for 47 percent of all combined fresh and saline withdrawals from waters of the United States in 1995.[3] The withdrawal of such large quantities of cooling water in turn has the potential to affect large quantities of aquatic organisms including phytoplankton (tiny, free-floating photosynthetic organisms suspended in the water column), zooplankton (small aquatic animals, including fish eggs and larvae, that consume phytoplankton and other zooplankton), fish, and shellfish. Aquatic organisms drawn into cooling water intake structures are either impinged on components of the cooling water intake structure or entrained in the cooling water system itself.

Impingement takes place when organisms are trapped against intake screens by the force of the water being drawn through the cooling water intake structure. The velocity of the water withdrawal by the cooling water intake structure may prevent proper gill movement, remove fish scales, and cause other physical harm or death of affected organisms through exhaustion, starvation, asphyxiation, and descaling. Death from impingement (''impingement mortality'') can occur immediately or subsequently as an individual succumbs to physical damage upon its return to the waterbody.

Entrainment occurs when organisms are drawn through the cooling water intake structure into the cooling system. Organisms that become entrained are typically relatively small, aquatic organisms, including early life stages of fish and shellfish. Many of these small, fragile organisms serve as prey for larger organisms higher on the food chain which are commercially and recreationally desirable species. As entrained organisms pass through a facility's cooling system they may be subject to mechanical, thermal, and at times, chemical stress. Sources of such stress include physical impacts in the pumps and condenser tubing, pressure changes caused by diversion of the cooling water into the plant or by the hydraulic effects of the condensers, sheer stress, thermal shock in the condenser and discharge tunnel, and chemical toxic effects from antifouling agents such as chlorine. Similar to impingement mortality, death from entrainment can occur immediately or subsequently as the individual succumbs to the damage from the stresses encountered as it passed through the cooling water system once it is discharged back into the waterbody.

The environmental impacts attributable to impingement mortality and entrainment at individual facilities include losses of early life stages of fish and shellfish, reductions in forage species, and decreased recreational and commercial landings. EPA estimates that the current number of fish and shellfish, expressed as age 1 equivalents, that are killed from impingement and entrainment from cooling water intake structures at the facilities covered by this Phase II rule is over 3.4 billion annually. Expressing impingement mortality and entrainment losses as age 1 equivalents is an accepted method for converting losses of all life stages into individuals of an equivalent age and provides a standard metric for comparing losses among species, years, and facilities. The largest losses are in the mid-Atlantic, where EPA estimates 1.7 billion age 1 equivalents are lost annually due to impingement and entrainment.[4] Although the number of age 1 equivalent fish killed by impingement and entrainment is very large, precise quantification of the nature and extent of impacts to populations and ecosystems is difficult. Population dynamics and the physical, chemical, and biological processes of ecosystems are extremely complex. While generally accepted as a simple and transparent method for modeling losses, the proportional methodology that EPA uses to estimate impingement and entrainment nationwide has uncertainties that may result in under or over estimating actual impingement and entrainment rates.

Decreased numbers of aquatic organisms can disrupt aquatic food webs and alter species composition and overall levels of biodiversity. For example, a model that examined the effect of large entrainment losses of forage fish, such as bay anchovy, predicted subsequent reductions in predator populations (including commercially and recreationally important species such as striped bass, weakfish, and blue fish) as high as 25%.[5] This is because forage species, which comprise a majority of

[2] EPA 1999. Detailed Industry Questionnaires: Phase II Cooling Water Intake Structures & Watershed Case Study Short Questionnaire. U.S. Environmental Protection Agency, Office of Wastewater Management, Washington, D.C. OMB Control No. 2040–0213.

[3] Solley, W.B., R.R. Pierce and H.A. Perlman. 1998. Estimated Use of Water in the United States in 1995. U.S. Geological Survey Circular 1200.

[4] For more information, please see Chapter D2: Evaluation of Impingement and Entrainment in the Mid-Atlantic Region in the Section 316(b) Existing Facilities Regional Studies, Part D: Mid-Atlantic.

[5] Summers, J.K. 1989. Simulating the indirect effects of power plant entrainment losses on an estuarine ecosystem. Ecological Modelling, 49: 31–47.

entrainment losses at many facilities, are often a primary food source for predator species.

EPA is also concerned about the potential impacts of cooling water intake structures located in or near habitat areas that support threatened, endangered, or other species of concern (those species that might be in need of conservation actions, but are not currently listed as threatened or endangered under State or Federal law).[6] In the San Francisco Bay-Delta Estuary, California, in the vicinity of the Pittsburg and Contra Costa Power Plants several fish species (*e.g.*, Delta smelt, Sacramento splittail, chinook salmon, and steelhead) are now considered threatened or endangered by State and/or Federal authorities. EPA evaluated facility data on impingement and entrainment rates for these species and estimated that potential losses of special status fish species at the two facilities may average 8,386 age 1 equivalents per year resulting from impingement and 169 age 1 equivalents per year due to entrainment.[7] In another example, EPA is aware that from 1976 to 1994, approximately 3,200 threatened or endangered sea turtles entered enclosed cooling water intake canals at the St. Lucie Nuclear Generating Plant in Florida.[8] The facility developed a capture-and-release program in response to these events. Most of the entrapped turtles were captured and released alive; however, approximately 160 turtles did not survive. An incidental take limit established by NMFS in a 2001 biological opinion for this facility has been set at no more than 1,000 sea turtles captured in the intake, with less than one percent killed or injured as a result of plant operations (only two of those killed or injured may be Kemp's Ridley sea turtles and none may be hawksbill or leatherback sea turtles).[9] Although the extent to which threatened, endangered, and other special status species are taken by cooling water intake structures more generally is yet to be determined, EPA is concerned about potential impacts to such species.

Examples of Environmental Impacts Caused by Cooling Water Intakes

1. Hudson River

The power generation facilities on the Hudson River in New York are some of the most extensively studied in the nation. The fish populations in the Hudson River have also been studied extensively to measure the impacts of these power plants. Studies of entrainment at five Hudson River power plants during the 1980s predicted year-class reductions ranging from six percent to 79 percent, depending on the fish species.[10] A Draft Environmental Impact Statement (DEIS) prepared by industry of entrainment at three Hudson River facilities (Roseton, Bowline, and Indian Point) predicted year-class reductions of up to 20 percent for striped bass, 25 percent for bay anchovy, and 43 percent for Atlantic tomcod.[11] The New York State Department of Environmental Conservation (NYSDEC) concluded that any ''compensatory responses to this level of power plant mortality could seriously deplete any resilience or compensatory capacity of the species needed to survive unfavorable environmental conditions.'' [12] In the DEIS, the facilities argue that their operation has not harmed the local aquatic communities, because all observed population changes are attributable to causes other than the operation of the power plants, such as water chestnut growth, zebra mussel invasion, changes in commercial fishing, increases in salinity and improved water quality in the New York Harbor.

In contrast, the Final Environmental Impact Statement (FEIS) prepared by NYSDEC for these three facilities concludes that impacts are associated with the power plants and notes that these impacts are more like habitat degradation than the ''selective cropping'' of fish that occurs during regulated fishing because the entire community is impacted rather than specific species higher on the food chain.[13] The multiple facilities on the Hudson River act cumulatively on the entire aquatic community. New York State's 2002 section 316(b) report lists the Hudson River downstream from the Federal dam at Troy, New York, as impacted by cooling water use by power plants due to the loss each year of a substantial percentage of annual fish production. The FEIS estimates, from samples collected between 1981 and 1987, that the average annual entrainment losses from these three facilities includes 16.9 million American shad, 303.4 million striped bass, 409.6 million bay anchovy, 468 million white perch, and 826.2 million river herring.[14] In addition, related studies have found a small long-term decline in both species richness and diversity within the resident fish community. A commenter on the DEIS cited further evidence that Atlantic tomcod, Atlantic sturgeon, bluefish, weakfish, rainbow smelt, white perch and white catfish are showing long-term trends of declining abundance of 5 to 8% per annum.[15] Declines in abundances of several species and changes in species composition have raised concerns about the overall health of the community. The FEIS concluded that additional technology was necessary to minimize the adverse environmental impact from these three once-through systems.[16]

The FEIS further concluded that entrainment at these facilities has diminished the forage base for each species so there is less food available for the survivors. This disruption of the food chain compromises the health of the entire aquatic community. The FEIS used, as a simplified hypothetical example, the loss of an individual bay anchovy that would ordinarily serve as prey for a juvenile striped bass. If this individual bay anchovy is killed via entrainment and disintegrated upon

[6] For more information, please see Chapter A12: Threatened & Endangered Species Analysis Methods in the Regional Studies for the Final Section 316(b) Phase II Existing Facilities Rule.

[7] Impingement and entrainment data were obtained from the 2000 Draft Habitat Conservation Plan for the Pittsburg and Contra Costa facilities. Please see EPA's Regional Studies for the Final Section 316(b) Phase II Existing Facilities Rule for detailed information on EPA's evaluation of impingement and entrainment at these facilities.

[8] Florida Power and Light Company. 1995. Assessment of the impacts at the St. Lucie Nuclear Generating Plant on sea turtle species found in the inshore waters of Florida.

[9] Florida Power and Light Company, 2002. Florida Power & Light Company St. Lucie Plant Annual Environmental Operating Report 2002.

[10] Boreman J. and P. Goodyear. 1988. Estimates of entrainment mortality for striped bass and other fish species inhabiting the Hudson River Estuary. *American Fisheries Society Monograph* 4:152–160.

[11] Consolidated Edison Company of New York. 2000. Draft environmental impact statement for the state pollutant discharge elimination system permits for Bowline Point, Indian Point 2 & 3, and Roseton steam electric generating stations.

[12] New York State Department of Environmental Conservation (NYSDEC). 2000. Internal memorandum provided to the USEPA on NYDEC's position on SPDES permit renewals for Roseton, Bowline Point 1 & 2, and Indian Point 2 & 3 generating stations.

[13] New York State Department of Environmental Conservation (NYSDEC). 2003. Final Environmental Impact Statement: Concerning the Applications to Renew NYSPDES Permits for the Roseton 1 & 2, Bowling 1 & 2 and Indian Point 2 & 3 Steam Electric Generating Stations, Orange, Rockland and Westchester Counties.

[14] Ibid.

[15] Henderson, P.A. and R.M. Seaby. 2000. Technical comments on the Draft Environmental Impact Statement for the State Pollution Discharge Elimination System Permit Renewal for Bowline Point 1 & 2, Indian Point 2 & 3, and Roseton 1 & 2 Steam Generating Stations. Pisces Conservation Ltd.

[16] New York State Department of Environmental Conservation (NYSDEC). 2003. Final Environmental Impact Statement: Concerning the Applications to Renew NYSPDES Permits for the Roseton 1 & 2, Bowline 1 & 2 and Indian Point 2 & 3 Steam Electric Generating Stations, Orange, Rockland and Westchester Counties.

passage through a CWIS, it is no longer available as food to a striped bass, but rather it is only useful as food to lower trophic level organisms, such as detritivores (organisms that feed on dead organic material). Further, the bay anchovy would no longer be available to consume phytoplankton, which upsets the distribution of nutrients in the ecosystem.[17]

The Hudson River, like many waterbodies in the nation, has undergone many changes in the past few decades. These changes, which have affected fish populations either positively or negatively, include improvements to water quality as a result of upgrades to sewage treatment plants, invasions by exotic species such as zebra mussels, chemical contamination by toxins such as PCBs and heavy metals, global climate shifts such as increases in annual mean temperatures and higher frequencies of extreme weather events (*e.g.*, the El Niño-Southern Oscillation), and strict management of individual species stocks such as striped bass.[18] In addition, there are dramatic natural changes in fish populations on an annual basis and in the long term due to natural phenomena because the Hudson River, like many waterbodies, is a dynamic system with many fundamental, fluctuating environmental parameters—such as flow, temperature, salinity, dissolved oxygen, nutrients, and disease—that cause natural variation in fish populations each year.[19] The existence of these interacting variables makes it difficult to determine the exact contribution of impingement and entrainment losses on a population's relative health. Nonetheless, as described later in this section, EPA is concerned about the potential for cumulative impacts resulting from multiple facility intakes that collectively impinge and/or entrain aquatic organisms within a specific waterbody.

2. Mount Hope Bay

Environmental impacts were also studied in another recent permit reissuance for the Brayton Point Station in Somerset, Massachusetts, where EPA is the permitting authority. EPA determined that, among other things, the facility's cooling water system had contributed to the collapse of the fishery and inhibited its recovery despite stricter commercial and recreational fishing limits and improved water quality due to sewage treatment upgrades. The facility currently withdraws nearly one billion gallons of water each day and the average annual losses of aquatic organisms due to impingement and entrainment are estimated in the trillions, including 251 million winter flounder, 375 million windowpane flounder, 3.5 billion tautog and 11.8 billion bay anchovy. A dramatic change in the fish populations in Mount Hope Bay is apparent after 1984 with a decline by more than 87 percent, which coincides with a 45 percent increase in cooling water withdrawal from the bay due to the modification of Unit 4 from a closed-cycle recirculating system to a once-through cooling water system and a similar increase in the facility's thermal discharge.[20 21] The downward trend of finfish abundance in Mount Hope Bay is significantly greater than declines in adjacent Narragansett Bay that is not influenced by the operation of Brayton Point Station.[22] Despite fishing restrictions, fish stocks have not recovered.

3. Southern California Bight

At the San Onofre Nuclear Generating Station (SONGS), in a normal (non-El Niño) year, an estimated 57 tons of fish were killed per year when all units were in operation.[23] The amount lost per year included approximately 350,000 juveniles of white croaker, a popular sport fish; this number represents 33,000 adult equivalents or 3.5 tons of adult fish. In shallow water, densities of queenfish and white croaker decreased 60 percent within one kilometer of SONGS and 35 percent within three kilometers from SONGS as compared to densities prior to facility operations. Densities of local midwater fish decreased 50 to 70 percent within three kilometers of the facility. In contrast, relative abundances of some bottom-dwelling species in the same areas were higher because of the enriched nature of the SONGS discharge, which in turn supported elevated numbers of prey items for bottom-dwelling fish.

4. Missouri River

In contrast to these examples, facilities sited on waterbodies previously impaired by anthropogenic activities such as channelization demonstrate limited entrainment and impingement losses. The Neal Generating Complex facility, located near Sioux City, Iowa, on the Missouri River is coal-fired and utilizes once-through cooling systems. According to a ten-year study conducted from 1972–82, the Missouri River aquatic environment near the Neal complex was previously heavily impacted by channelization and very high flow rates meant to enhance barge traffic and navigation.[24] These anthropogenic changes to the natural river system resulted in significant losses of fish habitat. At this facility, there was found to be little impingement and entrainment by cooling water intakes.

Studies like those described in this section provide only a partial picture of the range of environmental impacts associated with cooling water intake structures. Although numerous studies were conducted to determine the environmental impacts caused by impingement and entrainment at existing facilities, many of them are based on limited data that were collected as long as 25 years ago. EPA's review of available facility impingement and entrainment studies identified a substantial number of serious study design limitations, including data collections for only one to two years or limited to one season and for a subset of the species affected by cooling water intakes; limited taxonomic detail (*i.e.*, many losses not identified to the species level); a general lack of statistical information such as inclusion of variance measures in impingement and entrainment estimates; and the lack of standard methods and metrics for quantifying impingement and entrainment, which limits the potential for evaluating cumulative impacts across multiple facilities. Further, in many cases it is likely that facility operating conditions and/or the state of the waterbody itself has changed since these studies were conducted. Finally, the methods for monitoring impingement and entrainment used in the 1970s and 1980s, when most section 316(b) evaluations were performed, were often inconsistent and incomplete, making quantification of impacts difficult in some cases. Recent advances in environmental assessment techniques

[17] Ibid.

[18] Ibid.

[19] Ibid.

[20] Ibid.

[21] T Gibson, M. 1995 (revised 1996). Comparison of trends in the finfish assemblages of Mt. Hope Bay and Narragansett Bay in relation to operations for the New England Power Brayton Point station. Rhode Island Division of Fish and Wildlife, Marine Fisheries Office.

[22] EPA–New England. 2002. Clean Water Act NPDES Permitting Determinations for Thermal Discharge and Cooling Water Intake from Brayton Point Station in Somerset, MA (NPDES Permit No. MA 0003654), July 22, 2002.

[23] Murdoch, W.W., R.C. Fay, and B.J. Mechalas. 1989. Final Report of the Marine Review Committee to the California Coastal Commission. August 1989, MRC Document No. 89–02.

[24] Tondreau, R., J. Hey and E. Shane, Morningside College. 1982. Missouri River Aquatic Ecology Studies: Ten Year Summary (1972–1982). Prepared for Iowa Public Service Company, Sioux City, Iowa.

provide new and in some cases better tools for monitoring impingement and entrainment and quantifying the current magnitude of the impacts.[25] [26]

EPA is also concerned about the potential for cumulative impacts related to cooling water withdrawal. Cumulative impacts may result from (1) multiple facility intakes impinging and/or entraining aquatic organisms within a specific waterbody, watershed, or along the migratory pathway of specific species; (2) the existence of multiple stressors within a waterbody/watershed, including cooling water intake withdrawals; and (3) long-term occurrences of impingement and/or entrainment losses that may result in the diminishment of the compensatory reserve of a particular fishery stock.

Historically, environmental impacts related to cooling water intake structures have been evaluated on a facility-by-facility basis. These historical evaluations do not consider the potential for a fish or shellfish species to be concomitantly impacted by cooling water intake structures belonging to other facilities that are located within the same waterbody or watershed in which the species resides or along the coastal migratory route of a particular species. The potential cumulative effects of multiple intakes located within a specific waterbody or along a coastal segment are difficult to quantify and are not typically assessed. (One relevant example is provided for the Hudson River; see discussion earlier in this section.) Nonetheless, EPA analyses suggest that almost a quarter of all Phase II existing facilities are located on a waterbody with another Phase II existing facility (DCN 4–4009). Thus, EPA is concerned that although the potential for aquatic species to be affected by cooling water withdrawals from multiple facility intakes is high, this type of cumulative impact is largely unknown and has not adequately been accounted for in evaluating impacts. However, recently the Atlantic States Marine Fisheries Commission (ASMFC) was requested by its member States to investigate the cumulative impacts on commercial fishery stocks, particularly overutilized stocks, attributable to cooling water intakes located in coastal regions of the Atlantic.[27] Specifically, the ASMFC study will evaluate the potential cumulative impacts of multiple intakes on Atlantic menhaden stock [28] which range along most of the U.S. Atlantic coast with a focus on revising existing fishery management models so that they accurately consider and account for fish losses from multiple intake structures. Results from these types of studies, although currently unavailable, will provide significant insight into the degree of impact attributable to intake withdrawals from multiple facilities.

EPA also considered information suggesting that impingement and entrainment, in conjunction with other factors, may be a nontrivial stress on a waterbody. EPA recognizes that cooling water intake structures are not the only source of human-induced stress on aquatic systems. Additional stresses to aquatic systems include, but are not limited to, nutrient, toxics, and sediment loadings; low dissolved oxygen; habitat loss; and stormwater runoff. Although EPA recognizes that a nexus between a particular stressor and adverse environmental impact may be difficult to establish with certainty, EPA believes stressors that cause or contribute to the loss of aquatic organisms and habitat such as those described above, may incrementally impact the viability of aquatic resources. EPA analyses suggest that over 99 percent of all existing facilities with cooling water withdrawal that EPA surveyed in its section 316(b) survey of existing facilities are located within two miles of waters that are identified as impaired by a State or Tribe (see 66 FR 65256, 65297). Thus, the Agency is concerned that to the extent that many of the aquatic organisms subject to the effects of cooling water withdrawals reside in impaired waterbodies, they are potentially more vulnerable to cumulative impacts from an array of physical and chemical anthropogenic stressors.

Finally, EPA believes that an aquatic population's potential compensatory ability—the capacity for a species to increase its survival, growth, or reproduction in response to reductions sustained to its overall population size—may be compromised by impingement and entrainment losses in conjunction with all the other stressors encountered within a population's natural range, as well as impingement and entrainment losses occurring consistently over extended periods of time. As discussed in the Phase I new facility rule (see 66 FR 65294), EPA is concerned that even if there is little evidence that cooling water intakes alone reduce a population's compensatory reserve, the multitude of stressors experienced by a species can potentially adversely affect its ability to recover.[29] Moreover, EPA notes that the opposite effect or ''depensation'' (decreases in recruitment as stock size declines[30]) may occur if a population's size is reduced beyond a critical threshold. Depensation can lead to further decreases in population abundances that are already seriously depleted and, in some cases, recovery of the population may not be possible even if the stressors are removed. In fact, there is some evidence that depensation may be a factor in some recent fisheries collapses.[31] [32] [33]

Another problem associated with assessing the environmental impact of cooling water intakes is that existing fishery resource baselines may be inaccurate.[34] There is much evidence that the world's fisheries are in general decline,[35] [36] however, many fishery stocks have not been adequately assessed. According to a 2002 study, only 23 percent of U.S. managed fish stocks have been fully assessed and of these, over 40 percent are considered depleted or are being fished beyond sustainable levels.[37] Another study estimated that more than 70 percent of commercial fish stocks are fully

[25] Schmitt, R.J. and C.W. Osenberg. 1996. Detecting Ecological Impacts. Academic Press, San Diego, CA.

[26] EPRI 1999. Catalog of Assessment Methods for Evaluating the Effects of Power Plant Operations on Aquatic Communities. TR–112013, EPRI, Palo Alto, CA.

[27] Personal communication, D. Hart (EPA) and L. Kline (ASMFC), 2001.

[28] Personal communication, D. Hart (EPA) and L. Kline (ASMFC), 2003.

[29] Hutchings, J.A. and R.A. Myers. 1994. What can be learned from the collapse of a renewable resource? Atlantic cod, *Gadus morhus,* of Newfoundland and Labrador. Canadian Journal of Fisheries and Aquatic Sciences 51:2126–2146.

[30] Goodyear, C.P. 1977. Assessing the impact of power plant mortality on the compensatory reserve of fish populations. Pages 186–195 in W. Van Winkle, ed., Proceedings of the Conference on Assessing the Effects of Power Plant Induced Mortality on Fish Populations. Pergamon Press, New York, NY.

[31] Myers, R.A., N.J. Barrowman, J.A. Hutchings, and A.A. Rosenburg. 1995. Population dynamics of exploited fish stocks at low population levels. Science 26:1106–1108.

[32] Hutchings, J.A. and R.A. Myers. 1994. What can be learned from the collapse of a renewable resource? Atlantic cod, *Gadus morhus,* of Newfoundland and Labrador. Canadian Journal of Fisheries and Aquatic Sciences 51:2126–2146.

[33] Liermann, M. and R. Hilborn. 1997. Depensation in fish stocks: A hierarchic Bayesian meta-analysis. Can. J. Fish. Aquatic. Sci. 54:1976–1985.

[34] Watson, R. and D. Pauly. 2001. Systematic distortions in world fisheries catch trends. Nature 414:534–536.

[35] Ibid.

[36] Pew Oceans Commission. 2003. America's Living Oceans: Charting a course for sea change. Summary Report. May 2003. Pew Oceans Commission, Arlington, VA.

[37] U.S. Commission on Ocean Policy. 2002. Developing a National Ocean Policy: Mid-Term Report of the U.S. Commission on Ocean Policy. Washington, DC.

exploited, overfished or collapsed.[38] Another estimated that large predatory fish stocks are only a tenth of what they were 50 years ago.[39] Most studies of fish populations last only a few years, do not encompass the entire life span of the species examined, and do not account for cyclical environmental changes such as ENSO events, and other long term cycles of oceanographic productivity.[40]

Although a clear and detailed picture of the status of all our fishery resources does not exist,[41] it is undisputed that fishermen are struggling to sustain their livelihood despite strict fishery management restrictions which aim to rebuild fish populations. EPA shares the concerns expressed by expert fishery scientists that historical overfishing has increased the sensitivity of aquatic ecosystems to subsequent disturbance, making them more vulnerable to other stressors, including cooling water intake structures.

In conclusion, EPA's mission includes ensuring the sustainability of communities and ecosystems. Thus, EPA must comprehensively evaluate all potential threats to resources and work towards eliminating or reducing identified threats. As discussed in this section, EPA believes that impingement and entrainment losses attributable to cooling water intakes do pose a threat to aquatic organisms and through today's rule is seeking to minimize that threat.

V. Description of the Final Rule

Clean Water Act section 316(b) requires that any standard established pursuant to section 301 or section 306 of the CWA and applicable to a point source shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact. Today's final rule establishes national performance requirements for Phase II existing facilities that ensure such facilities fulfill the mandate of section 316(b).

This rule applies to Phase II existing facilities that use or propose to use a cooling water intake structure to withdraw water for cooling purposes from waters of the United States and that have or are required to have a National Pollutant Discharge Elimination System (NPDES) permit issued under section 402 of the CWA. Phase II existing facilities include only those facilities whose primary activity is to generate and transmit electric power and who have a design intake flow of 50 MGD or greater, and that use at least 25 percent of the water withdrawn exclusively for cooling purposes (see § 125.91). Applicability criteria for this rule are discussed in detail in section II of this preamble.

Under this final rule, EPA has established performance standards for the reduction of impingement mortality and, when appropriate, entrainment (see § 125.94). The performance standards consist of ranges of reductions in impingement mortality and/or entrainment (*e.g.*, reduce impingement mortality by 80 to 95 percent and/or entrainment by 60 to 90 percent). These performance standards reflect the best technology available for minimizing adverse environmental impacts determined on a national categorical basis. The type of performance standard applicable to a particular facility (*i.e.*, reductions in impingement only or impingement and entrainment) is based on several factors, including the facility's location (*i.e.*, source waterbody), rate of use (capacity utilization rate), and the proportion of the waterbody withdrawn. Exhibit V–1 summarizes the performance standards based on waterbody type.

In most cases, EPA believes that these performance standards can be met using design and construction technologies or operational measures. However, under the rule, the performance standards also can be met, in whole or in part, by using restoration measures, following consideration of design and construction technologies or operational measures and provided such measures meet restoration requirements (see § 125.94(c)).

As noted earlier in this section, today's rule generally requires that impingement mortality of all life stages of fish and shellfish must be reduced by 80 to 95 percent from the calculation baseline; and for some facilities, entrainment of all life stages of fish and shellfish must be reduced by 60 to 90 percent from the calculation baseline (see § 125.94(b)).

EXHIBIT V–1.—PERFORMANCE STANDARD REQUIREMENTS

Waterbody type	Capacity utilization rate	Design intake flow	Type of performance standard
Freshwater River or Stream	Less than 15%	N/A [1]	Impingement mortality only.
	Equal to or greater than 15%.	5% or less mean annual flow.	Impingement mortality only.
		Greater than 5% of mean annual flow.	Impingement mortality and entrainment.
Tidal river, Estuary or Ocean	Less than 15%	N/A [1]	Impingement mortality only.
	Equal to or greater than 15%.	N/A	Impingement mortality and entrainment.
Great Lakes	Less than 15%	N/A	Impingement mortality only.
	Equal to or greater than 15%.	N/A	Impingement mortality and entrainment.

[38] Broad, W.J. and A.C. Revkin. 2003. Has the Sea Given Up its Bounty? The New York Times. July 29, 2003.

[39] Myers, R.A. and B. Worm. 2003. Rapid worldwide depletion of predatory fish communities. Nature 423: 280–283.

[40] Jackson, J.B.C., M.X. Kirby, W.H. Berger, K.A. Bjorndal, L.W. Botsford, B.J. Bourque, R.H. Bradbury, R. Cooke, J. Erlandson, J.A. Estes, T.P. Hughes, S. Kidwell, C.B. Lange, H.S. Lenihan, J.M. Pandolfi, C.H. Peterson, R.S. Steneck, M.J. Tegner, and R.R. Warner. 2001. Historical overfishing and the recent collapse of coastal ecosystems. Science 293(5530):629–638.

[41] National Marine Fisheries Service (NMFS). 2002. Annual Report to Congress on the Status of U.S. Fisheries—2001. U.S. Dep. Commerce, NOAA, Natl. Mar. Fish. Serv., Silver Spring, MD, 142 pp.

EXHIBIT V–1.—PERFORMANCE STANDARD REQUIREMENTS—Continued

Waterbody type	Capacity utilization rate	Design intake flow	Type of performance standard
Lakes or Reservoirs	N/A	Increase in design intake flow must not disrupt thermal stratification except where it does not adversely affect the management of fisheries.	Impingement mortality only.

[1] Determination of appropriate compliance reductions is not applicable.

This final rule identifies five alternatives a Phase II existing facility may use to achieve compliance with the requirements for best technology available for minimizing adverse environmental impacts associated with cooling water intake structures. Four of these are based on meeting the applicable performance standards and the fifth allows the facility to request a site-specific determination of best technology available for minimizing adverse environmental impacts under certain circumstances. EPA has established these compliance alternatives for meeting the performance standards to provide a significant degree of flexibility to Phase II existing facilities, to ensure that the rule requirements are economically practicable, and to provide the ability for Phase II existing facilities to address unique site-specific factors. Application requirements vary based on the compliance alternative selected and, for some facilities, include development of a Comprehensive Demonstration Study. Application requirements are discussed later in this section. The five compliance alternatives are described in the following paragraphs.

Under § 125.94(a)(1)(i) and (ii), a Phase II existing facility may demonstrate to the Director that it has already reduced its flow commensurate with a closed-cycle recirculating system, or that it has already reduced its design intake velocity to 0.5 ft/s or less. If a facility can demonstrate to the Director that it has reduced, or will reduce, flow commensurate with a closed-cycle recirculating system, the facility is deemed to have met the performance standards to reduce impingement mortality and entrainment (see § 125.94 (a)(1)(i)). Those facilities would not be required to submit a Comprehensive Demonstration Study with their NPDES application. If the facility can demonstrate to the Director that is has reduced, or will reduce maximum through-screen design intake velocity to 0.5 ft/s or less, the facility is deemed to have met the performance standards to reduce impingement mortality only. Facilities that meet the velocity requirements would only need to submit application studies related to determining entrainment reduction, if subject to the performance standards for entrainment.

Under § 125.94(a)(2) and (3), a Phase II existing facility may demonstrate to the Director, either that its current cooling water intake structure configuration meets the applicable performance standards, or that it has selected design and construction technologies, operational measures, and/or restoration measures that, in combination with any existing design and construction technologies, operational measures, and/or restoration measures, meet the specified performance standards in § 125.94(b) and/or the requirements in § 125.94(c).

Under § 125.94(a)(4), a Phase II existing facility may demonstrate to the Director that it has installed and is properly operating and maintaining a rule-specified and approved design and construction technology in accordance with § 125.99(a). Submerged cylindrical wedgewire screen technology is a rule-specified design and construction technology that may be used in instances in which a facility's cooling water intake structure is located in a freshwater river or stream and meets other criteria specified at § 125.99(a).

In addition, under this compliance alternative, a facility or other interested person may submit a request to the Director for approval of a different technology. If the Director approves the technology, it may be used by all facilities with similar site conditions under his or her jurisdiction if allowed under the State's administrative procedures. Requests for approval of a technology must be submitted to the Director and include a detailed description of the technology; a list of design criteria for the technology and site characteristics and conditions that each facility must possess in order to ensure that the technology can consistently meet the appropriate impingement mortality and entrainment performance standards in § 125.94(b); and information and data sufficient to demonstrate that all facilities under the jurisdiction of the Director can meet the relevant impingement mortality and entrainment performance standards in § 125.94(b) if the applicable design criteria and site characteristics and conditions are present at the facility. A Director may only approve an alternative technology following public notice and opportunity for comment on the approval of the technology (§ 125.99(b)).

Under § 125.94(a)(5) (i) or (ii), if the Director determines that a facility's costs of compliance would be significantly greater than the costs considered by the Administrator for a like facility to meet the applicable performance standards, or that the costs of compliance would be significantly greater than the benefits of meeting the applicable performance standards at the facility, the Director must make a site-specific determination of best technology available for minimizing adverse environmental impact. Under this alternative, a facility would either compare its projected costs of compliance using a particular technology or technologies to the costs the Agency considered for a like facility in establishing the applicable performance standards, or compare its projected costs of compliance with the projected benefits at its site of meeting the applicable performance standards of today's rule (see section IX.H). If in either case costs are significantly greater, the technology selected by the Director must achieve an efficacy level that comes as close as practicable to the applicable performance standards without resulting in significantly greater costs.

During the first permit term, a facility that chooses compliance alternatives in § 125.94(a)(2), (3), (4), or (5) may request that compliance with the requirements of this rule be determined based on the implementation of a Technology Installation and Operation Plan indicating how the facility will install and ensure the efficacy, to the extent practicable, of design and construction technologies and/or operational measures, and/or a Restoration Plan (§ 125.95(b)(5)). The Technology Installation and Operation Plan must be developed and submitted to the Director in accordance with § 125.95(b)(4)(ii). The Restoration Plan must be developed in accordance with § 125.95(b)(5). During subsequent permit terms, if the facility has been in compliance with the construction, operational, maintenance, monitoring, and adaptive management requirements in its TIOP and/or Restoration Plan during the preceding permit term, the facility may request that compliance during subsequent permit terms be based on its remaining in compliance with its TIOP and/or Restoration Plan, revised in accordance with applicable adaptive management requirements if the applicable performance standards are not being met.

Three sets of data are required to be submitted 180 days prior to expiration of a facility's existing permit by all facilities regardless of compliance alternative selected (see § 122.21(r)(2)(3) and (5)). These are:

- Source Water Physical Data: A narrative description and scaled drawings showing the physical configuration of all source waterbodies used by the facility, including areal dimensions, depths, salinity and temperature regimes, and other documentation that supports your determination of the waterbody type where each cooling water intake structure is located; identification and characterization of the source waterbody's hydrological and geomorphological features, as well as the methods used to conduct any physical studies to determine the intake's area of influence and the results of such studies; and locational maps.
- Cooling Water Intake Structure Data: A narrative description of the configuration of each of its facility's cooling water intake structures and where it is located in the waterbody and in the water column; latitude and longitude in degrees, minutes, and seconds for each of its cooling water intake structures; a narrative description of the operation of each of its cooling water intake structures, including design intake flows, daily hours of operation, number of days of the year in operation, and seasonal changes, if applicable; a flow distribution and water balance diagram that includes all sources of water to the facility, recirculating flows, and discharges; and engineering drawings of the cooling water intake structure.
- Cooling Water System Data: A narrative description of the operation of each cooling water system, its relationship to the cooling water intake structures, proportion of the design intake flow that is used in the system, the number of days of the year the system is in operation, and seasonal changes in the operation of the system, if applicable; and engineering calculations and supporting data to support the narrative description.

In addition to the specified data facilities are require to submit, some facilities are also required to conduct a Comprehensive Demonstration Study. Specific requirements for the Comprehensive Demonstration Study vary based on the compliance alternative selected. Exhibit II summarizes the Comprehensive Demonstration Study requirements for each compliance alternative. Specific details of each Comprehensive Demonstration Study component are provided in section IX of this preamble.

EXHIBIT V–2.—SUMMARY OF COMPREHENSIVE DEMONSTRATION STUDY REQUIREMENTS FOR COMPLIANCE ALTERNATIVES

Compliance alternative (§ 125.94(b))	Comprehensive demonstration study requirements (§ 125.95(b))
1—Demonstrate facility has reduced flow commensurate with closed-cycle recirculating system.	None.
1—Demonstrate facility has reduced design intake velocity to ≤ 0.5 ft/s	No requirements relative to impingement mortality reduction. If subject to entrainment performance standard, the facility must only address entrainment in the applicable components of its Comprehensive Demonstration Study, based on the compliance option selected for entrainment reduction.
2—Demonstrate that existing design and construction technologies, operational measures, and/or restoration measures meet the performance standards.	Proposal for Information Collection. Source Waterbody Flow Information. Impingement Mortality and/or Entrainment Characterization Study (as appropriate). Technology and Compliance Assessment Information —Design and Construction Technology Plan —Technology Installation and Operation Plan Restoration Plan (if appropriate). Verification Monitoring Plan.
3—Demonstrate that facility has selected design and construction technologies, operational measures, and/or restoration measures that will, in combination with any existing design and construction technologies, operational measures, and/or restoration measures, meet the performance standards.	Proposal for Information Collection. Source Waterbody Flow Information. Impingement Mortality and/or Entrainment Characterization Study (as appropriate). Technology and Compliance Assessment Information —Design and Construction Technology Plan —Technology Installation and Operation Plan Restoration Plan (if appropriate). Verification Monitoring Plan.
4—Demonstrate that facility has installed and properly operates and maintains an approved technology.	Technology Installation and Operation Plan. Verification Monitoring Plan.

EXHIBIT V–2.—SUMMARY OF COMPREHENSIVE DEMONSTRATION STUDY REQUIREMENTS FOR COMPLIANCE ALTERNATIVES—Continued

Compliance alternative (§ 125.94(b))	Comprehensive demonstration study requirements (§ 125.95(b))
5—Demonstrate that a site-specific determination of BTA is appropriate	Proposal for Information Collection. Source Waterbody Flow Information. Impingement Mortality and/or Entrainment Characterization Study (as appropriate). Technology Installation and Operation Plan. Restoration Plan (if appropriate). Information to Support Site Specific Determination of BTA including: —Comprehensive Cost Evaluation Study (cost-cost test and cost-benefit test); —Valuation of Monetized Benefits of Reducing IM&E (cost-benefit test only); —Site-Specific Technology Plan (cost-cost test and cost-benefit test); Verification Monitoring Plan.

The requirements in today's final rule are implemented through NPDES permits issued under section 402 of the CWA. Permit applications submitted after the effective date of the rule must fulfill rule requirements. However, facilities whose existing permit expires before [insert four years after date of publication in the FR], may request a schedule for submission of application materials that is as expeditious as practicable but does not exceed [insert three years and 180 days after date of publication in the FR], to provide sufficient time to perform the required information collection requirements. Phase II existing facilities must comply with this final rule when they become subject to an NPDES permit containing these requirements.

Finally, today's rule preserves each State's right to adopt or enforce more stringent requirements (see § 125.90(d)). It also provides that if a State demonstrates to the Administrator that it has adopted alternative regulatory requirements in its NPDES program that will result in environmental performance within a watershed that is comparable to the reductions of impingement mortality and entrainment that would otherwise be achieved under § 125.94, the Administrator must approve such alternative regulatory requirements (§ 125.90(c)).

VI. Summary of Most Significant Revisions to the Proposed Rule

A. Data Updates

Based on comments received, additional information made available, and the results of subsequent analyses, EPA revised a number of assumptions that were used in developing the engineering costs, the information collection costs, the economic analyses, and the benefits analyses. These new assumptions are presented below and were used in the analyses in support of this final rule.

1. Number of Phase II Facilities

Since publishing the NODA, EPA continued to verify design flow information for facilities that had been classified as either Phase II (large, existing power production) or Phase III (smaller, power producing or manufacturing) facilities. This verification resulted in the following changes: One facility that was classified as a Phase II facility at proposal was reclassified as being out of scope of the section 316(b) regulation, as it ceased operating. Four facilities that were classified as Phase III facilities at proposal based on projected design intake flow were reclassified as Phase II facilities. As a result, the overall number of Phase II facilities increased from 540 to 543 facilities.[42] For the final rule, all costs, benefits, and economic analyses are based on the updated set of Phase II facilities.

The reason for the change is that the Agency revised the estimated design intake flows for facilities that responded to the short-technical questionnaire EPA used to collect information for this rule. The Agency has now adopted a more robust set of annual flow data (using all the years of data collected for the final rule, rather than only flows for 1998 as reported at proposal). This change altered the calculated design intake flows for the facilities that provided responses to the short-technical questionnaire that EPA used to collect data. Facilities that provided responses to the detailed questionnaire were unaffected, as the Agency collected maximum design intake flows directly through the detailed questionnaire.

2. Technology Costs

Since publishing the NODA, EPA used new information to revise the capital and operation and maintenance (O&M) costs for several compliance technologies, including those used as the primary basis for the final rule. Overall, the cost updates resulted in the following changes: total capital costs decreased by 5 percent and total operation and maintenance costs decrease by 3 percent. These comparisons are based on the raw costs, adjusted to year-2002 dollars, which have not been discounted or annualized.[43] The revised costing assumptions are discussed in detail in section VI.3.

3. Permitting and Monitoring Costs

Since proposal, EPA made several corrections and revisions to its burden and cost estimates for implementing the information collection requirements of today's rule, based on comments received and additional analysis. The following corrections and revisions were made since proposal:

• EPA corrected the hourly rates for the statistician and biological technician labor categories, which were inadvertently transposed at proposal.

• EPA increased the burdens associated with impingement and entrainment monitoring for the Impingement Mortality and Entrainment Characterization Study.

[42] Note that these numbers are unweighted. [As with many surveys, EPA was able to obtain data from most, but not all of the facilities potentially subject to this rule. To estimate the characteristics for those facilities that were not surveyed, EPA assigned a statistically derived sample weight to those facilities for which data were collected.] On a sample-weighted basis, the number of Phase II facilities increased from 551 to 554. The number of Phase II facilities modeled by the Integrated Planning Model (IPM) increased from 531 to 535.

[43] Based on additional research conducted after NODA publication and prior to issuance of the final rule, EPA changed the projected compliance response for some facilities. These changes, together with the increase in the number of in-scope Phase II facilities, contributed to the change in total compliance costs.

• EPA revised the pilot study costs to assume that only a subset of facilities which are projected to install new technologies will perform pilot studies, and to be proportional to the projected capital costs for installing these new technologies in order to comply with the rule. EPA also developed an alternative national cost estimate using slightly different assumptions with regard to pilot study costs (see section XI).

• EPA adjusted the facility-level costs to account for facilities that were projected to demonstrate compliance through the installation of a wedge-wire screen in a freshwater river under the compliance alternative in 125.94(a)(4).

4. Net Installation Downtime for Non-recirculating Cooling Tower Compliance Technologies

In developing the proposal for this rule, the Agency estimated that technologies other than recirculating cooling towers would not require installation downtime for construction. However, the Agency amended this outlook for the NODA and published revised estimates of net construction downtimes for complying facilities installing a subset of technologies analyzed and developed as candidates for best technology available (BTA). Based on comments received on the NODA, the Agency has conducted further research into the construction downtimes that it used in the NODA for certain technologies. For the final regulation analysis, the Agency has adopted minor revisions to the construction downtimes for certain technologies, with the general effect being an increase in the net construction downtimes for a few technologies that the Agency views as candidates for reducing entrainment. (Net downtime was estimated by subtracting 4 weeks from total downtime, based on an assumption that facilities will schedule construction downtime during a 4 week period of normal downtime unrelated to the rule, for example, for routine maintenance.) As such, the Agency projects that a significant number of facilities expected to comply with the entrainment reduction requirements of the rule will have increased downtime costs compared to the NODA and the proposal analyses. The final costs of this rule reflect these changes, which are further discussed in Section X and the Technical Development Document.

B. Regulatory Approach, Calculation Baseline, and Measuring Compliance

1. Regulatory Approach

EPA has largely adopted the proposed rule with some restructuring and one significant change: an additional compliance alternative, the approved technology option (§ 125.94(a)(4)) which was discussed in detail in the NODA (68 FR 13539). The restructuring of the rule language now makes the reduction of flow commensurate with a closed-cycle recirculating system a separate compliance alternative, such that the rule now includes five compliance alternatives. In addition, EPA has clarified that facilities may comply with the rule requirement in section 125.94 by successfully implementing the construction, operational, maintenance, monitoring, and adaptive management requirements in a Technology Installation and Operation Plan developed in accordance with § 125.95(b)(4)(ii) and/or a Restoration Plan developed in accordance with § 125.95(b)(5). These plans must be designed and adaptively managed to meet the applicable performance standards in § 125.94(b) and (c). The following discussion describes the regulatory approach of the final rule, as developed through the proposed rule and the NODA.

EPA proposed requirements for the location, design, construction, and capacity of cooling water intakes based on the waterbody type and the volume of water withdrawn by a facility (67 FR 17122). EPA grouped waterbodies into five categories, as in the Phase I regulation—freshwater rivers and streams, lakes and reservoirs, Great Lakes, estuaries and tidal rivers, and oceans. In general, the more sensitive or biologically productive the waterbody, the more stringent were the requirements proposed. The proposed requirements also varied based on the percentage of the source waterbody withdrawn and the capacity utilization rate.

Under the proposed rule, a facility could choose one of three compliance options: (1) Demonstrate that the facility currently meets the specified performance standards, (2) select and implement design and construction technologies, operational measures, or restoration measures that will, in combination with any existing design and construction technologies, operational measures, or restoration measures, meet the specified performance standards, and/or (3) demonstrate that the facility qualifies for a site-specific determination of best technology available, because its costs of compliance are significantly greater than those considered by EPA during the development of the proposed rule or the facility's costs of compliance would be significantly greater than the benefits of compliance with the proposed performance standards at the facility. A facility could also use restoration measures in addition to or in lieu of design and construction technologies and/or operational measures to achieve compliance under any of the compliance options.

In the NODA, EPA sought comment on a proposed fourth compliance option (68 FR 13522, 1359–41). In response to comments expressing concern that the proposed Comprehensive Demonstration Study requirements (at § 125.95(b)) would impose a significant burden on permit applicants, EPA examined an additional, more streamlined compliance option under which a facility could implement certain specified technologies that have been predetermined by EPA or the permitting authority to be highly likely to meet applicable performance standards, in exchange for not having to perform most of the elements of the proposed Comprehensive Demonstration Study.

Two variations were offered in the NODA: (1) EPA would evaluate the effectiveness of specific technologies in achieving an 80 to 95 percent reduction in impingement mortality and a 60 to 90 percent reduction in entrainment and then specify applicability criteria to ensure that the technology would meet the performance standards at facilities satisfying the criteria, or (2) EPA would establish the criteria and a process for States to pre-approve intake structure control technologies as likely to meet the performance standards. For facilities located on freshwater rivers and streams and meeting specified criteria, wedgewire screens would be expected to meet the proposed performance standards. EPA also recognized that these two variations are not mutually exclusive and either or both could be adopted in the final rule.

To a large extent, EPA is adopting the regulatory framework put forth in the proposed rule and supplemented by the NODA. To the three compliance alternatives originally proposed, EPA has added an approved technology alternative discussed in the NODA and included reduction of flow commensurate with closed-cycle cooling as a distinct alternative.

2. Calculation Baseline

Also, in response to comments that the proposed definition for the calculation baseline was overly vague, EPA published in the NODA a series of additional considerations regarding the calculation baseline and a new definition of it taking these considerations into account (68 FR 13522, 13580–81). The specifications are as follows and the new definition is in today's final rule at § 125.93.

• Baseline cooling water intake structure is located at, and the screen face is parallel to, the shoreline or another depth if this would result in higher baseline impingement mortality and entrainment than the surface. EPA believes it is appropriate to allow credit in reducing impingement mortality from screen configurations that employ angling of the screen face and currents to guide organisms away from the structure before they are impinged.

• Baseline cooling water intake structure opening is located at or near the surface of the source waterbody. EPA believes it is appropriate to allow credit in reducing impingement mortality or entrainment due to placement of the opening in the water column.

• Baseline cooling water intake structure has a traveling screen with the standard 3/8 inch mesh size commonly used to keep condensers free from debris. This allows a more consistent estimation of the organisms that are considered ''entrainable'' vs. ''impingeable'' by specifying a standard mesh size that can be related to the size of the organism that may potentially come in contact with the cooling water intake structure.

• Baseline practices, procedures, and structural configurations are those that the facility would maintain in the absence of any structural or operational controls implemented in whole or in part for the purpose of reducing impingement mortality and entrainment. This recognizes and provides credit for any structural or operational controls, including flow or velocity reductions, a facility had adopted that reduce impingement mortality or entrainment.

EPA also requested comment on allowing an ''as built'' approach under which facilities could choose to use the existing level of impingement mortality and entrainment as the calculation baseline if they did not wish to take credit for the previously adopted measures. This could significantly simplify the monitoring and calculations necessary to determine the baseline.

In the NODA, EPA also discussed an approach to compliance under which facilities would have an ''optimization period'' during which they would not be required to meet performance standards but, rather, would install, operate and maintain the selected control technologies to minimize impingement mortality and entrainment. EPA suggested several possible durations for this optimization period, and also requested comment on not specifying the duration, but instead leaving it up to the Director. 68 FR 13586 (March 19, 2003).

For the final rule, EPA adopted the NODA definition of calculation baseline with some modifications. More specifically, EPA clarified the calculation baseline to include consideration of intake depth other than at or near the surface in determining the baseline. EPA also adopted the ''as built'' approach for the calculation baseline, which allows facilities to use current levels of impingement mortality and entrainment as the calculation baseline if the facility is configured similarly to the criteria set up for the calculation baseline.

Finally, EPA clarified how compliance with the requirements in § 125.94 should be determined. In particular, the final rule provides that compliance during the first permit term (and subsequent permit terms if specified conditions are met) may be determined based on compliance with the construction, operational, maintenance, monitoring, and adaptive management requirements in an approved Technology Installation and Operation Plan and/ or an approved Restoration Plan, that has been developed in accordance with specified requirements to meet the applicable performance standards.

3. Measuring Compliance

EPA has clarified how compliance will be measured. At proposal, EPA received comment from the industry that there were uncertainties associated with how compliance with the proposed requirements, particularly the numeric impingement mortality and entrainment performance standards, would be determined. Under the proposed rule and NODA, determining compliance, while obviously dependent on the compliance alternative selected, would, in general, require the development of waterbody characterization data, including key criteria (species, parameters, etc.) to be measured and monitored; a determination of baseline environmental impacts; implementation of cooling water intake technologies (assuming the facility does not already meet applicable performance standards and pursues this alternative); monitoring the selected criteria; and an evaluation of compliance with the applicable numeric impingement mortality and/or entrainment permit standard. The industry stakeholders were concerned that using the performance standard to set enforceable performance requirements would require facilities to collect and analyze greater amounts of data than EPA projected to be able to account for the variability inherent in biological and efficacy data needed to support compliance determinations in spite of overall good technology performance. These stakeholders stated that setting enforceable performance standards would lead to greater administrative burdens and delays when determining numeric standards and monitoring requirements to determine compliance. They were also concerned that establishing numeric standards would stifle innovation because of fears that a technology would not perform as anticipated. These stakeholders suggested that the performance standards in the rule serve as a consistent basis for setting permit conditions and for identifying technologies; installing, operating, and maintaining the chosen technology; performing compliance monitoring; and refining or adjusting operation, maintenance, or other factors in light of initial monitoring.

Today's rule allows facilities to develop and implement a Technology Installation and Operation Plan that would, when used, serve as the primary mechanism upon which compliance with the performance standard requirements of this rule is determined. EPA has established this compliance mechanism because it will ensure that Phase II existing facilities will continually be required to achieve a level of performance that constitutes, for them, best technology available for minimizing adverse environmental impact. For facilities that choose to comply with applicable requirements in whole or in part through the use of restoration measures, the Restoration Plan would serve a similar function. The Restoration Plan is discussed in detail in section IX.

An existing facility that chooses to use a Technology Installation and Operation Plan must (1) select design and construction technologies, operational measures, and/or restoration measures that will meet the performance standards, and (2) prepare a Technology Installation and Operation Plan documenting what, how and when it will install, operate, maintain, monitor, assess, and adaptively manage the design and construction technologies and operational measures to meet the performance standards, including operational parameters and inspection schedules, etc. Each facility using a Technology Installation Operation Plan must specify key parameters regarding monitoring (*e.g.*, parameters to be monitored, location, and frequency), optimization activities and schedules for undertaking them, ways of assessing efficacy (including adaptive management plan for revising design and construction technologies or operational measures) that ensure that such technologies and measures are effectively implemented, and revised as needed to meet performance standards. This plan must be reviewed and approved by the Director and evaluated for sufficiency and/or revised at each permit term to ensure that the facility is moving expeditiously toward attainment of the applicable performance standards. Once approved, each Phase II existing facility must implement the plan according to its terms. Compliance with the final rule's performance standards during the permit term will be assessed based on the terms of the plan. If a facility does not comply with the plan, the Director has discretion to implement the performance standards or requirements through specifying numeric impingement mortality and entrainment requirements or technology prescription (for the site-specific alternative) in the permit. In addition, a facility that is unable to meet the applicable performance standards using the Technology Installation and Operation Plan approach may request in a subsequent permit that the Director make a site-specific determination of best technology available in accordance with § 125.94(a)(5).

Under these provisions, compliance is determined in terms of whether the facility is implementing, in accordance with the Technology Installation and Operation Plan schedule, the technologies, measures and practices determined by the Director to be the best technologies available for minimizing adverse environmental impact for that facility. The Section 316(b) requirements for the facility are expressed non-numerically, which is analogous to the use of best management practices under other provisions of the CWA. See, *e.g.*, sections 402(a) and 402(p). While EPA has been able to calculate ranges for national performance standards based on model technologies, EPA has insufficient data to determine—as it routinely can do in the context of effluent limitations guidelines and standards—that use of those model technologies will consistently result in achievement of those standards.

The record persuades EPA that there is uncertainty associated with the application and long-term efficacy of these technologies at all facilities under the multitude of different site-specific factors and conditions under which these technologies might have to perform. In addition, even at a single site, there is substantial year-to-year variability in species abundance and composition, as well as other natural and anthropogenic factors, that may affect the performance of a particular technology installed at the facility and it is unclear how this would affect the efficacy of the technology. The Technology Installation and Operation Plan provisions are intended to account for this. For example, meeting numerical reduction standards may not be possible at some sites either because hydrological conditions are not conducive to technological effectiveness, or due to species sensitivity. A Technology Installation and Operation Plan allows a facility, working with the Director, to identify, install, and adaptively manage technologies suited to its particular site conditions. In addition, measuring impingement mortality and entrainment reduction is difficult and would require a substantial amount of multi-year biological data and analysis is burdensome for the facility to develop, is often well beyond the type of information EPA can expect State Directors to be able to develop when monitoring compliance. A Technology Installation and Operation Plan simplifies enforcement: if a facility fails to meet the schedules and other terms of its plan, it is violating its section 316(b) requirements; there is no need to engage in extensive debate about the meaning of complex biological data. This does not mean that biological monitoring and assessment of success in meeting applicable performance standards is not important. If fact, it is critical to the compliance approach adopted in the rule in that it informs facilities and permit authorities when adaptive management, including revisions to the Technology Installation and Operation Plan, are needed to meet the performance standards.

The Technology Installation and Operation Plan provisions also reflect that there is uncertainty about how long it would take a facility to adaptively manage the technology and determine the appropriate operating conditions for the technology to meet the applicable performance requirements. Data and comments available to EPA suggest that it is common for existing facilities to adjust technologies over time in order to achieve optimum performance and, therefore, an adaptive management approach as specified under a plan is appropriate. See documentation at DCN# 1–3019–BE, 4–1830, and 6–5001. EPA understands that adaptive management is going to be necessary for a number of facilities because there are relatively few rigorous evaluations of efficacy under different site and operating conditions. The available studies may also be limited in the numbers and types of species that they have evaluated and they may not show the long term demonstrated effectiveness (and/or consistency of effectiveness) of the technology with the added uncertainties associated with the variability of natural biological systems. By requiring facilities to employ adaptive management principles, EPA assures that the facility will be implementing, on an ongoing basis, the best array of technologies available to them.

As noted above, the Technology Installation and Operation Plan provisions also simplify implementation because they identify the specific compliance requirements needed to meet the performance standard ranges and reduce some of the burden associated with measuring and enforcing compliance with these ranges for both existing facilities and Directors. Directors and facilities may find use of a Technology Installation and Operation Plan preferable because it is less feasible to develop and accurately evaluate biological monitoring data over a relatively short period, as would be required by measuring compliance against a numeric performance standard. Rather, the plan provisions allow implementation to be adaptive, and allow for data development and assessment to proceed in a manner that is appropriate for the facility, technology, and waterbody characteristics.

EPA has the legal authority to express section 316(b) requirements in terms of design criteria, in addition to or in place of enforceable numeric performance standards. EPA employed a design criterion approach in the Phase I rule, when EPA was able to identify a single nationally available and economically practicable technology for the category of new facilities as a whole, in that case closed-cycle recirculating cooling technology. In this rule, EPA was not able to identify a uniform set of technologies that would be available and economically practicable for all existing facilities, but EPA was able to articulate a uniform nationally applicable principle in the form of the performance standards in § 125.94(b), by which such technologies could be identified by the Director and implemented through the use of a Technology Installation and Operation Plan designed to achieve them. While the technology solution was different in Phase I and Phase II, the legal principle is the same. In addition, EPA has the legal authority to identify section 316(b) requirements as an evolving set of technologies, rather than a single technology array fixed in time. Section 316(b) requires that any technology selected under that section must be the best available to the facility. This term encompasses consideration of effectiveness, costs, non-water quality environmental impacts, feasibility issues and a host of other considerations relevant to existing facilities. See section 304(b)(2)(B). The record indicates that for some facilities, the question of what are *available* technologies and, among those, what is the *best* technology, may change over time. A Technology Installation and Operation Plan is intended to assure that at all times a facility is implementing a technology—or a technology plan—that reflects the best of all technologies consistent with uniform guiding principles in the form of performance standards available to them in light of their site-specific circumstances.

Finally, EPA notes that the way in which performance standards guide technology selection and implementation varies slightly among the five compliance options. For facilities complying with § 125.94(a)(1), the technologies identified are so effective that EPA is confident that any facility employing them will meet the performance standards, so a Technology Installation and Operation Plan and performance monitoring are not required. Because these technologies are not available to all Phase II existing facilities, however, EPA has provided alternative compliance options. For facilities complying in accordance with § 125.94(a)(2), (3), or (4), compliance is generally achieved by implementation of a Technology Installation and Operation Plan designed to meet applicable performance standards. Finally, for facilities that comply in accordance with § 125.94(a)(5) for whom even compliance in accordance with § 125.94(a)(2), (3), or (4) is not available because of significantly higher costs, compliance is achieved by implementation of a Technology Installation and Operation Plan that achieves an efficacy as close as practicable to the applicable performance standards.

4. Site-Specific Requirements

a. Costs Significantly Greater Than Costs Considered by the Administrator

In today's final rule, a facility that demonstrates to the Director that the costs of compliance with the performance standards and/or restoration requirements would be significantly greater than the costs considered by the Administrator for a similar facility, will be given a site-specific determination of best technology available for minimizing adverse environmental impact. The standards of the rule have not changed since proposal, with the exception of one clarification: in the final rule, the alternative site-specific requirements established by the Director must achieve an efficacy that is as close as practicable to the performance standards and/or restoration requirements specified in § 125.94(b) and (c). This was not specified in the proposed rule language. In addition, today's final rule also explains how a facility should calculate costs considered by the Administrator for a similar facility, for comparison with the costs of compliance for the facility. EPA details these steps in § 125.94(a)(5)(i)(A)–(F).

In the proposed rule, submittal requirements for facilities requesting a variance based upon a cost-cost test were identical to those for facilities requesting a variance based on a cost-benefit test. Thus, a facility requesting a site-specific determination based on a cost-cost comparison had to submit three studies: the Cost Evaluation Study, the Valuation of Monetized Benefits of Reducing Impingement and Entrainment, and the Site-Specific Technology Plan. In the final rule, by contrast, a facility must submit only the Cost Evaluation Study and the Site-Specific Technology Plan.

Under the Comprehensive Cost Evaluation Study detailed at proposal, a facility must submit detailed engineering cost estimates to document the costs of implementing the technologies and/or operational measures in the facility's Design and Construction Plan. In the final rule, the facility must provide, in addition to the engineering cost estimates, a demonstration that the costs significantly exceed the benefits of complying with the applicable performance standards. EPA did not make significant changes to the requirements under the Site-Specific Technology Plan.

In summary, the major changes in the cost-cost analysis are as follows:

- In the final rule, EPA has specified how a facility must ''calculate costs considered by the Administrator'' for comparison with the facility's estimate of the costs of compliance with the final rule,
- Elimination of the requirement to submit a Valuation of Monetized Benefits of Reducing Impingement and Entrainment, and
- Addition of the requirement to demonstrate that the costs significantly exceed the costs considered by the Administrator for a similar facility, under the Cost Evaluation Study.

b. Costs Significantly Greater Than Benefits

In today's final rule, a facility that demonstrates to the Director that the costs of compliance with the performance standards and/or restoration requirements would be significantly greater than the benefits will be given a site-specific determination of best technology available for minimizing adverse environmental impact. The standards of the rule have not changed since proposal, with the exception of one clarification: in the final rule, the alternative site-specific requirements established by the Director must achieve an efficacy that is as close as practicable to the performance standards and/or restoration requirements specified in § 125.94(b) and (c). This was not specified in the proposed rule language.

In the final rule, as in the proposal, a facility requesting a site-specific determination based on a cost-benefit comparison must submit three studies: the Cost Evaluation Study, the Benefits Valuation Study (referred to in proposal as Valuation of Monetized Benefits of Reducing Impingement and Entrainment), and the Site-Specific Technology Plan. The final rule has both added and clarified requirements for the first two components relative to the proposal, but has provided no substantive changes in the requirements for the Site-Specific Technology Plan.

Under the Comprehensive Cost Evaluation Study detailed at proposal, a facility must submit detailed engineering cost estimates to document the costs of implementing the technologies and/or operational measures in the facility's Design and Construction Plan. In the final rule, the facility must provide, in addition to the engineering cost estimates, a demonstration that the costs significantly exceed the benefits of complying with the applicable performance standards.

Additional clarifications are found in the Benefits Valuation Study. In the proposed rule, a facility was required to submit (1) a description of the methodology used to estimate the benefits' value, (2) the basis for assumptions and quantitative estimates, and (3) an uncertainty analysis. In the final rule, EPA has retained the three submittal requirements. Under the first component, EPA has specified the categories of potential valuation estimates in the final rule, namely commercial, recreational and ecological benefits. EPA has added that a facility should include non-use benefits if applicable. To the second component, EPA has added that the basis may include a determination of entrainment survival if the Director approved such a study. Requirements for the uncertainty analysis remain unchanged from proposal. In the final rule, EPA has added that a facility will be required to submit peer review of the items submitted (upon the Director's request) and a narrative description of non-monetized benefits that would result at the site if the facility was to meet applicable performance standards.

In summary, the major changes in the cost-benefit analysis are as follows:

- Facilities will be required to achieve an efficacy that is "as close as practicable" to performance standards and/ or restoration requirements,
- Facilities will need to specifically demonstrate that costs are significantly greater than the benefits of compliance, and
- Facilities will have additional requirements under the Benefits Valuation Study.

VII. Basis for the Final Regulation

A. Why Is EPA Establishing a Multiple Compliance Alternative Approach for Determining Best Technology Available for Minimizing Adverse Environmental Impact?

Today's final rule authorizes a Phase II existing facility to choose one of five alternatives for establishing the best technology available for minimizing adverse environmental impacts at the facility. A facility may (1) demonstrate that it has reduced or will reduce its cooling water intake flow commensurate with a closed-cycle, recirculating system, and or that it has reduced, or will reduce, the maximum through-screen design intake velocity to 0.5 ft/ s or less; (2) demonstrate that its existing design and construction technologies, operational measures, and/or restoration measures meet the applicable performance standards and restoration requirements; (3) demonstrate that it has selected design and construction technologies, operational measures, and/or restoration measures that will, in combination with any existing design and construction technologies, operational measures, and/or restoration measures, meet the applicable performance standards and restoration requirements; (4) demonstrate that it will install or has installed and properly operates and maintains an approved design and construction technology; or (5) demonstrate that it has selected, installed, and is properly operating and maintaining, or will install and properly operate and maintain, design and construction technologies, operational measures, and/or restoration measures that the Director has determined to be the best technology available for the facility based on application of a specified cost-to-cost test or a cost-to-benefit test. The basis for each of the five compliance alternatives is explained in section VII.C. of this preamble.

The rule establishes performance standards for the reduction of impingement mortality and entrainment. EPA established these performance standards in part based on a variety of technologies, but the rule does not mandate the use of any specific technology. These performance standards vary by waterbody type (*i.e.*, freshwater river/stream, estuary/tidal river, ocean, Great Lake, or lake/ reservoir) and the capacity utilization rate of the facility. They may be met in whole or in part using restoration measures after demonstrating, among other things, that the facility has evaluated the use of design and construction technologies and operational measures at the site. The basis for the performance standards is explained in section VII.B. of this preamble and the basis for the restoration requirements is explained at section VII.F. of this preamble. For a more detailed description of the rule, see sections V and IX of this preamble. These requirements reflect the best technology available for minimizing adverse environmental impact from cooling water intake structures.

EPA adopted this regulatory scheme because it provides a high degree of flexibility for existing facilities to select the most effective and efficient approach and technologies for minimizing adverse environmental impact associated with their cooling water intake structures. This approach also reflects EPA's judgment that, given the wide range of various factors that affect the environmental impact posed by Phase II existing facilities, different technologies or different combinations of technologies can be used and optimized to achieve the performance standards.

B. Why and How Did EPA Establish the Performance Standards at These Levels?

1. Overview of Performance Standards

The final rule establishes two types of performance standards, one that addresses impingement mortality and one that addresses entrainment. EPA used impingement mortality and entrainment as a metric for performance because these are primary and distinct types of harmful impacts associated with the use of cooling water intake structures (*see also* section IV). Both the impingement mortality and the entrainment performance standards apply to facilities demonstrating compliance under alternatives two, three, and four, described above (§ 125.94(a)(2), (3), and (4)). In addition, the Director's site-specific alternative requirements must be as close as practicable to the applicable performance standards under § 125.94. Performance standards for entrainment do not apply to facilities with low utilization capacity, those with a design intake flow of five percent or less of the mean annual flow of a freshwater river or stream, and those that withdraw cooling water from a lake (other than one of the Great Lakes) or reservoir because such facilities have a low propensity for causing significant entrainment impacts due to limited facility operation, low intake flow, or general waterbody characteristics. The impingement mortality performance standard requires a Phase II existing facility that complies under § 125.94(a)(2), (3), and (4) to reduce impingement mortality of all life stages of fish and shellfish by 80 to 95 percent from the calculation baseline.

Both an entrainment performance standard and an impingement mortality standard apply to facilities with a capacity utilization rate of 15 percent or greater and that withdraw cooling water from a tidal river, estuary, ocean, one of the Great Lakes, as well as facilities that use cooling water from a freshwater river or stream and the design intake flow of the cooling water intake structure is greater than five percent of the mean annual flow because EPA believes that these facilities cause more significant entrainment impacts. The entrainment standard, where applicable, requires a Phase II facility to reduce entrainment of all life stages of fish and shellfish by 60 to 90 percent from the calculation baseline.

2. Basis for Performance Standards

Overall, the performance standards that reflect best technology available under today's final rule are not based on a single technology but, rather, are based on consideration of a range of technologies that EPA has determined to be commercially available for the industries affected as a whole and have acceptable non-water quality environmental impacts, except for some potential regional energy (reliability) impacts that will be minimized to the extent possible through flexible compliance options. Because the requirements implementing section 316(b) are applied in a variety of settings and to Phase II existing facilities of different types and sizes, no single technology is most effective at all existing facilities, and a range of available technologies has been used to derive the performance standards.

EPA developed the performance standards for impingement mortality reduction based on an analysis of the efficacy of the following technologies: (1) Design and construction technologies such as fine and wide-mesh wedgewire screens, as well as aquatic filter barrier systems, that can reduce mortality from impingement by up to 99 percent or greater compared with conventional once-through systems; (2) barrier nets that may achieve reductions of 80 to 90 percent; and (3) modified screens and fish return systems, fish diversion systems, and fine mesh traveling screens and fish return systems that have achieved reductions in impingement mortality ranging from 60 to 90 percent as compared to conventional once-through systems.

Available performance data for entrainment reduction are not as comprehensive as impingement data. However, aquatic filter barrier systems, fine mesh wedgewire screens, and fine mesh traveling screens with fish return systems have been shown to achieve 80 to 90 percent or greater reduction in entrainment compared with conventional once-through systems. EPA notes that screening to prevent organism entrainment may cause impingement of those organisms instead.

3. Discussion of Key Aspects of Performance Standards

The performance standards at § 125.94(b)(1),(2), and (3) are based on the type of waterbody in which the intake structure is located, the volume of water withdrawn by a facility, and the facility capacity utilization rate. Under the final rule, EPA has grouped waterbodies into five categories: (1) Freshwater rivers or streams, (2) lakes or reservoirs, (3) Great Lakes, (4) tidal rivers and estuaries, and (5) oceans. The Agency considers location, one aspect of which is waterbody type, to be an important factor in addressing adverse environmental impact caused by cooling water intake structures. Because different waterbody types have the potential for different adverse environmental impacts, the requirements to minimize adverse environmental impact vary by waterbody type.

The reproductive strategies of tidal river and estuarine species, together with other physical and biological characteristics of those waters, make them more susceptible than other waterbodies to impacts from cooling water intake structures (66 FR 288857–288859; 68 FR 17140). In contrast, many aquatic organisms found in non-tidal freshwater rivers and streams are less susceptible to entrainment due to their demersal (bottom-dwelling) nature and the fact that they do not typically have planktonic (free-floating) egg and larval stages (66 FR 28857; 68 FR 17140). Comments on the proposed Phase II existing facility rule also acknowledge that waterbody type is an important factor in assessing the impacts of cooling water intake structures, although some commenters preferred a site-specific approach, and others maintained that all waters deserve the most rigorous technology. A number of States supported EPA's proposed approach.

Absent entrainment control technologies, entrainment at a particular site is generally proportional to intake flow at that site. As discussed above, EPA believes it is reasonable to vary performance standards by the potential for adverse environmental impact in a waterbody type. EPA is limiting the requirement for entrainment controls in fresh waters to those facilities that withdraw the largest proportion of water from freshwater rivers or streams because they have the potential to impinge and entrain larger numbers of fish and shellfish and therefore have a greater potential to cause adverse environmental impact. EPA is not requiring entrainment reductions in freshwater rivers or streams where facilities withdraw 5 percent or less of the source water annual mean flow because such facilities generally have a low propensity for causing significant entrainment impacts due to the low proportion of intake flow in combination with the characteristics of the waterbody.

There are additional performance standards for facilities withdrawing from a lake (other than one of the Great Lakes) or a reservoir. If such a facility proposes to increase the design intake flow of the cooling water intake structure, the increase in total design intake flow must not disrupt the natural thermal stratification or turnover pattern of the source water except in cases where the disruption does not adversely affect the management of fisheries § 125.94(b)(3)(iii)). The natural thermal stratification or turnover pattern of a lake is a key characteristic that is potentially affected by the intake flow (which can alter temperature and/or mixing of cold and warm water layers) and location of cooling water intake structures within such waterbodies. Cooling water intake structures withdrawing from the Great Lakes are required to reduce fish and shellfish impingement mortality by 80 to 95 percent and to reduce entrainment by 60 to 90 percent. As described in the Phase I proposed rule (65 FR 49086) and NODA (66 FR 28858), EPA believes that the Great Lakes are a unique system that should be protected to a greater extent than other lakes and reservoirs. Similar to oceans, large lakes such as the Great Lakes can possess estuarine-like environments in the lower reaches of tributary streams. For example, within the U.S., a total of 1,370 distinct coastal wetlands fringe the Great Lakes and the channels that connect the lakes. (2–016A Herdendorf, C.E. Great Lakes estuaries. Estuaries, 13(4): 493–503. 1990, pg. 493). The Agency is therefore specifying entrainment controls as well as impingement mortality controls for the Great Lakes. EPA has not applied the entrainment performance standard to lakes other than the Great Lakes because, in general, these waterbodies contain aquatic organisms that tend to be less impacted by entrainment than organisms in estuaries or fresh water rivers or streams.

The performance standards for facilities with cooling water intake structures located in a tidal river or estuary and with a capacity utilization rate of 15 percent or greater are to reduce impingement mortality by 80 to 95 percent and entrainment by 60 to 90 percent for fish and shellfish. As discussed previously, EPA believes estuaries and tidal rivers are more susceptible than other waterbodies to adverse impacts from impingement and entrainment.

The performance standards for facilities with cooling water intake structures located in an ocean are to reduce impingement mortality by 80 to 95 percent and entrainment by 60 to 90 percent for fish and shellfish. EPA is establishing requirements for facilities withdrawing from oceans that are similar to those for tidal rivers and estuaries because the coastal zone of oceans (from which coastal cooling water intake structures withdraw water) are highly productive areas for fish and shellfish. (*See* the Phase I proposed rule (65 FR 45060) and documents in the record for the Phase I new facility rule (Docket # W–00–03) such as 2–013A through O, 2–019A–R11, 2–019A–R12, 2–019A–R33, 2–019A–R44, 2–020A, 3–0059). EPA is also concerned about the extent to which fishery stocks that rely upon tidal rivers, estuaries and oceans for habitat are overutilized and seeks to minimize the impact that cooling water intake structures may have on these species or forage species on which these fishery stocks may depend. Recent data demonstrate that approximately 78% of the fish stocks managed by the National Oceanic and Atmospheric Administration's National Marine Fishery Service (NMFS) are fully exploited, overfished, or collapsed (America's Living Oceans: Charting a Course for Sea Change, Pew Oceans Commission, June 4, 2003). (*See also* documents 2–019A–R11, 2–019A–R12, 2–019A–R33, 2–019A–R44, 2–020A, 2–024A through O, and 3–0059 through 3–0063 in the record of the Final New Facility Rule (66 FR 65256), Docket # W–00–03).

In accordance with the Phase II rule, facilities that operate with a capacity utilization rate of less than 15 percent are subject to the performance standard for impingement mortality only. EPA is not requiring, in today's rule, that these facilities control entrainment. EPA has several reasons for this. First, EPA has determined that entrainment control technology is not economically practicable in view of the reduced operating levels of these facilities. These facilities also tend to operate most often in mid-winter or late summer, which are times of peak energy demand but periods of generally low abundance of entrainable life stages of fish and shellfish. Finally, the total volume of water withdrawn by these facilities is significantly lower than for facilities operating at or near peak capacity, and as noted above, entrainment at a site is generally proportional to flow, absent entrainment controls. Consequently, EPA determined that it was neither necessary nor cost-effective for these facilities to reduce entrainment where the total volume of water withdrawn and the number of organisms that would be protected from entrainment is likely to be small. EPA is also allowing facilities with multiple, distinct cooling water intakes that are exclusively dedicated to different generating units to determine capacity utilization and applicable performance standards separately for each intake for the same reasons.

As in the Phase I rule, EPA is setting performance standards for minimizing adverse environmental impact based on a relatively easy to measure and certain metric—reduction of impingement mortality and entrainment. Although adverse environmental impact associated with cooling water intake structures can extend beyond impingement and entrainment, EPA has chosen this approach because impingement and entrainment are primary, harmful environmental effects that can be reduced through the use of specific technologies. In addition, where other impacts at the population, community, and ecosystem levels exist, these will also be reduced by reducing impingement and mortality. Using impingement mortality and entrainment as a metric provides certainty about performance standards and streamlines, and thus speeds, the issuance of permits.

EPA is expressing the performance standard in the form of ranges rather than a single performance benchmark because of the uncertainty inherent in predicting the efficacy of any one of these technologies, or a combination of these technologies, across the spectrum of facilities subject to today's rule. The lower end of the range is being established as the percent reduction that EPA, based on the available efficacy data, expects all facilities could eventually achieve if they were to implement and optimize available design and construction technologies and operational measures on which the performance standards are based. (*See* Chapter 4, ''Efficacy of Cooling Water Intake Structure Technologies,'' of the Phase II Existing Facility Technical Development Document, EPA–821–R–04–007, February 2004. Also, *see* EPA's 316(b) technology efficacy database, DCN 6–5000.) The lower end of the range also reflects, in part, higher mortality rates at sites where there may be more fragile species that may not have a high survival rate after coming in contact with fish protection technologies at the cooling water intake structure (*e.g.*, fine mesh screens). The higher end of the range is a percent reduction that available data show many facilities can and have achieved with the available technologies upon which the performance standards are based.

In specifying a range, EPA anticipates that facilities will select the most cost-effective technologies or operational measures to achieve the performance level (within the stated range) based on conditions found at their site, and that Directors will review the facility's application to ensure that appropriate alternatives were considered. Proper selection, operation, and maintenance of these technologies would serve to increase potential efficiencies of the technologies. EPA also expects that some facilities may be able to meet these performance requirements by selecting and implementing a suite (*i.e.*, more than one) of technologies and operational measures and/or, as discussed in this section, by undertaking restoration measures.

Several additional factors support EPA's expectation that the impingement mortality and entrainment reduction reflected in the performance standards can eventually be achieved by all facilities using the design and construction technologies and measures on which the standards were based. First, a significant portion of the available performance data reviewed is from the 1970s and 1980s (when section 316(b) was initially implemented) and does not reflect recent developments, innovations (*e.g.*, aquatic filter barrier systems, sound barriers), or experience using these technologies. These data, developed during early implementation of the CWA, do not fully reflect today's improved understanding of both how the various control technologies work and the various factors that reflect what constitutes and how to measure healthy aquatic conditions. Second, these conventional barrier and return system technologies have not been optimized on a widespread level to date, as would be encouraged by this rule. Available information indicates that facilities that use these cooling water intake structure technologies often achieve better results from the technologies through adjusting which technologies are applied and how they are used. Such optimization, which also benefits from the advances in understanding noted above, would be promoted under this rule as facilities work to achieve the performance standards. Third, EPA believes that some facilities could achieve further reductions (estimated at 15–30 percent) in impingement mortality and entrainment by providing for seasonal flow restrictions, variable speed pumps, systems conversions to closed-cycle, recirculating systems, and other operational measures and innovative flow reduction alternatives. Such operational measures could be used to supplement design and construction technologies where necessary to meet the performance standards. Facilities also could benefit from combining inexpensive technologies as a ''suite.'' For additional discussion, see chapter 4 in the Phase II Existing Facility Technical Development Document.

The calculation baseline used to determine compliance with performance standards is defined in § 125.93 as an estimate of impingement mortality and entrainment that would occur at a site assuming (1) the cooling water system had been designed as a once-through system; (2) the opening of the cooling water intake structure is located at, and the face of the standard 3⁄8-inch mesh traveling screen is oriented parallel to, the shoreline near the surface of the source waterbody; and (3) the baseline practices and procedures are those that the facility would maintain in the absence of any operational controls, including flow or velocity reductions, implemented in whole or in part for the purposes of reducing impingement mortality and entrainment. In addition, the facility may choose to use the current level of impingement mortality and entrainment as the calculation baseline. EPA's definition also clarifies the range of available information sources for the baseline. The calculation baseline may be estimated using: historical impingement mortality and entrainment data from the facility or from another facility with comparable design, operational, and environmental conditions; current biological data collected in the waterbody in the vicinity of the facility's cooling water intake structure; or current impingement mortality and entrainment data collected at the facility. Further, a facility may request that the calculation baseline be modified to be based on a location of the opening of the cooling water intake structure at a depth other than at or near the surface if it can demonstrate to the Director that the other depth would correspond to a higher baseline level of impingement mortality and/or entrainment. EPA decided to use this definition because it represents the most common default conditions the Agency could identify to give facilities credit for design and construction technologies, operational measures, and/or restoration measures that they have already implemented to minimize adverse environmental impact, while providing a clear and relatively simple definition. Based on comments received on the Phase II NODA, this calculation baseline definition includes additional criteria that EPA has added to provide clarity to the analysis. (Proposed changes to the calculation baseline were discussed in the Phase II NODA, see 68 FR 13580). In many cases, existing technologies at the site show some reduction in impingement and entrainment when compared to this baseline. In such cases, impingement mortality and entrainment reductions (relative to the calculated baseline) achieved by these existing technologies should be counted toward compliance with the performance standards. In addition, operational measures such as operation of traveling screens, employment of more efficient return systems, and even locational choices should be credited for any corresponding reduction in impingement mortality and entrainment. See section IX of this preamble for a discussion of how the calculation baseline is used to compare facility performance with the rule's performance standards.

C. What Is the Basis for the Five Compliance Alternatives That EPA Selected for Establishing Best Technology Available?

1. Meeting Performance Standards Through Reducing Intake Flow Commensurate With a Closed Cycle Recirculating System or Reduced Design Intake Velocity

Under § 125.94(a)(1)(i), any facility that reduces its flow to a level commensurate with a closed-cycle, recirculating cooling system meets the performance standards in today's rule because such a reduction in flow is deemed to satisfy any applicable impingement mortality and entrainment performance standards for all waterbodies. Facilities that select this compliance alternative either through the use of closed-cycle recirculating system technology at the plant, or by retrofitting their facility, will not be required to further demonstrate that they meet the applicable performance standards. Similarly, under 125.94(a)(1)(ii), any facility that reduces its design intake velocity to 0.5 ft/s or less is deemed to have met the performance standards for impingement mortality and is not required to demonstrate further that it meets the performance standards for impingement mortality.

Available data described in Chapter 3 of the Phase II Existing Facility Technical Development Document suggest that closed-cycle, recirculating cooling systems (*e.g.*, cooling towers or ponds) can reduce mortality from impingement by up to 98 percent and entrainment by up to 98 percent when compared with conventional once-through systems.[44] Although closed-cycle, recirculating cooling is not one of the technologies on which the performance standards are based, use of a closed-cycle, recirculating cooling system would always achieve the performance standards and therefore, facilities that reduce their flow commensurate with closed-cycle, recirculating cooling systems are deemed to have met performance standards. The rule, at § 124.94(a)(1)(i), thus establishes a compliance alternative based on the use of a closed-cycle, recirculating cooling system. While EPA based the requirements of the new facility rule on the performance standards of closed-cycle recirculating systems, EPA has determined that this technology is not economically practicable for many existing Phase II facilities. EPA is nonetheless aware that some existing facilities have installed this highly effective technology and has thus provided a streamlined alternative for such facilities.

Additionally, EPA established a compliance alternative that allows facilities to reduce intake velocity to meet the impingement mortality performance standards. As EPA discussed in the proposed rule at 67 FR 17151 and Phase I final rule at 66 FR 65274, intake velocity is one of the key factors that can affect the impingement of fish and other aquatic biota, since in the immediate area of the intake it exerts a direct physical force against which fish and other organisms must act to avoid impingement and entrainment. As discussed in that notice, EPA compiled data from three swim speed studies (University of Washington study, Turnpenny, and EPRI) and these data indicated that a 0.5 ft/s velocity would protect at least 96 percent of the tested fish. As further discussed, EPA also identified federal documents (Boreman, DCN 1–5003–PR; Bell (1990); and National Marine Fisheries Service (NMFS), (1997)), an early swim speed and endurance study performed by Sonnichsen *et al.* (1973), and fish screen velocity criteria that are consistent with this approach.

[44] Reducing the cooling water intake structure's capacity is one of the most effective means of reducing entrainment (and impingement). For the traditional steam electric utility industry, facilities located in freshwater areas that have closed-cycle recirculating cooling water systems can, depending on the quality of the make-up water, reduce water use by 96 to 98 percent from the amount they would use if they had once-through cooling water systems. Steam electric generating facilities that have closed-cycle, recirculating cooling systems using salt water can reduce water usage by 70 to 96 percent when make-up and blowdown flows are minimized. The lower range of water usage would be expected where State water quality standards limit chloride to a maximum increase of 10 percent over background and therefore require a 1.1 cycle of concentration. The higher range should be attainable where cycles of concentration up to 2.0 are used for the design.

2. Meeting Performance Standards Through the Use of Design and Construction Technologies, Operational Measures, and/or Restoration Measures

Under the second and third compliance alternatives (§ 125.94(a)(2) and (3)), a facility may either demonstrate to the Director that the facility's existing design and construction technologies, operational measures, and/or restoration measures already meet the minimum performance standards specified under § 125.94(b) and (c), or that it has selected design and construction technologies, operational measures, and/or restoration measures or some combination thereof that will meet these performance standards.

Available data indicate that, when considered as a suite of technologies, barrier and fish handling technologies are available on a national basis for use by Phase II existing facilities. These technologies exist and are in use at various Phase II facilities and, thus, EPA considers them collectively technologically achievable. In addition, 50 percent of the potentially regulated facilities that do not already have closed-cycle cooling systems have some other technology in place that reduces impingement or entrainment. In turn, a large subset of these facilities (33 percent) also have fish handling or return systems that reduce the mortality of impinged organisms. The fact that these technologies are collectively available means that one or more technologies within the suite is available to each Phase II facility.

EPA finds that the design and construction technologies necessary to meet the requirements are commercially available and economically practicable for existing facilities, because facilities can and have installed many of these technologies years after a facility began operation. Typically, additional design and construction technologies such as fine mesh screens, wedgewire screens, fish handling and return systems, and aquatic filter fabric barrier systems can be installed during a scheduled outage (operational shutdown). Referenced below are examples of facilities that installed these technologies after they initially started operating.

Lovett Generating Station. A 495 MW facility (gas-fired steam), Lovett is located in Tomkins Cove, New York, along the Hudson River. The facility first began operations in 1949 and has three generating units with once-through cooling systems. In 1994, Lovett began the testing of an aquatic filter barrier system to reduce entrainment, with a permanent system being installed the following year. Improvements and additions were made to the system in 1997, 1998, and 1999, with some adjustments being accepted as improvements of this vendor's technology for all subsequent installations at other locations.

Big Bend Power Station. Situated on Tampa Bay, Big Bend is a 1998 MW (coal-fired steam) facility with four generating units. The facility first began operations in 1970 and added generating units in 1973, 1976, and 1985. Big Bend supplies cooling water to its once-through cooling water systems via two intake structures. When the facility added Unit 4 in 1985, regulators required the facility to install additional intake technologies. A fish handling and return system, as well as a fine-mesh traveling screen (used only during months with potentially high entrainment rates), were installed on the intake structure serving both the new Unit 4 and the existing Unit 3.

Salem Generating Station. A 2381 MW facility (nuclear), Salem is located on the Delaware River in Lower Alloways Creek Township, New Jersey. The facility has two generating units, both of which use once-through cooling and began operations in 1977. In 1995, the facility installed modified Ristroph screens and a low-pressure spray wash with a fish return system. The facility also redesigned the fish return troughs to reduce fish trauma.

Chalk Point Generating Station. Located on the Patuxent River in Prince George's County, Maryland, Chalk Point has a capacity of 2647 MW (oil-fired steam). The facility has four generating units and uses a combination of once-through and closed-cycle, recirculating cooling systems (two once-through systems serving two generating units and one recirculating system with a tower serving the other two generating units). In 1983, the facility installed a barrier net, followed by a second net in 1985, giving the facility a coarse mesh (1.25″) outer net and a fine mesh (.75″) inner net. The barrier nets are anchored to a series of pilings at the mouth of the intake canal that supplies the cooling water to the facility and serve to reduce both entrainment and the volume of trash taken in at the facility.

3. Meeting Performance Standards Through Use of an Approved Design and Construction Technology

Under the fourth compliance alternative, a facility can demonstrate that it meets specified conditions and that it has installed and properly operates and maintains a pre-approved technology. EPA is approving one technology at this time: submerged cylindrical wedgewire screen technology to treat the total cooling water intake flow. There are five conditions that must be met in order to use this technology to comply with the rule: (1) The cooling water intake structure is located in a freshwater river or stream; (2) the cooling water intake structure is situated such that sufficient ambient counter currents exist to promote cleaning of the screen face; (3) the through screen design intake velocity is 0.5 ft/s or less; (4) the slot size is appropriate for the size of eggs, larvae, and juveniles of any fish and shellfish to be protected at the site; and (5) the entire main condenser cooling water flow is directed through the technology (small flows totaling less than two MGD for auxiliary plant cooling uses are excluded). Directors are explicitly authorized in § 125.99 to pre-approve other technologies for use at facilities with other specified characteristics within their respective jurisdiction after providing the public with a notice and an opportunity to comment on the request for approval of the technology. The Director's authority to pre-approve other technologies is not limited to technologies for use by facilities located on freshwater rivers and streams.

EPA has adopted this compliance alternative in response to comments that suggested that EPA provide an additional, more streamlined compliance option under which a facility could implement certain specified technologies that are deemed highly protective in exchange for reducing the scope of the Comprehensive Demonstration Study. (*See* 68 FR 13522, 13539; March 19, 2003). EPA evaluated the effectiveness of specific technologies using the impingement mortality and entrainment reduction performance standards as assessment criteria. The technology selected for the approved technology option has a demonstrated ability to reduce impingement mortality by 80 to 95 percent for fish and shellfish and, if required, reduce entrainment by 60 to 90 percent for any stages of fish and shellfish at facilities that meet the conditions specified in section 125.99(a). Thus, the technology has a demonstrated ability to meet the most stringent performance standards that would apply to any facility situated on a freshwater river or stream. (*See* DCN 1–3075, 1–5069, 1–5070, 3–0002, and 4–4002B. *Also see,* DCN 6–5000 and Chapter 3 of the Technical Development Document.) Because cylindrical wedgewire screens are believed to be effective when deployed under the specified conditions and properly maintained, facilities that select this compliance option are provided substantially streamlined requirements for completing the Comprehensive Demonstration Study. However, facilities selecting this option are still required to prepare a Technology Installation and Operation Plan to monitor the effectiveness of the technology at their site in meeting the performance standards.

4. Site-Specific Determination of Best Technology Available To Minimize Adverse Environmental Impact

A facility may comply with the rule by seeking a site-specific demonstration of the best technology available to minimize adverse environmental impact by demonstrating, to the Director's satisfaction, that its cost of complying with the applicable performance standards would be significantly greater than the costs considered by EPA for a like facility when establishing such performance standards, or that its costs would be significantly greater than the benefits of complying with such performance standards at the facility. (*See* sections 125.94(a)(5)(i) and (ii)). If a facility satisfies one of the two cost tests in § 125.94(a)(5), then the Director must establish site-specific alternative requirements based on design and construction technologies, operational measures, and/or restoration measures that achieve an efficacy that is, in the judgment of the Director, as close as practicable to the applicable performance standards without resulting in costs that are significantly greater than either the costs considered by the Administrator in establishing the applicable performance standards, or the benefits at the facility.

In establishing the performance standards in 125.94(b) and the compliance alternatives in sections 125.94(a)(1)–(4), EPA considered several factors, including efficacy, availability, ease of implementation, indirect effects, the costs that EPA expects all existing facilities to incur (national costs) and the benefits if all existing facilities meet the performance standards (national benefits). This provision for alternative requirements is included in the rule to give facilities flexibility to demonstrate that the best technology available to minimize adverse environmental impact at their particular sites may be less stringent than would otherwise be achieved if the facility selected one of the compliance alternatives in sections 125.94(a)(1)–(4). (For a discussion of EPA's legal authority to authorize compliance with alternative requirements based on this cost-cost comparison, *see* Section VIII. I.).

a. Basis of the Cost-Cost Test

For a number of related reasons, EPA chose to use a comparison of a facility's actual costs to the costs EPA estimated that facility would incur to meet the national performance standards (a ''cost-cost test'') as a basis for obtaining a site-specific determination of best technology available. EPA's record for this rule shows that, for the category of existing facilities as a whole, today's rule is technically achievable and economically practicable. Although EPA collected more information for this rulemaking than is typical for an effluent limitation guideline rulemaking, detailed information on some factors important to the effectiveness and costs of the technologies, such as debris loading and the presence of navigational channels within the waterbody at which cooling water intakes are sited, was not requested. Moreover, the information EPA used to develop its costs was in some cases limited by the fact that, while EPA sent surveys to all facilities covered under today's rule, only 42% were sent detailed questionnaires. The remaining 58% only received a short technical questionnaire which requested minimal characterization information. Also, EPA may not have elicited information regarding characteristics of a particular facility that, if known would have either significantly changed EPA's national cost estimates or demonstrated that none of the technologies on which the categorical requirements are based are economically achievable by the facility. Similarly, existing facilities have less flexibility than new facilities in selecting the location of their intakes and technologies for minimizing adverse environmental impact, and therefore it may be difficult for some facilities to avoid costs much higher than those EPA considered when establishing the performance standards. The cost-cost site-specific alternative ensures that the overall rule remains economically practicable for facilities subject to today's rule. In short, for certain facilities EPA may not have anticipated some site-specific costs or the costs for retrofit may exceed those EPA considered. Despite EPA's best effort, such costs are difficult to estimate in a national rule. Because of the wide range of available technologies considered and a number of site-specific factors that may significantly affect the cost and practicability of installing particular technologies at particular sites, the site-specific uncertainty in the cost estimates is higher than for an effluent limitations guidelines rulemaking. Thus, EPA may not have anticipated all site-specific costs that a facility could incur. In addition, existing facilities have less flexibility than new facilities in selecting the location of their intakes and technologies for minimizing adverse environmental impact and, therefore, it may be difficult for some facilities to avoid costs much higher than those EPA considered when establishing the performance standards in the rule. For all of these reasons, EPA believes that the cost-cost site-specific compliance alternative is necessary to ensure that the rule is economically practicable for existing Phase II facilities. In order to ensure that this alternative provides only the minimum relaxation of performance standards that is needed to make the rule economically practicable, § 125.94(a)(5)(i) requires that the site-specific requirements achieve an efficacy that is as close as practicable to the applicable performance standards without resulting in costs that are significantly greater than those considered by the Administrator for a like facility when establishing the performance standards.

b. Basis of the Cost-Benefit Test

EPA decided to use a comparison of a facility's costs to the benefits of meeting the performance standards at the facility (a ''cost-benefit test'') as another basis for obtaining a site-specific determination of BTA to minimize adverse environmental impact. Section 316(b) authorizes consideration of the environmental benefit to be gained by requiring that the location, design, construction, and capacity of cooling water intake structures reflect the best economically practicable technology available for the purpose of minimizing adverse environmental impact. Accordingly, in determining that the technologies on which EPA based the compliance alternatives and performance standards are the best technologies available for existing facilities to minimize adverse environmental impact, EPA considered the national cost of those technologies in comparison to the national benefits—*i.e.*, the reduction in impingement and entrainment that EPA estimated would occur nationally if all existing facilities selected one of the compliance options in sections 125.94(a)(1)–(4). While EPA believes that there is considerable value in promulgating national performance standards under section 316(b) based on what EPA determines, on a national basis, to be the best technology available to minimize adverse environmental impacts, EPA also recognizes that, at times, determining what is necessary to minimize adverse environmental impacts can necessitate a site-specific inquiry. EPA's comparison of national costs to national benefits may not be applicable to a specific site due to variations in (1) the performance of intake technologies and (2) characteristics of the waterbody in which the intake(s) are sited, including the resident aquatic biota. For example, there may be some facilities where the absolute numbers of fish and shellfish impinged and entrained is so minimal that the cost to achieve the required percentage reductions would be significantly greater than the benefits of achieving the required reductions at that particular site. More specifically, because of the location of the intake, the characteristics of a particular waterbody, or the behavioral patterns of the fish or shellfish in that particular waterbody, there may be little or no impingement mortality or entrainment occurring at the site (see Neal Generating Complex facility example provided in section IV of this preamble). For such a facility, the cost of reducing an already small amount of impingement mortality and entrainment by 80 to 95 percent and 60 to 90 percent, respectively, may be significantly greater than the benefits. In short, it may not be cost-effective and, therefore may be economically impracticable for a facility to achieve percentage reductions when attempting to save a small number of fish or shellfish. Thus, in a waterbody that is already degraded, very few aquatic organisms may be subject to impingement or entrainment, and the costs of retrofitting an existing cooling water intake structure may be significantly greater than the benefits of doing so. By requiring best technology available to minimize adverse environmental impact, section 316(b) invites a consideration of both technology and of environmental conditions, including the potential for adverse impacts, in the receiving waterbody. EPA believes it is a reasonable interpretation of the statute to allow the Director to consider the results of meeting the performance standards in terms of reducing environmental impacts (*i.e.*, the benefits) in cases where the costs of installing the technology are significantly greater than the reduction in environmental impacts would warrant. As with the cost-cost site-specific provision, EPA also wants to ensure that any relaxation of the performance standards be the minimum necessary to ensure that the costs are not significantly greater than the benefits. Section 125.94(a)(5)(i) thus provides that alternative site-specific requirements must achieve an efficacy that is as close as practicable to the applicable performance standards without resulting in costs that are significantly greater than the benefits of meeting the performance standards at the facility.

D. How Has EPA Assessed Economic Practicability?

The legislative history of section 316(b) indicates that the term ''best technology available'' should be interpreted as ''best technology available commercially at an economically practicable cost.'' [45] This position reflects congressional concern that the application of best technology available should not impose an impracticable and unbearable economic burden. Thus, EPA has conducted extensive analyses of the economic impacts of this final rule, using an integrated energy market model (the IPM [45]). For a complete discussion of this analysis, please refer to section XI.B.1 of this preamble or Chapter B3 of the Economic and Benefits Analysis (EBA) in support of this final rule (DCN 6–0002).

EPA believes that the requirements of this rule reflect the best technology available at an economically practicable cost. EPA examined the effects of the rule's compliance costs on capacity, generation, variable production costs, prices, net income, and other measures, both at the market and facility levels. In addition, the other economic analyses conducted by EPA showed that the costs for this rule are economically practicable.

However, EPA believes that a consideration of the relationship of costs to environmental benefits is an important component of economic practicability. As discussed in section VIII.C of the proposed Phase I rule (65 FR 49094) EPA has long recognized that there should be some reasonable relationship between the cost of cooling water intake structure control technology and the environmental benefits associated with its use. As the preamble to the 1976 final rule implementing section 316(b) stated, neither the statute nor the legislative history requires a formal or informal cost-benefit assessment (41 FR 17387; April 26, 1976).

[45] *See* 118 CONG. REC 33,762 (1972), reprinted in 1 Legislative History of the Water Pollution Control Act Amendments of 1972, at 264 (1973) (Statement of Representative Don H. Clausen).

E. What Were the Major Options Considered for the Final Rule and Why Did EPA Reject Them?

EPA considered a number of options for determining the best technology available to minimize adverse environmental impact at Phase II existing facilities and assessed these options based on overall efficacy, availability, economic practicability, including economic impact and the relationship of costs with benefits, and non-water quality environmental impacts, including energy impacts. Under the options EPA considered, facilities would be allowed to implement restoration measures to meet the performance standards. Similarly, any options considered also would allow facilities to request alternative, less stringent, requirements if the Director had determined that data specific to the facility indicated that compliance with the relevant requirement would result in compliance costs significantly greater than those EPA considered in establishing the applicable requirement, or compliance costs significantly greater than the benefits of complying with the applicable performance standards. The alternative requirements would be no less stringent than justified by the significantly greater cost or the significant adverse impacts on local air quality or local energy markets. EPA also considered several site-specific approaches to establishing best technology available. These include the site-specific sample rule discussed at 67 FR 17159, an alternative based on EPA's 1977 Draft Guidance, and alternatives suggested by the Utility Water Act Group (UWAG) and Public Service Electric and Gas Company (PSEG), respectively (*see* 67 FR 17162). EPA's reasons for not adopting these site specific alternatives are discussed in section VII.E.5 of this preamble. The five major technology options EPA considered but did not select for the final rule are discussed in greater detail in the next section. Finally, the costs and benefits presented below are those developed at proposal because these estimates are most useful for purposes of comparison. Subsequent analyses, such as those presented in the NODA, have resulted in higher cost estimates in general, but did not alter the relative ranking of these options as EPA made determinations regarding the final rule. Rather, these analyses indicated that the costs for options that would have required more extensive retrofitting efforts than the final rule are even higher relative to the costs of the final rule than they were estimated to be at proposal.

1. Intake Capacity Commensurate With Closed-Cycle, Recirculating Cooling System for All Facilities

EPA considered a regulatory option that would have required Phase II existing facilities with a design intake flow 50 MGD or more to reduce the total design intake flow to a level, at a minimum, commensurate with that which can be attained by a closed-cycle recirculating cooling system using minimized make-up and blowdown flows. In addition, facilities in specified circumstances (*e.g.*, located where additional protection is needed due to concerns regarding threatened, endangered, or protected species or habitat; or regarding migratory, sport or commercial species of concern) would have had to select and implement additional design and construction technologies to minimize impingement mortality and entrainment. This option would not have distinguished between facilities on the basis of the waterbody type from which they withdraw cooling water. Rather, it would have required that the same stringent controls be the nationally applicable minimum for all waterbody types. This is the basic regulatory approach EPA adopted for new facilities at 40 CFR 125.80.

EPA did not select a regulatory scheme based on the use of closed-cycle, recirculating cooling systems at existing facilities based on its generally high costs (due to conversions), the fact that other technologies approach the performance of this option, concerns for energy impacts due to retrofitting existing facilities, and other considerations. Although closed-cycle, recirculating cooling water systems serve as the basis for requirements applied to Phase I new facilities, for Phase II existing facilities, a national requirement to retrofit existing systems is not the most cost-effective approach and at many existing facilities, retrofits may be impossible or not economically practicable. EPA estimates that the total capital costs for individual high-flow plants (*i.e.*, greater than 2 billion gallons per day) to convert to wet towers generally ranged from $130 to $200 million, with annual operating costs in the range of $4 to $20 million (*see* TDD; DCN 6–0004). For purposes of general comparison, EPA estimated that capital and installation costs for cooling towers under the Phase I rule would range from approximately $170,000 to $12.6 million per plant (annualized), depending on flow. At proposal, EPA estimated that the total social cost of compliance for this option for Phase II existing facilities would be approximately $3.5 billion per year.

It is significant to note, however, that EPA's estimates did not fully incorporate costs associated with acquiring land needed for cooling towers and, therefore, these estimates may not fully reflect the costs of the option. For example, based on a survey conducted by one industry commenter, EPA learned that 31 out of 56 plants surveyed said that they would need to acquire additional property to accommodate cooling towers, if required by today's rule. EPA recognizes that this could be a significant cost. EPA also recognizes that there may be impediments, irrespective of costs, to acquiring land for cooling towers. Land upon which to construct cooling towers may be difficult or impossible to obtain, especially in urban areas; some facilities might even turn to displacement of wetlands as a solution. The Agency did not include these potential costs in its analysis for the NODA or proposal. In contrast to new facilities, which can take into account the Phase I requirements when choosing where to situate their structures (including cooling towers), existing facilities have far less flexibility and incur far greater costs. EPA believes that this is a special problem for existing facilities that is relevant to determining whether, as a national categorical matter, closed-cycle cooling is the best technology available for existing facilities for minimizing adverse environmental impacts associated with cooling water intake structures. EPA received retrofit cost estimates from a number of commenters that indicate that such costs could be at least twice those projected by EPA.

Another issue concerns the energy impacts of cooling towers. EPA examined the information it received after publication of the proposed rule and NODA, and agrees that the energy penalty associated with cooling towers, together with other factors, indicates that this technology is not the best technology available for existing facilities for minimizing adverse environmental impacts associated with cooling water intake structures. In reaching this conclusion, EPA relied on energy penalty information provided by the U.S. Department of Energy. EPA worked closely with the U.S. Department of Energy in preparing today's rule because of their expertise in power plant operations and engineering. The U.S. Department of Energy pointed out to EPA that existing fossil-fuel facilities converting from once-through cooling water systems to wet-cooling towers would produce 2.4 percent to 4.0 percent less electricity even while burning the same amount of coal. For at least one nuclear power plant, which provides 78% of the electricity consumed by the State of Vermont, the energy penalty associated with converting to cooling towers was estimated to be 5.3 percent. Expressed differently, DOE estimated that nationally, on average 20 additional 400-MW plants might have to be built to replace the generating capacity lost by replacing once-through cooling systems with wet cooling towers if such towers were required by all Phase II facilities.

This energy penalty leads to other negative consequences. Because this deficit is predicted to occur during the summer months (when energy demand is highest), the net effect would be more consumption of fossil fuel, which in turn increases the emission of sulfur dioxide, NO_X, particulate matter, mercury and carbon dioxide. Increasing fuel consumption at existing coal power plants yields the largest increase in air emissions because existing systems are less efficient at producing power (and therefore burn more coal) and because they generally have less air pollution control equipment in place. EPA believes that it is reasonable to consider these non-water quality environmental impacts and the additional costs associated with controlling these increased emissions in making today's decision. EPA further believes that it is authorized to do so because of the links between § 316(b) and sections 301 and 306, which require EPA to consider both the energy impacts and the air pollution impacts of technologies when identifying technologies in the effluent guidelines context. *See* CWA section 304(b)(2)(B) (cross-referenced in § 301); CWA section 306(b)(1)(B) (new source performance standards).

Some commenters also assert that EPA underestimated the down time that the facility would experience as it converts to cooling towers. This, again, is not an impact that would be experienced by new facilities. EPA agrees that such down time can be significant. Indeed, one of the four retrofit case studies EPA developed indicated a down time of 10 months, and EPA believes it is reasonable to infer that many other facilities would experience the same loss.

EPA also agrees with the commenters who assert that the empirical data base of four retrofit cases to which EPA compared cooling tower retrofit costs and engineering characteristics is not representative of the broader population of facilities and could be too narrow a set from which to develop national costs that would be applicable to a wide range of facilities. Of the four retrofits EPA studied, two were in a single state (South Carolina), none were located along a coast, and only one generated more than 500 MW of electricity. EPA also recognizes that all of these conversions were performed before 1992. While it is true that the vast majority of the new, greenfield utility and non-utility combined cycle plants built in the past 20 years have wet cooling towers, EPA believes that it is significant that so few existing facilities retrofitted to the technology during the same period. The rarity of this technology as a retrofit further indicates that it is not economically practicable for the vast majority of existing facilities.

EPA also considered several additional points made by commenters in rejecting this option. Some commenters asserted that certain facilities with closed-cycle, recirculating cooling systems often need to address the impacts of cooling tower plumes, and subsequent fog and icing in metropolitan areas, and noise abatement. Commenters also asserted that the costs of retrofitting and operating such systems at facilities which do not now have them is disproportionate to the potential benefits derived, particularly given the similarity in the level of protection provided under this option (all facilities required to reduce flow commensurate with a closed-cycle, recirculating system) and the final rule. Finally, they stated that the need for flexibility in a rule pertaining to existing facilities is critical to allow facility owners a range of options to meet the fish protection requirements. EPA does not agree that in all cases the costs of retrofitting a closed-cycle cooling water system is disproportionate to the benefits derived. Nevertheless, EPA recognizes that these concerns have merit for many facilities and that the validity and extent of such concerns often must be assessed on a case-by-case basis.

Each of these factors has a cost and an economic impact that EPA believes is appropriate to consider when evaluating whether cooling towers are the best technology available for existing facilities for minimizing adverse environmental impacts associated with cooling water intake structures. The capital costs estimated by EPA at proposal are already very high; when costs reflecting reasonable changes to EPA's assumptions are added to them, the total capital cost investment and associated economic impact is simply too high at this time for EPA to be able to justify selecting cooling towers as a required technology for all existing Phase II facilities.

EPA further compared the efficacy of closed-cycle, recirculating cooling systems with that estimated for design and construction technologies. Although not identical, the ranges of impingement and entrainment reduction are similar under both options, such that the reductions estimated for the design and construction technologies, particularly when optimized, approach those estimated for closed-cycle, recirculating cooling systems. Therefore, the use of design and construction technologies as the basis for this rule is supported since they can approach closed-cycle, recirculating systems at less cost with fewer implementation problems. EPA considered this similarity in efficacy, along with the economic practicability and availability of each type of technology, in determining that a closed-cycle, recirculating cooling system is not the required technology for all Phase II existing facilities.

2. Intake Capacity Commensurate With Closed-Cycle, Recirculating Cooling Systems Based on Waterbody Type

EPA also considered an alternate technology-based option in which closed-cycle, recirculating cooling systems would have been required for all facilities on certain waterbody types. Under this option, EPA would have grouped waterbodies into the same five categories as in today's rule: (1) Freshwater rivers or streams, (2) lakes or reservoirs, (3) Great Lakes, (4) tidal rivers or estuaries; and (5) oceans. Because oceans, estuaries and tidal rivers contain essential habitat and nursery areas for the vast majority of commercial and recreational important species of shell and finfish, including many species that are subject to intensive fishing pressures, these waterbody types would have required more stringent controls based on the performance of closed-cycle, recirculating cooling systems. EPA discussed the susceptibility of these waters in a Notice of Data Availability (NODA) for the Phase I rule (66 FR 28853, May 25, 2001) and invited comment on documents that may support its judgment that these waters are particularly susceptible to adverse impacts from cooling water intake structures. In addition, the NODA presented information regarding the low susceptibility of non-tidal freshwater rivers and streams to impacts from entrainment from cooling water intake structures.

Under this alternative option, facilities that operate at less than 15 percent capacity utilization would, as in today's final rule, only be required to have impingement control technology. Facilities that have a closed-cycle, recirculating cooling system would have required additional design and construction technologies to increase the survival rate of impinged biota or to further reduce the amount of entrained biota if the intake structure was located within an ocean, tidal river, or estuary where there are fishery resources of concern to permitting authorities or fishery managers.

Facilities with cooling water intake structures located in a freshwater (including rivers and streams, the Great Lakes and other lakes) would have had the same requirements as under today's final rule. If a facility for which closed-cycle recirculating technology was required chose to comply with alternative requirements, then the facility would have had to demonstrate that alternative technologies would reduce impingement and entrainment to levels comparable to those that would be achieved with a closed-loop recirculating system (90% reduction). If such a facility chose to supplement its alternative technologies with restoration measures, it would have had to demonstrate the same or substantially similar level of protection. (For additional discussion see the Phase I final rule 66 FR 65256, at 65315 columns 1 and 2.)

At proposal, EPA estimated that there would be 109 [46] facilities located on oceans, estuaries, or tidal rivers that do not have a closed-cycle, recirculating cooling system and would need to reduce intake flow to a level commensurate with that which can be attained by a closed-cycle, recirculating cooling system or upgrade design and construction technology (*e.g.,* screens) in order to meet performance standards for reducing impingement mortality and entrainment.

Although EPA estimated the costs of this option to be less expensive at the national level than an option based on closed-cycle, recirculating cooling systems everywhere, EPA did not select this option based on total social costs estimates of greater than $1 billion per year and its lack of cost-effectiveness, as well as on concerns regarding potential energy impacts. Facilities located on oceans, estuaries, and tidal rivers would incur high capital and operating and maintenance costs for conversions of their cooling water systems. Furthermore, since impacted facilities would be concentrated in coastal regions, EPA is concerned that there is

[46] Sample-weighted.

the potential for short term energy impacts and supply disruptions in these areas if multiple facilities retrofit concurrently or over a relatively short time-frame, as would be required by these regulations.

3. Intake Capacity Commensurate With Closed-Cycle, Recirculating Cooling System Based on Waterbody Type and Proportion of Waterbody Flow

EPA also considered a variation on the above approach that would have required only facilities withdrawing very large amounts of water from an estuary, tidal river, or ocean to reduce their intake capacity to a level commensurate with that which can be attained by a closed-cycle, recirculating cooling system. For example, for facilities with cooling water intake structures located in a tidal river or estuary, if the intake flow is greater than 1 percent of the source water tidal excursion, then the facility would have had to meet standards for reducing impingement mortality and entrainment based on the performance of wet cooling towers. These facilities would instead have had the choice of reducing cooling water intake flow to a level commensurate with wet cooling towers or of using alternative technologies to meet reduction standards based on the performance of wet cooling towers. If a facility on a tidal river or estuary had intake flow equal to or less than 1 percent of the source water tidal excursion, the facility would have only had to meet the same impingement and entrainment performance standards as in the final Phase II rule. These standards were developed based on the performance of technologies such as fine mesh screens and traveling screens with well-designed and operating fish return systems. The more stringent, closed-cycle, recirculating cooling system-based requirements would have also applied to a facility that has a cooling water intake structure located in an ocean with an intake flow greater than 500 MGD.

This option also would impose much higher costs on a subset of facilities than the final rule. Based on an analysis of data collected through the detailed industry questionnaire and the short technical questionnaire, at proposal, EPA estimated there were potentially 109 Phase II existing facilities located on estuaries, tidal rivers, or oceans which would incur capital costs under this option. Of these 109 facilities, EPA estimated that 51 would exceed the applicable flow threshold and be required to meet performance standards for reducing impingement mortality and entrainment based on a reduction in intake flow to a level commensurate with that which can be attained by a closed-cycle recirculating system. Of the 58 [47] facilities estimated to fall below the applicable flow threshold, 10 facilities already meet these performance standards and would not require any additional controls, whereas 48 [48] facilities would require entrainment or impingement controls, or both. Because this option would only require cooling tower-based performance standards for facilities located on tidal rivers, estuaries or oceans where they withdraw saline or brackish waters, EPA does not believe that this option would raise any significant water quantity issues.

At proposal, EPA estimated the total social cost of compliance for the waterbody/capacity-based option to be approximately $0.97 billion per year. EPA did not select this option because it was not determined to be the most cost-effective approach on a national basis. While the national costs of this option are slightly lower than those of requiring wet cooling towers-based performance standard for all facilities located on oceans, estuaries and tidal rivers, the cost for facilities to meet these standards are still substantial. Although EPA would provide an opportunity to seek alternative requirements to address locally significant air quality or energy impacts, EPA does not believe a framework such as this provides sufficient flexibility to ensure effective implementation and to minimize non-water quality (including energy) impacts. In addition, as noted above for the other cooling tower based options that EPA rejected, facilities can achieve almost the same level of impingement mortality and entrainment reductions using the technologies on which this final rule is based as they can using cooling towers, but at substantially lower cost.

4. Impingement Mortality and Entrainment Controls Everywhere

At proposal, EPA evaluated an option that required impingement mortality and entrainment controls for all facilities. This option did not allow for the development of best technology available on a site-specific basis. This alternative based requirements on the percent of source water withdrawn and, like today's final rule, also restricted disruption of the natural thermal stratification of lakes or reservoirs. It also imposed entrainment performance requirements on Phase II existing facilities located on freshwater rivers or streams, and lakes or reservoirs where EPA has determined in today's final rule that such controls are not necessary. Finally, under this alternative, restoration could be used, but only as a supplement to the use of design and construction technologies or operational measures.

This option established clear performance-based requirements that were based on the use of available technologies to reduce adverse environmental impact. Such an alternative would be consistent with the focus on use of best technology required under section 316(b). However, as indicated above, this option lacks the flexibility of the final rule in applying the necessary and appropriate available technology and therefore would be less effective in addressing the specific cooling water intake structure impacts posed by Phase II facilities in their various environmental settings.

At proposal, total social cost of compliance for this option was estimated at approximately $300 million per year. EPA did not select this option because other options were more cost-effective, in part because this option requires entrainment controls in freshwater rivers, streams, and lakes. The benefits of the final rule are almost the same as those for this option but a lower cost (since lakes and reservoirs, and for design intake flows below 5% in freshwater rivers and streams are the least likely to provide significant benefits).

5. Site-Specific Options as Best Technology Available To Minimize Adverse Environmental Impact

In the proposed rule EPA also considered several site-specific approaches to establishing best technology available. These include the site-specific sample rule discussed at 67 FR 17159, an alternative based on EPA's 1977 Draft Guidance (67 FR 17161), and alternatives suggested by UWAG and PSEG, respectively (*see* 67 FR 17162).

EPA did not adopt any of these site-specific regulatory options for several reasons. None of these site-specific approaches would have established national performance standards for best technology available to minimize adverse environmental impact. EPA believes that such national performance standards promote the consistent application of the best technology available to minimize adverse environmental impact. In addition, based on contact with States (*see* Phase I NODA, 66 FR 28865, Phase II proposal 67 FR 17152–3) and anecdotal

[47] Not sample-weighted.

[48] Not sample-weighted.

information[49] EPA believes that each of these site-specific options would have resulted in higher administrative burdens being imposed on applicants and permit writers relative to the final rule. As EPA has discussed in the preamble to the proposal (*see* 67 FR 17167), these administrative burdens can be associated with the need to determine in each case whether adverse impacts are occurring, the nature and level of any such impacts, and which design and construction technologies constitute the best technology available to minimize adverse environmental impacts, including a consideration of costs and benefits. Further, all of the proposed site-specific options increase the likelihood that each significant cooling water intake permitting issue would become a point of contention between the applicant and permit writer, which EPA's experience indicates slows the permitting process, makes it more resource intensive, and makes it more costly. Finally, because the final rule provides facilities with the option of selecting from five compliance alternatives, including a site-specific compliance alternative, the final rule provides facilities with flexibility comparable to that of a site-specific rule. The site-specific alternative in the final rule provides clear standards for eligibility (the cost-cost and cost-benefit tests), and clear standards on which to base the alternative requirements that they achieve an efficacy as close as practicable to the national performance standards without exceeding the cost-test or benefits-test thresholds. EPA believes that structuring a site-specific compliance alternative in this way will significantly reduce the potential areas of disagreement between permit writer and applicant that are inherent in the other site-specific approaches that it rejected, while still providing facilities with appropriate flexibility. Through the multiple compliance alternatives specified in this rule, EPA has sought to balance the statutory requirements of section 316(b) and the need for reasonable limits on the administrative burden imposed on both applicants and permit writers against the need for existing facilities to have flexibility in implementing the requirements.

6. Flow Reduction Commensurate With the Level Achieved by Dry Cooling Systems Based on Waterbody Type

EPA conducted a full analysis for the Phase I rule and concluded that dry cooling was not an economically practicable option for new facilities on a national basis. Dry cooling systems use either a natural or a mechanical air draft to transfer heat from condenser tubes to air. In conventional closed-cycle recirculating wet cooling towers, cooling water that has been used to cool the condensers is pumped to the top of a recirculating cooling tower; as the heated water falls, it cools through an evaporative process and warm, moist air rises out of the tower, often creating a vapor plume. Hybrid wet-dry cooling towers employ both a wet section and dry section and reduce or eliminate the visible plumes associated with wet cooling towers.

For the Phase I rule, EPA evaluated zero or nearly zero intake flow regulatory alternatives, based on the use of dry cooling systems. EPA determined that the annual compliance cost to industry for this option would be at least $490 million. EPA based the costs on 121 new facilities having to install dry cooling. For the Phase II proposal, EPA estimated that total social costs for dry cooling based on waterbody type were $2.1 billion per year (or roughly double the costs for wet towers). Thus, this option would be more expensive than dry cooling for new facilities. The cost for Phase II existing facilities to install dry cooling would be significantly higher than the cost for new facilities to do so due to the complexities of retrofitting both the dry cooling equipment and components of the cooling system. At proposal, EPA estimated that 550 Phase II existing facilities would be subject to Phase II regulation. The cost would be significantly higher because existing facilities have less flexibility, thus incurring higher compliance costs (capital and operating) than new facilities. For example, existing facilities might need to upgrade or modify existing turbines, condensers, and/or cooling water conduit systems, which typically imposes greater costs than use of the same technology at a new facility. In addition, retrofitting a dry cooling tower at an existing facility would require shutdown periods during which the facility would lose both production and revenues, and decrease the thermal efficiency of an electric generating facility.

The disparity in costs and operating efficiency of dry cooling systems compared with wet cooling systems is considerable when viewed on a nationwide or regional basis. For example, under a uniform national requirement based on dry cooling, facilities in the southern regions of the United States would be at an unfair competitive disadvantage compared to those in cooler northern climates because dry cooling systems operate more efficiently in colder climates. Even under a regional subcategorization strategy for facilities in cool climatic regions of the United States, adoption of a minimum requirement based on dry cooling would likely impose unfair competitive restrictions for steam electric power generating facilities because of the elevated capital and operating costs associated with dry cooling. Adoption of requirements based on dry cooling for a subcategory of facilities under a particular capacity would pose similar competitive disadvantages for those facilities.

As explained in the preamble to the proposal, EPA does not consider performance standards based on dry cooling a reasonable option for a national requirement, nor for subcategorization under this rule, because the technology of dry cooling carries costs that would potentially cause significant closures for Phase II existing facilities. Dry cooling technology would also have a significant detrimental effect on electricity production by reducing the energy efficiency of steam turbines. Unlike a new facility that can use direct dry cooling, an existing facility that retrofits for dry cooling would most likely use indirect dry cooling which is much less efficient than direct dry cooling. In contrast to direct dry cooling, indirect dry cooling does not operate as an air-cooled condenser. In other words, the steam is not condensed within the structure of the dry cooling tower, but instead indirectly through a heat exchanger. Therefore, the indirect dry cooling system would need to overcome additional heat resistance in the shell of the condenser compared to the direct dry cooling system. Ultimately, the inefficiency (*i.e.,* energy penalty) of indirect dry cooling systems will exceed those of direct dry cooling systems in all cases.

Although the dry cooling option is extremely effective at reducing impingement and entrainment, it is not economically practicable for existing facilities and would cause additional adverse environmental impacts and serious energy impacts. Although dry cooling technology uses extremely low-

[49] For example, a site-specific determination for Brayton Point, Rhode Island, has required resources for greater than two full time equivalents (FTEs) over three years for permitting and support staff, as well as approximately $400,000 in contractor costs to address technical issues and applicant experts. Similarly, development of a permit for Salem has required resources for greater than two full time equivalents (FTEs) over three years for permitting and support staff, as well as approximately $340,000 in contractor costs to address technical issues and applicant experts.

level or no cooling water intake, thereby reducing impingement and entrainment of organisms to extremely low levels, section 316(b) does not require that adverse environmental impact be completely eliminated, but that it be minimized using the best technology available. (DOE energy penalty study; DCN 4–2512). EPA does not believe that dry cooling technology is ''available'' to most Phase II existing facilities.

Although EPA has rejected dry and wet cooling tower technologies as a national minimum requirement, EPA does not intend to restrict the use of these technologies or to dispute that they may be the appropriate cooling technology for some facilities. For example, facilities that are repowering and replacing the entire infrastructure of the facility may find that dry cooling is an acceptable technology in some cases. This technology may be especially appropriate in situations where access to cooling water is limited. Wet cooling tower technology may be suitable where adverse effects of cooling water intakes are severe and where screening systems are impractical, or where thermal discharge impacts pose serious environmental problems. Under Clean Water Act section 510, a State may choose to impose more stringent standards than required by Federal regulations. States may continue to use this authority to require facilities to use dry or wet cooling systems.

F. What Is the Role of Restoration and Trading Under Today's Final Rule?

1. What Is the Role of Restoration?

EPA is providing facilities with the option to use restoration for compliance alternatives § 125.94(a)(2), (3), and (5) where the performance of the restoration measures (the production and increase of fish and shellfish in the facility's waterbody or watershed, including maintenance of community structure and function), is substantially similar to that which would have been achieved if the facility reduced impingement mortality and entrainment through the use of design and construction technologies and/or operational measures, to meet the applicable performance standards. (For a complete discussion of the legal analysis supporting restoration, see section VIII of this preamble.) The role of restoration under this rule is to provide additional flexibility to facilities in complying with the rule by eliminating or significantly offsetting the adverse environmental impact caused by the operation of a cooling water intake structure. Restoration measures that increase fish and shellfish in an impacted waterbody or watershed and result in performance substantially similar to that which would otherwise be achieved through reductions in impingement mortality and entrainment further the goal of minimizing adverse environmental impact while offering additional flexibility to both permitting authorities and facilities. Restoration measures may include such activities as removal of barriers to fish migration, reclamation of degraded aquatic organism habitat, or stocking of aquatic organisms. These are still technologies, within the meaning of that term as used in section 316(b) and as such are an appropriate means for meeting technology based performance standards. They are not analogous to water quality based effluent limitations on pollutant discharges because they are not designed to meet water quality standards or dependent on the condition of the receiving waterbody. Rather, they provide an additional means to meet the same performance standards that guide the selection of design and construction technologies and operational measures.

Restoration measures have been used at existing facilities as one of many tools to implement section 316(b) on a case-by-case, best professional judgment basis to compensate for the death and injury of fish and other aquatic organisms caused by the cooling water intake structure. Under today's rule, a Phase II existing facility may utilize restoration either in lieu of or as a supplement to design and construction technologies and/or operational measures. For example, a facility may demonstrate to the Director that velocity controls are the most feasible technology choice for the facility but that, when used on their own, the velocity controls are insufficient to meet the applicable performance standards at § 125.94(b). The facility may then, in conjunction with the use of velocity controls, implement restoration measures to increase the fish and shellfish productivity of the waterbody in order to meet the performance standards at § 125.94(b). Another facility might demonstrate to the Director that restoration measures alone achieve the greatest compliance with the performance standards. A facility may alternatively request a site-specific determination of best technology available under § 125.94(a)(5) and use restoration measures to meet the alternate requirements.

Facilities that propose to use restoration measures must demonstrate to the Director that they evaluated the use of design and construction technologies and operational measures and determined that the use of restoration measures is appropriate because meeting the applicable performance standards or requirements through the use of other technologies is less feasible, less cost-effective, or less environmentally desirable than meeting the standards in whole or in part through the use of restoration measures. Facilities must also demonstrate that the restoration measures they plan to implement, alone, or in combination with design and construction technologies and/or operational measures, will produce ecological benefits (production of fish and shellfish) at a level that is substantially similar to the level that would be achieved through compliance with the applicable impingement mortality and/or entrainment performance standards under § 125.94(b), or alternative site-specific requirements under § 125.94(a)(5). In other words, restoration measures must replace the fish and shellfish lost to impingement mortality and entrainment, either as a substitute or as a supplement to reducing impingement mortality and entrainment through design and control technologies and/or operational measures. While the species makeup of the replacement fish and shellfish may not be exactly the same as that of the impingement mortality and entrainment losses, the Director must make a determination that the net effect is to produce a level of fish and shellfish in the waterbody that is ''substantially similar'' to that which would result from meeting the performance standards through design and construction technologies and/or operational measures alone. The final rule requires that a facility use an adaptive management method for implementing restoration measures because the performance of restoration projects must be regularly monitored and potentially adjusted to ensure the projects achieve their objectives (see 67 FR 17146–17148 and 68 FR 13542).

The final rule also requires that restoration projects which replace the lost fish and shellfish with a different species mix (''out of kind'' restoration) be based on a watershed approach to restoration planning. The boundaries of a ''watershed'' should be guided by the cataloging unit of the ''Hydrologic Unit Map of the United States'' (USGS, 1980), although it may be appropriate to use another watershed or waterbody classification system developed at the state or local level if such a system compares favorably in level of detail. For example, in coastal systems that support migratory fish, a coastal waterbody that transects a number of watersheds may be the most appropriate unit for planning restoration.

2. What Is the Role of Trading in Today's Rule?

In § 125.90(c), today's final rule provides that if a State demonstrates to the Administrator that it has adopted alternative regulatory requirements in its NPDES program that will result in environmental performance within a watershed that is comparable to the reductions of impingement mortality and entrainment that would otherwise be achieved under § 125.94, the Administrator must approve such alternative requirements. A trading program could be a part of these alternative regulatory requirements.

At proposal, EPA sought comment on the potential role of trading in the context of the section 316(b) Phase II rulemaking and possible approaches for developing a trading program. Trading under other EPA programs has been shown to provide opportunities for regulatory compliance at reduced costs. The EPA Office of Water's Water Quality Trading Policy, published in January 2003 [DCN 6–5002], fully supports trading nutrients and sediment and adopts a case-by case approach to evaluating proposals to trade other pollutants.

Trading in the context of section 316(b) raises many complex issues, for example, how to establish appropriate units of trade and how to measure these units effectively given the dynamic nature of the populations of aquatic organisms subject to impingement mortality and entrainment. Should a State choose to propose a trading program under § 125.90(c), EPA will evaluate the State's proposal on a case-by-case basis to ensure the program complies with the regulatory requirement—that it will result in environmental performance within a watershed that is comparable to the reductions of impingement mortality and entrainment that would otherwise be achieved under the requirements established at § 125.94. Some commenters suggested that EPA adopt a trading program that would allow trading between aquatic organisms and pollutant discharges. EPA is concerned that such a program would introduce comparability and implementation challenges that would be difficult to overcome and therefore, EPA does not expect that such a program would work within the framework of today's final rule. In addition, EPA does not believe that it is possible at this time to quantify with adequate certainty the potential effects on ecosystem function, community structure, biodiversity, and genetic diversity of such trades, especially when threatened and/or endangered species are present. Based on the current state of the science in aquatic community ecology and ecological risk assessment, States wishing to develop trading programs within the context of 316(b) would be best off focusing on programs based on metrics of comparability between fish and shellfish gains and losses among trading facilities, rather than the much more complex metrics that would be necessary for comparability among fish and shellfish losses on the one hand, and pollutant reductions on the other.

VIII. Summary of Major Comments and Responses to the Proposed Rule and Notice of Data Availability (NODA)

A. Scope and Applicability

1. Phase II Existing Facility Definition

Numerous commenters supported limiting the scope of the Phase II rule to existing facilities that generate and transmit electric power, or generate and sell such power to another entity for transmission, but suggested that EPA has not sufficiently limited the rule to only these facilities. Commenters noted that the proposed definition of ''Phase II existing facility'' does not adequately exempt existing manufacturing facilities that may occasionally transfer power off-site during peak load events. Some commenters suggested that EPA clarify the Phase II rule to specify that it does not apply to facilities whose primary business is not power generation. Some suggested limiting applicability to specified SIC codes (*e.g.,* provided that the rule only applies to facilities in SIC 4911). Examples of facilities identified by commenters that they believe should be excluded from Phase II include manufacturers that produce electricity by co-generation, power generating units that predominantly support a manufacturer, *e.g.,* iron and steel, but also export some power, and facilities that generate power for internal use.

Commenters requested that EPA further clarify when repowering is subject to existing facility requirements. For example, some commenters viewed as inconsistent the fact that the addition of a generating unit at an existing single unit site could increase intake flows by 100% and meet the existing facility definition, while a replacement facility that increases intake flows by a much lesser amount (*e.g.,* 25%) would not meet the existing facility definition. These commenters suggested that EPA consider a facility as an existing facility unless changes to the facility result in new environmental impacts.

In § 125.91(a)(3) of today's rule, an existing facility is subject to this rule if its primary activity is either to generate and transmit electric power, or to generate electric power that it sells to another entity for transmission. This provision was included in the rule in response to comments such as those described previously in this section. EPA believes that this criterion—the primary activity being the generation of electric power—sufficiently clarifies and limits the scope of this rule to existing facilities whose primary business is power generation. As discussed in Section II of this preamble, the final rule does not apply to existing manufacturing facilities, including manufacturing facilities that generate power for their own use and transmit any surplus power, or sell it for transmission, provided the primary activity of the facility is not electric power generation. For example, in the case of a facility that operates its own power generating units and such units predominantly support that facility's manufacturing operation, its primary activity remains manufacturing, even if the facility exports some power. Whether a facility's primary activity is to generate electric power will need to be determined on a case-by-case basis. Section II also makes clear that a manufacturing facility is not covered by this final rule just because it is co-located with another Phase II facility.

EPA considered specifying SIC or NAIC codes to clarify the scope of the rule beyond that proposed in § 125.91(a)(3), but did not do so because it believes the changes in the final rule are sufficient to address many issues raised in comments and because of concerns that SIC and NAIC codes may change over time, which could unintentionally alter the scope of the rule.

With regard to repowering, section II of today's notice discusses the scope of the final rule and specifically discusses the repowering issue. Section II also addresses other Phase I versus Phase II classification issues.

2. Thresholds

Some commenters supported use of the 50 MGD design intake flow threshold and the 25 percent cooling water use criteria in § 125.91(a)(2) and (4), respectively. Some suggested that facilities agreeing to limit their actual intake to less than 50 MGD should be excluded from the rule's requirements or be allowed to request an exemption. Other commenters maintained that permitted or actual flows should be used rather than design flows. Some commenters asked that EPA clarify that, when applicable, the lesser design value of an intake facility and conveyance structure versus the design volume of intake pumps should be used to determine the 50 MGD threshold for applicability. Alternatively, others asserted that EPA should provide guidance that a facility's design intake flow is not necessarily the flow associated with that of the intake pumps.

Several commenters stated that emergency cooling water and emergency service water intakes should be exempt from the 50 MGD design intake flow threshold. These commenters recommended that EPA distinguish between primary cooling water intakes and emergency service water intakes, for example, at nuclear facilities. They reasoned that emergency service water systems, which can have a large design capacity (*i.e.,* design capacity greater than 50 MGD), generally use an intake that normally operates a nominal amount of time to ensure that the system is in working order. Such back-up systems are required for safety, but under normal conditions do not increase the operational capacity of the facility. Thus, these commenters maintain that rarely used emergency service water should not count towards 50 MGD.

With regard to the criterion that a Phase II existing facility must use at least 25 percent of the water it withdraws exclusively for cooling, some commenters indicated that proposed § 125.91(d), which describes how to measure whether 25 percent of water withdrawn is used for cooling, was ambiguous. Commenters asserted that EPA should not require monthly determinations of applicability of the Phase II rule. One commenter suggested that EPA should assess the 25 percent cooling water use on an annual basis calculated once during permit renewal, since such an approach would provide a high degree of certainty.

As discussed in the proposed rule (67 FR 17129–17130), EPA chose the design intake flow 50 MGD threshold to focus on the largest existing power generating facilities, which the Agency believes are those with the greatest potential to cause or contribute to adverse environmental impact. EPA estimates that the 50 MGD threshold would subject approximately 543 of 902 (60 percent) of existing power generating facilities to this rule and would address 90 percent of the total flow withdrawn by existing steam electric power generating facilities. The 25 percent threshold ensures that nearly all cooling water and the most significant facilities using cooling water intake structures are addressed by these requirements. EPA notes that Phase II existing facilities, which are limited to facilities whose primary activity is power generation, typically use far more than 25 percent of the water they withdraw for cooling. Yet, as in the new facility rule, cooling water that is used in a manufacturing process either before or after it is used for cooling would not count towards calculating the percentage of a facility's intake flow that is used for cooling purposes.

EPA has retained in the final rule the 50 MGD threshold based on design intake flow, rather than actual flow, for several reasons. Design intake flow is a fixed value based on the design of the facility's operating system and the capacity of the circulating and other water intake pumps employed at the facility. This approach provides clarity—the design intake flow does not change, except in those limited circumstances when a facility undergoes major modifications or expansion, whereas actual flows can vary significantly over sometimes short periods of time. EPA believes that an uncertain regulatory status is undesirable because it impedes both compliance by the permittee and regulatory oversight, as well as achievement of the overall environmental objectives. Further, using actual flow may result in the NPDES permit being more intrusive to facility operation than necessary since facility flow would be a permit condition and adjustments to flow would have to be permissible under such conditions and applicable NPDES procedures. It also would require additional monitoring to confirm a facility's status, which imposes additional costs and information collection burdens, and it would require additional compliance monitoring and inspection methods and evaluation criteria, focusing on operational aspects of a facility.

With regard to intake versus pump capacity, EPA notes that under § 125.93 of the final rule, design intake flow means the value assigned (during the cooling water intake structure design) to the total volume of water withdrawn from a source waterbody over a specific time period. Because numerous aspects of a cooling water intake or system can limit a facility's intake flow, and because flow is a critical factor that affects the impacts posed by each facility's cooling water intake structures, EPA has determined that it is more appropriate for the final rule to focus on a facility's total designed volume of water withdrawn over a period of time, rather than to condition applicability of the rule on more specific parameters, such as intake capacity or pump design, which individually do not fully determine total design intake flow.

The final rule does not explicitly exclude emergency cooling water and emergency service water intakes from consideration in determining which facilities are in-scope. Although EPA does not have detailed data on emergency cooling water and emergency intakes, based on other available data EPA does not believe that including consideration of emergency intakes within this rule significantly alters the scope of the rule. EPA's survey of all existing electric utilities and non-utilities indicated that 84 percent of surveyed facilities have an average flow that equals or exceeds 50 MGD. These facilities would by necessity have a design intake flow that also equals or exceeds 50 MGD. Moreover, EPA assumes that this average flow data represent normal operating conditions and does not include emergency cooling water use. Consequently, EPA believes that relatively few facilities are potentially affected by this issue.

Finally, § 125.91(a)(4), which describes how a facility must determine whether it meets the 25 percent cooling water use criterion has been changed in the final rule and provides that the percent of cooling water used be measured on an average annual basis. EPA believes this approach is more appropriate than making this determination on an average monthly basis, primarily because the annual average is an easier measurement to make. Furthermore, because all Phase II existing facilities generate power, most of the water will be used for cooling, rendering monthly evaluation of this value unnecessary. The final rule does not specify how often the facility must measure flow for this annual average. The facility is encouraged to consult the Permit Director to determine what level of data collection is needed.

B. Environmental Impact Associated With Cooling Water Intake Structures

Many comments addressed adverse environmental impact, questioning the definition and quantification of adverse environmental impacts. Several suggested defining adverse environmental impact exclusively at the population, community, or ecosystem levels, and believe that numbers of impinged and entrained organisms should not be a measure of adverse environmental impact. Some commenters argued that, if a facility can prove it does not cause adverse environmental impact at the population level, then it should be exempt from section 316(b) regulations. Commenters cited numerous studies to illustrate whether cooling water intake structures cause adverse environmental impacts and claimed that where abundance or biomass falls, it was usually the result of some other stressor (overfishing, pollution, etc). These commenters asserted that populations are able to thrive despite high rates of impingement and entrainment because of density-dependence and compensation.

Numerous other commenters disagreed with limiting the definition of adverse environmental impact to the population, community or ecosystem levels, and contended that any measure of impingement and entrainment constitutes adverse environmental impact. They asserted that power plants contribute to fish kills directly by impingement and entrainment, and indirectly by habitat loss. These commenters maintained that the results of population or ecosystem studies are highly subjective, and have no place in determining BTA, as once such impact levels are reached, recovery is often impossible. Regardless of the severity of adverse environmental impact, these commenters argued that section 316(b) requires minimization of adverse environmental impact. They maintained that cooling water intake structures contribute to fishery collapse and vast reductions in fish biomass and abundance that are measurable at the species level. These commenters suggested that actual national impacts due to cooling water intake structures are vastly underestimated due to poor data collection methodologies utilized when the majority of the studies were performed and because studies performed on impinged and entrained organisms overlooked the vast majority of affected species.

In today's final rule, EPA has elected not to define adverse environmental impact. EPA believes that it is reasonable to interpret adverse environmental impact as the loss of aquatic organisms due to impingement and entrainment. For a further discussion of this issue, see Section IV above.

With regard to the relationship between intake flow and adverse environmental impact, some commenters asserted that the relationship of impingement and entrainment to flow is such that catch rates increase non-linearly (exponentially) in relation to the volume of water withdrawn, with entrainment rates being more strongly correlated to flow than impingement. Environmental commenters advocated for flow reduction technologies, such as retrofitting closed-cycle cooling technologies, as the most direct means of reducing fish kills from power plant intakes; they assert that reducing intake by up to 98 to 99 percent would result in a similarly high reduction of impinged and entrained organisms. Other commenters insisted that there is no statistically significant relationship between catch rate and flow, and the mathematical models that evaluate this relationship are inaccurate.

EPA believes the record contains ample evidence to support the proposition that entrainment is related to flow (see DCN 2–013L–R15 and 2–013J) while impingement is related to a combination of flow, intake velocity and fish swim speed (see DCN 2–029). Larger withdrawals of water may result in commensurately greater levels of entrainment. Entrainment impacts of cooling water intake structures are closely linked to the amount of water passing through the intake structure because the eggs and larvae of some aquatic species are free-floating and may be drawn with the flow of cooling water into an intake structure. Swim speeds of affected species as well as intake velocity must be taken into account to predict rates of impingement in relation to flow in order to account for the ability of juvenile and adult lifestages of species to avoid impingement. Due to this relationship, EPA agrees that reducing intake by installing flow reduction technologies will result in a similarly high reduction of impinged and entrained organisms, but EPA believes that other technologies that do not necessarily reduce flow but that do reduce the number of aquatic organisms impinged and entrained will also minimize adverse environmental impact associated with cooling water intake structures. As such, today's rule provides for flexibility in meeting the performance standards.

C. Performance Standards

The performance standards promulgated today are expressed as reductions of impingement and entrainment measured against a calculation baseline. The purpose of a calculation baseline is to properly credit facilities that have installed control technologies prior to the promulgation of the rule. EPA received numerous comments on the performance standards and the calculation baseline.

1. Appropriate Standards

Many commenters discussed the appropriateness of the performance standards. While many commenters acknowledged that the performance range may be attained at some facilities (using certain technologies and in appropriate conditions), several commenters stated that the technical justification for the performance standards was insufficient and may be biased towards higher performing examples of each technology. Many commenters submitted that some technologies will perform at some sites, but that no technology will meet the standards at all sites. Another commenter supported the concept of the performance standards, as long as sufficient flexibility was retained through the use of restoration measures and cost tests. Some commenters suggested allowing permit writers the flexibility to create site-specific performance standards.

EPA has selected performance standards to facilitate a more streamlined permitting process, and to provide consistent national standards. EPA has chosen to express the targets by reference to a percentage reduction in impingement and entrainment because, as discussed above, these losses can easily be traced to cooling water intake structures. Therefore, this is a convenient indicator of the efficacy of controls in reducing environmental impact. As discussed in more detail below, it is also a useful basis against which to consider the efficacy of restoration technologies, which focus on the replacement of fish and shellfish as an alternative means of minimizing adverse environmental impact of intake structures.

Additional documentation has been collected and reviewed by EPA to further support the percent reductions contained in the performance standards. EPA has added this information to the Technology Efficacy database (DCN 6–5000), which EPA has expanded to allow users to query and compare basic data on technology performance and applicability. EPA recognizes that some may disagree with basing the performance standards on the wide range of data available in the database. While many documents do show a level of success in reducing impingement mortality or entrainment, other studies have shown the deployed technology to be unsuccessful or at best inconclusive. EPA does not view the varying degrees of success with regards to a specific technology as indicative that the performance standards cannot be met, but rather as evidence that some technologies work in some applications but not in others.

It is for this reason that performance standards, rather than prescriptive technologies, were chosen. By opting for performance standards instead of requiring the deployment of specified technologies, EPA maintains a desired flexibility in the implementation of the rule, thus allowing a facility to select measures that are appropriate to the site conditions and facility configuration. EPA believes that there are technologies available (including restoration measures) that can be used to meet the performance standards at the majority of facilities subject to the final Phase II rule. EPA believes that it will likely be the exceptional case where no technology or suite of technologies will be able to achieve the performance standards. This is not to say, however, that the technologies are always economically practicable to implement; there may be situations where the costs are not justified and it is for those situations that EPA has provided for site-specific determinations of best available technology for minimizing adverse environmental impact.

2. Application of the Performance Standards

Commenters generally noted that the application of the performance standards would be very difficult, for a number of site-specific reasons. Several commenters noted that the performance standards are not sufficiently defined to make a full evaluation of their applicability. For example, EPA has not defined the performance standards as being measured using all species or selected species, or by counting individuals versus measuring biomass. Some commenters noted that each of the methods discussed by EPA could have merit at a given facility, and that flexibility would be needed to evaluate compliance at a variety of intake configurations. Another commenter further noted that it is inappropriate for EPA to state that the performance standards are achievable when the standards are undefined. One commenter suggested that EPA has not shown that the performance standards can be met at a reasonable cost. Other commenters stated that reductions may be achievable for only some species of life stages and that this approach may not account for natural fluctuations in population. These commenters claim that implementing a uniform, nationwide performance standard would be exceedingly complex and subject to site-specific factors that could significantly affect the performance of the control technology. Several commenters noted that, for these reasons, EPA should strongly consider a site-specific approach to implement 316(b), including a risk assessment-based approach as suggested by one commenter.

A number of commenters stated that the performance standards would be best implemented as a set of goals or as a best management practice. These commenters contended that in view of the wide variety of environmental conditions at facilities, including natural fluctuations in populations, compliance with a national performance standard will be difficult. They claimed that by using the standards as a goal instead of a condition in the permit, a facility can have greater certainty as to its compliance status. Similarly, several commenters suggested that the permit contain conditions requiring proper technology selection, installation, maintenance, and adjustments instead of requiring compliance with the performance standards.

Commenters were divided over the concept of a range for the performance standards. Some commenters supported the range, arguing that a facility can achieve some reduction within the range and still be compliant, and others were opposed, claiming that a range of performance promotes uncertainty in determining compliance. Some commenters also noted that, by giving a facility a range of performance, EPA is encouraging performance in the lower end of the range and therefore not meeting the definition of ''best technology available.''

Several commenters noted that consideration of entrainment mortality is important to correctly determine compliance. One commenter also noted that natural events will affect compliance, such as moribund fish being swept into an intake or heavy debris loads following a storm.

As in the Phase I rule, EPA is setting performance standards for minimizing adverse environmental impact based on a conceptually simple and certain metric-reduction of impingement mortality and entrainment. EPA recognizes however, that there are challenges associated with measuring such reduction due to fluctuations in waterbody conditions (species abundance, composition, etc.) over time. While it is relatively straightforward to measure impingement mortality and entrainment reductions relative to past levels, it is more difficult to determine reductions relative to what would have occurred in the absence of control technologies if waterbody conditions change after the technologies are installed. Data provided with the proposed rule (DCN 4–0003) indicate that there is substantial variability over time in the numbers and species mix of impinged and entrained organisms at any given facility. While changes in operational practices and sampling methods account for some of this variability, the data indicate that there may be substantial natural variability in waterbody conditions as well. This natural variability and the changes to species composition over time may affect the ability of these technologies to perform consistently at a certain level. This is one reason why EPA has provided a compliance determination alternative under which facilities comply with the construction, operational, maintenance, monitoring, and adaptive management requirements of a Technology Installation and Operation Plan (or Restoration Plan) designed to meet the performance standards, rather than having to demonstrate quantitatively that they are consistently meeting them, which may be difficult in the face of natural variability. Under this approach, if monitoring data suggest that performance standards are not being met despite full compliance with the terms of the Technology Installation and Operations Plan or the Restoration Plan, the Plan will need to be adjusted to improve performance.

EPA has provided examples of facilities in different areas of the country sited on different waterbody types that are currently meeting or exceeding the performance standards promulgated today. The ability of these facilities to attain similar performance standards suggests that while site-specific factors can influence the performance of a given technology, it is the exceptional situation where no design or construction technology is capable of meeting the performance standards. EPA opted for performance ranges instead of specific compliance thresholds to allow both the permittee and the permitting authority a certain degree of flexibility in meeting the obligations under the final Phase II rule. EPA does not believe that performance ranges promote uncertainty. Instead, EPA has selected performance ranges out of the recognition that precise results may not be able to be replicated in different waterbody types in different areas of the country. EPA disagrees with the comment that it has not shown that the performance standards can be met at a reasonable cost. The cost and economic impact analysis for the final rule supports EPA's determination that the final rule, including the performance standards, are economically practicable at a national level. In addition, the final rule includes a site-specific compliance alternative to address any potential situation where meeting the performance standards, when evaluated on a facility-specific basis, would result in costs that are significantly greater than the costs considered by EPA, for a like facility in establishing the standards, or that are significantly greater than the benefits of compliance with the applicable performance standards at the facility. Thus, the final rule ensures that the costs of the rule are economically practicable to the extent required by section 316(b).

In developing the final rule, EPA identified and examined a broad range of cooling water intake structure technologies and determined, at a national level, that these technologies support the final performance standards. EPA notes that, although the performance standards address all life stages of fish and shellfish, the Director has significant discretion as to how the performance standards are applied in the permit. For example, the Director may determine that all species must be considered or that only representative species are to be considered. With regard to natural fluctuations in fish and shellfish populations, and the Technology Installation and Operation Plan compliance scheme discussed above addresses the concern that natural fluctuations could impact the level of impingement mortality and entrainment at a given facility over time. Further, the Director is given considerable discretion to determine, based on the facility's Comprehensive Demonstration Study, the appropriate averaging period and precise metric for determining impingement mortality and entrainment reductions. Generally, averaging over longer time periods (*i.e.*, a full five year permit term) can substantially reduce the impact of natural variability on the determination of whether the performance standards are being met.

3. Requirements by Waterbody Type

As stated in section C. 2, different performance standards would apply for facilities located upon different waterbody types. Comments were received both in support of and against basing performance standards in part on waterbody type. Some commenters did not support the withdrawal threshold of 5 percent of the mean annual flow for facilities on freshwater rivers, as the organisms at an intake may not be subject to entrainment or may not be evenly distributed. Some State commenters supported the withdrawal threshold for freshwater rivers, and another suggested correlating the intake flow requirements with the total flow of the waterbody to better protect smaller flow rivers. One State commenter generally opposed all of the proposed thresholds on freshwater rivers as being arbitrary and stated that the regulations would be more effective by considering the impacts to the population within the waterbody. For lakes and reservoirs, one commenter opposed the requirement to not disturb the thermal stratification of the waterbody, stating that the requirement has not been defined in sufficient detail, that EPA has presented no evidence that the disruption is always detrimental, or presented any discussion of technologies that might mitigate any thermal disturbances. Some commenters did not support additional controls on the Great Lakes, stating that the Lakes are not unique and do not require greater protection. Another State commenter suggested that additional requirements be implemented for any impaired waterbody.

EPA considers location to be an important factor in addressing adverse environmental impact and one expressly included in the language of section 316(b). When cooling water is withdrawn from sensitive biological areas, there is a heightened potential for adverse environmental impact, since these areas typically have higher concentrations of impingeable and entrainable aquatic organisms. Therefore, the final rule includes performance standards that vary, in part, by waterbody type. For example, estuaries and tidal rivers have a higher potential for adverse impact because they contain essential habitat and nursery areas for a majority of commercial and recreational species of fish and shellfish. Therefore, EPA believes that these areas warrant a higher level of control that includes both impingement and entrainment controls.

EPA also included performance standards for other waterbody types. Facilities withdrawing greater than 5% of the mean annual flow from freshwater rivers and streams will have additional requirements. As described in the Phase I proposed rule (65 FR 49060) and the Phase II NODA (66 FR 28853), the withdrawal threshold is based on the concept that absent any other controls, withdrawal of a unit volume of water from a waterbody will result in the entrainment of an equivalent unit of aquatic life (such as eggs and larval organisms) suspended in that volume of the water column. Thus, facilities withdrawing greater than 5% of the mean annual flow from freshwater rivers and streams may entrain equal proportions of aquatic organisms. Freshwater rivers and streams are somewhat less susceptible to entrainment than certain other categories of waterbodies and, therefore, the final rule limits the requirement for entrainment control in fresh waters to those facilities that withdraw the largest proportion of water from freshwater rivers or streams. EPA has promulgated special requirements for facilities withdrawing from lakes and reservoirs. Facilities tend to withdraw from the deeper portions of lakes and reservoirs, as these areas hold the coolest water. The rule specifies that the intake flows must not disturb the natural stratification (thermoclines) in the waterbody, as this may disrupt the composition of dissolved oxygen and adversely affect aquatic species. While such disruption is often detrimental, this additional performance standard does not apply where the disruption does not adversely affect the management of fisheries. Intake location, the volume of water withdrawn, and other design technologies can be used to address this requirement. Facilities located on the Great Lakes are also subject to additional requirements because these waterbodies have areas of high productivity and sensitive habitat and in this respect have an ecological significance akin to estuaries.

4. Approved Design and Construction Technology Option

In response to comments on the burden to facilities and permit writers, EPA is including in the final rule an approved design and construction technology option (previously referred to as a ''streamlined technology option'' or ''pre-approved technology option'') for facilities in certain locations. Under this option, a facility installing a specified technology would be subject to reduced application requirements, including a reduced Comprehensive Demonstration Study. In addition, the final rule sets forth criteria that State Directors may use to identify and approve additional technologies.

Nearly all commenters supported the concept of an approved design and construction technology option as a positive step in facilitating implementation of section 316(b). Several commenters added that this option should not preclude the use of cost tests, restoration measures or the use of other approaches. One commenter opposed the approved design and construction technology option, arguing that the selection of only one or two technologies oversimplifies the complexity of waterbodies, and that the approach would not be sufficiently protective.

Some commenters agreed that the wedgewire screen should be an effective technology in certain situations and noted that EPA should specify screen slot openings in the approved design and construction technology option. One of the commenters stated that research on the wedgewire screen suggests that the technology should easily meet the impingement requirements, but that further research may be necessary to confirm the effectiveness for entrainment reductions with varying slot openings.

Some commenters offered suggestions for additional changes to the option, such as developing scientifically sound, peer-reviewed criteria for evaluating pre-approved technologies, identifying the technologies in technical guidance documents as opposed to the regulation, and continuing to allow restoration measures. Some commenters also suggested specifying that any monitoring performed would be informational in nature and not affect the facility's compliance status, or that facilities only be required to ''substantially meet'' the stated goals. Other commenters suggested expanding the scope of the approved design and construction technology option to include prescribed operational or restoration measures or preapproved technologies for intakes located on man-made cooling reservoirs.

A facility that chooses to comply under the pre-approved technology option should not, in addition, need to employ restoration measures. The intent of the pre-approved technology compliance alternative is to provide a means to reduce the application and information collection requirements for facilities that are able to meet performance standards through a technology that is proven to meet performance standards for impingement mortality and entrainment in most cases. A facility that chooses to comply by meeting the conditions specified at § 125.99(a), therefore, should be able to achieve the performance standards for both impingement mortality and entrainment. Facilities that propose an alternative technology for consideration as a pre-approved technology under § 125.99(b) are encouraged by EPA to propose technologies to the Director for approval that are capable of meeting performance standards for both impingement mortality and entrainment with a high degree of confidence. However, a situation could arise where a pre-approved technology only meets performance standards for impingement mortality or entrainment. In such cases, facilities that choose to comply using an approved design and construction technology that only met a subset of applicable performance standards could either employ other (1) design and construction technologies, operational measures and/or restoration measures or (2) request a site-specific requirements for the remaining performance standards based on either the cost-cost or cost-benefit test.

Some commenters stated that EPA should specify the wedgewire screen slot opening size. EPA disagrees that it should specify a uniform screen slot opening size for all facilities that choose the approved design and construction technology alternative. The rule states in § 125.99(a)(1)(iv) that the screen slot size must be appropriate for the size of eggs, larvae, and juveniles of all fish and shellfish to be protected from entrainment at the site. Because the species to be protected differ among locations, the slot sizes will need to be tailored to the sizes of the various assemblages of species at each site. EPA therefore has determined that the Director should determine the appropriate design criteria, such as wedgewire screen slot opening size, on a case-by-case basis. Since no impingement mortality and entrainment Characterization Study is required under this streamlined option, EPA expects that this determination would be based on available information regarding species and life-stage composition of organisms within the receiving waterbodies. Facilities may wish to assemble available data and propose a screen slot opening size for the Director's consideration.

Some commenters stated that EPA should develop peer-reviewed criteria for evaluating pre-approved technologies other than the wedgewire screen technology described in § 125.99(a). EPA disagrees that it needs to develop specific criteria for evaluating pre-approved technologies. EPA believes that the Director is best equipped to determine the most appropriate technologies for approval in their jurisdictions, since these Directors are most familiar with the site-conditions and intake configurations of the facilities within their jurisdictions, and have physical access to the facilities. Under § 125.99, EPA has set forth a broad framework outlining the types of information that the permitting authority would need to evaluate specific technologies, including design criteria of the proposed technology, site characteristics and conditions necessary to ensure that the technology will meet the performance standards, and data to demonstrate that the facilities in the Director's jurisdiction with the proposed technology and site conditions will be able to meet the performance standards in § 125.94(b). EPA believes that the Directors will be able to evaluate the data and make determinations as to whether the proposed technologies are suitable for use as approved design and construction technologies in their jurisdictions. However, EPA is requiring that the Director take public comment on such determinations prior to finalizing them.

In answer to comments that EPA should not require facilities choosing the approved design and construction compliance alternative to demonstrate through monitoring that they meet the applicable performance standards, EPA disagrees. EPA believes that verification monitoring is very important because, while the pre-approved technologies are designed to meet the performance standards in most cases, the actual efficacy of any technology will be affected by site-specific circumstances and conditions, as well as proper operation and maintenance of the technology. For this reason, EPA believes that it is necessary and appropriate for these facilities to prepare a Technology Installation and Operation Plan that describes how they will operate and maintain the technology and assess success in meeting the performance standards, as well as adaptive management steps they will take if the technology does not perform as expected. They must also propose a Verification Monitoring Plan to describe the monitoring they will perform to support their performance assessment. EPA notes that facilities that select the approved technology alternative have significantly reduced application and information collection requirements relative to facilities that comply under other alternatives.

One commenter stated that the approved design and construction technology alternative will not be sufficiently protective given the complexity of waterbodies. While EPA does not agree with this comment, EPA recognizes that the efficacy of a given technology will be affected by site-specific conditions, such as biological and chemical factors in the waterbody. Because the efficacy of the technology will be affected by such site-specific conditions, EPA has required all facilities that choose to comply using the approved design and construction technology compliance alternative to submit a Technology Installation and Operation Plan and a Verification Monitoring Plan, and to determine if they are meeting the applicable performance standards through monitoring, and adjust their operations accordingly if they are not. EPA believes, based upon extensive research, that the majority of facilities with the appropriate site conditions, and that have installed and properly operated and maintained submerged cylindrical wedgewire screen technology, should be capable of meeting the performance standards set forth in § 125.94(b). For facilities that fail to meet performance standards through the approved design and technology alternative, the Director may amend the facility's permit to require the use of additional design and construction technologies, operational measures, and/or restoration measures, in order to meet the performance standards, or if appropriate, issue a site-specific determination of BTA.

5. Capacity Utilization Threshold

In the proposed rule, EPA introduced reduced requirements for facilities that are typically not operating year-round and would therefore bear a proportionately higher cost to comply with the rule. EPA proposed that facilities that operate less than 15% of the time (also known as peaking facilities) would only be subject to impingement reductions, regardless of the waterbody type upon which the facility is located.

Generally, commenters supported the concept of reduced requirements for peaking facilities. However, commenters stated that EPA must further refine the definition of peaking facilities and in many cases suggested that EPA adopt the United States Department of Energy's definition of capacity utilization. Aspects of EPA's definition on which commenters requested clarification included how to measure the capacity rate (per intake, per facility, per generating unit, etc.), the time frame for determining historic utilization rates, and the definition of ''available'' with respect to how to calculate the capacity utilization rate. One commenter further suggested that EPA allow an expanded definition (*i.e.*, a higher capacity utilization rate) for facilities that typically operate in periods of low abundance of entrainable organisms. One commenter further requested that the reduced requirements for peaking facilities be extended to account for future operations at the plant as well. Another commenter expressed concern over the definition of the threshold, as the operational time for the facility could still coincide with periods of high abundances of organisms and therefore still result in significant entrainment. One commenter opposed the threshold, stating it could encourage facilities to reduce electricity production in order to have less stringent requirements and therefore impact energy production, prices, and energy supply nationwide.

State commenters generally supported the concept, but were divided as to the threshold utilization rate; some States preferred a lower threshold and one mentioned that it would prefer a higher threshold. One State did not support the reduced requirements for peaking facilities, noting that the time frame in which the facility operates may be more important than the volume withdrawn. Another State suggested that restoration or mitigation also be required of peaking facilities.

EPA has identified peaking facilities in the final Phase II rule as those facilities that operate at an overall capacity of less than 15 percent. EPA believes that facilities operating below 15% should be subject to less stringent compliance requirements relative to a typical base load facility. The threshold of 15% is based on these facilities' reduced operating levels, low potential for entrainment impacts, and consideration of economic practicability (*see,* 67 FR 17141). To address commenter concerns, EPA has modified the capacity utilization definition to say that the capacity utilization rate applies only to that portion of the facility that generates electricity for transmission or sale using a thermal cycle employing the steam water system as the thermodynamic medium. The Agency has amended the definition of the capacity utilization rate threshold to remove the term ''available'' from the definition, as requested by comments. Further, the Agency has allowed for calculation of the capacity utilization rate on an intake basis, when the intake is exclusively dedicated to a subset of the plant's generating units, and for determination of the capacity utilization rate based on a binding commitment of future operation below the threshold.

Peaking facilities are typically older, less efficient generating units. Because the cost of operation is higher, peaking facilities are generally employed when generating demand is greatest and economic conditions justify their use. Such usage is typically a fraction of the unit's overall generating capacity and represents significantly less cooling water used when compared to the design intake capacity. This would appear to obviate the need for entrainment controls for the facility.

Most peaking facilities are employed during the highest electrical demand period, typically mid-winter or mid-summer. It is generally accepted that while these seasons can sometimes be associated with a higher abundance of aquatic organisms or spawning events, mid-winter and mid-summer are not typically considered to be critical periods for aquatic communities. Given these operating conditions, generally entrainment controls would appear to be an unnecessary cost for these facilities because the losses, while they occur, would have minimal adverse environmental impact.

D. Site-Specific Approach

Past implementation of section 316(b) often followed the draft guidance document published in 1977, which promoted a largely site-specific approach. In this rulemaking, EPA is establishing national performance standards for best technology available for minimizing adverse environmental impacts in connection with cooling water intake structures. Many comments were received regarding a site-specific approach to implementation.

1. Approach

Many commenters favored a site-specific approach in place of national performance standards. Many of the commenters cited a need for flexibility to comply with the regulations, and stated that only a site-specific approach can represent the best framework for addressing site-specific environmental impacts in a cost-effective manner. Commenters also favored an approach that resembles current practices for implementation of 316(b), in which site-specific determinations are made without reference to national performance standards.

Some commenters did not support the concept of a site-specific rule. One commenter stated that it does not fulfill a national standard and allows a more lenient application for some facilities. Another commenter added that a site-specific approach favors industry, as the resources of the regulators and interested public groups to respond to information-intensive site-specific determinations are limited. Some States also expressed concern over a site-specific approach, as it could be less stringent than the present approach, as well as more burdensome. Some other States expressed support for site-specific approaches.

In the final rule, EPA has established national performance requirements for the reduction of impingement mortality and entrainment that reflect best technology available to minimize adverse environmental impact for Phase II existing facilities, and has authorized five different compliance alternatives to achieve those standards, including a site-specific alternative. Thus, the Agency has provided both clear national standards of environmental protection and sufficient flexibility to allow for the selection of cost-efficient approaches to compliance and permit administration. In addition, under certain compliance alternatives, Phase II existing facilities can use restoration measures, either in lieu of, or in combination with technologies and/or operational measures, when design and construction and/or operational measures alone are less feasible, less cost-effective or less environmentally desirable. This provides additional flexibility to permittees and permitting agencies. Finally, as discussed in Section VII of this preamble, EPA does not agree that all aspects of certain site-specific approaches effectively fulfill the requirements of section 316(b).

2. Existing Programs and Determinations

Several commenters stated that there is already a successful 30-year history of implementing section 316(b). Some commenters noted that many States currently implement 316(b) using a site-specific approach and that these programs should be allowed to continue, including any restoration or enhancement programs the States have established. Others stated that existing BTA determinations (conducted using a site-specific approach) should remain valid.

EPA acknowledges that some States' existing programs and determinations have been successful in reducing adverse environmental impacts to waters of the United States associated with cooling water intake structures. EPA disagrees, however, that all existing BTA determinations should remain valid. Some historical BTA decisions may be based on physical, chemical or biological conditions that are no longer relevant at the site, or reflect BTA technology that is outdated and would not meet the performance standards set forth in today's final rule. However, the final rule provides for EPA approval of alternative State program requirements where such State NPDES requirements will result in environmental performance within a watershed that is comparable to the reductions of impingement mortality and entrainment that would otherwise be achieved under § 125.94. (*see* § 125.90(c)). Thus, this rule provides a reasonable degree of flexibility for States to implement existing effective programs. In § 125.94(e), States are also allowed to establish more stringent BTA requirements if necessary to comply with State, tribal, or other federal law.

E. Implementation

1. Calculation Baseline

Numerous commenters indicated that they were unclear as to how to calculate the baseline conditions for impingement mortality and entrainment. Some commenters suggested that the calculation baseline should reflect unrestricted operation at full design capacity year-round to avoid continually changing the baseline, since maintenance and operational schedules change over time. Another commenter added that the baseline definition must specify that data be based upon maximum operation of a given facility, to avoid allowing a facility to withdraw more water than it has been permitted for (based on an averaged flow). Other commenters claimed that the use of a calculation baseline was problematic due to the difficulties of extrapolation between localities and waterbody types. One commenter asserted that the calculation baseline should reflect current local environmental conditions, not historical or hypothetical future conditions and should specify the level of operation that would be maintained in the absence of operational controls implemented for reducing impingement and entrainment.

Many commenters supported an ''As Built'' alternative approach where a facility would calculate entrainment reduction based on historical measurements before installation of new technology or sampling immediately in front of the new technology and enumerating the organisms of a size that will pass through a standard 3⁄8-inch screen. Several commenters agreed that the use of historical data would aid in estimating the calculation baseline while others cautioned against the use of historical data that may not be relevant to the current conditions. One commenter disagreed with EPA's statement that the baseline could be estimated by evaluating existing data from a nearby facility; the commenter asserted that site-specific factors determine whether an organism will interact with a cooling water intake structure and/or survive the interaction. Overall, most commenters recommended that EPA allow the Director broad discretion and flexibility in evaluating the calculation baseline due to varying site conditions.

The calculation baseline provides a standard intake configuration by which facilities can determine relative reductions in impingement and entrainment. EPA acknowledges the numerous comments on the proposed definition and has refined the definition to provide more clarity in implementing this concept. For example, the definition in the proposed rule incorporated a shoreline intake structure. In the final rule, the definition has been clarified to specify a 3⁄8-inch mesh traveling screen at a shoreline intake structure. Based on available data that indicate this is a common intake structure configuration at Phase II existing facilities, EPA designated a 3⁄8-inch screen as the standard mesh size against which reductions will be calculated. Similarly, the assumption of no impingement or entrainment controls in the definition in the proposed rule has been clarified to describe an intake where the baseline operations do not take into include any procedures or technologies to reduce impingement or entrainment. EPA recognizes that some facilities may have control technologies in place that already reduce impingement or entrainment; the final calculation baseline would allow credit for such reductions. Additionally, EPA further clarified the definition to include the potential data sources that may be used in defining the calculation baseline, such as historical data, data collected at nearby locations, or data collected at the facility. EPA is authorizing the use of existing biological data in determining the calculation baseline to minimize the impacts to facilities, provided that the data are representative of current facility and/or waterbody conditions (as applicable) and were collected using appropriate quality control procedures.

EPA has further clarified the definition to provide that the calculation baseline may be based on an intake structure located at a depth other than a surface intake if the facility can demonstrate that the standard definition (*i.e.,* a shoreline surface intake) would correspond to a higher baseline level of impingement mortality and/or entrainment.

EPA chose not to incorporate operating capacity into the calculation baseline, as the definition is not dependent upon intake flow volumes. EPA has chosen to adopt the ''as built'' approach: as stated in § 125.93, a facility may choose to use the current level of impingement mortality and entrainment as the calculation baseline.

EPA recognizes that this definition cannot address the variety of intake configurations and other conditions at all facilities and therefore cannot define the calculation baseline in all settings. However, EPA believes that the calculation baseline in the final rule is clear and straightforward to implement, and allows for proactive facilities (*i.e.*, those with control technologies, operational procedures, or restoration measures already in place) to take credit for existing measures.

2. How Will Attainment of the Standards Be Measured?

At the time of the NODA, EPA was evaluating several approaches for measuring success in meeting performance standards. EPA therefore requested comments on whether performance should be measured based on an assessment of the impacts to all fish and shellfish species (''all-species approach'') or to fish and shellfish from only a subset of species determined to be representative of all the species that have the potential to be impinged or entrained (''representative species approach''). These comments are addressed under section 2. a below. Several terms to describe the representative species approach have been used historically. To avoid confusion among the terms ''representative indicator species,'' ''representative important species,'' and ''critical aquatic organisms,'' EPA is adopting the term ''representative species'' for the purpose of simplicity in this section. EPA also requested comment as to whether enumeration of organisms or biomass should be used as the metric for measuring success in meeting the performance standards. These comments are addressed in section 2. b below. With regard to counting absolute numbers of organisms, EPA also requested comment on the option of counting undifferentiated organisms (*i.e.*, counting without specifying taxonomic identification).

After attempting to select optimal approaches for both the scope and metric to use in determining attainment of the performance standards, EPA has determined site-specific factors such as biological assemblage at the site, intake location, and waterbody type must be factored into decisions regarding how to evaluate attainment. EPA has therefore decided that, in its Verification Monitoring Plan (125.95(b)(7)), the facility must propose, among other things, the parameters to be monitored for determining attainment. The Director will be best suited to review and approve proposed parameters for each facility on a case-by-case basis.

a. Scope of Evaluation: All-Species Consideration vs. Representative Species

Several commenters supported the use of a representative species evaluation, as opposed to the all-species evaluation, as the most practical approach in many cases. Another commenter stated that even with the representative species approach, factors other than simply numeric reduction in impingement mortality and entrainment must be considered when determining attainment. On the other hand, one commenter stated that an ''all species'' approach could make compliance demonstrations simpler and somewhat less expensive so long as the taxonomic identity of collected organisms is not required. The commenter noted that this would not be appropriate, however, in cases where taxonomic identification is needed, such as where eggs and larval stages are converted to age-1 equivalents.

As part of the representative species inquiry, EPA also requested comment on whether 10 to 15 species might be an appropriate number of representative species to protect all species and ecosystem functions at a facility. One commenter responded, stating that 15 was too large a number. This commenter suggested that a demonstration should focus on the four or five species and add to the list only if there was another species of special concern.

In response to the commenter who suggested that EPA should evaluate factors other than reduction in numbers of organisms impinged or entrained, EPA has selected several means by which to determine compliance with section 316(b) requirements. For facilities that choose to demonstrate compliance with the performance standards, the metric that will be used to evaluate compliance with the performance standards is the facility's reduction of impingement mortality and entrainment through the installation of design and control technologies and/or operational measures. For these facilities, compliance may then be measured against a facility's calculation baseline, which the facility estimates and submits with its permit application package. The calculation baseline is defined at § 125.93. For facilities that choose to use compliance with the terms of a Technology Installation and Operation Plan or Restoration Plan to determine compliance, the degree of success in meeting performance standards is still an important criteria for determining if adaptive management is needed, but it would not be the basis for determining compliance. For facilities that choose to use restoration measures, attainment of performance standards will be based upon whether the production of fish and shellfish from the restoration measures is substantially similar to the level of fish and shellfish the facility would achieve by meeting the applicable impingement and/or entrainment requirements. If a facility has been approved for a site-specific determination of best technology available, the Director will establish alternate requirements accordingly. EPA expects that a variety of factors will be considered in determining the appropriate compliance option for a facility, such as waterbody type, intake location, percentage withdrawal of mean annual flow of rivers or streams, capacity to upset thermal stratification in lakes, a facility's calculation baseline, and the appropriateness of existing or proposed protective technologies or measures.

EPA agrees that a single approach may not be optimal in all cases. The Agency has therefore not prescribed the methods (including a metric) for assessing success in meeting performance standards in today's final rule. Rather, the Director must determine whether a clearly defined all-species approach or representative species approach is appropriate on a case-by case basis, based upon the information and proposed methods presented by the facility. The Director may choose to require evaluation of all species or of certain representative species.

In response to comments regarding EPA's suggested number of representative species, the facility will propose the number of species to monitor, as well as decisions regarding species and life stages to monitor, for review and approval by the Director as part of Verification Monitoring Plan (125.95(b)(7)), Technology Installation and Operation Plan (125.95(b)(4)(ii)), and, if applicable, the Restoration Plan required at 125.95(b)(5). As such, in cases where the representative species approach is applied, the Director may approve the number of representative species proposed by the facility, based upon the specifics of the waterbody from which the facility is withdrawing, the percentage volume of water withdrawn relative to the freshwater river or stream (as applicable), and other factors.

b. Metric: Absolute Counts vs. Biomass

EPA requested comment as to whether species impinged or entrained may be measured by counting the total number of individual fish and shellfish, or by weighing the total wet or dry biomass of the organisms. In response to the use of absolute counts of organisms or biomass (weight) for determining compliance, commenters offered a variety of views. Regarding the use of biomass as a metric, one commenter expressed that measuring either biomass or total undifferentiated numbers of species would be appropriate for cases where restoration was the chosen option, since restoration will never result in one-for-one species compensation. Several commenters pointed out a disadvantage of counting numbers of organisms: early life stages will dominate the numbers and thereby dominate the compliance determination, even though most of them would have suffered large natural mortality losses even without entrainment. To correct for this, a few commenters suggested identifying the organisms and converting them to an equivalent unit to ensure that each life stage is appropriately weighed. Specifically, one commenter suggested converting to equivalent juveniles, when measuring organisms by biomass, to correct for the fact that the count will be dominated by later larval stages even though the number of these organisms per unit weight will be small compared to eggs and larvae. This commenter continued that this approach would be useful for forage species, since biomass is an appropriate measure of the organisms that serve as a food source for commercial and recreational species.

EPA received many comments regarding the need for flexibility in determining the appropriate metric to use to determine attainment of performance standards. Several commenters asserted that the rule should allow flexibility in the approach and the choice of metric should factor in whether one is assessing impingement mortality, entrainment or both; species and life stages affected, and compliance option.

EPA has decided to give the Director the authority to review and approve methods of determining compliance proposed by the facility as part of the Verification Monitoring Plan. (125.95(b)(7)), Technology Installation and Operation Plan (125.95(b)(4)(ii)), and, if applicable, the Restoration Plan required at 125.95(b)(5). Thus, the facility will propose, and the Director will review and approve, species and life stages of concern. The Director may choose to require evaluation of all species or of certain indicator species; or the Director may elect to verify attainment of performance standards using biomass as a metric. EPA believes that as each situation will be somewhat unique, it should be left to the facility to propose and the Director approve the appropriate unit, biomass or actual counts.

c. Other Means of Determining Attainment of Performance Standards

Several commenters also suggested that EPA should allow for the use of existing data for measuring attainment in lieu of requiring existing facilities to collect and develop new data. Commenters also suggested that if a facility currently implements the best technology available to minimize adverse environmental impact, it should be found in compliance even if the newly promulgated performance standards are not being met. Other commenters expressed that a facility should be considered in compliance even during occurrences of unavoidable episodic impingement and entrainment events. These commenters stated that in such unusual circumstances, the facility should be provided with an exemption from any regulatory actions.

EPA agrees with commenters that under certain circumstances, facilities' historical data may be sufficient to verify that they are meeting performance standards, as long as the historical data is reflective of current operation of the facility and of current biological conditions at the site. For example, under compliance alternative 2, a facility may use historical data to demonstrate that existing design and construction technologies, operational or restoration measures, meet the performance standards. EPA also believes that some historical data may be appropriate for determining the calculation baseline and for characterizing the nature of impingement and entrainment at the site, and therefore has given the Director the discretion to determine whether historical data are applicable to current conditions (see 125.95(b)(1)(ii), 125.95(b)(2)(i), and 125.95(b)(3)(iii)). In addition, a facility that proves, using existing data, that it has reduced its intake capacity commensurate with closed-cycle recirculating systems would be considered to be in compliance, and therefore would not be required to meet the performance standards for either impingement mortality or entrainment.

After the first permit term, facilities may submit a request for reduced information collection activities to their Director. Facilities that are able to demonstrate that conditions at their facility and in the waterbody from which their facility withdraws surface water are substantially unchanged since their previous permit application will qualify for reduced requirements (§ 125.95(a)(3)). In all these cases, historical data are used and required to measure success in meeting performance standards. However, facilities required to submit a Verification Monitoring Plan must still submit verification monitoring data for at least two years following implementation of technologies and/or operational measures.

Other commenters argued that a facility that is implementing permit conditions reflecting a historical determination of the best technology available should be considered in compliance with today's final rule even if the facility is not meeting performance standards. EPA disagrees that a historical determination of the best technology available is appropriate for complying with the requirements set forth by today's rule. Many historical determinations of the best technology available are less protective of aquatic organisms and ecosystems than the standards set by today's rule, and would undermine the national performance standards that EPA has determined reflect the current best technology available for minimizing adverse environmental impact. Furthermore, biological, chemical and physical conditions at the facilities may have changed since the earlier determinations were made, and the best technology available determinations may no longer apply. Many of the historical best technology available determinations are twenty years old or older and may not correspond with current waterbody or operating conditions.

The question whether a facility should be considered in compliance even during occurrences of unavoidable episodic impingement and entrainment events is left to the Director. At the Director's discretion, facilities that are generally in compliance, but that experience an unusual peak of impingement mortality and/or entrainment, may be considered to still be in compliance on the basis of past good performance. Moreover, the inclusion of a compliance determination alternative based on a Technology Installation and Operations Plan in the final rule also addresses these episodic issues.

d. Monitoring

One commenter stated that monitoring frequencies should be established to address the inherent variability in the rates in impingement and entrainment over the seasons of the year. Monthly or biweekly monitoring is probably appropriate in many cases. The same commenter stated that standard statistical procedures could be followed to establish sample sizes needed to establish appropriate levels of precision in the estimates (*e.g.,* 95% confidence intervals within 15–25% of the mean). In contrast, another commenter pointed out that weekly sampling would be necessary to determine compliance, as had been necessary for the Salem facility. Another commenter suggested that the most cost-effective way of conducting studies would be over the periods of peak abundance.

Some commenters stated that facilities should be allowed to cease monitoring following achievement of the performance standards. Some suggested that facilities meeting performance standards through a closed-cycle cooling system should be exempt from monitoring. Another commenter disagreed with the two-year monitoring requirement altogether.

EPA has determined that a uniform averaging period would not be appropriate; rather, the Director will be best suited to make all such determinations by evaluating these and other factors for each facility on a case-by-case basis. The Director will be able to make determinations regarding averaging periods based upon site-specific factors, such as biological assemblage at the site, annual and diel fluctuations in concentration and populations present, and the selected compliance alternative. EPA disagrees that a facility should cease monitoring once performance standards are achieved, as site-specific conditions at any facility are bound to change with time, affecting a facility's ability to achieve performance standards. EPA agrees that facilities meeting performance standards through flow reductions commensurate with closed-cycle cooling should be exempt from monitoring (see § 125.94(a)(1)(i)). Finally, EPA believes that the two-year monitoring requirement is appropriate so that any site-specific variability in impingement and entrainment rates can be detected.

e. Timing

Some States favored flexibility in implementation including delaying the effective date for permits to be renewed soon after the rule is finalized. Some commenters suggested that the requirements of the rule must be timed so that facilities are not forced into a period of noncompliance because of the time needed to determine, design, and install new intake technology.

One commenter expressed that implementation schedules are too strict. Along the same vein, another commenter suggested that EPA should build flexibility into the implementation schedule so that facilities are not forced into periods of noncompliance.

Commenters generally wanted to see flexibility in the averaging periods (time increments for determining success in meeting the percent reduction or production specified by the performance standards and restoration requirements in § 125.94,) and a way to tailor the sampling schedules to the needs of the site. These commenters indicated that the monitoring should be frequent enough to provide useful information, but not so intensive as to make the program unnecessarily costly or time-consuming. Furthermore, several recommended that a compliance schedule be written into the permits, to allow facilities to install and test new equipment. Several commenters agreed that different facilities might require different amounts of time, as dictated by where they are in the cycle and what their circumstances are.

EPA has provided for time to comply with permitting requirements. A facility whose permit expires more than four years after the date of publication of this final rule must submit the required information 180 days before the expiration of their permit. A facility whose permit expires within four years of the date of publication of this final rule may request that the Permit Director establish a schedule for submission of the permit application. Such submission should be as expeditiously as practicable, but no later than three and one-half years from the date of publication of this final rule. It is expected that the time that facilities need to comply with permitting requirements will be variable, ranging from one year for those not needing to do an impingement mortality and entrainment study to over three years for those needing to collect more than one years worth of impingement and entrainment data.

EPA has also provided that facilities may opt to comply with the Technology Installation and Operations Plan compliance scheme that allows facilities who properly implement the Technology Installation and Operations Plan (or Restoration Plan, as applicable) to be considered in compliance with the requirements of § 125.94. As indicated above, the final rule provides the Director the flexibility to establish an appropriate averaging period to meet the particular situation present in the waterbody within which the facility is located.

3. Entrainment Survival

EPA invited comment on whether to allow Phase II existing facilities to incorporate estimates of entrainment survival when determining compliance with the applicable performance standards. Commenters responded with numerous comments regarding survival with respect to the performance standards as well as comments regarding EPA's assumption of zero percent entrainment survival (100 percent mortality) in the benefits assessment for today's rule.

Some commenters opposing the zero percent survival assumption argued that in the event a facility can demonstrate entrainment survival, it should be awarded credits towards meeting performance standards. EPA disagrees. Today's final rule sets performance standards for reducing entrainment rather than reducing entrainment mortality. EPA chose this approach because EPA does not have sufficient data to establish performance standards based on entrainment survival for the technologies used as the basis for today's rule. If EPA had incorporated entrainment survival into any of its conclusions regarding the appropriate performance standards, then the actual performance standard would most likely have been higher.

Many commenters argued that in many cases organisms survive entrainment and the zero percent survival assumption was too conservative. Some commenters suggested that EPA was biased in its approach to entrainment survival. For example, one commenter stated that EPA was biased as a result of relying heavily on old entrainment survival literature.

Based on its review of all entrainment survival studies available to the Agency, EPA believes that its assumption of zero percent survival in the benefits assessment is justified. The primary issue with regard to the studies EPA reviewed is whether the results can support a defensible estimate of survival substantially different from the value zero percent survival assumed by EPA. The review of the studies has shown that while organisms are alive in some of the discharge samples, the proportion of the organisms that are alive in the samples is highly variable and unpredictable on a national basis. In addition, some studies contain various sources of potential bias that may cause the estimated survival rates to be higher than the actual survival rates. For these reasons, EPA believes the current state of knowledge does not support reliable predictions of entrainment survival that would provide a defensible estimate for entrainment survival above zero at a national level. However, today's final rule does allow facilities to use the results of a well-constructed, sites-specific entrainment survival study, approved by the Director, in their benefits assessments when seeking site-specific entrainment requirements. The permitting authority must review and accept the study before the results may be incorporated into the benefits assessments. In cases where there is uncertainty in the survival rates, permitting authorities may want to specify that benefits be presented as a range that reflects this uncertainty.

4. Comprehensive Demonstration Study (CDS)

a. Requirements and Burden

The majority of commenters expressed two concerns regarding the CDS: (1) it was too burdensome and costly, and the volume of information required was too overwhelming, and (2) several components required clarification. These commenters generally suggested that the costs of such a study were underestimated, and many indicated that the cost estimates for completing the CDS contained misleading or incorrect information. Commenters indicated that the information required for completing the CDS was similar to the data that would be needed for implementing a purely site-specific approach and was therefore overly burdensome. Commenters suggested that EPA require a more simplified demonstration study or waive the requirement for facilities that select one of the approved technologies. Some commenters suggested, in general, that costs could be greatly reduced by streamlining this process, for example, by exempting facilities from certain components based on (1) facilities that have proven that they are not harming the aquatic community, and (2) facilities for which there exists relevant historical data.

Several States anticipated that the majority of their facilities were likely to choose the site-specific compliance alternative, and indicated that a rule that requires cost/benefit analyses for many decisions would be difficult to administer and require significant resources to implement. They claimed that the site-specific performance standards compliance option would impose a substantial review burden and would require specialized expertise. Some States questioned whether existing permitting staff resources over the first 5 years will be sufficient to review material and develop permit requirements.

Many commenters suggested that EPA could lower costs by streamlining the CDS, exempting facilities that are not causing adverse environmental impact or have historical data, and waiving the monitoring components for facilities that have installed approved technologies.

EPA believes that many efficiencies have been added to the rule since the proposal and the NODA to address concerns that the CDS is too burdensome and costly. First, EPA has provided five compliance alternatives to choose from, one of which allows a facility to install an approved design and construction technology with minimal CDS requirements. In addition, facilities with design intake flow commensurate with closed-cycle recirculating systems are exempt entirely from the CDS; facilities may only have to submit partial CDS information if they have reduced their design intake velocity to less than or equal to 0.5 feet per second and are only required to meet requirements as they relate to reductions in entrainment. In addition, requiring an early submission of the Proposal for Information Collection allows the Director to potentially minimize the amount of information required by the facility. Also, by allowing the use of historical data, EPA has minimized costs for many facilities. In the cases where new studies are required, EPA has given the permittee and the Director discretion to set conditions for the studies which will not be overly burdensome. Facilities may also reduce costs incurred through the information collection process in subsequent permit terms by submitting, one year prior to expiration of the existing permit, a request for reduced permit application information based on conditions of their cooling water intake structure and waterbody remaining substantially unchanged since the previous permit issuance.

One commenter expressed concern that historical data should not be allowed in the development of the CDS, as it may not accurately reflect current conditions. EPA believes that some historical data may be appropriate for determining the calculation baseline and for characterizing the nature of impingement and entrainment at the site, and therefore has given the Director the discretion to determine whether historical data are applicable to current conditions. EPA expects to provide guidance to Directors to help them make determinations about historical data submitted by facilities. Historical data will not be used to determine attainment of performance standards; this will be verified through a monitoring program approved by the Director.

b. Timing of Submitting Information

Commenters submitted a variety of opinions about timing. Generally, most favored limiting the submittal of CDS components to a frequency equal to or greater than once every five years (one permitting cycle) to reduce burden. Another commenter argued that there is no reason to mandate timing, and that approval of the Director should not be necessary. Other commenters suggested that a time frame is necessary, and that the information should be submitted with the renewal application for a NPDES permit. Numerous commenters asserted that consultation activities should occur prior to development of the Comprehensive Demonstration Study; that schedules and requirements should be specified in the permit for various data collection, analysis, and application submission activities; implementation schedules are too strict; and monitoring requirements need clarification. Yet another commenter suggested to ‘‘start the clock’’ with the issuance of the renewed permit. Commenters also indicated that anywhere from one year to several years might be necessary to verify success in meeting the performance standards. Several commenters suggested that given the nature of cooling water intake impacts and the proposed requirements, section 316(b) permit and BTA determinations should not be made every five years. Instead, they suggested that one-time determinations should suffice, or that facilities should be allowed to rely on previous section 316(b) demonstrations if conditions remain essentially unchanged. There was also some general confusion as to when the rule would actually become effective.

In response to the comment that EPA should not request submittal of CDS components more frequently than every five years or more, EPA has included a provision whereby a facility may be granted reduced CDS submittal requirements if it can prove that conditions at the facility and in the waterbody have not substantially changed. Facilities will be required to review whether conditions, such as biological, chemical or physical conditions, have substantially changed at each permit renewal cycle. If conditions have changed, facilities will be required to submit all of the relevant CDS components (those that would be affected by the changed conditions when they submit the application for permit renewal.

One commenter stated that the CDS should be a one-time submittal. EPA disagrees that all components of the CDS should only be researched and submitted a single time for the lifetime of the facility, regardless of potential changes in the plant and/or waterbody, because the natural and anthropogenic changes that occur in waterbodies over time may affect a facility’s ability to meet performance standards using the current design and construction technologies, operational measures, and/or restoration measures in place.

In response to comments that timing was not clear in previous versions of the rule, EPA agrees, and has clarified timing issues in today’s final rule. A facility whose permit expires more than four years after the date of publication of this final rule must submit the required information 180 days before the expiration of their permit. A facility whose permit expires within four years of the date of publication of this final rule may request that the Permit Director establish a schedule for submission of the permit application, but that such submission should be as expeditiously as practicable, but no later than three and one-half years from the date of publication of this final rule. It is expected that the time that facilities need to comply with permitting requirements will be variable, ranging from one year for those not needing to do an impingement mortality and entrainment study to over three years for those needing to collect more than one years worth of impingement and entrainment data.

Some commenters felt that decisions about the timing of the CDS submittal should be left to the Director. EPA agrees and has provided only that the proposal for information collection should be submitted prior to the start of information collection activities, but that the facility may initiate information collection prior to receiving comment from the Permit Director. All other components of the Comprehensive Demonstration Study must be submitted 180 days prior to permit expiration except as noted above for the first, permit term following promulgation of the rule.

5. State Programs

Many States requested that existing State section 316(b) programs be allowed to be used to meet the requirements of Phase II. One commenter asserted that the Phase II rule should not overturn past State section 316(b) decisions at existing facilities that were made on a site-specific basis and that examined the impacts of the cooling water intake structure in relation to the specific biological community. Several commenters stated that EPA did not sufficiently recognize the work already done by the States in implementing section 316(b). Several commenters do not believe that a State should have to demonstrate that its program is ''functionally equivalent'' to today's rule (*i.e.,* that its alternative regulatory requirements achieve environmental performance within a watershed that is comparable to the reductions of impingement mortality and entrainment that would otherwise be achieved under § 125.94).

In response to comments about existing State section 316(b) programs, EPA believes that § 125.90(c) in today's rule, by allowing alternative State programs, acknowledges the work already done by States. In response to the comment that a State should not have to prove that its program achieves environmental performance comparable to those that would be achieved under § 125.94, EPA disagrees. While EPA is giving significant flexibility to permitting agencies at the State level to determine how and what each facility must protect and monitor, it believes it is important to set uniform national performance standards.

F. Restoration

In the proposed rule EPA requested comments on the use of restoration measures by facilities within scope of the rulemaking (67 FR 17146). EPA received diverse comments. Many commenters supported a role for restoration measures. Several commenters stated that allowing restoration provides additional flexibility to those who must comply with the section 316(b) requirements, and may provide a more cost-effective means of minimizing adverse environmental impact than operational measures or design and construction technologies. Other commenters stated that restoration is a well-accepted concept that should have a voluntary role in section 316(b) determinations and constitutes an appropriate means for reducing the potential for causing adverse environmental impact. Several commenters felt that restoration could provide significant benefits in addition to compensating for impingement and entrainment losses. A number of commenters requested flexibility in the implementation of restoration projects. Some commenters stated that restoration should not be limited to supplementing technology or operational measures, but should instead be allowed as a complete substitute for such measures. However, other commenters stated that restoration measures should only be used once every effort has been made to use technology to avoid impacts.

Commenters further stated that restoration should not be mandatory and that EPA lacks authority under section 316(b) to require it, but also asserted that it should have an important role in section 316(b) permitting decisions. Commenters also stated that restoration should not be considered the best technology available for minimizing adverse environmental impact because it is not a technology that addresses the location, design, construction, or capacity of a cooling water intake structure. However, one commenter argued that past restoration measures should be considered during a regulator's determination of whether or not adverse environmental impact is occurring from a cooling water intake structure.

Other commenters felt restoration should have a limited role or no role in the context of section 316(b). One commenter wrote that restoration measures, in the context of section 316(b), are generally unworkable and that the only measurable restoration method would be offsetting, in which an applicant stops use of an older intake facility that does more harm than the proposed one. One commenter stated that restoration methods must reproduce the ecological value of lost organisms and that they have not seen restoration projects adequately successful in this manner in their region of the country. Many commenters pointed out uncertainties associated with compensating for those organisms impacted by a cooling water intake structure through restoration.

Some commenters suggested that, if restoration is allowed, there should be consultation with other State and Federal resource agencies to avoid inconsistent approaches and to provide useful information on the affected waterbody.

Several commenters remarked on EPA's proposal to include requirements for uncertainty analysis, adaptive management plans, and peer review in the final rule. Some commenters were in favor of the requirements and felt that they would enhance restoration measure certainty and performance. Some commenters were concerned that the requirements would be overly burdensome or would overly restrict the restoration measure options available to permit applicants.

EPA has retained restoration in the final rule and believes that the restoration requirements strike an appropriate balance between the need for flexibility and the need to ensure that restoration measures achieve ecological results that are comparable to other technologies on which the performance standards are based. Facilities that propose to use restoration measures, in whole or in part, must demonstrate to the Director that they have evaluated the use of design and construction technologies and/or operational measures and found them to be less feasible, less cost-effective, or less environmentally desirable than meeting the applicable performance standards in whole or in part through the use of restoration measures. The requirement to look at design and construction technologies and/or operational measures in order to ensure that facilities give due consideration to the technologies on which the performance standards are based.

Facilities must also demonstrate that the use of restoration measures achieves performance levels that are substantially similar to those that would be achieved under the applicable performance standards. To address concerns regarding the uncertainty of restoration measures, EPA has included, among other things, requirements for uncertainty analysis, adaptive management plans, monitoring, and peer review, if requested by the Director. Finally, EPA does not believe the requirements for restoration measures are overly burdensome or prescriptive as there is a need to ensure that these types of measures achieve the anticipated environmental benefit. Moreover, under the rule, facilities are provided at least three and one-half years to submit their restoration plan and complete the required studies.

G. Costs

1. Facility-Level Costs

Generally, commenters were split regarding the national costs of the rule. Industry commenters stated that the cost analysis presented in the proposal underestimated the compliance costs in several facets of the analysis, including capital costs of the technology, the site-specific contingencies associated with retrofitting, and facility down time. Several commenters stated that EPA underestimated the costs for the monitoring requirements for both the characterization study in the permit application and for verification monitoring. Other commenters generally stated the opposite, arguing that EPA overestimated the compliance costs, especially for installing cooling towers. Some commenters stated that costs should not be a consideration in section 316(b) determinations.

The Agency significantly revised the approach to developing costs for the NODA. Those revisions incorporated some of the comments on the costing methodology for technologies that reduce impingement and entrainment. EPA's approach to estimating the costs of the requirements of the final rule reflect the NODA comments on the revised methodology, and additional analyses. EPA, however, did not revise its estimates for cooling towers subsequent to the NODA because it decided not to further pursue this regulatory option for the reasons outlined more specifically in Section VII. EPA believes that our costing of cooling tower technology is appropriate as it is based on vendor and engineering firm experience in developing costs for Phase II facilities.

2. Market-Level Impacts

Numerous industry commenters stated that EPA significantly underestimated the impacts to generators, consumers, reliability, and energy supply. EPA disagrees with these commenters. EPA performed an analysis of facility- and market-level impacts (including impacts to generators, consumers, reliability, and energy supply) using the Integrated Planning Model (IPM®), which has been widely used in air quality regulations and in other public policy arenas affecting the electric power generation industry.

One commenter stated that the IPM analysis does not account for the economic impacts of other regulatory programs. EPA disagrees with this assertion. The IPM base case accounts for costs associated with current federal and state air quality requirements, including future implementation of SO_2 and NO_X requirements of Title IV of the Clean Air Act and the NO_X SIP call as implemented through a cap and trade program. Because of its relative newness, it does not account for costs associated with the Phase I facility regulations.

One commenter stated that EPA justified the rule by using a cost-to-revenue comparison and that this comparison neither measures profitability nor represents the most efficient economic solution for each facility. As discussed in Section VII. above, the economic practicability of the Phase II regulation is based on the electricity market model analyses using the IPM, not the cost-to-revenue ratio. The cost-to-revenue ratio is only one of several additional measures EPA used to assess the magnitude of compliance costs.

Some commenters stated that EPA did not properly take account of differences between utilities, which own and operate rate-based facilities, and nonutilities, which own and operate competitive generating facilities. EPA disagrees with this comment. EPA believes that in a deregulated market, the distinction between utilities and nonutilities is no longer relevant. While such a distinction may have been important in the past, when only a few unregulated nonutilities competed with regulated utilities, this is no longer the case. The share of Phase II facilities that are owned by unregulated entities has increased from 2 percent in 1997 to 31 percent in 2001. By the time the final rule will take effect, even more Phase II facilities that currently operate under a rate-based system will be operating in a competitive market. Furthermore, EPA does not believe that nonutilities will be differentially impacted compared to utilities, even in the case that deregulation might not have taken effect in all markets by the time this rule is implemented. Competitive pressures, even in regulated environments, will reduce the ability of utilities to pass on costs to their consumers.

Some commenters stated that small or publicly owned facilities may be significantly affected. EPA disagrees with this statement. EPA's SBREFA analysis showed that this rule will not lead to a significant economic impact on a substantial number of small entities (See Section XIII.C below). While municipally owned facilities bear a relatively larger compliance cost per MW of generating capacity than do facilities owned by other types of entities, EPA's analyses show that these costs are not expected to lead to significant economic impacts for these facilities.

Some commenters stated that even a requirement to convert all facilities to closed-cycle cooling would not significantly affect energy supply and that the costs to facilities and consumers is small and in some cases, overstated by EPA's analysis. EPA disagrees with this statement. EPA considered several options that would require some or all facilities to install closed-cycle recirculating systems and rejected them on the basis of economic practicability and technological feasibility. See Section VII.B for more detail on why EPA rejected closed-cycle recirculating systems.

H. Benefits

In its analysis for section 316(b) Phase II Proposal, EPA relied on nine case studies to estimate the potential economic benefits of reduced impingement and entrainment. EPA extrapolated facility-specific estimates to other facilities located on the same waterbody type and summed the results for all waterbody types to obtain national estimates. During the comment period on the proposed rule EPA received numerous comments on the valuation approaches applied to evaluate the proposed rule, including commercial and recreational fishing benefits, non-use benefits, benefits to threatened and endangered species (T&E), as well as on the methods used to extrapolate case study results to the national level. EPA tried to address concerns raised by commenters on the proposal in the revised methodology presented in the NODA and the final rule analysis.

1. Benefits Analysis Design

A number of commenters expressed concern about EPA's reliance on a few case studies and the extrapolation method used for estimating benefits at the national level for the proposed rule analysis. The commenters noted that even within the same waterbody type, there are important ecological and socioeconomic differences among different regions of the country. To address this concern, EPA revised the design of its analysis to examine cooling water intake structure impacts at the regional-scale. The estimated benefits were then aggregated across all regions to yield the national benefits estimate. These analytical design changes were presented in the NODA. No major comments were received on EPA's regional benefit approach as described in the NODA.

2. Commercial Fishing Benefits

During the comment period on the proposed rule EPA received a number of comments on the methods used to estimate producer surplus and consumer surplus in the commercial fishing sector. Commenters felt that the methods overestimated benefits. The new methods used by EPA assume that producer surplus is 0% to 40% of gross revenues in the commercial fishing sector. EPA also now assumes that the Phase II rule will not create increases in commercial harvest large enough to impact prices. Thus, no consumer surplus impact is estimated. Commenters on the NODA noted these changes and agreed with them.

3. Recreational Fishing Benefits

A number of comments were received on the recreational fishing benefits estimates EPA included in the proposal, which primarily relied on a benefits transfer approach. Benefit transfer involves adapting research conducted for another purpose in the available literature to address the policy questions in hand. For more detail on the valuation methods used in the final rule analysis, see Chapter A9 of the Regional Analysis document (DCN 6–0003). For three of the nine case studies, this analysis was supplemented by original revealed preference studies. Revealed preference methods use observed behavior to infer users' value for environmental goods and services. Examples of revealed preference methods include travel cost, hedonic pricing, and random utility models (RUM). For more detail on the revealed preference methods used in the final rule analysis, see Chapters A9 and A11 of the Regional Analysis document (DCN 6–0003). Although most commenters agreed that properly executed benefits transfer is an appropriate method for valuing nonmarket goods, they pointed out that original revealed preference studies that provide site-specific recreational fishing benefit estimates provide a superior alternative to benefits transfer. In response to these comments, EPA developed original or used available region-specific recreational angler behavior models, which provide site-specific estimates of willingness-to-pay for improvements in recreational fishing opportunities, to estimate recreational fishing benefits from reduced impingement and entrainment for seven of the eight study regions. Chapter A11 of the Regional Analysis document provides detailed discussion of the methodology used in EPA's RUM analysis (DCN 6–0003). Due to data limitations, EPA used a benefit transfer approach to value recreation fishing benefits from reduced impingement and entrainment in the Inland region.

4. Non-Use Benefits

Numerous comments were received on EPA's proposed non-use benefit estimates. Most commenters agreed that non-use values are difficult to estimate and that EPA's estimates of non-use benefits using the 50% rule was inappropriate because it relies on outdated studies. Commenters, however, disagreed as to whether EPA had vastly overstated or underestimated non-use benefits in the proposed Phase II rule analysis.

Some commenters stated that EPA's approach to estimating non-use benefits of the proposed rule significantly overestimates total benefits and that ecological benefits of the section 316(b) regulation are negligible. Other commenters asserted that EPA's benefits estimates significantly undervalued the total ecological benefits (including use and non-use) of preventing fish kills. These commenters indicated that it would be impossible to claim that the value of the unharvested commercial and recreational and forage species lost to impingement and entrainment was equal to zero. Reasons some commenters gave for the underestimation of total benefits included the following: total losses were underestimated by using outdated monitoring data for periods when population levels (and therefore impingement and entrainment) were much lower than the present; cumulative impacts were not sufficiently considered; recreational and commercial values were underestimated; commercial invertebrate species were ignored; ecological value of forage species was not considered; non-use benefits were underestimated; and secondary economic impacts were not included. Overall these commenters argued that a net benefit underestimation could be corrected by (1) assuming that non-use values were two times the estimated value of recreation, commercial and forage values; and (2) assuming that unharvested fish had a value greater than zero.

In response to public comments regarding the analysis of non-use values in the proposed rule, EPA considered the results of several different approaches to quantifying non-use values. The Agency points out that none of the available methods for estimating either use or non-use values of ecological resources is perfectly accurate; all have shortcomings.

EPA has determined that none of the methods it considered for assessing non-use benefits provided results that were appropriate to include in this final rule, and has thus decided to rely on a qualitative discussion of non-use benefits. The uncertainties and methodological issues raised in the approaches considered could not be resolved in time for inclusion in the rule. EPA continues to evaluate various approaches for evaluating non-use benefits of CWA rules.

5. Habitat Replacement Cost (HRC)

Some commenters argued that the HRC methods are not legitimate valuation methods because they concern costs, not benefits. However, other commenters argued that although HRC analysis is not a benefit's analysis in the strict economic sense it can provide a practical approach to capturing the full range of ecosystem services and, thus, is appropriate for evaluating the benefits of this rule. These commenters further pointed out that ''restoration cost is used as a measure of damages under CERCLA for Superfund sites, under the National Marine Sanctuaries Act, and under the oil spill provisions of the Clean Water Act. Use of restoration costs was explicitly upheld in the landmark Ohio vs. Interior court decision of 1989.''

EPA has removed the disputed results of the HRC analyses from its benefits estimates for the final rule. For the NODA, EPA revised the HRC analysis presented in the proposed rule (see 67 FR 17191). Instead of the costs of habitat replacement, EPA used estimated willingness-to-pay values for the resource improvements that would be achieved by the habitat replacement/restoration equivalents.

During the comment period on the NODA, EPA received a number of comments on the revised habitat-based valuation method. Specifically, several commenters questioned the appropriateness of using willingness to pay values for habitat restoration as a ''proxy'' for either the total value or the non-use value of the fishery resources that would be preserved due to reduced impingement and entrainment. EPA explored this approach to estimating non-use values for three case study regions: the North Atlantic, Mid-Atlantic, and Great Lakes Regions. However, due to limitations and uncertainties regarding the application of this methodology, EPA elected not to include benefits based on this approach in the costs and benefits analysis of the final section 316(b) rule.

6. Benefits to Threatened and Endangered Species.

Similarly to the HRC approach, commenters strongly disagreed about the appropriateness of EPA using the societal revealed preference (SRP) method to value benefits from reducing impingement and entrainment of threatened and endangered species because these methods concern costs not benefits. The SRP method uses (1) evidence of actions taken to benefit a resource that were developed, approved, and implemented voluntarily by government and quasi-government agencies and (2) data on anticipated and actual expenditures required to complete the actions. EPA has removed the disputed results of the societal revealed preference analyses from its benefits estimates for the final rule because the uncertainties and methodological issues raised in the approaches considered could not be resolved in time for inclusion in the rule.

Some commenters argued that benefits transfer is the second best approach to estimating benefits from improved protection of threatened and endangered species if conducting an original stated preference study is not feasible. Specifically, the commenters recommended that EPA use benefits transfer for valuing improved protection of threatened and endangered species instead of the societal revealed preference method. In response to these comments, EPA has explored a benefits transfer approach to valuing improved protection of threatened and endangered species due to the final section 316(b) regulation. For detail, see Chapters A13 and B6 of the Regional Analysis document (DCN 6–0003). EPA, however, notes that benefits based on this method were not included in the benefit cost analysis of the final section 316(b) rule due to the uncertainties and limitations discussed in Section A13–6.1 of the Regional Study document (see DCN 6–0003).

7. Timing of Benefits

During the comment period on the proposed rule, EPA received a number of comments on the time at which benefits of the rule accrue to society. The commenters assert that the estimated commercial and recreational fishing benefits are overstated because timing of benefits was not taken into account. Specifically, the commenters argue that benefits could not be fully realized until installation of the cooling technology is completed and enough years pass after that first year of reduced impingement and entrainment mortality such that every fish avoiding impingement and entrainment in that year can be harvested by commercial and recreational fishermen. In response to public comments on the proposed rule analysis, EPA revised recreational and commercial fishing benefits analysis to account for a one-year construction period required to install CWIS technology to reduce impingement and entrainment, and a time lag between impingement and entrainment cessation and the time when recreational and commercial fish species will be large enough to be harvested. In accounting for a delay in benefits, EPA used both a three percent and a seven percent discount rate as recommended by OMB requirements.

I. EPA Legal Authority

1. Authority To Set a National Standard for Cooling Water Intake Structures

Some commenters challenged EPA's authority to set a national standard for cooling water intake structures, arguing that CWA section 316(b) requires EPA to provide a site-specific assessment of ''best technology available to minimize adverse environmental impact.'' These commenters maintain that the language and legislative history of CWA section 316(b), the objectives of the CWA, and prior EPA practice of site-specific application of CWA section 316(b) preclude EPA from setting a national standard under this rule.

EPA is authorized under section 501(a) of the Clean Water Act ''to prescribe such regulations as are necessary to carry out [its] functions'' under the Clean Water Act. Moreover, EPA interprets CWA section 316(b) to authorize national requirements for cooling water intake structures. CWA section 316(b) applies to sources subject to CWA sections 301 and 306, which authorize EPA to promulgate national categorical effluent limitations guidelines and standards for direct dischargers of pollutants. The reference in CWA section 316(b) to these sections indicates that Congress expected that CWA section 316(b) requirements, like those of CWA sections 301 and 306, could be applied as a national, categorical standard. *Cronin* v. *Browner,* 898 F. Supp. 1052, 1060 (1995) (''EPA was also free to choose, as it did, to implement section 316(b) by issuing one overarching regulation that would apply to all categories of point source subject to sections 301 and 306 that utilize cooling water intake structures.''); *see also Virginia Electric Power Co.* v. *Costle,* 566 F. 2d 446 (1977).

2. Authority To Consider Cost in Establishing Performance Standards and Compliance Options

Some commenters objected to EPA's consideration of costs in the determination of BTA. These commenters note that CWA section 316(b) does not expressly mention compliance costs, in contrast to other technology-based provisions of the CWA, which explicitly direct EPA to consider such costs. If Congress had intended that EPA consider costs under section 316(b), they argue, it would have expressly directed the EPA to do so.

EPA believes that it legitimately considered costs in establishing ''best technology available'' under CWA section 316(b). Although CWA section 316(b) does not define the term ''available,'' it expressly refers to CWA sections 301 and 306—both of which require EPA to consider costs in determining the ''availability'' of a technology. Specifically, CWA section 301(b)(1)(A) requires certain existing facilities to meet effluent limitations based on ''best practicable control technology currently available,'' which requires ''consideration of the total cost of application of technology in relation to the effluent reduction benefits to be achieved from such application.'' 33 U.S.C. 1314(b)(1)(B). Similarly, CWA section 301(b)(2)(A) requires application of the ''best available technology economically achievable,'' which in turn requires consideration of ''the cost of achieving such effluent reduction.'' 33 U.S.C. 1314(b)(2)(B). Finally, CWA section 306(b)(1)(B), which governs the effluent discharge standards for new sources, expressly states that in establishing the ''best available demonstrated control technology'' the Administrator shall take into consideration ''the cost of achieving such effluent reduction'' 33 U.S.C. 1316(b)(1)(B). Although these standards are somewhat different, each mandates the consideration of costs in establishing the technology-based standard. Because CWA sections 301 and 306 are expressly cross-referenced in CWA section 316(b), EPA believes that it reasonably interpreted CWA section 316(b) as authorizing consideration of the same factors considered under CWA sections 301 and 306, including cost. EPA's interpretation of section 316(b) as authorizing a consideration of costs was explicitly upheld in litigation on the Phase I new facilities rule. *Riverkeeper* v. *EPA,* slip op. at 28 (2nd Cir., Feb. 3, 2004).

EPA's interpretation is supported by the legislative history of CWA section 316(b): '' 'best technology available' should be interpreted as best technology available at an economically practicable cost.'' *See* 118 Cong. Rec. 33,762 (1972), *reprinted in* 1 Legislative History of the Water Pollution Control Act Amendments of 1972, 93d Cong., 1st Sess. at 264 (Comm. Print 1973) (Statement of Representative Don H. Clausen). EPA's interpretation of CWA section 316(b) is also consistent with judicial interpretations of the section. *See, e.g., Seacoast Anti-Pollution League* v. *Costle,* 597 F.2d 306, 311 (1st Cir. 1979) (''The legislative history clearly makes cost an acceptable consideration in determining whether the intake design 'reflect[s] the best technology available' ''); *Hudson Riverkeeper Fund, Inc.* v. *Orange & Rockland Util., Inc.* 835 F. Supp. 160, 165–66 (S.D.N.Y. 1993).

3. Authority To Allow Site-Specific Determination of BTA To Minimize AEI Based on a Cost-Cost Comparison

The final rule allows a facility to pursue a site-specific determination of ''best technology available to minimize adverse environmental impact'' where the facility can demonstrate that its costs of compliance under the compliance alternatives in §125.94(a)(2) through (4) would be significantly greater than the costs considered by the Administrator for a like facility in establishing the performance standard.

Some commenters argue that CWA section 316(b) does not authorize EPA to provide for a site-specific assessment of ''best technology available.'' These commenters argued that EPA was required under CWA section 316(b) to set a national standard for ''best technology available'' (BTA), at least as stringent as the national standard for ''best available technology'' (BAT) under CWA section 301. These commenters asserted that the similar wording of the BTA and BAT requirements, and the fact that CWA section 316(b) explicitly references CWA section 301 as the basis for its application, indicates legislative intent to equate BTA with BAT and thus requires a national—not site-specific—standard.

EPA disagrees. The CWA section 316(b) authorizes a site-specific determination of BTA. Although, the CWA section 316(b) authorizes EPA to promulgate national categorical requirements, EPA also notes that the variety of factors to be considered in determining these requirements—such as location and design—indicate that site-specific conditions can be highly relevant to the determination of BTA to minimize adverse environmental impact. In addition to specifying ''best technology available'' in relation to a national categorical performance standard, today's rule also authorizes a site-specific determination of BTA when conditions at the site lead to a more costly array of controls than EPA had expected would be necessary to achieve the applicable performance standards.

This site-specific compliance option is similar to the ''fundamentally different factors'' provision in CWA section 301(n), which authorizes alternative requirements for sources subject to national technology-based standards for effluent discharges, if the facility can establish that it is fundamentally different with respect to factors considered by EPA in promulgating the national standard. The fundamentally different factors provision was added to the CWA in 1987, but prior to the amendment, both the Second Circuit and the Supreme Court upheld EPA's rules containing provisions for alternative requirements as reasonable interpretations of the statute. *NRDC* v. *EPA,* 537 F.2d 642, 647 (2d Cir. 1976) (''the establishment of the variance clause is a valid exercise of the EPA's rulemaking authority pursuant to section 501(a) which authorizes the Administrator to promulgate regulations which are necessary and proper to implement the Act''); *EPA* v. *National Crushed Stone Ass'n,* 449 U.S. 64 (1980) (approving EPA's alternative requirements provision in a standard adopted pursuant to CWA section 301(b)(1), even though the statute did not expressly permit a variance.) EPA's alternative site-specific compliance option in this rule is similarly a reasonable interpretation of section 316(b) and a valid exercise of its rulemaking authority under CWA section 501.

Based on this interpretation, EPA and State permitting authorities have been implementing CWA section 316(b) on a case by case basis for over 25 years. Such a case-by-case determination of BTA has been recognized by courts as being consistent with the statute. See *Hudson Riverkeeper Fund* v. *Orange and Rockland Util,* 835 F. Supp. 160, 165 (S.D.N.Y. 1993) (''This leaves to the permit writer an opportunity to impose conditions on a case by case basis, consistent with the statute'').

Some commenters specifically challenged EPA's authority to consider costs in its site-specific assessment of best technology available. However, as discussed earlier, EPA reasonably interprets CWA section 316(b) to authorize it to consider costs of compliance in determining best technology ''available.'' Therefore, where EPA fails to consider a facility's unusual or disproportionate costs in setting the national requirements for ''best technology available,'' it reasonably authorizes permit authorities to set site-specific alternative limits to account for these costs. See *Riverkeeper* v. *EPA,* slip op. at 25 (2nd Cir. Feb. 3, 2004) (upholding site-specific alternative limits under the Phase I rule for new facilities where a particular facility faces disproportionate compliance costs.)

In addition, EPA notes that—contrary to some commenters' assertions—the rule does not in fact authorize permitting authorities to consider a facility's ''ability to pay'' in its site-specific assessment of BTA. It only allows consideration of whether the facility has unusual or disproportionate compliance costs relative to those considered in establishing the performance standards—not whether the facility has the financial resources to pay for the required technology. Moreover, in setting the alternative BTA requirements, the permit authorities may depart from the rule's national technology-based standards only insofar as necessary to account for the unusual circumstances not considered by the Agency during its rulemaking.

4. Authority To Allow Site-Specific Assessment of BTA Where Facility's Costs of Compliance Are Significantly Greater Than Benefits of Compliance

Some commenters objected to the second site specific regulatory option—authorizing a site-specific determination of best technology available where the facility can demonstrate that its costs of compliance under §125.94(a)(2) through (4) would be significantly greater than the benefits of complying with the applicable performance requirements at the facility. These commenters argue that a cost-benefit decision making criterion is not authorized under the CWA. Many of these commenters assert that while it may be reasonable for EPA to exclude technologies if their costs are ''wholly disproportionate'' to the benefits to be achieved, EPA lacks the statutory authority to conduct a formal cost/benefit analysis to determine the best technology available on a site-specific basis.

EPA believes that the Clean Water Act authorizes a site-specific determination of the best technology available to *minimize* adverse environmental impact where the costs of compliance with the rule's performance standards are significantly greater than its benefits. This authority stems from the statutory language of CWA section 316(b). As discussed in Section III above, Section 316(b) requires that cooling water intake structures reflect the best technology available for minimizing adverse environmental impact. The object of the ''best technology available'' is explicitly articulated by reference to the receiving water: to minimize adverse environmental impact in the waters from which cooling water is withdrawn. In contrast, under section 301 the goal of BAT is explicitly articulated by reference to a different purpose, to make reasonable further progress toward the national goal of eliminating the discharge of all pollutants (section 301(b)(2)(A)). Similarly, under section 304, the goal of BPT and BCT is explicitly articulated by reference to the degree of effluent reduction attainable. (section 304(b)(1)(A) and section 304(b)(4)(A)). EPA has previously considered the costs of technologies in relation to the benefits of minimizing adverse environmental impact in establishing 316(b) limits, which historically have been done on a case-by-case basis. *See, e.g., In Re Public Service Co. of New Hampshire,* 10 ERC 1257 (June 17, 1977); *In Re Public Service Co. of New Hampshire,* 1 EAD 455 (Aug. 4, 1978); *Seacoast Anti-Pollution League* v. *Costle,* 597 F. 2d 306 (1st Cir. 1979). Under CWA section 316(b), EPA may consider the benefits that the technology-based standard would produce in a particular waterbody, to ensure that it will ''minimize adverse environmental impact.'' EPA believes that the technology-based standards established in this final rule will, as a national matter, ''minimize adverse environmental impact.'' However, the degree of minimization contemplated by the national performance standards may not be justified by site-specific conditions. In other words, depending on the circumstances of the receiving water, it may be that application of less stringent controls than those that would otherwise be required by the performance standards will achieve the statutory requirement to ''minimize'' adverse environmental impact, when considered in light of economic practicability. An extreme example is a highly degraded ship channel with few fish and shellfish, but such situations can only be identified and addressed through a site-specific assessment.

For these reasons, EPA reasonably interprets the phrase ''minimize adverse environmental impact'' in section 316(b) to authorize a site-specific consideration of the benefits of the technology-based standard on the receiving water. EPA continues to believe that any impingement or entrainment would be an adverse environmental impact, but has determined that 316(b) does not require minimization of adverse environmental impact beyond that which can be achieved at a cost that is economically practicable. EPA believes that the relationship between costs and benefits is one component of economic practicability for purposes of section 316(b), and as noted previously, the legislative history indicates that economic practicability may be considered in determining what is best technology *available* for purposes of 316(b). EPA believes that allowing a relaxation of the performance standards when costs significantly exceed benefits, but only to the extent justified by the significantly greater costs, is a reasonable way of ensuring that adverse environmental impact be minimized at an economically practicable cost. This does not mean that there is a need to make a finding of ''adverse environmental impact'' before performance standard based CWA section 316(b) requirements would apply. Rather, EPA is authorizing an exception to performance standard based requirements on a site-specific basis in limited circumstances: when the costs of complying with the national performance standards are significantly greater than the benefits of compliance at a particular site.

5. Authority To Allow Restoration To Comply With the Rule Requirements

The final rule authorizes the use of restoration measures that produce and result in increases of fish and shellfish in a facility's watershed in place of, or as a supplement to, installing design and control technologies and/or operational measures that reduce impingement mortality and entrainment. Restoration measures can include a wide range of activities including measures to enhance fish habitat and reduce stresses on aquatic life; creation of new habitats to serve as spawning or nursery areas, and creation of a fish hatchery and/or restocking of fish being impinged and entrained with fish that perform a substantially similar function in the aquatic community.

While the Phase I rule also authorized use of restoration measures, today's rule includes additional regulatory controls on the use of restoration measures to ensure that they are used appropriately to comply with the applicable performance requirements or site specific alternative requirements. For example, restoration measures are authorized only after a facility demonstrates to the permitting authority that it has evaluated other design and construction technologies and operational measures and determined that they are less feasible, less cost-effective, or less environmentally desirable than meeting the performance standards or alternative site-specific requirements in whole or in part through the use of restoration measures. The facility must also demonstrate that the proposed restoration measures will produce ecological benefits (*i.e.*, the production of fish and shellfish for the facility's waterbody or watershed, including maintenance of community structure and function) at a level that is substantially similar to the level a facility would achieve through compliance with the applicable performance standards or alternative site-specific requirements. Further, the permitting authority must review and approve the restoration plan to determine whether the proposed restoration measures will meet the applicable performance standards or site specific alternative requirements. Consequently, the restoration provisions of today's rule are designed to minimize adverse environmental impact to a degree that is comparable to the other technologies on which the rule is based.

The use of restoration to meet the requirements of section 316(b) is consistent with the goals of the Clean Water Act: measures that restore fish and shellfish to compensate for those that are impinged and entrained further the objective of the Clean Water Act ''to restore, maintain, and protect the biological integrity of the nation's waters.'' 33 U.S.C. 1251(a) (emphasis added). It is also consistent with EPA's and States' past practices in implementing section 316(b) in individual permit decisions. For at least twenty years, EPA and States have authorized existing facilities to comply with section 316(b) requirements, at least in part, through the use of restoration measures. For example, the Chalk Point Generating Station, located on the Patuxent River in Prince George's

County, Maryland constructed a fish rearing facility in partial compliance of its 316(b) obligations (DCN–1–5023–PR).

Although the United States Court of Appeals for the Second Circuit recently remanded the portion of EPA's Phase I new facility rule that authorized restoration measures to meet that rule's requirements, EPA believes that portion of the decision should not apply to this Phase II rulemaking. Indeed, the Second Circuit explicitly stated that ''[i]n no way [does it] mean to predetermine the factors and standard applicable to Phase II and III of the rulemaking.'' *Riverkeeper* v. *EPA*, slip op. at 12, note 13 (2nd Cir. Feb. 3, 2004). This is probably because there are important differences between new and existing facilities that warrant interpreting section 316(b) more broadly to give existing facilities additional flexibility to comply with section 316(b). As noted above, restoration measures have been used to comply with section 316(b) limits at existing facilities for several years because of the more limited availability of other technologies for existing facilities. Costs to retrofit an existing facility to install a ''hard'' technology can be much higher than costs to install one at the time a facility is constructed, and those costs can vary considerably from site to site. Thus, the range of technologies that are ''available'' to existing facilities to meet the performance standards is narrower than the range of technologies available to new facilities.

In recognition of the vast differences between existing and new facilities, Congress established separate sections in the Clean Water Act for establishing discharge limitations on existing and new facilities. Effluent limitations guidelines for existing facilities are established under sections 301 and 304, whereas new source performance standards are established under section 306. Those sections set out two distinct sets of factors for developing effluent limitations guidelines for existing facilities and new source performance standards for new facilities. Notably, there are only two factors explicitly stated in section 306 for the Administrator to consider in establishing new source performance standards—cost and non-water quality impacts, whereas for existing facilities Congress calls upon EPA to consider a much broader range of factors in section 304(b)(2)(b):

> the age of equipment and facilities involved, the process employed, the engineering aspects . . . of various types of control techniques, process changes, the cost of achieving such effluent reduction, non-water quality environmental impacts (including energy requirements), and such other factors as [EPA] deems appropriate.

This list reflects the wide range of facility characteristics and circumstances that can influence the feasibility and availability of a particular technology across a particular industry. Existing facilities generally face more and different problems than new facilities because of the technological challenges and high costs associated with retrofitting as compared to building a new facility. Indeed, by including the phrase ''and such other factors as [EPA] deems appropriate,'' Congress made certain that EPA would have sufficient flexibility in establishing limitations for existing facilities to consider all relevant factors.

For several other reasons, EPA believes the Second Circuit decision is not binding on this Phase II rule. First, section 316(b) requires the design of a cooling water intake structure to reflect the best technology available to ''minimize adverse environmental impact.'' The phrase ''minimize adverse environmental impact ''is not defined in section 316(b). For the Phase II rule, EPA interprets this phrase to allow facilities to minimize adverse environmental impact by reducing impingement and entrainment, or to minimize adverse environmental impact by compensating for those impacts after the fact. Section 316(b) does not explicitly state when the adverse environmental impact of cooling water structures must be minimized—that is whether they must be prevented from occurring in the first place or compensated for after the fact or where the minimization most occurs—at the point of intake or at some other location in the same watershed. Therefore, under *Chevron*, EPA is authorized to define ''minimize'' to authorize restoration at existing facilities to minimize the effects of adverse environmental impact.

In another context under the Clean Water Act, EPA has interpreted authority to ''minimize adverse effects'' as including authority to require environmental restoration. Section 404 of the CWA authorizes the Army Corps of Engineers to issue permits for discharges of dredged or fill material into waters of the United States. EPA was granted authority to establish regulations containing environmental guidelines to be met by the Corps in issuing section 404 permits. See CWA section 404(b)(1). Current regulations, in place since 1980, prohibit a discharge unless, among other requirements, all practicable steps are taken to avoid, minimize and mitigate for the environmental effects of a discharge. See 40 CFR 230.10. Of particular relevance here, the regulations require that steps be taken to ''minimize potential adverse effects of the discharge on the aquatic ecosystem'' 40 CFR 230.10(d). EPA has specifically defined minimization steps to include environmental restoration. See 40 CFR 230.75(d) (''Habitat development and restoration techniques can be used to minimize adverse impacts and to compensate for destroyed habitat'').

Moreover, at the time of the Phase I litigation, EPA had not interpreted the term ''reflect'' in section 316(b), and therefore, the Second Circuit did not consider its meaning in determining whether restoration could be used as a design technology to meet the Phase I rule requirements. Section 316(b) requires that ''the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.'' (emphasis supplied). The term ''reflect'' is significant in two respects. First, it indicates that the design, location, construction and capacity of the cooling water intake structure itself must be based on the best technology available for such structures. This authorizes EPA to identify technologies that can be incorporated into the physical structure of the intake equipment. It also indicates that the choice of what actually is the best physical configuration of a particular cooling water intake structure can take into account, *i.e.*, reflect, other technologies—and their effects—that are not incorporated into the structure itself. For example, barrier nets are not incorporated into the physical design of the cooling water intake structure, but their use—and effectiveness—influences the physical design of the cooling water intake structure. Another relevant example is the technology known as ''closed-cycle'' cooling. Although this technology is physically independent of the cooling water intake structure, it directly influences decisions regarding the design capacity of the cooling water intake structure: as more cooling water is recycled, less needs to be withdrawn. Both barrier nets and closed-cycle cooling are considered ''design'' technologies. Similarly, properly designed restoration measures can be best technologies available that can influence the design of the physical cooling water intake structure. To put it another way, for purposes of minimizing adverse environmental impact, requirements for cooling water intake structures reflect a variety of best technologies available, which EPA construes to include restoration measures. A dry cooling system is another example of a technology that although physically independent of the cooling water intake structure is nonetheless considered an acceptable method to minimize adverse environmental impacts. In fact, since a dry cooling system uses air as a cooling medium, it uses little or no water, dispensing altogether with the need for a cooling water intake structure.

EPA has discretion to characterize restoration measures as technologies for purposes of section 316(b). Section 316(b) does not define either the phrase ''cooling water intake structure'' or the term ''technology'' and, therefore, leaves their interpretation to EPA. EPA has defined the phrase cooling water intake structure in today's rule to mean the total physical structure and any associated waterways used to withdraw cooling water from waters of the United States. This definition embraces elements both internal and external to the intake equipment. EPA did not define the term technology in today's rule, but looked for guidance to section 304(b), which the Second Circuit has recognized can help illuminate section 316(b). Section 301(b)(2) best available technology limitations are based on factors set forth in section 304(b). Section 304(b), while not using the term technology, discusses the ''application of the best control measures and practices achievable including treatment techniques, process and procedure innovations, operating methods, and other alternatives.'' This is a broad, non-exclusive list. Indeed, BAT effluent limitations guidelines under this authority have been based on a vast array of treatment techniques, operation practices (including chemical substitution), and management practices. See 40 CFR Part 420 (effluent guidelines for concentrated animal feeding operations); 40 CFR Part 430, Subparts B & E (effluent guideline for pulp and paper industry); See also 62 FR 18504 (April 15, 1998).

Employing this broad concept of technology, in today's rule EPA has determined that the design of cooling water intake structures may reflect technologies relating to the restoration of fish and shellfish in the waters from which cooling water is withdrawn. Restoration is not included in the definition of ''design and construction technology'' in today's rule so as to distinguish restoration from ''hard'' technologies for purposes of the rule. Under the regulatory scheme of the final rule, restoration is treated differently than other technologies for several purposes, all of which are to help ensure that restoration projects achieve substantially similar performance as design and construction technologies and/or operational measures. When these restoration technologies are used they must produce ecological benefits (the production of fish and shellfish for a facility's waterbody or watershed, including maintenance of community structure and function) at a level that is substantially similar to the level the facility would achieve by using other design and construction technologies and/or operational measures to achieve the applicable performance standards or alternative site-specific performance requirements in § 125.94. In other words, the operation of the cooling water intake structure together with these restoration technologies will achieve the overall performance objective of the statute: to minimize the adverse environmental impact of withdrawing cooling water. For facilities using this authority, their hardware decisions for the cooling water intake structure thus take into account—or reflect—the impacts of restoration technology.

EPA acknowledges that in 1982, when Congress was considering substantial amendments to the Clean Water Act, EPA testified in support of a proposed amendment to CWA section 316(b) that would have expressly authorized the use of restoration measures as a compliance option, suggesting that EPA may have interpreted section 316(b) at that time as not authorizing restoration measures to minimize the adverse environmental impact of cooling water intake structures. In EPA's view, the Second Circuit gave undue weight to that testimony, particularly because it was provided before the Supreme Court's decision in *Chevron U.S.A.* v. *Natural Resources Defense Council,* 467 U.S. 837 (1984), which gave administrative agencies latitude to fill in the gaps created by ambiguities in statutes the agencies have been charged by Congress to implement. For at least twenty years, EPA and States have authorized existing facilities to comply with section 316(b) requirements, at least in part, through the use of restoration measures. Additionally, since 1982 EPA has gathered substantially more data to inform its judgment regarding cooling water intake structures, the environmental impact resulting from them, and various technologies available to reduce impingement and entrainment. Finally, EPA notes that, in contrast to water quality based effluent limitations that are included in NPDES permits to meet water quality standards, the required performance of restoration measures under this final rule is not tied to conditions in the water body. Rather it is tied directly to the performance standards, just as is the performance of the other technologies that facilities may use to meet the standards. While the design and operation of restoration measures will necessarily be linked to conditions in the waterbody (as is also the case for ''hard'' technologies) the performance standards that restoration measures must meet are not.

6. Authority To Apply CWA Section 316(b) Requirements to Existing Facilities

Some commenters argued that CWA § 316(b) does not apply to existing facilities, but rather authorizes only a one-time, pre-construction review of cooling water intake structure location, design, construction and capacity.

EPA disagrees with this assertion. CWA section 316(b) applies to ''any standard established pursuant to section 1311 [CWA section 301] or section 1316 [CWA section 306].'' CWA section 301 establishes the statutory authority for EPA to promulgate technology-based standards for effluent discharges from existing sources. Therefore, CWA section 316(b) requirements can, and indeed must, apply to existing facilities. Given that section 316(b) requirements apply to existing facilities, such requirements cannot reasonably be viewed as mandating only a one-time, pre-construction review. Moreover, as the court noted in *Riverkeeper* v. *EPA*, slip op. at 44–45 (2nd Cir. Feb. 3, 2004), ''if Congress intended to grandfather in new or modified intake structures as well as the related point sources that discharge heat, it could have done so in section 316(c).''

7. Authority To Regulate ''Capacity'' of the ''Intake Structure'' Through Restrictions on Flow Volume

Some commenters asserted that EPA was not authorized to require closed-cycle cooling systems, pointing out that CWA section 316(b) addresses cooling water ''intake structures,'' not cooling systems or cooling operations. EPA's performance standards based on closed-cycle cooling, they argued, constitutes an impermissible restriction of the cooling system or operation, which is not part of the ''intake structure'' itself. Others asserted that the term ''capacity,'' as used in CWA section 316(b), refers to the size of the cooling water intake structure, not the volume of flow through the intake. They therefore questioned EPA's authority to regulate flow volume by requiring the use of closed-cycle cooling systems.

The rule does not in fact require the use of closed-cycle cooling systems. Rather, the rule provides facilities with five different compliance options, only one of which is based on closed-cycle cooling technology. Moreover, EPA is authorized to set performance standards based on closed-cycle cooling technology, as it did in the Phase I rule, which was upheld in *Riverkeeper* v. *EPA*, slip op. (2nd Cir. Feb. 3, 2004). See also Section III.

8. Authority To Determine That Technologies Short of Closed-cycle Cooling Constitute ''Best Technology Available To Minimize Adverse Environmental Impact''

Many commenters asserted that closed-cycle cooling is the ''best technology available to minimize adverse environmental impact,'' and that EPA must therefore require facilities to reduce their cooling water intake capacity to a level commensurate with closed-cycle cooling. According to these commenters, this rule violates CWA section 316(b) by adopting performance standards less protective than ''best technology available.''

EPA reasonably rejected closed-cycle cooling systems as ''best technology available'' based on consideration of relevant factors, including the costs of closed-cycle cooling, the energy impacts, the relative effectiveness of closed-cycle cooling in minimizing impingement and entrainment in variable waterbodies, and the availability of other design and control technologies that can be effective in significantly reducing environmental impacts. As the court held in *Riverkeeper* v. *EPA*, slip op. at 29 (2nd Cir. Feb. 3, 2004), ''the Clean Water Act allows EPA to make a choice among alternatives based on more than impingement and entrainment.'' In short, EPA has discretion to consider a variety of factors besides the efficacy of technologies, including cost, and to compare the relative effectiveness of technologies that reduce impingement and entrainment. EPA's weighing of the factors is entitled to a high degree of deference. See also Section III and VII.

9. Authority To Require Implementation of CWA Section 316(b) Through NPDES Permits

Some commenters argued that EPA lacks authority to include section 316(b) requirements in section 402 NPDES permits, because—unlike sections 301, 306, and 402—section 316(b) regulates ''intakes'' and not ''discharges.''

EPA disagrees with this comment. This rule properly requires implementation of CWA section 316(b) standards through CWA section 402 NPDES permits. CWA section 402(a)(1) authorizes the issuance of NPDES permits for discharges that comply with effluent guidelines limitations under CWA sections 301 and 306. CWA section 316(b) requirements can be implemented through CWA section 402 because they apply to all point sources subject to standards issued under CWA sections 301 and 306. *See, U.S. Steel Corp* v. *Train,* 556 F.2d 822, 850 (7th Cir. 1977) (finding that CWA section 402 implicitly requires that CWA section 316(b) be implemented through NPDES permits). EPA's choice of NPDES permits, which already reflect CWA sections 301 and 306 effluent limitations, is reasonable.

10. Authority To Implement CWA Section 316(b) Requirements Without Compensating Regulated Entities for ''Taking'' of Property

Several commenters suggest that this rule authorizes an impermissible regulatory taking. Specifically, they argue that the rule requires facilities to limit their intake flows, thus impairing their property rights to the water and entitling them to compensation under the Fifth Amendment to the U.S. Constitution.

EPA notes, however, that the rule does not in fact require a facility to limit its intake flows. Rather, it provides a facility with a variety of compliance options, only one of which is based on flow limitations. While a facility could choose to comply with the section 316(b) requirements by reducing its intake flow to a level commensurate with a closed-cycle cooling system (the first compliance option), it could also select one of the other compliance options that does not require flow restrictions. EPA therefore believes that this rule does not authorize a compensable ''taking'' of property within the meaning of the Fifth Amendment.

IX. Implementation

As in the Phase I rule, section 316(b) requirements for Phase II existing facilities will be implemented through the NPDES permit program. Today's final rule establishes application requirements in §§ 122.21 and 125.95, monitoring requirements in § 125.96, and record keeping and reporting requirements in § 125.97 for Phase II existing facilities. The final regulations also require the Director to review application materials submitted by each regulated facility and include monitoring and record keeping requirements in the permit (§ 125.98). EPA will develop a model permit and permitting guidance to assist Directors in implementing these requirements. In addition, the Agency will develop implementation guidance for owners and operators that will address how to comply with the application requirements, the sampling and monitoring requirements, and the record keeping and reporting requirements in these final regulations.

In this final rule, an existing facility may choose one of five compliance alternatives for establishing best technology available for minimizing adverse environmental impact at the site:

(1) Demonstrate that it will reduce or has reduced its intake flow commensurate with a closed-cycle recirculating system and is therefore deemed to have met the impingement mortality and entrainment performance standards, or that it will reduce or has reduced the design intake velocity of its cooling water intake structure to 0.5 feet per second (ft/s) and is therefore deemed to have met the impingement mortality performance standards;

(2) Demonstrate that its existing design and construction technologies, operational measures, and/or restoration measures meet the performance standards and/or restoration requirements;

(3) Demonstrate that it has selected and will install and properly operate and maintain design and construction technologies, operational measures, and/or restoration measures that will, in combination with any existing design and construction technologies, operational measures, and/or restoration measures, meet the specified performance standards and/or restoration requirements;

(4) Demonstrate that it meets the applicability criteria for a rule-specified technology or a technology that has been pre-approved by the Director and that it has installed, or will install, and will properly operate and maintain the technology; or,

(5) Demonstrate that it is eligible for a site-specific determination of best technology available to minimize adverse environmental impact and that it has selected, installed, and is properly operating and maintaining, or will install and properly operate and maintain design and construction technologies, operational measures, and/or restoration measures that the Director has determined to be the best technology available to minimize adverse environmental impact for the facility.

The application, monitoring, record keeping, and reporting requirements for each of the compliance alternatives are detailed in the following sections.

A. When Does the Final Rule Become Effective?

This rule becomes effective sixty (60) days after the date of publication in the **Federal Register**. After the effective date of the regulation, existing facilities will need to comply when an NPDES permit containing requirements consistent with Subpart J is issued to the facility (see § 125.92). Under current NPDES program regulations, this will occur when an existing NPDES permit is reissued or, when an existing permit is modified or revoked and reissued. Under today's rule, a facility that is required to comply with this rule within the first four years after the publication date of this rule may request that the Director approve an extended schedule for submitting its Comprehensive Demonstration Study. This schedule must be as expeditious as practicable and not extend beyond three years and 180 days after the publication date of the final rule. The Comprehensive Demonstration Study, once submitted, forms the basis for the Director's determination of specific requirements consistent with Subpart J to be included in the permit. EPA has included this provision to afford facilities time to collect information and perform studies, including pilot studies where necessary, needed to support the development of the Comprehensive Demonstration Study.

Between the time the existing permit expires and the time an NPDES permit containing requirements consistent with this subpart is issued to the facility, permit requirements reflecting the best technology available to minimize adverse environmental impact will continue to be determined based on the Director's best professional judgement.

B. What Information Must I Submit to the Director When I Apply for My Reissued NPDES Permit?

The NPDES regulations governing the permit application process at 40 CFR 122.21 require that facilities currently holding a permit submit an application for permit renewal 180 days prior to the end of the current permit term, which is five years (see § 122.21(d)(2)). If you are the owner or operator of a facility that is subject to this final rule, you will be required to submit the information specified at 40 CFR 122.21(r)(2), (3), and (5) and all applicable sections of § 125.95, except for the Proposal for Information Collection, with your application for permit reissuance.

The Proposal for Information Collection component of § 125.95 should be submitted to the Director for review and comment prior to the start of information collection activities. For a typical facility that plans to install a technology, it is estimated that a facility would need to submit this Proposal for Information Collection about fifteen (15) months prior to the submission of the remainder of the required information, which is about twenty-one (21) months prior to the expiration of your current permit. This approximate timing is based on the sequential Comprehensive Demonstration Study requirements and the estimated level of effort required to complete the studies and allow time for the Director's review and approval. The timing provided in this section is for illustrative purposes only and represents a schedule that the average facility may need to follow to meet the deadlines established in today's rule. Some facilities may require more, or less time to perform the studies and prepare the application requirements. All facilities, except those that choose to comply with the rule by reducing intake capacity to a level commensurate with a closed-cycle recirculating system in accordance with § 125.94(a)(1)(i), or by adopting a pre-approved technology in accordance with § 125.94(a)(4) must submit a Proposal for Information Collection for review and comment by the Director (§ 125.95(b)(1)). Facilities that comply with impingement mortality requirements by reducing intake velocity to 0.5 ft/s or less in accordance with § 125.95(a)(1)(ii) will only need to submit a Comprehensive Demonstration Study, including a Proposal for Information Collection, for entrainment reduction requirements, if applicable. The Proposal for Information Collection requirements are detailed later in this section. Figure 1 presents an example of a possible timeframe a facility may follow in preparing and submitting application components.

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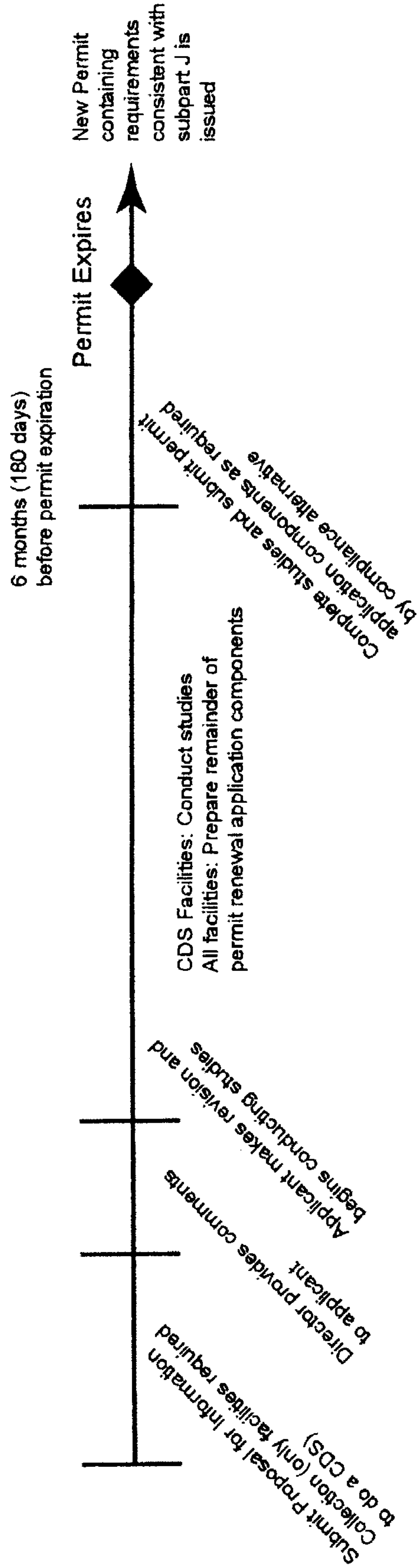
Figure 1. Sample Application Timeline



Notes

1. The timeframes provided in this figure are approximate.
2. The remainder of the permit renewal application (to be submitted 180 days prior to permit expiration) includes Source Water Physical Data; Cooling Water Intake Structure Data; and Cooling Water System Description. The applicant must submit all components of the permit application as appropriate for the compliance alternative selected.
3. The Director may alter the application timeline as necessary.

Following submission of the Proposal for Information Collection, the Director will review and provide comments on the proposal. During this time, the facility may proceed with planning, assessment, and data collection activities in fulfillment of Comprehensive Demonstration Study requirements. The Director is encouraged to provide comments expeditiously (*i.e.,* within 60 days) so the permit applicant can make responsive modifications to its information gathering activities.

It is assumed that most facilities would need approximately one year to complete the studies outlined in the Proposal for Information Collection. These must be completed at least 180 days prior to the end of the current permit term, by which time the remainder of required application information must be submitted. If the facility requires more than one year to complete studies described in the Proposal for Information Collection, the facility are encouraged to consult with the Director. Facilities are also encouraged to consult with the Director regarding their schedule for study completion.

After the first permit containing requirements consistent with Subpart J is issued, facilities may submit a request to their Director soliciting a reduced information collection effort for subsequent permit applications in accordance with § 125.95(a)(3), which allows facilities to demonstrate that the conditions at their facility and within the waterbody in which their intake is located remain substantially unchanged since their previous permit application. The request for reduced cooling water intake structure and waterbody application information must contain a list and justification for each information item in §§ 122.21(r) and 125.95(b) that has not changed since the previous permit application. The applicant must submit this request at least one year prior to the expiration of the current permit term and the Director is required to act on the request within 60 days.

The Director must review and approve the information you provide in your permit application, confirm whether your facility should be regulated as an existing facility under these final regulations, or under Phase III regulations for existing facilities that will be developed in the future, or as a new facility under regulations that were published on December 19, 2001 (66 FR 65256), and confirm the compliance alternative selected (compliance alternatives 1, 2, 3, 4, or 5). Following review and approval of your permit application, the Director will develop a draft permit for public notice and comment. The comment period will allow the facility and other interested parties to review the draft permit conditions and provide comments to the Director. The Director will consider all public comments received on the draft permit and develop a final permit based upon the application studies submitted and other information submitted during the comment period, as appropriate. The Director will incorporate the relevant requirements for the facility's cooling water intake structure(s) into the final permit.

Today's final rule modifies regulations at 40 CFR 122.21(r) to require Phase II existing facilities to prepare and submit some of the same information required for new facilities. Phase II existing facilities are required to submit two general categories of information when they apply for a reissued NPDES permit: (1) Physical data to characterize the source waterbody in the vicinity where the cooling water intake structures are located (40 CFR 122.21(r)(2)), and (2) data to characterize the design and operation of the cooling water intake structures (40 CFR 122.21(r)(3)). Unlike new facilities, however, Phase II existing facilities are not required to submit the Source Water Baseline Biological Characterization Data required under 40 CFR 122.21(r)(4). Today's final rule adds a new requirement at 40 CFR 122.21(r)(5) to require a facility to submit information describing the design and operating characteristics of its cooling water system(s) and how it/they relate to the cooling water intake structure(s) at the facility.

In addition, today's final rule requires all Phase II existing facilities to submit the information required under § 125.95 consistent with the compliance alternative selected. In general, the final application requirements in § 125.95 require most Phase II existing facility applicants to submit some or all of the components of a Comprehensive Demonstration Study (§ 125.95(b), see also Exhibit II in section V). As noted in section V, facilities that do not need to conduct a Comprehensive Demonstration Study are those that (1) reduce their flow commensurate with a closed cycle, recirculating cooling system, (2) install a rule-specified or Director-approved technology in accordance with § 125.99 (except that these facilities must still submit a Technology Installation and Operation Plan and Verification Monitoring Plan), or (3) reduce intake velocity to 0.5 ft/s or less (except that these facilities must still submit a Comprehensive Demonstration Study for entrainment requirements, if applicable).

Each component of the Comprehensive Demonstration Study and its applicability is described later in this section. In addition, the requirements for each of the five compliance alternatives are detailed, with respect to which components are required for each alternative.

1. Source Water Physical Data (40 CFR 122.21(r)(2))

Under the final requirements at 40 CFR 122.21(r)(1)(ii), Phase II existing facilities subject to this final rule are required to provide the source water physical data specified at 40 CFR 122.21(r)(2) in their application for a reissued permit. These data are needed to characterize the facility and evaluate the type of waterbody and species potentially affected by the cooling water intake structure. The Director is expected to use this information to evaluate the appropriateness of the design and construction technologies, operational measures, and/or restoration measures proposed by the applicant.

The applicant is required to submit the following specific data: (1) A narrative description and scaled drawings showing the physical configuration of all source waterbodies used by the facility, including areal dimensions, depths, salinity and temperature regimes, and other documentation that supports the facility's determination of the waterbody type where each cooling water intake structure is located; (2) an identification and characterization of the source waterbody's hydrological and geomorphological features, as well as the methods used to conduct any physical studies to determine the intake's area of influence within the waterbody and the results of such studies; and (3) locational maps.

2. Cooling Water Intake Structure Data (40 CFR 122.21(r)(3))

Under the final requirements at 40 CFR 122.21(r)(1)(ii), Phase II existing facilities are required to submit the data specified at 40 CFR 122.21(r)(3) to characterize the cooling water intake structure which should assist in the evaluation of its potential for impingement and entrainment of aquatic organisms. Information on the design of the intake structure and its location in the water column, in conjunction with biological information, will allow the permit writer to evaluate which species, or life stages of a species, are potentially subject to impingement and entrainment. A diagram of the facility's water balance should be used to identify the proportion of intake water used for cooling, make-up, and process water. The water balance diagram also provides a picture of the total flow in and out of the facility, allowing the permit writer to evaluate the suitability of proposed design and construction technologies and/or operational measures.

The applicant is required to submit the following specific data: (1) A narrative description of the configuration of each of its cooling water intake structures and where they are located in the waterbody and in the water column; (2) latitude and longitude in degrees, minutes, and seconds for each of its cooling water intake structures; (3) a narrative description of the operation of each of the cooling water intake structures, including design intake flows, daily hours of operation, number of days of the year in operation, and seasonal operation schedules, if applicable; (4) a flow distribution and water balance diagram that includes all sources of water to the facility, recirculating flows, and discharges; and (5) engineering drawings of the cooling water intake structure(s).

3. Cooling Water System Data (40 CFR 122.21(r)(5))

Under the final requirements at 40 CFR 122.22(r)(1)(ii), Phase II existing facilities are required to submit the cooling water system data specified at 40 CFR 122.21(r)(5) to characterize the operation of cooling water systems and their relationship to the cooling water intake structure(s) at the facility. Also required is a narrative description of the proportion of design intake flow that is used in the system, the number of days of the year that the cooling water system is in operation, and any seasonal changes in the operation of the system, if applicable. The facility must also submit design and engineering calculations prepared by a qualified expert, such as a professional engineer, and supporting data to support the narrative description. This information is expected to be used by the applicant and the Director in determining the appropriate standards that can be applied to the Phase II facility.

4. Comprehensive Demonstration Study (§ 125.95(b))

Final requirements at § 125.95(b) require all existing facilities, except those deemed to have met the performance standards by reducing intake capacity to a level commensurate with the use of a closed-cycle, recirculating cooling water system, or by reducing intake velocity to 0.5 ft/s or less (impingement mortality standards only), or facilities that select an approved technology in accordance with § 125.94(a)(4), to perform and submit to the Director all applicable components of a Comprehensive Demonstration Study, including data and detailed analyses to demonstrate that they will meet applicable requirements in § 125.94(b). As noted in section V, Comprehensive Demonstration Study requirements vary depending on the compliance alternative selected.

The Comprehensive Demonstration Study has seven components:

- Proposal for Information Collection;
- Source Waterbody Flow Information;
- Impingement Mortality and/or Entrainment Characterization Study;
- Technology and Compliance Assessment Information;
- Restoration Plan;
- Information to Support Site-specific Determination of Best Technology Available for Minimizing Adverse Environmental Impact; and
- Verification Monitoring Plan.

All Phase II existing facilities, except those mentioned above, are required to submit at a minimum the following: a Proposal for Information Collection (§ 125.95(b)(1)); Source Waterbody Flow Information (§ 125.95(b)(2)); an Impingement Mortality and/or Entrainment Characterization Study (§ 125.95(b)(3)); and a Verification Monitoring Plan (§ 125.95(b)(7)). Note that facilities selecting restoration measures provide a monitoring plan as part of their Restoration Plan, in accordance with § 125.95(b)(5)(v), rather than a Verification Monitoring Plan in accordance with § 125.95(b)(7). The requirements in these two provisions are similar, but tailored specifically to the monitoring needs of restoration projects, and design and construction technologies and operational measures, respectively. Phase II existing facilities that have reduced their intake velocity to less than or equal to 0.5 ft/s but are still required to reduce entrainment (if the standard applies), must submit only those components of the Impingement Mortality and/or Entrainment Characterization Study pertaining to entrainment, in addition to the other required components of the Comprehensive Demonstration Study. Facilities that are required to meet only the impingement mortality reduction requirements in § 125.94(b), are required to submit a study only for the impingement reduction requirements.

Facilities that comply with applicable requirements either wholly or in part through the use of existing or proposed design and construction technologies or in part through the use of existing or proposed design and construction technologies, and/or operational measures must submit the Technology and Compliance Assessment Information in § 125.95(b)(4), consisting of a Design and Construction Technology Plan (§ 125.95(b)(4)(i)) and a Technology Installation and Operation Plan (§ 125.95(b)(4)(ii)). (Facilities that use a pre-approved technology in accordance with § 125.94(b)(4) need only submit the Technology Installation and Operation Plan.) The Technology Installation and Operation Plan explains how the facility intends to install, operate, maintain, monitor, and adaptively manage the selected technologies to meet the applicable performance standards or site-specific technology requirements, and in most cases will provide the basis for determining compliance with § 125.94(b).

Only those Phase II existing facilities that propose to use restoration measures wholly or in part to meet the performance standards in § 125.94(b) or site-specific requirements developed pursuant to § 125.94(a)(5) are required to submit the Restoration Plan (§ 125.95(b)(5)). This Plan serves an analogous function for restoration measures to that served by the Technology and Compliance Assessment Information for design and construction technologies and operational measures, in that it shows the design of the measures, explains how the facility will construct, maintain, monitor, and adaptively manage the measures to meet applicable performance standards and/or site specific requirements, and serves as a basis for determining compliance.

Only those Phase II existing facilities who request a site-specific determination of the best technology available are required to submit Information to Support Site-specific Determination of Best Technology Available for Minimizing Adverse Environmental Impact (§ 125.95(b)(6)). Facilities that select the compliance alternative at § 125.94(a)(4) (Approved Technology), are required to submit only two items: the Technology Installation and Operation Plan (§ 125.95(b)(4)(ii)) and the Verification Monitoring Plan (§ 125.95(b)(7)).

a. Proposal for Information Collection

As a facility, you are required to submit to the Director for review and comment, a proposal stating what information will be collected to support the Comprehensive Demonstration Study (see § 125.95(b)(1)). This proposal must provide the following:

- A description of the proposed and/or implemented technology(ies) and/or restoration measures to be evaluated in the study (§ 125.95(b)(1)(i));

• A list and description of any historical studies characterizing impingement and entrainment and/or the physical and biological conditions in the vicinity of the cooling water intake structures and their relevance to this proposed study (§ 125.95(b)(1)(ii)). If you propose to use existing data, you must demonstrate the extent to which the data are representative of current conditions and that the data were collected using appropriate quality assurance/quality control procedures;

• A summary of any past, ongoing, or voluntary consultations with appropriate Federal, State, and Tribal fish and wildlife agencies that are relevant to this study and a copy of written comments received as a result of such consultation (§ 125.95(b)(1)(iii));

• A sampling plan for any new field studies you propose to conduct in order to ensure that you have sufficient data to develop a scientifically valid estimate of impingement and entrainment at your site (§ 125.95(b)(1)(iv)). The sampling plan must document all methods and quality assurance/quality control procedures for sampling and data analysis. The sampling and data analysis methods you propose must be appropriate for a quantitative survey and must take into account the methods used in other studies performed in the source waterbody. Also, the methods must be consistent with any methods required by the Director. The sampling plan must include a description of the study area (including the area of influence of the cooling water intake structure(s)), and provide taxonomic identifications of the sampled or evaluated biological assemblages (including all life stages of fish and shellfish) to the extent this is known in advance and relevant to the development of the plan.

In addition, the proposal should provide other information, where available, that would aid the Director in reviewing and commenting on your plans for conducting the Comprehensive Demonstration Study (*e.g.*, information on how you plan to conduct a Benefits Valuation Study, or gather additional data to support development of a Restoration Plan). EPA recognizes that in some cases collection and analysis of information will be an iterative process and plans for information collection may change as new data needs are identified. For example, a facility may not be able to design a Benefits Valuation Study and determine what additional data are needed (*e.g.*, quantified information on non-use benefits) until it has first collected and analyzed the data for its Impingement Mortality and/or Entrainment Characterization Study. While the Proposal for Information Collection is only required to be submitted once, EPA encourages permit applicants to consult with the Director as appropriate after the proposal has been submitted, in order to ensure that the Director has complete and appropriate information to develop permit conditions once the permit is submitted.

As stated previously, the proposal for information collection must be submitted prior to the start of information collection activities and should allow sufficient time for review and comment by the Director, although facilities are permitted to begin data collection activities before receiving the Director's comments. Directors are encouraged to provide their comments expeditiously (*i.e.*, within 60 days) to allow facilities time to make responsive modifications in their information collection plans. Adequate time for data collection efforts identified in the proposal for information collection prior to the due date for the permit application should also be scheduled.

b. Source Waterbody Flow Information

Under the requirements at § 125.95(b)(2)(i), Phase II existing facilities (except those that comply with the rule under § 125.94(a)(1)(i) with cooling water intake structures that withdraw cooling water from freshwater rivers or streams are required to provide the documentation showing the mean annual flow of the waterbody and any supporting documentation and engineering calculations that allow a determination of whether they are withdrawing less than or greater than five (5) percent of the annual mean flow. This will provide information needed to determine whether the entrainment performance standards of § 125.94(b)(2) apply to the facility. Two potential sources of the documentation are publicly available flow data from a nearby U.S. Geological Survey (USGS) gauging station or actual instream flow monitoring data collected by the facility. Representative historical data (from a period of time up to 10 years, if available) must be used to make this determination.

Under § 125.95(b)(2)(ii), Phase II existing facilities with cooling water intake structures that withdraw cooling water from a lake (other than one of the Great Lakes) or reservoir and that propose to increase the facility's design intake flow are required to submit a narrative description of the thermal stratification of the waterbody and any supporting documentation and engineering calculations showing that the increased total design intake flow meets the requirement to not disrupt the natural thermal stratification or turnover pattern (where present) of the source water in a way that adversely impacts fisheries, including the results of any consultations with Federal, State, or Tribal fish or wildlife management agencies. Typically, this natural thermal stratification will be defined by the thermocline, which may be affected to a certain extent by the withdrawal of cooler water and the discharge of heated water into the system. If increased total design intake flow is proposed, and disruption of the natural thermal stratification is a positive or neutral impact, the facility should include this information with the data submitted in this section.

c. Impingement Mortality and/or Entrainment Characterization Study (§ 125.95(b)(3))

The final regulations require that you submit the results of an Impingement Mortality and/or Entrainment Characterization Study in accordance with § 125.95(b)(3). If your facility has reduced its design, through-screen intake velocity to less than or equal to 0.5 ft/s, you are not required to submit the impingement mortality component of this study (§ 125.94(a)(1)(ii)). Facilities whose capacity utilization rate is less than 15 percent, facilities that withdraw cooling water only from a lake or reservoir other than one of the Great Lakes, and those facilities that withdraw less than 5 percent of the mean annual flow of a freshwater river or stream would only be required to submit the impingement mortality component of this study because no performance standards for entrainment apply. This Impingement Mortality and Entrainment characterization must include the following: (1) Taxonomic identifications of all life stages of fish, shellfish, and any species protected under Federal, State, or Tribal Law (including threatened or endangered species) that are in the vicinity of the cooling water intake structure(s) and are susceptible to impingement and entrainment; (2) a characterization of all life stages of fish, shellfish, and any species protected under Federal, State, or Tribal Law (including threatened or endangered species) identified in the taxonomic identification noted above, including a description of the abundance and temporal and spatial characteristics in the vicinity of the cooling water intake structure(s), based on sufficient data to characterize annual, seasonal, and diel variations in impingement mortality and entrainment (*e.g.*, related to climate and weather differences, spawning, feeding and water column migration); and (3) documentation of the current impingement mortality and entrainment of all life stages of fish, shellfish, and any species protected under Federal, State, or Tribal Law (including threatened or endangered species) identified above and an estimate of impingement mortality and entrainment to be used as the calculation baseline. The documentation may include historical data that are representative of the current operation of your facility and of biological conditions at the site. This information must be provided in sufficient detail to support development of the other elements of the Comprehensive Demonstration Study. Thus, while the taxonomic identification in item 1 will need to be fairly comprehensive, the quantitative data required in items 2 and 3 may be more focused on species of concern, and/or species for which data are available.

Impingement mortality and entrainment samples to support the calculations required by the Design and Construction Technology Plan and Restoration Plan must be collected during periods of representative operational flows for the cooling water intake structure and the flows associated with the samples must be documented. EPA recommends that the facility coordinate a review of its list of threatened, endangered, or other protected species with the U.S. Fish and Wildlife Service, National Marine Fisheries Service, or other relevant agencies to ensure that potential impacts to these species have been evaluated.

d. Technology and Compliance Assessment Information (§ 125.95(b)(4))

The Technology and Compliance Assessment Information required under § 125.95(b)(4) is comprised of two parts: (1) The Design and Construction Technology Plan; and (2) the Technology Installation and Operation Plan. If you plan to utilize the compliance alternative in § 125.94(a)(4), you need only submit the Technology Installation and Operation Plan. If you plan to utilize the compliance alternative in § 125.94(a)(2) or (3) using design and construction technologies and/or operational measures (either existing or new), you must submit both parts. Note that facilities seeking a site-specific determination of BTA in accordance with § 125.94(a)(5), must submit a Site-Specific Technology Plan in accordance with § 125.95(b)(6)(iii) rather than a Design and Construction Technology Plan. The two plans contain similar requirements, but are tailored to the compliance alternative selected. Facilities seeking a site-specific determination of the best technology available must submit a Technology Installation and Operation Plan along with their Site-Specific Technology Plan.

The Design and Construction Technology Plan must explain the technologies or operational measures selected by a facility to meet the requirements in § 125.94(a)(2) and (3). The Agency recognizes that selection of the specific technology or group of technologies for your site will depend on individual facility and waterbody conditions. Examples of appropriate technologies may include, but are not limited to, wedgewire screens, fine mesh screens, fish handling and return systems, barrier nets, aquatic filter barrier systems, and enlargement of the cooling water intake structure to reduce velocity. Examples of operational measures include, but are not limited to, seasonal shutdowns or reductions in flow, and continuous or more frequent rotation of travelling screens. Information required as part of your Design and Construction Technology Plan includes the following: (1) capacity utilization rate for your facility (or for individual intake structures where appropriate) and supporting data, including average annual net generation of the facility in megawatt hours (MWh) as measured over a five-year period (if available) of representative operating conditions and the total net capacity of the facility in megawatts (MW) and calculations (§ 125.95(b)(4)(i)); (2) a narrative description of the design and operation of all design and construction technologies and/or operational measures that you have or will put into place to meet the performance standards for reduction of impingement mortality of those species most susceptible to impingement, and information that demonstrates the efficacy of those technologies and/or operational measures for those species; (3) a description of the design and operation of all design and construction technologies or operational measures that you have or will put into place, to meet the performance standards for reduction of entrainment for those species most susceptible to entrainment, if applicable to your facility, and information that demonstrates the efficacy of those technologies and/or operational measures for those species; (4) calculations of the reduction in impingement mortality and/or entrainment of all life stages of fish and shellfish that would be achieved by the technologies and/or operational measures you have selected based on the Impingement Mortality and/or Entrainment Characterization Study in § 125.95(b)(3); and (5) design and engineering calculations, drawings, and estimates to support the narrative descriptions required in the Design and Construction Technology Plan prepared by a qualified expert such as a professional engineer.

If your facility has multiple intake structures and each is dedicated exclusively to the cooling water needs of one of more generating units, you may calculate the capacity utilization rate separately for each structure, for purposes of determining whether entrainment reduction performance standards are applicable. Note that you would still be required to consider the total design intake flow at all structures combined in determining whether your design intake flow exceeds 5 percent of the mean annual flow of a freshwater river or stream. If your capacity utilization rate, for either a single intake structure or the facility as a whole, is 15 percent or greater based on the historical 5 year annual average, but you make a binding commitment to the Director to maintain your capacity utilization rate below 15 percent for the duration of the permit, you may base your capacity utilization rate determination on that commitment.

In determining compliance with any requirements to reduce impingement mortality or entrainment, you must assess the total reduction in impingement mortality and entrainment against the calculation baseline developed under the Impingement Mortality and Entrainment Characterization Study (§ 125.95(b)(3)). The calculation baseline is defined at § 125.93 as an estimate of impingement mortality and entrainment that would occur at your site assuming (1) The cooling water intake system has been designed as a once-through system; (2) the opening of the cooling water intake structure is located at, and the face of the standard 3/8-inch mesh traveling screen is oriented parallel to, the shoreline near the surface of the source waterbody; and (3) the baseline practices, procedures, and structural configuration are those that the facility would maintain in the absence of any structural or operational controls, including flow or velocity reductions, implemented in whole or in part for the purposes of reducing impingement mortality and entrainment. You may also choose to use your facility's current level of impingement mortality and entrainment as the calculation baseline. EPA has previously referred to this as the "as-built approach." Reductions in impingement mortality and entrainment from the calculation baseline as a result of any design and construction technologies and/or operational measures already implemented at your facility should be added to the reductions expected to be achieved by any additional design and construction technologies and operational measures that will be implemented in order to meet the applicable performance standards (§ 125.95(b)(4)(i)(C)). In this case, the calculation baseline could be estimated by evaluating existing data from a facility nearby without impingement and/or entrainment control technology (if relevant) or by evaluating the abundance of organisms in the source waterbody in the vicinity of the intake structure that may be susceptible to impingement and/or entrainment. Additionally, if a portion of the total design intake flow is water withdrawn for a closed-cycle, recirculating cooling system (but flow is not sufficiently reduced to satisfy the compliance option in § 125.94(a)(1)(i)), such facilities may use the reduction in impingement mortality and entrainment that is attributed to the reduction in flow in meeting the performance standards in § 125.94(b). The calculation baseline may be estimated using: historical impingement mortality and entrainment data from your facility or from another facility with comparable design, operational, and environmental conditions; current biological data collected in the waterbody in the vicinity of your cooling water intake structure; or current impingement mortality and entrainment data collected at your facility. A facility may request that the calculation baseline be modified to be based on a location of the opening of the cooling water intake structure at a depth other than at or near the surface if they can demonstrate to the Director that the other depth would correspond to a higher baseline level of impingement mortality and/or entrainment.

The Technology Installation and Operation Plan is required for all facilities that choose the compliance alternative in § 125.94(a)(2), (3), (4), or (5), propose to use design and construction technologies and/or operational measures (either existing or new) to meet performance standards or site specific requirements. Such facilities must submit the following information to the Director for review and approval: (1) A schedule for the installation and maintenance of any new design and construction technologies; (2) a list of the operational parameters that will be monitored, including the location and the frequency at which you will monitor them; (3) a list of activities you will undertake to ensure to the degree practicable the efficacy of the installed design and construction technologies and operational measures, and the schedule for implementing them; (4) a schedule and methodology for assessing the efficacy of any installed design and construction technologies and operational measures in achieving applicable performance standards, including an adaptive management plan for revising design and construction technologies and/or operational technologies if your assessment indicates that applicable performance standards are not being met; and (5) for facilities that select a pre-approved technology in accordance with § 125.94(a)(4), documentation that appropriate site conditions (as specified by EPA or the Director in accordance with § 125.99) exist at your facility. In developing the schedule for installation and maintenance of any new design and construction technologies in item 1, you should schedule any downtime to coincide with otherwise necessary downtime (*e.g.*, for repair, overhaul, or routine maintenance of the generating units) to the extent practicable. Where additional downtime is required, you may coordinate scheduling of this downtime with the North American Electric Reliability Council and/or other generators in your area to ensure that impacts to energy reliability and supply are minimized. The Director should approve any reasonable scheduling provision included for this purpose. Those facilities that propose to use restoration measures must submit the Restoration Plan required at § 125.95(b)(5).

Today's final rule requires the Director to evaluate, using information submitted in your application, bi-annual status reports, and any other available information, the performance of any technologies, operational measures, and/or restoration measures you may have implemented in previous permit terms. Additional or different design and construction technologies, operational measures, and/or restoration measures may be required if the Director determines that the initial technologies, operational measures, and/or restoration measures you selected and implemented will not meet the requirements of § 125.94(b) and (c), as provided in § 125.98(b)(1)(i). The rule also requires that your permit contain a condition requiring your facility to reduce impingement mortality and entrainment commensurate with the efficacy of the installed design and construction technologies and/or operational measures. This is designed to ensure that technologies are operated and maintained to ensure their efficacy to the degree practicable, and not merely to meet the low end of the applicable performance standard range, if better performance is practicable. The Technology Installation and Operation Plan is one of the most important pieces of documentation for implementing the requirements of this final rule. It serves to (1) guide facilities in the installation, operation, maintenance, monitoring, and adaptive management of selected design and construction technologies and/or operational measures; (2) provide a schedule and methodology for assessing success in meeting applicable performance standards and site-specific requirements; and (3) provide a basis for determining compliance with the requirements of § 125.94(a)(2)–(5). Facilities and Directors are encouraged to take appropriate care in developing, reviewing and approving the plan. Note that for facilities employing restoration measures, the Restoration Plan serves the same required functions.

e. Restoration Plan (§ 125.95(b)(5))

EPA views restoration measures as part of the ''design'' of a cooling water intake structure, and considers restoration measures one of several technologies that may be employed, in combination with others, to minimize adverse environmental impact. The consideration of restoration measures is relevant to the section 316(b) determination of the requisite design of cooling water intake structures because restoration measures help minimize the adverse environmental impact attributable to such structures. Facilities may use restoration measures that produce and/or result in levels of fish and shellfish in the facility's waterbody or watershed that are substantially similar to those that would result through compliance with the applicable performance standards or alternative site-specific requirements. In order to employ restoration measures, the facility must demonstrate to the Director that it has evaluated the use of design and construction technologies and/or operational measures and determined that the use of restoration measures is appropriate because meeting the applicable performance standards or site-specific requirements through the use of design and construction technologies and/or operational measures alone is less feasible, less cost-effective or less environmentally desireable than meeting the standards in whole or in part through the use of restoration measures. Facilities must also demonstrate to the Director that the restoration measures, alone or in combination with any feasible design and construction technologies and/or restoration measures, will produce ecological benefits and maintain fish and shellfish in the waterbody, including community structure and function, at a substantially similar level to that which would be achieved by meeting the applicable performance standards at § 125.94(b) or the site-specific requirements developed pursuant to § 125.94(a)(5). The Director must approve any use of restoration measures.

To help all parties review the proposed or existing restoration measures and to help ensure adequate performance of those measures, § 125.95(b)(5) requires facilities proposing to use restoration measures to submit a Restoration Plan with their applications to the Director for review and approval. In the submittal, the facility must address species identified, in consultation with Federal, State, and Tribal fish and wildlife management agencies with responsibility for fisheries and wildlife potentially affected by its the facility's cooling water intake structures, as species of concern. The level of complexity of the Restoration Plan likely will be commensurate with the restoration measures considered or proposed.

First, the facility must demonstrate that it has evaluated the use of design and construction technologies and/or operational measures and explain how it determined that the use of restoration measures would be more feasible, cost-effective, or environmentally desirable than meeting the applicable performance standards or site-specific requirements wholly through the use of design and construction technologies, and/or operational measures.

Second, the facility must submit a narrative description of the design and operation of all restoration measures the facility has in place or has selected and proposes to implement to produce fish and shellfish. If the ecological benefits from an existing restoration project are required to compensate for some environmental impact other than the impact from impingement and entrainment by the cooling water intake structure (*e.g.*, a wetland created to satisfy section 404 of the Clean Water Act requirements), those ecological benefits should not be counted towards meeting the applicable performance standards or site-specific requirements. The narrative description should identify the species targeted under any restoration measures.

Third, the facility must submit a quantification of the ecological benefits of the existing and/or proposed restoration measures. The facility must estimate the reduction in fish and shellfish impingement mortality and entrainment that would be necessary to comply with applicable performance standards or site-specific requirements, using information from the Impingement Mortality and Entrainment Characterization Study and any other available and appropriate information. The facility must then calculate the production of fish and shellfish from existing and proposed restoration measures. The quantification must also include a discussion of the nature and magnitude of uncertainty associated with the performance of the restoration measures and a discussion of the time frame within which ecological benefits are expected to accrue from the restoration project.

Fourth, the facility must provide design calculations, drawings, and estimates documenting that the proposed restoration measures, in combination with design and construction technologies and/or operational measures, or alone, will meet the requirements for production of fish and shellfish. Production of fish and shellfish as a result of relevant restoration measures already implemented at the facility should be added to the production expected to be achieved by the additional restoration measures. If the restoration measures address the same fish and shellfish species identified in the Impingement Mortality and Entrainment Characterization Study (in-kind restoration), the facility must demonstrate that the restoration measures will produce a level of these fish and shellfish substantially similar to that which would result from meeting applicable performance standards or site-specific requirements. In this case, the calculations should include a site-specific evaluation of the suitability of the restoration measures based on the species that are found at the site. If the restoration measures address fish and shellfish species different from those identified in the Impingement Mortality and Entrainment Characterization Study (out-of-kind restoration), the facility must demonstrate that the restoration measures produce ecological benefits substantially similar to or greater than those that would be realized through in-kind restoration. Such a demonstration should be based on a watershed approach to restoration planning and consider applicable multi-agency watershed restoration plans, site-specific peer-reviewed ecological studies, and/or consultation with appropriate Federal, State, and Tribal natural resource agencies. While both in-kind and out-of-kind restoration require a quantification of the levels of fish and shellfish the restoration measures are expected to produce, out-of-kind restoration may include a qualitative demonstration that these ecological benefits are substantially similar to or greater than those that would be realized through in-kind restoration, because different species are being produced that may not be directly comparable to those identified in the Impingement Mortality and/or Entrainment Characterization Study.

Fifth, the facility must submit a plan utilizing an adaptive management method for implementing, maintaining, and demonstrating the efficacy of the restoration measures it has selected and for determining the extent to which restoration measures, or the restoration measures in combination with design and construction technologies and operational measures, have met the applicable performance standards or site-specific requirements. Adaptive management is a process in which a facility chooses an approach for meeting a project goal, monitors the effectiveness of that approach, and then, based on monitoring and any other available information, makes any adjustments necessary to ensure continued progress toward the project's goal. This cycle is repeated as necessary until the goal is met.

The adaptive management plan must include (1) A monitoring plan that includes a list of the restoration parameters that the facility will monitor, the frequency at which they will be monitored, and the success criteria for each parameter; (2) a list of activities the facility will undertake to ensure the efficacy of the restoration measures, a description of the linkages between these activities and the items described in the monitoring plan, and an implementation schedule for the activities; and (3) a process for revising the restoration plan as new information, including monitoring data, becomes available, and if the applicable performance standards or site-specific requirements are not being met.

Sixth, the facility must submit a summary of any past or ongoing consultation with Federal, State, and Tribal fish and wildlife management agencies on its use of restoration measures, including any written comments received as a result of such consultations.

Seventh, if requested by the Director, the facility must conduct a peer review of items to be submitted as part of the Restoration Plan. Written comments from peer reviewers must be submitted to the Director and made available to the public as part of the permit application. Peer reviewers must be selected in consultation with the Director who may consult with EPA, Federal, State and Tribal fish and wildlife management agencies with responsibility for fish and wildlife potentially affected by the facility's cooling water intake structure(s). Peer reviewers must have appropriate qualifications (*e.g.*, in the fields of geology, engineering and/or biology) depending upon the materials to be reviewed.

Finally, the facility must include in the Plan a description of information to be included in a status report to the Director every two years. The final regulations at § 125.98(b)(1)(ii) require that this information be reviewed by the Director to determine whether the proposed restoration measures, in conjunction with (or in lieu of) design and construction technologies and/or operational measures, will meet the applicable performance standards or site-specific requirements, or, if the restoration is out-of-kind, will produce ecological benefits (fish and shellfish) including maintenance or protection of community structure and function in your facility's waterbody or watershed.

f. Compliance Using a Pre-approved Technology (§ 125.94(a)(4))

If you choose to comply with the fourth compliance alternative, you must submit documentation to the Director that your facility meets the appropriate site conditions and you have installed and will properly operate and maintain submerged cylindrical wedgewire screen technology (as described in § 125.99(a)(1)) or other technologies as approved by the Director under § 125.99(b)). If you are subject to impingement mortality performance standards only, and plan to install wedgewire screens with a maximum through-screen design intake velocity of 0.5 ft/s or less, you should choose the compliance alternative in § 125.94(a)(1)(i), and do not need to demonstrate that you meet the other criteria in § 125.99(a)(1) or prepare a Technology Installation and Operation Plan or Verification Monitoring Plan.

Facilities subject to entrainment performance standards seeking compliance under this alternative must submit a Technology Installation and Operation Plan and a Verification Monitoring Plan that address entrainment reduction, and document that all of the appropriate site conditions in § 125.99(a)(1) exist at their facility. To qualify for compliance using the cylindrical wedgewire screen technology, your facility must meet the following conditions: (1) Your cooling water intake structure is located in a freshwater river or stream; (2) your cooling water intake structure is situated such that sufficient ambient counter-currents exist to promote cleaning of the screen face; (3) your maximum through-screen design intake velocity is 0.5 ft/s or less; (4) the slot size is appropriate for the size of eggs, larvae, and juveniles of all fish and shellfish to be protected at the site; and (5) your entire main condenser cooling water flow is directed through the technology. Note that small flows totalling less than 2 MGD for auxiliary plant cooling do not necessarily have to be included. Facilities should demonstrate that they meet these criteria in the Technology Installation and Operation Plan.

In addition, any interested person may submit a request that a technology be approved for use in accordance with the compliance alternative in § 125.94(a)(4). If the Director approves, the technology may be used by all facilities that have similar site conditions under the Director's jurisdiction. To do this, the interested person must submit the following as required by § 125.99(b): (1) A detailed description of the technology; (2) a list of design criteria for the technology and site characteristics and conditions that each facility must have in order to ensure that the technology can consistently meet the appropriate impingement mortality and entrainment performance standards in § 125.94(b); and (3) information and data sufficient to demonstrate that all facilities under the jurisdiction of the Director can meet the applicable impingement mortality and entrainment performance standards in § 125.94(b) if the applicable design criteria and site characteristics and conditions are present at the facility.

EPA has adopted this compliance alternative in response to comments suggesting that EPA provide an additional, more streamlined compliance option under which a facility could implement certain specified technologies that are deemed highly protective in exchange for reducing the scope of the Comprehensive Demonstration Study. (See, 68 FR 13522, 13539; March 19, 2003).

g. Verification Monitoring Plan (§ 125.95(b)(7))

Finally, § 125.95(b)(7) requires all Phase II existing facilities complying under §§ 125.94(a)(2), (3), (4), or (5) using design and construction technologies and/or operational measures, to submit a Verification Monitoring Plan to measure the efficacy of the implemented design and construction technologies and/or operational measures. The plan must include at least two years of monitoring to verify the full-scale performance of the proposed or already implemented design and construction technologies and/or operational measures. Note that verification monitoring is also required for restoration measures but the requirements for this monitoring are included as part of the Restoration Plan in § 125.95(b)(5)(v). Components of the Verification Monitoring Plan must include:

(i) Description of the frequency and duration of monitoring, the parameters to be monitored, and the basis for determining the parameters and the frequency and duration of monitoring. The parameters selected and the duration and frequency of monitoring must be consistent with any methodology for assessing success in meeting applicable performance standards in your Technology Installation and Operation Plan as required by § 125.95(b)(4)(ii);

(ii) A proposal on how naturally moribund fish and shellfish that enter the cooling water intake structure would be identified and taken into account in assessing success in meeting the performance standards in § 125.94(b); and,

(iii) A description of the information to be included in a bi-annual status report to the Director.

The facility and the Director will use the results of verification monitoring to assess the facility's success in meeting the performance standards for impingement mortality and entrainment reduction or alternate site-specific requirements and to guide adaptive management in accordance with the requirements in the facility's Technology Installation and Operation Plan. Restoration monitoring is discussed separately under § 125.95(b)(5)(v). Verification monitoring is required to begin once the technologies and/or operational measures are implemented and continue for a sufficient period of time (but at least two years) to assess success in reducing impingement mortality and entrainment.

C. How Will the Director Determine the Appropriate Cooling Water Intake Structure Requirements?

Initially, the Director must determine whether the facility is covered by this rule. If the answer to all the following questions is yes, the facility will be required to comply with the requirements of this final rule (§ 125.91).

- Is the facility a point source?
- Does the facility use or propose to use a cooling water intake structure(s) with a total design intake flow of 50 million gallons per day (MGD) or more to withdraw cooling water from waters of the United States?
- As its primary activity, does the facility both generate and transmit electric power or generate electric power but sell it to another entity for transmission?
- Is at least 25 percent of the water withdrawn used solely for cooling purposes?

In the case of a Phase II existing facility that is co-located with a manufacturing facility, only that portion of the cooling water intake flow that is used by the Phase II facility to generate electricity for sale to another entity will be considered for purposes of determining the 50 MGD and 25 percent criteria.

Use of a cooling water intake structure includes obtaining cooling water by any sort of contract or arrangement with one or more independent suppliers of cooling water if the supplier withdraws water from waters of the United States (except as provided below) but is not itself a Phase II existing facility. This provision is intended to prevent circumvention of these requirements by creating arrangements to receive cooling water from an entity that is not itself a Phase II existing facility. However, for purposes of this provision, a public water system or any entity that sells treated effluent to be used as cooling water is not a ''supplier.'' Thus, obtaining cooling water from a public water system or treated effluent used as cooling water does not constitute use of a cooling water intake structure. This rule is not intended to discourage the beneficial reuse of treated effluent, nor is it intended to impose requirements on public water systems.

Permit Application Review

The Director must review the application materials submitted under § 122.21(r) and § 125.95 and determine the appropriate performance standards to apply to the facility and approve a set of design and construction technologies, operational measures, and/or restoration measures to meet these standards. The first step is to review the Proposal for Information Collection and determine if the technologies, operational measures, and/or restoration measures to be evaluated seem appropriate for the site and if the data gathering activities (including the sampling plan) seem adequate to support the development of the other components of the Comprehensive Demonstration Study, including impingement mortality and entrainment estimates. The Director will also review any existing data submitted. The Director must review and provide comment on the Proposal for Information Collection; however, a facility may proceed with planning, assessment, and data collection activities in fulfillment of Comprehensive Demonstration Study requirements prior to receiving comments from the Director. The Director is encouraged to provide comments expeditiously (*i.e.*, within 60 days) so the facility can make responsive modifications to its information collection plans.

If a facility submits a request in accordance with § 125.95(a)(3) to reduce information about its cooling water intake structures and the source waterbody required to be submitted in its permit application (other than for the first permit term after promulgation of this rule, for which complete information is required), the Director must approve the request within 60 days if conditions at the facility and in the waterbody remain substantially unchanged since the facility's previous application.

The Director must also review all information submitted under § 122.21(r)(2), (3), and (5) and § 125.95, as appropriate, to determine appropriate permit conditions based on the requirements in this subpart. At each permit renewal, or more frequently as appropriate, the Director must assess success in meeting applicable performance standards, restoration requirements, and/or alternate site-specific requirements.

At each permit renewal, the Director must review the application materials and monitoring data to determine whether additional requirements should be included in the permit to meet the applicable performance standards. Additional requirements may include, but are not limited to, additional design and construction technologies, operational measures, and/or restoration measures, improved operation and maintenance of existing technologies and measures, and/or increased monitoring.

Permitting Requirements

Following consideration of the information submitted by the Phase II existing facility in its NPDES permit application, the Director must determine the appropriate requirements and conditions to include in the permit based on the compliance alternatives in § 125.94(a) for establishing best technology available chosen by the facility. The following requirements must be included in each permit:

(1) *Cooling Water Intake Structure Requirements.* Requirements that implement the applicable provisions of § 125.94 must be included in the permit conditions. To accomplish this, the Director must evaluate the performance of the design and construction technologies, operational measures, and/or restoration measures proposed and implemented by the facility and require additional or different design and construction technologies, operational measure, and/or restoration measures, and/or improved operation and maintenance of existing technologies and measures, if needed to meet the applicable impingement mortality and entrainment performance standards, restoration requirements for fish and shellfish production, or alternate site-specific requirements.

In determining compliance with the performance standards for facilities proposing to increase withdrawals of cooling water from a lake (other than a Great Lake) or a reservoir in § 125.94(b)(3), the Director must consider anthropogenic factors (those not considered ''natural'') unrelated to the Phase II existing facility's cooling water intake structures that can influence the occurrence and location of a thermocline. Anthropogenic factors may include source water inflows, other water withdrawals, managed water uses, wastewater discharges, and flow/level management practices (*e.g.,* some reservoirs release water from deeper bottom layers). The Director must coordinate with appropriate Federal, State, or Tribal fish and wildlife agencies to determine if any disruption of the natural thermal stratification resulting from the increased withdrawal of cooling water does not adversely affect the management of fisheries.

To develop appropriate requirements for the cooling water intake structure(s), the Director must do the following:

(i) Review and approve the Design and Construction Technology Plan required in § 125.95(b)(4) to evaluate the suitability and feasibility of the design and construction technology and/or operational measures proposed to meet the performance standards of § 125.94(b), or site-specific requirements developed pursuant to § 125.94(a)(5);

(ii) If the facility proposes restoration measures in accordance with § 125.94(c), review and approve the Restoration Plan required under § 125.95(b)(5) to determine whether the proposed measures, alone or in combination with design and construction technologies and/or operational measures, will meet the requirements under § 125.94(c);

(iii) In each reissued permit, include a condition in the permit requiring the facility to reduce impingement mortality and entrainment (or to increase fish and shellfish production, if applicable) commensurate with the efficacy at the facility of the installed design and construction technologies, operational measures, and/or restoration measures;

(iv) If the facility implements design and construction technologies and/or operational measures and requests that compliance with the requirements of § 125.94 be measured for the first permit (or subsequent permit terms, if applicable) employing the Technology Installation and Operation Plan in accordance with § 125.95(b)(4)(ii), the Director must review and approve the plan and require the facility to meet the terms of the plan including any revisions to the plan that may be necessary if applicable performance standards or site-specific requirements are not being met. If the facility implements restorations measures and requests that compliance with the requirements in § 125.94 be measured for the first permit term (or subsequent permit terms, if applicable) employing a Restoration Plan in accordance with § 125.95(b)(5), the Director must review and approve the plan and require the facility to meet the terms of the plan including any revision to the plan that may be necessary if applicable performance standards or site-specific requirements are not being met. In determining whether to approve a Technology Installation and Operation Plan or Restoration Plan, the Director must evaluate whether the design and construction technologies, operational measures, and/or restoration measures the facility has installed, or proposes to install, can reasonably be expected to meet the applicable performance standards in § 125.94(b), restoration requirements in § 125.94(c)(2), and/or alternative site-specific requirements established pursuant to § 125.94(a)(5), and whether the Technology Installation and Operation Plan and/or Restoration Plan complies with the applicable requirements of § 125.95(b). In reviewing the Technology Installation and Operation Plan, the Director must approve any reasonable scheduling provisions that are designed to ensure that impacts to energy reliability and supply are minimized, in accordance with § 125.95(b)(4)(ii)(A). If the facility does not request that compliance with the requirements in § 125.94 be measured employing a Technology Installation and Operation Plan and/or Restoration Plan, or the facility has not been in compliance with the terms of its current Technology Installation and Operation Plan and/or Restoration Plan during the preceding permit term, the Director must require the facility to comply with the applicable performance standards in § 125.94(b), restoration requirement in § 125.94(c)(2), and/or alternative site-specific requirements developed pursuant to § 125.94(a)(5). In considering a permit application, the Director must review the performance of the design and construction technologies, operational measures, and/or restoration measures implemented and require additional or different design and construction technologies, operational measures, and/or restoration measures, and/or improved operation and maintenance of existing technologies and measures, if needed to meet the applicable performance standards, restoration requirements, and/or alternative site-specific requirements.

(v) Review and approve the proposed Verification Monitoring Plan submitted under § 125.95(b)(7) (for design and construction technologies) and/or monitoring provisions of the Restoration Plan submitted under § 125.95(b)(5)(v) and require that the monitoring continue for a sufficient period of time to demonstrate whether the design and construction technology, operational measures, and/or restoration measures meet the applicable performance standards in § 125.94(b), restoration requirements in § 125.94(c)(2) and/or site-specific requirements established pursuant to § 125.94(a)(5);

(vi) If a facility requests requirements based on a site-specific determination of best technology available for minimizing adverse environmental impact, the Director must review the application materials submitted under § 125.95(b)(6) and any other information submitted, including quantitative and qualitative benefits, that would be relevant to a determination of whether alternative requirements are appropriate for the facility. If a facility submits a study to support entrainment survival at the facility, the Director must review and approve the results of that study. If the Director determines that alternative requirements are appropriate, the Director must make a site-specific determination of best technology available for minimizing adverse environmental impact in accordance with § 125.94(a)(5). The Director may request revisions to the information submitted by the facility in accordance with § 125.95(b)(6) if it does not provide an adequate basis to make this determination. Any site-specific requirements established based on new and/or existing design and construction technologies, operational measures, and/or restoration measures, must achieve an efficacy that is, in the Director's judgement, as close as practicable to the applicable performance standards without resulting in costs that are significantly greater than the costs considered by the Administrator for a like facility to achieve the applicable performance standards or the benefits of complying with the applicable performance standards in § 125.94(b);

(vii) The Director must review information on the proposed methods for assessing success in meeting applicable performance standards and/or restoration requirements submitted by the facility under § 125.95(b)(4)(ii)(D) and/or (b)(5)(v)(A), evaluate those and other available methods, and specify how success in meeting the performance standards and/or restoration requirements must be determined including the averaging period for determining the percent reduction in impingement mortality and entrainment and/or the production of fish and shellfish. Compliance for facilities who request that compliance be measured employing a Technology Installation and Operation Plan and/or Restoration Plan must be determined in accordance with § 125.98(b)(1)(iv).

(2) *Monitoring Conditions.* The Director must require the facility to perform monitoring in accordance with the Technology Installation and Operation Plan in § 125.95(b)(4)(ii), the Restoration Plan required by § 125.95(b)(5), if applicable, and the Verification Monitoring Plan required by § 125.95(b)(7). In determining any additional applicable monitoring requirements in accordance with § 125.96, the Director must consider the monitoring facility's Verification Monitoring, Technology Installation and Operation, and/or Restoration Plans, as appropriate. The Director may modify the monitoring program based on changes in physical or biological conditions in the vicinity of the cooling water intake structure.

(3) *Record Keeping and Reporting.* At a minimum, the permit must require the facility to report and keep records specified in § 125.97.

(4) *Pre-Approved Design and Construction Technologies.* Section 125.94(a)(4) offers facilities the choice of adopting a protective, pre-approved design and construction technology, and preparing a significantly streamlined Comprehensive Demonstration Study. Section 125.99 lists one pre-approved

technology (wedgewire screens) and provides an opportunity for the Director to pre-approve other technologies.

For a facility that chooses to demonstrate that they have installed and properly operate and maintain a design and construction technology approved in accordance with § 125.99, the Director must review and approve the information submitted in the Technology Installation and Operation Plan in § 125.95(b)(4)(ii) and determine if they meet the criteria in § 125.99.

If a person/facility requests approval of a technology under § 125.99(b), the Director must review and approve the information submitted and determine its suitability for widespread use at facilities with similar site conditions in its jurisdiction with minimal study. The Director must evaluate the adequacy of the technology when installed in accordance with the required design criteria and site conditions to consistently meet the performance standards in § 125.94(b). The Director may only approve a technology following public notice and consideration of comment regarding such approval.

(5) *Bi-Annual Status Report.* The Director must specify monitoring data and other information to be included in a status report every two years. The other information may include operation and maintenance records, summaries of adaptive management activities, or any other information that is relevant to determining compliance with the terms of the facility's Technology Installation and Operation Plan and/or Restoration Plan.

D. What Will I Be Required To Monitor?

Section 125.96 of today's final rule provides that Phase II existing facilities must perform monitoring in accordance with the Verification Monitoring Plan required by § 125.95(b)(7), the Technology Installation and Operation Plan required by § 125.95(b)(4)(ii), if applicable, the Restoration Plan required by § 125.95(b)(5), and any additional monitoring specified by the Director to demonstrate compliance with the applicable requirements of § 125.94. In developing monitoring conditions, the Director should consider the need for biological monitoring data, including impingement and entrainment sampling data sufficient to assess the presence, abundance, life stages (including eggs, larvae, juveniles, and adults), and mortality of aquatic organisms (fish and shellfish or other organisms required to be monitored by the Director) impinged or entrained during operation of the cooling water intake structure. This type of data may be used to develop permit conditions to implement the requirements of this rule. The Director should ensure, where appropriate, that any required monitoring will allow for the detection of any annual, seasonal, and diel variations in the species and numbers of individuals that are impinged or entrained.

The Director may modify the monitoring program based on changes in physical or biological conditions in the vicinity of the cooling water intake structure. The Director may also require monitoring of operational parameters for facilities that employ a Technology Installation and Operation Plan or Restoration Plan to comply with the requirements of § 125.94. The Director must specify what monitoring or other data is to be included in a status report every two years.

E. How Will Compliance Be Determined?

This final rule will be implemented by the Director placing conditions consistent with the requirements of this part in NPDES permits. A facility may demonstrate compliance by meeting the performance standards in § 125.94(b) applicable to the facility. The application information, including components of the Comprehensive Demonstration Study, as appropriate, should demonstrate that the facility is already meeting the performance standards, or that it will install and properly operate and maintain design and construction technologies, operational measures, and/or restoration measures to meet the performance standards, or that a site-specific determination of best technology available is necessary. To support this demonstration, the facility should submit the following information to the Director:

- Data submitted with the NPDES permit application to show that the facility meets location, design, construction, and capacity requirements consistent with the compliance alternative selected;
- Data to demonstrate that the facility is meeting the performance standards consistent with the compliance alternative selected;
- Compliance monitoring data and records as prescribed by the Director.

The specifics of how success in meeting the performance standards shall be measured (i.e, the number of species, whether critical species or all species) and the method of measurement (*e.g.,* total biomass, total counts, etc.) must be determined by the Director based on review of the proposed methodology submitted by the facility in its Technology Installation and Operation Plan and/or Restoration Plan, and any other methods the Director considers appropriate.

Alternatively, the facility may request that compliance be determined based on whether it has complied with the construction, operational, maintenance, monitoring, and adaptive management requirements of its Technology Installation and Operation Plan (for design and construction technologies and/or operational measures) or Restoration Plan (for restoration measures). In this case, the facility must still assess success in meeting applicable performance standards or restoration requirements but this assessment serves to guide the adaptive management process rather than as a basis for determining compliance. After the first permit term following promulgation of this subpart, facilities are only eligible for this compliance determination alternative if they have been in compliance with the terms of their Technology Installation and Operation Plan and/or Restoration Plan during the preceding permit term. Under this compliance determination alternative, the Technology Installation and Operation Plan or Restoration Plan must specify construction, operational, maintenance, monitoring, and adaptive management requirements that can reasonably be expected to achieve success in meeting the applicable performance standards, restoration requirements and/or site-specific requirements. These construction, operational, maintenance, monitoring, and adaptive management requirements must also be approved by the Director, who will also specify what monitoring data and other information must be included in the facility's biannual status report.

The required elements of the Technology Installation and Operation Plan include (1) a schedule for installation and maintenance of any new technologies; (2) operational parameters to be monitored; (3) activities to ensure the efficacy of technologies and measures; (4) a schedule and methodology for assessing the efficacy of installed technologies and measures in meeting the performance standards; (5) an adaptive management plan; and (6) for facilities using a pre-approved compliance technology, documentation that they meet the conditions for its use. The Restoration Plan requires corresponding information as appropriate for restoration measures.

EPA believes that it is important for facilities to consider and document each of the components of the Technology

Installation and Operation Plan, regardless of which compliance determination approach is used. However, the level of detail appropriate for some of the components may be different for the two different approaches. For facilities that comply by demonstrating success in meeting performance standards, particularly in cases where they are already meeting the standards and no significant changes in technologies or operations are needed, brief summaries may be sufficient for most components, though they will still need detailed documentation of their schedule and methodology for assessing efficacy of installed technologies and measures for meeting the standards. Conversely, for facilities where compliance is determined based on whether they have complied with the construction, operation, maintenance, monitoring, and adaptive management approaches required in the Technology Installation and Operation Plan or Restoration Plan, a fairly detailed specification of these requirements will be appropriate. The Director should ensure that the level of detail in the Technology Installation and Operation Plan or Restoration Plan is sufficient to support whichever compliance determination approach is selected.

Section 125.97 requires existing facilities to keep records and report monitoring data and other information specified by the Director in a bi-annual status report although Directors may require more frequent reports. Facilities must also keep records of all data used to complete the permit application and show compliance with the requirements of § 125.94, any supplemental information developed under § 125.95, and any compliance monitoring data submitted under § 125.96, for a period of at least three (3) years from date of permit issuance. The Director may require that these records be kept for a longer period.

F. What Are the Respective Federal, State, and Tribal Roles?

Today's final regulations amend 40 CFR 123.25(a)(36) to add a requirement that authorized State and Tribal programs have sufficient legal authority to implement today's requirements (40 CFR part 125, subpart J). Therefore, today's final rule affects authorized State and Tribal NPDES permit programs. Under 40 CFR 123.62(e), any existing approved section 402 permitting program must be revised to be consistent with new program requirements within one year from the date of promulgation, unless the NPDES-authorized State or Tribe must amend or enact a statute to make the required revisions. If a State or Tribe must amend or enact a statute to conform with today's final rule, the revision must be made within two years of promulgation. States and Tribes seeking new EPA authorization to implement the NPDES program must comply with the requirements when authorization is approved. This final regulation does not alter State authority under section 510 of the Clean Water Act.

EPA recognizes that some States have invested considerable effort in developing and implementing section 316(b) regulatory programs. This final regulation allows States to use these programs to fulfill section 316(b) requirements where the State demonstrates to the Administrator that such programs will achieve comparable environmental performance. Specifically, the final rule allows any State to demonstrate to the Administrator that it has adopted alternative regulatory requirements in its NPDES program that will result in environmental performance within each relevant watershed that is comparable to the reductions in impingement mortality and entrainment that would otherwise be achieved under § 125.94.

In addition to updating their programs to be consistent with today's final rule, States and Tribes authorized to implement the NPDES program are required under NPDES State program requirements to implement the cooling water intake structure requirements of subpart J following promulgation of the final regulations. The permit requirements in this final rule must be implemented upon the first issuance or reissuance of permits following promulgation.

Duties of an authorized State or Tribe under this regulation may include:

- Review and verification of permit application materials, including a permit applicant's determination of source waterbody classification and the flow of a freshwater river or stream at the point of the intake;
- Determination of the performance standards in § 125.94(b) that apply to the facility;
- Verification of a permit applicant's determination of whether it meets or exceeds the applicable performance standards;
- Verification that a permit applicant's Technology and Compliance Assessment Information, including the Design and Construction Technology Plan and Technology Installation and Operation Plan, demonstrates that the proposed technologies and measures will reduce the impacts to fish and shellfish to levels required;
- Verification that a permit applicant is eligible for site-specific requirements, and if so, development of site-specific requirements that achieve an efficacy as close as practicable to the applicable performance standards;
- Verification that the Technology Installation and Operation Plan can reasonably be expected to meet performance standards or alternative site-specific requirements;
- Verify that the facility meets the requirements of the approved compliance alternative it selected;
- Verify that any Restoration Plan meets all applicable requirements;
- Verify that the Verification Monitoring Plan is sufficient to assess technology efficacy;
- Development of draft and final NPDES permit conditions for the applicant implementing applicable section 316(b) requirements pursuant to this rule including whether compliance with the requirements of § 125.94 will be determined based on success in meeting applicable performance standards or based on complying with a Technology Installation and Operation Plan or Restoration Plan; and,
- Ensuring compliance with permit conditions based on section 316(b) requirements.

EPA will implement these requirements where States or Tribes are not authorized to implement the NPDES program. EPA also will implement these requirements where States or Tribes are authorized to implement the NPDES program but do not have sufficient authority to implement these requirements.

G. Are Permits for Existing Facilities Subject to Requirements Under Other Federal Statutes?

EPA's NPDES permitting regulations at 40 CFR 122.49 contain a list of Federal laws that might apply to Federally issued NPDES permits. These include the Wild and Scenic Rivers Act, 16 U.S.C. 1273 *et seq.;* the National Historic Preservation Act of 1966, 16 U.S.C. 470 *et seq.;* the Endangered Species Act, 16 U.S.C. 1531 *et seq.;* the Coastal Zone Management Act, 16 U.S.C. 1451 *et seq.;* and the National Environmental Policy Act, 42 U.S.C. 4321 *et seq. See* 40 CFR 122.49 for a brief description of each of these laws. In addition, the provisions of the Magnuson-Stevens Fishery Conservation and Management Act, 16 U.S.C. 1801 *et seq.,* relating to essential fish habitat might be relevant. Nothing in this final rulemaking authorizes activities that are not in compliance with these or other applicable Federal laws (*e.g.,* Marine Mammal Protection Act, 16 U.S.C. 1361 *et seq.,* and Migratory Bird Treaty Act, 16 U.S.C. 703 *et seq.*).

H. Alternative Site-Specific Requirements

Under § 125.94(a)(5), an existing facility may demonstrate to the Director that it has selected, installed, and is properly operating and maintaining, or will install and properly operate and maintain, design and construction technologies, operational measures, and/or restoration measures that the Director determines to be the best technology available to minimize adverse environmental impact for the facility based on the cost-cost test specified in sub-section (a)(5)(i) or the cost-benefit test specified in (a)(5)(ii) of the rule.

Section 125.94(a)(5)(i) provides that an existing facility may demonstrate that the costs of compliance under the compliance alternatives in § 125.94(a)(2) through (4) of the rule would be significantly greater than the costs considered by the Administrator for a like facility in establishing the applicable performance standards. In such cases, the Director must make a site-specific determination of the best technology available for minimizing adverse environmental impact. The Director must establish site-specific alternative requirements based on new and/or existing design and construction technologies, operational measures, and/or restoration measures that achieve an efficacy that is, in the judgment of the Director, as close as practicable to the applicable performance standards in § 125.94(b) of the rule.

Section 125.94(a)(5)(ii) provides that an existing facility may demonstrate that the costs of compliance under alternatives in § 125.94(a)(2) through (4) of the rule would be significantly greater than the benefits of complying with the applicable performance standards at that facility. In such cases, the Director must make a site-specific determination of best technology available for minimizing adverse environmental impact. The Director must establish site-specific alternative requirements based on new and/or existing design and construction technologies, operational measures, and/or restoration measures that achieve an efficacy that, in the judgment of the Director, is as close as practicable to the applicable performance standards in § 125.94(b) of the rule.

1. Facility's Costs Significantly Greater Than Costs Considered by EPA

If the Director determines that data specific to your facility indicate that the costs of compliance under § 125.94(a)(2) through (4) would be significantly greater than the costs considered by the Administrator for a facility like yours in establishing the applicable performance standards in § 125.94(b) you may request a site-specific determination of best technology available for minimizing adverse environmental impacts. A facility requesting this determination must submit a Comprehensive Cost Evaluation Study (§ 125.94(b)(6)(i)) and a Site Specific Technology Plan (§ 125.94(b)(6)(iii)). The Comprehensive Cost Evaluation Study must include engineering cost estimates in sufficient detail to document the costs of implementing design and construction technologies, operational measures, and/or restoration measures at the facility that would be needed to meet the applicable performance standards of § 125.94(b); a demonstration that the documented costs significantly exceed the costs considered by EPA for a facility like yours in establishing the applicable performance standards; and engineering cost estimates in sufficient detail to document the costs of implementing alternative design and construction technologies, operational measures, and/or restoration measures in the facility's Site-Specific Technology Plan developed in accordance with § 125.95(b)(6)(iii).

To make the demonstration that compliance costs are significantly greater than those considered by EPA, the facility must first determine its actual compliance costs. To do this, the facility first should determine the costs for any new design and construction technologies, operational measures, and/or restoration measures that would be needed to comply with the requirements of § 125.94(a)(2) through (4), which may include the following cost categories: The installed capital cost of the technologies or measures, the *net* operation and maintenance (O&M) costs for the technologies or measures (that is, the O&M costs for the final suite of technologies and measures once all new technologies and measures have been installed less the O&M costs of any existing technologies and measures), the *net* revenue losses (lost revenues minus saved variable costs) associated with *net* construction downtime (actual construction downtime minus that portion which would have been needed anyway for repair, overhaul or maintenance) and any pilot study costs associated with on-site verification and/or optimization of the technologies or measures. Costs should be annualized using a 7 percent discount rate, with an amortization period of 10 years for capital costs and 30 years for pilot study costs and construction downtime net revenue losses. Annualized costs should be converted to 2002 dollars ($2002), using the engineering news record construction cost index (see *Engineering News-Record.* New York: McGraw Hill. Annual average value is 6538 for year 2002). Costs for permitting and post-construction monitoring should not be included in this estimate, as these are not included in the EPA-estimated costs against which they will be compared, as described below. Because existing facilities already incur monitoring and permitting costs, and these are largely independent of the specific performance standards adopted and technologies selected to meet them, EPA believes it is both simpler and more appropriate to conduct the cost comparison required in this provision using direct compliance costs (capital, net O&M, net construction downtime, and pilot study) only. Adding permitting and monitoring costs to both sides of the comparison would complicate the methodology without substantially changing the results.

To calculate the costs that the Administrator considered for a like facility in establishing the applicable performance standards, the facility must follow the steps laid out below, based on the information in the table provided in Appendix A: Costs considered by EPA in Establishing Performance Standards. A sample of the table is provided below (see sample table). Note that those facilities that claimed the flow data that they submitted to EPA, and which EPA used to calculate compliance costs, as confidential business information (CBI), are not listed in the table provided in Appendix A, unless the total calculated compliance costs were zero. If these facilities wish to request a site-specific determination of best technology available based on significantly greater compliance costs, they will need to waive their claim of confidentiality prior to submitting the Comprehensive Cost Evaluation Study so that EPA can make the necessary data available to the facility, Director, and public.

SAMPLE TABLE.—COSTS CONSIDERED BY EPA IN ESTABLISHING PERFORMANCE STANDARDS ($2002)

Facility ID	Intake ID	EPA assumed design intake flow, gpm (X_{epa})	Capital cost	Baseline O&M annual cost	Post construction O&M annual cost	Annualized capital[3] + net O&M using EPA design intake flow[2] (y_{epa})	Net revenue losses from net construction downtime	Pilot study costs	Annualized downtime and pilot study costs[2,4]	Performance standards on which EPA cost estimates are based	EPA modeled technology code	Design flow adjustment slope (m)[1]
Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9	Column 10	Column 11	Column 12	Column 13
Fac 1 ID		....	....	....	....	....	....	....	....	....	....	....
Fac 2 ID		....	....	....	....	....	....	....	....	....	....	....
Fac 3 ID[5]	Intake 1	....	....	....	....	....	....	....	....	....	....	....
Fac 3 ID[5]	Intake 2	....	....	....	....	....	....	....	....	....	....	....
Etc.		....	....	....	....	....	....	....	....	....	....	....

[1] The design flow adjustment slope (m) represents the slope that corresponds to the particular facility using the technology in column 12.
[2] Discount rate = 7%
[3] Amortization period for capital costs = 10 years
[4] Amortization period for downtime and pilot study costs = 30 years
[5] Depending on the data provided, some facilities with multiple intakes were costed separately for each intake. In such cases, the facility should calculate the costs considered by EPA for each intake separately using the steps below and sum. Note that some cost components (e.g. construction downtime losses and pilot study costs) are assigned arbitrarily to one of the intakes, since it is difficult to determine how they would be assigned to each intake separately. Since the costs for multiple intakes are summed, this will not affect the results.

The data in Appendix A is keyed to both a facility name and survey ID number. Facilities should be able to determine their ID number from the survey they submitted to EPA during the rule development process.

Step 1: Determine which technology EPA modeled as the most appropriate compliance technology for your facility (§ 125.94(a)(5)(i)(A)). To do this, use the code in column 12 of Appendix A to look up the modeled technology in Table 9–1 below.

TABLE 9–1.—TECHNOLOGY CODES AND DESCRIPTIONS

Technology codes	Technology description
1	Addition of fish handling and return system to an existing traveling screen system.
2	Addition of fine-mesh screens to an existing traveling screen system.
3	Addition of a new, larger intake with fine-mesh and fish handling and return system in front of an existing intake system.
4	Addition of passive fine-mesh screen system (cylindrical wedgewire) near shoreline with mesh width of 1.75 mm.
5	Addition of a fish net barrier system.
6	Addition of an aquatic filter barrier system.
7	Relocation of an existing intake to a submerged offshore location with passive fine-mesh screen inlet with mesh width of 1.75 mm.
8	Addition of a velocity cap inlet to an existing offshore intake.
9	Addition of passive fine-mesh screen to an existing offshore intake with mesh width of 1.75 mm.
10	[Module 10 not used].
11	Addition of dual-entry, single-exit traveling screens (with fine-mesh) to a shoreline intake system.
12	Addition of passive fine-mesh screen system (cylindrical wedgewire) near shoreline with mesh width of 0.76 mm.
13	Addition of passive fine-mesh screen to an existing offshore intake with mesh width of 0.76 mm.
14	Relocation of an existing intake to a submerged offshore location with passive fine-mesh screen inlet with mesh width of 0.76 mm.

Step 2: Using EPA's costing equations, calculate the annualized capital and net operation and maintenance costs for a facility with your design flow using this technology (§ 125.94(a)(5)(i)(B)). To do this, you should use the following formula, which is derived from the results of EPA's costing equations for a facility like yours using the selected technology:

$$y_f = y_{epa} + m * \left(x_f - x_{epa}\right), (1)$$

Where:

y_f = annualized capital and net O&M costs using actual facility design intake flow,

x_f = actual facility design intake flow (in gallons per minute),

x_{epa} = EPA assumed facility design intake flow (in gallons per minute) (column 3),

y_{epa} = Annualized capital and net O&M costs using EPA design intake flow (column 7),and

m = design flow adjustment slope (column 13).

Rather than providing the detailed costing equations that EPA used to calculate annualized capital and net O&M costs for facilities to use each of the 14 modeled technologies, EPA has provided the simplified formula above, which collapses the results of those equations for the particular facility and technology into a single result (y_{epa}) and then allows the facility to adjust this result to reflect its actual design intake flow, using a technology specific slope for a facility like yours that is derived from the costing equations. This allows facilities to perform the flow adjustment required by § 125.94(a)(5)(i)(B) in a straightforward and transparent manner. Facilities, Directors, or members of the public who wish to review the detailed costing equations should consult the Technical Development Document, Chapter 3.

EPA has provided some additional information in Appendix A, beyond that which is needed to perform the calculations in § 125.95(a)(5)(ii), to facilitate comparison of the results obtained using formula 1 to the detailed costing equations in the TDD, for those who wish to do so. EPA does not expect facilities or permit writers to do this, and has in fact provided the simplified formula to preclude the need for doing so, but is providing the additional information to increase transparency. Thus, for informational purposes, the total capital cost (not annualized), baseline O&M cost, and post construction O&M cost from which the annualized capital and net O&M costs using EPA design intake flow (y_{epa} in column 7) are derived are listed separately in columns 4 through 6. To calculate y_{epa}, EPA annualized the total capital cost using a 7 percent discount rate and 10 year amortization period, and added the result to the difference between the post construction O&M costs and the baseline O&M costs.

Note that some entries in Appendix A have NA indicated for the EPA assumed design intake flow in column 2. These are facilities for which EPA projected that they would already meet otherwise applicable performance standards based on existing technologies and measures. EPA projected zero compliance costs for these facilities, irrespective of design intake flow, so no flow adjustment is needed. These facilities should use $0 as their value for the costs considered by EPA for a like facility in establishing the applicable performance standards. EPA recognizes that these facilities will still incur permitting and monitoring costs, but these are not included in the cost comparison for the reasons stated above.

Step 3: Determine the annualized net revenue loss associated with net construction downtime that EPA modeled for the facility to install the technology (§ 125.94(a)(5)(i)(C)) and the annualized pilot study costs that EPA modeled for the facility to test and optimize the technology (§ 125.94(a)(5)(i)(D)). The sum of these two figures is listed in column 10. For informational purposes, the total (not annualized) net revenue losses from construction downtime, and total (not annualized) pilot study costs are listed separately in columns 8 and 9. These two figures were annualized using a 7 percent discount rate and 30 year amortization period and the results added together to get the annualized facility downtime and pilot study costs in column 10.

Step 4: Add the annualized capital and O&M costs using actual facility design intake flow (y_f from step 2), and the annualized facility downtime and pilot study costs (column 10 from step 3) to get the preliminary costs considered by EPA for a facility like yours (§ 125.94(a)(5)(i)(E)).

Step 5: Determine which performance standards in § 125.94(b)(1) and (2) (*i.e.,* impingement mortality only, or impingement mortality and entrainment) are applicable to your facility, and compare these to the performance standards on which EPA's cost estimates are based, listed in column 11 (§ 125.94(a)(5)(i)(F)). If the applicable performance standards and those on which EPA's cost estimates are based are the same, then the preliminary costs considered by EPA for a facility like yours are the final costs considered by EPA for a facility like yours. If only the impingement mortality performance standards are applicable to your facility, but EPA based its cost estimates on impingement mortality and entrainment performance standards, then you should divide the preliminary costs by a factor of 2.148 to get the final costs. If impingement mortality and entrainment performance standards are applicable to your facility, but EPA based its cost estimates on impingement mortality performance standards only, then you should multiply the preliminary costs by 2.148 to get the final costs. In calculating compliance costs, EPA projected what performance standards would be applicable to the facility based on available data. However, because of both variability and uncertainty in the underlying parameters that determine which performance standards apply (*e.g.,* capacity utilization rate, mean annual flow), it is possible that in some cases the performance standards that EPA projected are not correct. The adjustment factor of 2.148 was determined by taking the ratio of median compliance costs for facilities to meet impingement mortality and entrainment performance standards over median compliance costs for facilities to meet impingement mortality performance standards only. While using this adjustment factor will not necessarily yield the exact compliance costs that EPA would have calculated had it had current information, EPA believes the results are accurate enough for determining whether a facility's actual compliance costs are ''significantly greater than'' the costs considered by EPA for a like facility in establishing the applicable performance standards. EPA believes it is preferable to provide a simple and transparent methodology for making this adjustment that yields reasonably accurate results, rather than a much more complex methodology that would be difficult to use and understand (for the facility, Director, and public), even if the more complex methodology would yield slightly more accurate results.

The Site-Specific Technology Plan is developed based on the results of the Comprehensive Cost Evaluation Study and must contain the following information:

• A narrative description of the design and operation of all existing and proposed design and construction technologies, operational measures, and/or restoration measures that you have selected in accordance with § 125.94(a)(5);

• An engineering estimate of the efficacy of the proposed and/or implemented design and construction technologies or operational measures, and/or restoration measures. This estimate must include a site-specific evaluation of the suitability of the technologies or operational measures for reducing impingement mortality and/or entrainment (as applicable) of all life stages of fish and shellfish based on representative studies (*e.g.,* studies that have been conducted at cooling water intake structures located in the same waterbody type with similar biological characteristics) and, if applicable, site-specific technology prototype or pilot studies. If restoration measures will be used, you must provide a Restoration Plan that includes the elements described in § 125.95 (b)(5);

• A demonstration that the proposed and/or implemented design and construction technologies, operational measures, and/or restoration measures achieve an efficacy that is as close as practicable to the applicable performance standards of § 125.94(b) without resulting in costs significantly greater than either the costs considered by the Administrator for a facility like yours in establishing the applicable performance standards, or as appropriate, the benefits of complying with the applicable performance standards at your facility; and,

• Design and engineering calculations, drawings, and estimates prepared by a qualified professional to support the elements of the Plan.

2. Facility's Costs Significantly Greater Than the Benefits of Complying With Performance Standards

A facility demonstrating that its costs are significantly greater than the benefits of complying with performance standards must perform and submit a Comprehensive Cost Evaluation Study, a Benefits Valuation Study, and a Site-Specific Technology Plan.

The Comprehensive Cost Evaluation Study is discussed in the previous section. It requires the same information for a cost-benefit site-specific determination as for a cost-cost site-specific determination, except that the demonstration in § 125.95(b)(6)(i)(B) must show that the facility's actual compliance costs significantly exceed the benefits of meeting the applicable performance standards at the facility.

The Benefits Valuation Study requires that a facility use a comprehensive methodology to fully value the impacts of impingement mortality and entrainment at its site and the benefits of complying with the applicable performance standards. In addition to the valuation estimates, the benefit study must include the following:

• A description of the methodology(ies) used to value commercial, recreational, and ecological benefits (including any non-use benefits, if applicable);

• Documentation of the basis for any assumptions and quantitative estimates. If you plan to use an entrainment survival rate other than zero, you must submit a determination of entrainment survival at your facility based on a study approved by the Director;

• An analysis of the effects of significant sources of uncertainty on the results of the study;

• If requested by the Director, a peer review of the items you submit in the Benefits Valuation Study. You must choose the peer reviewers in consultation with the Director who may consult with EPA and Federal, State, and Tribal fish and wildlife management agencies with responsibility for fish and wildlife potentially affected by your cooling water intake structure. Peer reviewers must have appropriate qualifications depending upon the materials to be reviewed.

• A narrative description of any non-monetized benefits that would be realized at your site if you were to meet the applicable performance standards and a qualitative assessment of their magnitude and significance.

All benefits, whether expressed qualitatively or quantitatively, should be addressed in the Benefits Valuation Study and considered by the Director in determining whether compliance costs significantly exceed benefits.

The benefits assessment should begin with an impingement and entrainment mortality study, which quantifies both the baseline mortality as well as the expected change from rule compliance. The benefits assessment should include a qualitative and/or quantitative description of the benefits that would be produced by compliance with the applicable performance standards at the facility site and, to the extent feasible, monetized (dollar) estimates of all significant benefits categories using well established and generally accepted valuation methodologies. The first benefit category to consider is use benefits, which includes such benefits as those to commercial and recreational fishermen. Well-established revealed preference and market proxy methods exist for valuing use benefits, and these should be used in all cases where the impingement and entrainment mortality study identifies substantial impacts to harvested or other relevant species.

The second benefit category to consider is non-use benefits. Non-use benefits may arise from reduced impacts to ecological resources that the public considers important, such as threatened and endangered species. Non-use benefits can generally only be monetized through the use of stated preference methods. When determining whether to monetize non-use benefits, permittees and permit writers should consider the magnitude and character of the ecological impacts implied by the results of the impingement and entrainment mortality study and any other relevant information.

• In cases where an impingement mortality and entrainment characterization study identifies substantial harm to a threatened or endangered species, to the sustainability of populations of important species of fish, shellfish or wildlife, or to the maintenance of community structure and function in a facility's waterbody or watershed, non-use benefits should be monetized.[50]

• In cases where an impingement mortality and entrainment characterization study does not identify substantial harm to a threatened or endangered species, to the sustainability of populations of important species of fish, shellfish or wildlife, or to the maintenance of community structure and function in a facility's waterbody or watershed, monetization is not necessary.

Permittees should consult with their permitting authority regarding their plans for assessing ecological and non-use benefits, including whether they plan to conduct a stated preference study and if so, the basic design of the study, including such items as target population, sampling strategy, approximate sample size, general survey design, and other relevant information. When conducting quantitative benefits assessments, permittees should carefully review and follow accepted best practices for such studies. A discussion of best practices regarding valuation can be found in EPA's Guidelines for Preparing Economic Analyses (EPA 2000, EPA 240–R–00–003, September 2000) and OMB Circular A–4: Regulatory Analysis (September 17, 2003, *www.whitehouse.gov/omb/inforeg/circular_a4.pdf).* In their benefits assessment, the permittee should present the results, as well as clearly describe the methods used, the assumptions made, and the associated uncertainties.

It is recommended that the permittee and Director seek peer review of the major biological and economic aspects of the final benefits assessment. The goal of the peer review process is to ensure that scientific and technical work products receive appropriate levels of critical scrutiny from independent scientific and technical experts as part of the overall decision-making process. In designing and implementing peer reviews, permittees and permit writers can look to EPA's Science Policy Council Handbook—Peer Review (EPA 100–B–98–00, January 1998, *www.epa.gov*) for guidance.

The Site-Specific Technology Plan is described in the previous section. It requires the same information for a cost-benefit site-specific determination as for a cost-cost site-specific determination, except that the demonstration in § 125.95(b)(6)(iii)(C) must show that the proposed and/or implemented technologies and measures achieve an efficacy that is as close as practicable to the applicable performance standards without resulting in costs significantly greater than the benefits of complying with the applicable performance standards at your facility.

X. Engineering Cost Analysis

A. Technology Cost Modules

In the Notice of Data Availability (NODA) (68 FR 13522, March 19, 2003), the Agency presented an approach for developing compliance costs that included a broad range of compliance technologies for calculating compliance costs as opposed to the approach used for the proposal, which was based on a limited set of technologies. In response to comments, EPA revised the costing modules that were presented in the NODA and used to develop the engineering costs for the final rule. Modifications made include adding a new set of costing modules to address the installation of fine-mesh wedgewire screens with open mesh sizes less than 1 mm in width; revising construction down time needed to relocate cooling water intake structures offshore; and reconsidering the applicability of the double-entry, single-exit technology and its ability to compensate for through-screen velocity issues for fine-mesh applications.

The following modules were used to develop compliance costs for the Agency's engineering cost analysis for the final rule:

• Addition of fish handling and return system to an existing traveling screen system;

• Addition of fine-mesh screens (both with and without a fish handling and return system) to an existing traveling screen system;

• Addition of a new, larger intake in front of an existing intake screen system;

• Addition of passive fine-mesh screen system (cylindrical wedgewire) near shoreline with mesh width of 1.75 mm;

• Addition of passive fine-mesh screen system (cylindrical wedgewire) near shoreline with mesh width of 0.76 mm;

• Addition of a fish net barrier system;

• Addition of an aquatic filter barrier system;

• Relocation of an existing intake to a submerged offshore location (with velocity cap inlet, passive fine-mesh screen inlet with mesh width of 1.75 mm, passive fine-mesh screen inlet with mesh width of 0.76 mm, or onshore traveling screens);

• Addition of a velocity cap inlet to an existing offshore intake;

• Addition of passive fine-mesh screen to an existing offshore intake with mesh width of 1.75 mm;

• Addition of passive fine-mesh screen to an existing offshore intake with mesh width of 0.76 mm;

• Addition or modification of a shoreline-based traveling screen for an offshore intake system; and

• Addition of dual-entry, single-exit traveling screens (with fine-mesh) to a shoreline intake system.

Further explanation and derivation of each of these costing modules and their application for the purposes of assessing costs is discussed in the Technical Development Document. For explanation of how the Agency applied these technology cost modules to determine compliance costs, see section X.B below.

B. Model Facility Cost Development

In order to implement the technology costing modules discussed in section X.A, the Agency used the same basic approach which was described in the NODA for the estimation of costs at the model facility level. This approach focuses as much as possible on site-specific characteristics for which the Agency obtained data through the section 316(b) questionnaires. In addition, EPA used available geographic information, including detailed topographic mapping and overhead satellite imagery, to better utilize site-specific characteristics of each model facility's intake(s) to determine the appropriate costing modules for that facility. The Agency also utilized facility-specific information collected for the regional benefits studies to further inform the selection of compliance technology at model facilities. The Technical Development Document provides the background and a more detailed explanation of the

[50] In cases where harm cannot be clearly explained to the public, monetization is not feasible because stated preference methods are not reliable when the environmental improvement being valued cannot be characterized in a meaningful way for survey respondents.

Agency's approach to model facility level costing, which has not changed dramatically from that published in the NODA (68 FR 13522).

EPA's approach to model facility-level costing may be described as follows. In order to project upgrades to technologies as a result of compliance with today's final rule, the Agency utilized as much information as was available about the characteristics of the facilities expected to be within the scope of the rule. By incorporating as many site-specific features as possible into the design and implementation of its costing approach, the Agency has been able to capture a representative range of compliance costs at what it deems ''model facilities.'' However, it is infeasible for the Agency to visit and study in detail all of the engineering aspects of each facility complying with this rule (over 400 facilities could incur technology-related compliance costs as a result of this rule). Therefore, although the Agency has developed costs that represent EPA's best effort to develop a site-specific engineering assessment for a particular facility, this assessment does not address any site-specific characteristics that only long-term study of each facility would reveal. Hence, the Agency refers to its approach as a ''model'' facility approach.

In selecting technology modules for each model facility, EPA, to a degree departed from its traditional least cost approach. The least cost approach, traditionally utilized for estimating compliance technology choices, relies on the principle that the complying plant will choose to install the least cost technology that meets the minimum standard. While the Agency is confident that the suite of available technologies can achieve the performance standards on § 125.94(b) generally, EPA lacks sufficient data to determine the precise performance of each technology on a site-specific basis for over 400 different applications. The Agency thus selected, based on criteria published in the NODA, one of a set of best performing technologies (rather than the least costly technology) that was suitable for each model facility (or intake), in order to ensure that the technology on which costs were based would in fact achieve compliance at that model site. The criteria for selecting the best performing technology for a model facility (or intake) utilized questionnaire data as the primary tool in the assessment. For those facilities utilizing recirculating cooling systems in-place, the Agency assigned no compliance actions as they met the standards at baseline. The Agency then determined those intakes (facilities) that met compliance requirements with technologies in-place. These facilities received no capital or annual operating and maintenance compliance upgrade costs (although they may receive administrative or monitoring costs). The Agency categorized facilities according to waterbody type from which they withdraw cooling water. The Agency then sorted the intakes (facilities) within each waterbody type based on their configuration as reported in the questionnaires. Generally, the categories of intakes within one waterbody type are as follows: canal/channel, bay/embayment/cove, shoreline, and offshore. Once the intake (facility) is classified to this level the Agency examines the type of technology in-place and compares that against the compliance requirements of the particular intake (facility). For the case of entrainment requirements, the intake technologies (outside of recirculating cooling) that qualify to meet the requirements at baseline are fine mesh screen systems, and combinations of far-offshore inlets with passive intakes or fish handling/return systems. A small subset of intakes has entrainment qualifying technologies in-place at baseline (for the purposes of this costing effort). Therefore, in the case of entrainment requirements, most facilities with the requirement would receive technology upgrades. The methodology for choosing these entrainment technologies is explained further on in this discussion. For the case of impingement requirements, there are a variety of intake technologies that qualify (for the purposes of this costing effort) to meet the requirements at baseline. The intake types meeting impingement requirements at baseline include the following: barrier net (the only fish diversion system which qualifies), passive intakes (of a variety of types), and fish handling and return systems. A significant number of intakes (facilities) have impingement technology in-place that meets the qualifications for this costing effort. Therefore, some intakes (facilities) require no technology upgrades when only impingement requirements apply. For facilities that do not pre-qualify for impingement and/or entrainment technology in-place (for the purposes of this costing effort), the Agency focuses next on questionnaire data relating to the intake type—canal/channel, bay/embayment/cove, shoreline, and offshore. Within each intake type, the Agency further classifies according to certain specific characteristics. For the case of bays, embayments, and coves, the Agency determined if the intake is flush, protruding, or recessed from shoreline. For the case of canals and channels, the Agency similarly focuses on whether the intake is flush, protruding, or recessed from a shoreline. For the case of shoreline intakes, the Agency necessarily assessed whether the intake is flush, protruding, or recessed. For the case of offshore intakes, the Agency examines whether or not the intake has an onshore terminus (or well) and assesses the characteristics of the onshore system. The information the Agency gathers up to this point is sufficient to narrow down the likely technology applications for each intake (facility). However, in order to determine the best technology application, the Agency also utilizes commercially available satellite images and maps where available. The use of the satellite images and maps aided the Agency in determining the potential for the construction of expanded intakes in-front of existing intakes and the potential for an intake modification to protrude into the waterbody (such as a near-shore t-screen) due to the degree of navigational traffic in the near vicinity of the intake and whether a protrusion might be tolerated, the possibility of installing a barrier net system, obvious signs of strong currents, the relative distance of a potentially relocated intake inlet, the possibility for fish return installations of moderate length, etc. The Agency was able to collect satellite images for most intakes (facilities) for which it required the resource. However, in some cases (especially those in the rural, mid-western U.S.), only maps were available. Hence, for the case of a significant number facilities located near small freshwater rivers/streams and lakes/reservoirs, the Agency utilized only the questionnaire data and the overhead maps available.

Once the Agency gathered the intake (facility) specific information to this degree, the applicable list of technologies for each intake was small (and in some cases only one technology would apply). Therefore, the Agency examined any other sources of information, such as those obtained for the regional benefits studies, to further narrow down the best technology to meet the requirements of the rule for each model intake (facility). Often, the decision was between just two or three potential technologies. If there was no evidence in the Agency's possession to suggest that the least-cost technology would not function, then the Agency would select this technology. However, should evidence imply that the least cost technology not be able to function reliably or have a feasibility issue related to site deployment (for example, a barrier net across a navigable waterway or a fish handling and return system with an extremely long return trough), then the Agency departed from the ''least-cost'' decision process and assigned the ''best-performing'' technology. In cases where more than one technology still remained after ruling out a least-cost alternative due to evidence (which was a rare occurrence), then the Agency attempted to balance the application of the remaining technologies about a median, thereby assigning moderately high costs for some cases and moderately low costs in others. Therefore, for the case of national costs, the Agency's application of technology cost modules reflect a reasonable national average.

C. Facility Flow Modifications

In developing costs and benefits for the NODA, the Agency revised intake flow information for a small subset of inscope facilities in an effort to ensure the accuracy and quality of the data. In developing costs and benefits for the final rule, the Agency has further refined the intake flow information used.

Since the NODA, the Agency re-evaluated its original decision to use the reported 1998 (the most recent of three years collected) annual flows for Detailed Questionnaire (DQ) recipients for the calculation of benefits. This, in turn, had an impact on the development of estimated design intake flows for short-technical questionnaire (STQ) recipients. As presented in the NODA, the Agency estimated design intake flows for STQ facilities using a statistical methodology based on linear regression of DQ recipients' annual intake flows and DQ recipients' design intake flows to assess the design intake flow information for facilities that responded to the short technical questionnaire. Because the Agency asked STQ respondents for only their actual annual intake flow for the 1998 reporting year only (or a typical operational year), it was necessary to calculate design intake flow information for the purpose of accurately assessing compliance costs. Therefore, for the NODA and proposal, the Agency calculated design intake flows for STQ facilities based on a model derived from only the 1998 DQ flow data. In retrospect, the Agency determined that a more robust approach would be to use all three years of annual DQ flows collected (1996—1998) and to take advantage of the statistical abilities afforded by the expanded data set (that is, to determine and exclude outliers). Hence, for this final rule, the Agency has estimated the costs and benefits of the rule using improved flow data over the NODA and proposal. For the case of STQ facilities, the Agency has utilized an improved data set for the calculation of design intake flows, and, in turn, the calculation of compliance costs.

XI. Economic Analysis

A. Final Rule Costs

EPA estimates that the final rule will have total annualized social (pre-tax) costs of $389 million ($2002). Of this total, $385 million are direct costs incurred by facilities and $4 million are implementation costs incurred by State and Federal government. On a post-tax basis, direct costs incurred by facilities subject to the final rule are expected to be $249 million, including one-time technology costs of complying with the rule, a one-time cost of installation downtime, annual operating and maintenance costs, and permitting costs (initial permit costs, annual monitoring costs, and permit reissuance costs).

These cost estimates include compliance costs for eight facilities that are projected to be base case closures.[51] Excluding compliance costs for projected base case closure facilities would result in annualized pre-tax facility compliance costs of approximately $376 million and annualized post-tax facility compliance costs of approximately $244 million. The equivalent annualized post-tax facility compliance costs were $178 million at proposal and $265 million for the NODA preferred option. The cost difference between proposal and the NODA is due primarily to the expanded range of technology options considered for the NODA and the ''best performing technology'' selection criteria used to assign cost modules to model facilities (*see* section IV of the NODA, 68 FR 13522, 13526).

In selecting technology modules for each model facility, EPA, to a degree departed from its traditional least cost approach. The least cost approach, traditionally utilized for estimating compliance technology choices relies on the principle that the complying plant will choose to install the least cost technology that meets the minimum standard. While the Agency is confident that the suite of available technologies can achieve compliance with the proposed performance requirements (60–90% reduction in entrainment and 80–95% reduction in impingement mortality relative to the calculation baseline), EPA lacks sufficient data and resources to determine the precise performance of each technology on a site-specific basis for over 400 different applications. The Agency thus selected, for subset of sites where multiple technologies could be under consideration to meet the requirements, a best performing technology (rather than the least costly technology of the choices). The best performing technology concept, when necessary to apply, relied on assigning technologies about a median cost, with some choices above and below. Therefore, for each model facility (or intake), in order to ensure that the technology on which costs were based would in fact achieve compliance at that model site, the Agency could not rely on a one-size fits all, least-cost approach. The cost difference between the NODA and the final rule is primarily a result of decreases in capital and permitting cost estimates.

Capital and O&M costs changed between NODA and final primarily due to three factors. The Agency revised its application of certain technology cost modules (especially the dual-entry, single-exist traveling screen module) between NODA and final, in response to comments received. The Agency revised its costs for some passive screen technology costs utilizing finer mesh screens, in response to comments received. In addition, the Agency credited facilities with far offshore intakes plus certain impingement controls in-place (such as fish handling or passive inlet screens) as having met the requirements for entrainment reduction at baseline. This final change was also in response to comments that recommended that the Agency correlate the benefits assessment more closely with the engineering cost estimates. The overall net result of these changes was to slightly decrease total capital and total O&M costs of the rule. However, on the basis of facilities expected to upgrade technologies to meet the rule requirements, the capital and O&M costs did increase slightly.

There are many uncertainties surrounding any forecast. The national annualized costs estimated for today's rule were necessarily developed using several major assumptions which are subject to uncertainty. The Agency attempted to develop a plausible range of costs focusing on four major cost assumptions surrounding the direct private cost of $385 million that may be incurred when facilities implement this rule. Uncertainty factors were analyzed for the cost assumptions affecting technology capital, technology O&M, downtime for connection outages, initial permitting, and pilot studies. This

[51] There are eight base case closures in 2008, the first model run year of the IPM. *See* section XI.B.1 for further discussion of analyses using the IPM.

uncertainty analysis provided a range of costs for the national private (direct) annualized compliance costs of $377 to $437 million. This range was developed by examining the effect of capacity utilization assumptions on technology capital and O&M costs; the effects of annualization time frame for initial permitting and downtime connection outages; the effects of sampling frequency and data analysis on pilot study costs; and excluding costs for facilities that have partial recirculating systems. For more information on the Agency's analysis of this issue, see DCN 6–5045.

Cost assumption	Base case facility compliance cost estimate	Sensitivity estimate
Annualization time frame for initial permitting and downtime.	30 years	20 years.
Partial recirculation system credit	No	Yes.
Capacity utilization rate used to estimate technology capital and O&M.	Based on 2008 IPM Forecast	Based on historic utilization.
Pilot study costs	Moderate sampling frequency	High sampling frequency.

B. Final Rule Impacts

1. Energy Market Model Analysis

At proposal and for the NODA, EPA used an electricity market model, the Integrated Planning Model (IPM®), to identify potential economic and operational impacts of various regulatory options considered for the Phase II regulation.[52] Electric reliability impact analyses could not be performed using the IPM model. EPA does recognize that due to down time or connection outages estimated to install several of the technologies, and the number of facilities that will need to come into compliance over the first few years after today's rule is promulgated, there may be short-term electric reliability issues unless care is taken within each region to coordinate outages with the North American Electric Reliability Council (NERC) and where possible with normal scheduled maintenance operations. Noting this, EPA has provided flexibility in today's rule so that facilities can develop workable construction schedules with their permit writers and coordinate with NERC to appropriately schedule down times (*see* § 125.95(b)(4)(ii)). As noted in the NERC 2003 Long-term Reliability Assessment, the overall impact on reliability of any new environmental requirements will ''* * * depend on providing sufficient time to make the necessary modifications and the commercial availability of control technologies.'' [53] EPA conducted impact analyses at the market level, by NERC region,[54] and for facilities subject to the Phase II regulation. Analyzed characteristics include changes in electricity prices, capacity, generation, revenue, cost of generation, and income. These changes were identified by comparing two scenarios: (1) The base case scenario (in the absence of any section 316(b) Phase I and Phase II regulation) and (2) the post compliance scenario (after the implementation of the new section 316(b) Phase II regulations). At proposal, EPA used the results of these comparisons to assess the impacts of the proposed rule and two of the five alternative compliance options considered by EPA: (1) The ''Intake Capacity Commensurate with Closed-Cycle, Recirculating Cooling System based on Waterbody Type/Capacity'' option and (2) the ''Intake Capacity Commensurate with Closed-Cycle, Recirculating Cooling System for All Facilities'' option. For the NODA, EPA assessed the impacts of the preferred option and the ''Intake Capacity Commensurate with Closed-Cycle, Recirculating Cooling System based on Waterbody Type/Capacity'' option, making several changes to the analysis (major changes included changes in IPM model aggregation, capacity utilization assumptions, and treatment of installation downtime; see section V.A of the NODA).

Since publication of the NODA, EPA has conducted further IPM analyses. The following sections present a discussion of changes to the analysis since the NODA and the results of the re-analysis of the final rule.

a. Changes to the IPM analyses since the NODA. EPA did not change its IPM assumptions and modeling procedures for this final rule. EPA continued to use the 2000 version of the IPM model to perform the final rule analysis. In the 2003 current version of the IPM, the model has been updated to include, among other things, effects of the State Multi-Pollutant regulations and the New Source Review settlements on environmental compliance costs associated with the IPM base case. Further, the 2003 version of the IPM model includes updated costs for existing facilities such as life extension costs. However, a few general changes affect the results presented in the following subsection. These changes are outlined in section VI.A and include the following: An increase in the estimated number of in-scope Phase II facilities from 551 to 554; revisions of technology, operating and maintenance, and permitting/monitoring costs; and changes to the assumption of construction downtimes for compliance technologies other than recirculating cooling towers.

b. Revised results for the Final Rule. This section presents the revised impact analysis of the final rule. The impacts of compliance with the final rule are defined as the difference between the modeling results for the base case scenario and the modeling results for the post-compliance scenario. Two base case scenarios were used to analyze the impacts associated with the final rule. The first base case scenario was developed using EPA's electricity demand assumption. Under this assumption, demand for electricity is based on the Annual Energy Outlook (AEO) 2001 forecast adjusted to account for efficiency improvements not factored into AEO's projections of electricity sales. The second base case was developed using the unadjusted electricity demand from the AEO 2001. The results presented in this section use the first, EPA-adjusted base case.

[52] For a detailed description of the IPM see Chapter B3 of the Economic and Benefits Analysis (EBA) document in support of the proposed rule (DCN 4–0002; *http://www.epa.gov/ost/316b/econbenefits/b3.pdf*).

[53] North American Electric Reliability Council (NERC). 2003. 2003 Long-term Reliability Assessment: The Reliability of Bulk Electric Systems in North America; prepared December 2003.

[54] The IPM models the ten NERC regions that cover the continental U.S.: ECAR (East Central Area Reliability Coordination Agreement), ERCOT (Electric Reliability Council of Texas), FRCC (Florida Reliability Coordinating Council), MAAC (Mid-Atlantic Area Council), MAIN (Mid-America Interconnected Network, Inc.), MAPP (Mid-Continent Area Power Pool), NPCC (Northeast Power Coordination Council), SERC (Southeastern Electricity Reliability Council), SPP (Southwest Power Pool), and WSCC (Western Systems Coordinating Council). Electric generators in Alaska and Hawaii are not interconnected with these regions and are not modeled by the IPM.

Results using the second base case are presented in the Appendix of Chapter B3 of the final EBA.

EPA analyzed impacts of the final rule using data from model run year 2010. Model run year 2010 was chosen to represent the effects of the final rule for a typical year in which all facilities are expected to be in compliance (for this analysis, EPA assumed that facilities come into compliance between 2005 and 2009; in reality, compliance is expected to begin in 2008).[55] The analysis was conducted at two levels: the market level including all facilities (by NERC region) and the Phase II facility level (including analyses of the in-scope Phase II facilities as a group and of individual Phase II facilities). The results of these analyses are presented in the following subsections.

i. Market-level impacts of the Final Rule. The market-level analysis includes results for all generators located in each NERC region including facilities both in-scope and out-of-scope of the proposed Phase II rule. Exhibit XI–1 presents five measures used by EPA to assess market-level impacts associated with the final rule, by NERC region: (1) Incremental capacity closures, calculated as the difference between capacity closures under the final rule and capacity closures under the base case; (2) incremental capacity closures as a percentage of baseline capacity; (3) post-compliance changes in variable production costs per MWh, calculated as the sum of total fuel and variable O&M costs divided by total generation; (4) post-compliance changes in energy price, where energy prices are defined as the wholesale prices received by facilities for the sale of electric generation; and (5) post-compliance changes in pre-tax income, where pre-tax income is defined as total revenues minus the sum of fixed and variable O&M costs, fuel costs, and capital costs. Additional results are presented in Chapter B3: Electricity Market Model Analysis (section B3–4.1) of the Economic and Benefits Analysis (EBA) in support of the final rule (DCN 6–0002). Chapter B3 also presents a more detailed interpretation of the results of the market-level analysis.

EXHIBIT XI–1.—MARKET-LEVEL IMPACTS OF THE FINAL RULE (2010)

NERC region	Baseline capacity (MW)	Incremental closures		Change in variable production cost per MWh (percent)	Change in energy price per MWh (percent)	Change in pre-tax income ($2002) (percent
		Capacity (MW)	% of baseline capacity			
ECAR	118,529		−0.0	0.1	0.3	−0.8
ERCOT	75,290		−0.0	0.0	5.8	−5.6
FRCC	50,324		−0.0	0.4	0.6	−3.0
MAAC	63,784		−0.0	0.4	0.1	−0.9
MAIN	59,494	94	0.2	0.1	−0.3	−0.3
MAPP	35,835		−0.0	−0.1	−0.3	0.1
NPCC	72,477		−0.0	−0.5	−0.1	−1.9
SERC	194,485		−0.0	0.0	−0.1	−0.5
SPP	49,948		−0.0	−0.1	−0.2	−0.4
WSCC	167,748	58	0.0	0.0	0.0	−0.5
Total	887,915	152	0.0	0.0	n/a	−1.0

Two of the ten NERC regions modeled, MAIN and WSCC, are estimated to experience economic closures of existing capacity as a result of the final rule. These closures represent negligible percentages of regional baseline capacity (0.2% in MAIN and less than 0.1% in WSCC) and of total U.S. baseline capacity (less than 0.1%). EPA estimates that four NERC regions will experience increases in variable production costs per MWh, although the largest increase will not exceed 0.4 percent. In addition, four NERC regions will experience an increase in energy prices under the final rule. Of these, only ERCOT is estimated to experience an increase of more than 1.0 percent (5.8 percent). Pre-tax incomes are estimated to decrease in all but one region, but the majority of these changes will be less than 1.0 percent. ERCOT is estimated to experience the largest decrease in pre-tax income (−5.6 percent). Only one region, MAPP, will experience an increase in market-level pre-tax income (0.1 percent).

ii. Facility-level impacts of the Final Rule. The results from model run year 2010 were used to analyze impacts on Phase II facilities at two levels: (a) Potential changes in the economic and operational characteristics of the group of in-scope Phase II facilities as a whole and (b) potential changes to individual facilities within the group of Phase II facilities. Exhibit XI–2 presents five measures used by EPA to assess impacts to the group of Phase II facilities associated with the final rule, by NERC region: (1) Incremental capacity closures, calculated as the difference between capacity closures under the final rule and capacity closures under the base case; (2) incremental capacity closures as a percentage of baseline capacity; (3) post-compliance changes in variable production costs per MWh, calculated as the sum of total fuel and variable O&M costs divided by total generation; (4) post-compliance changes in electricity generation; and (5) post-compliance changes in pre-tax income, where pre-tax income is defined as total revenues minus the sum of fixed and variable O&M costs, fuel costs, and capital costs. Additional results are presented in section B3–4.2 of the final EBA. Chapter B3 also presents a more detailed interpretation of the results of the analysis of Phase II facilities as a group.

[55] EPA also analyzed potential market-level impacts of the final rule for a year during which some Phase II facilities experience installation downtimes. This analysis used output from model run year 2008. See Chapter B3, section B3–4.3 of the final EBA for the results of this analysis.

EXHIBIT XI–2.—IMPACTS ON PHASE II FACILITIES OF THE FINAL RULE (2010)

NERC region	Baseline capacity (MW)	Incremental closures		Change in variable production cost per MWh (percent)	Change in generation (percent)	Change in pretax income (percent)
		Capacity (MW)	% of baseline capacity			
ECAR	82,313	0	0.0	0.0	−0.2	−1.0
ERCOT	43,522	0	0.0	−0.7	−1.8	−10.4
FRCC	27,537	0	0.0	0.3	−0.8	−4.0
MAAC	34,376	0	0.0	0.0	0.2	−1.4
MAIN	36,498	94	0.3	0.1	−0.3	−0.6
MAPP	15,749	0	0.0	−0.1	0.0	−0.3
NPCC	37,651	0	0.0	−1.7	−3.6	−4.3
SERC	107,450	0	0.0	−0.3	−0.2	−0.7
SPP	20,471	0	0.0	−0.4	−0.7	−1.0
WSCC	28,431	58	0.2	−0.9	−4.3	−10.4
Total	433,998	152	0.0	−0.6	−0.8	−1.8

Identical to the market-level results, EPA estimates that 152 MW, or less than 0.1%, of capacity at Phase II facilities will close as a result of the final rule. (If the AEO's higher demand forecast is utilized, it would result in a larger capacity of early closures of 493 MW or more than 0.1%. *See* EBA B3 appendix Table B3–A–3.) MAIN (94 MW) and WSCC (58 MW) are the only regions that are estimated to experience incremental capacity closures. In both regions, these incremental closures represent less than 0.3% of baseline capacity at Phase II facilities. Variable production costs per MWh at Phase II facilities increase in two regions and decrease in six regions under the final rule. No region experiences an increase in Phase II facility production costs that exceeds 0.5 percent, while Phase II facilities in NPCC and WSCC see reductions of 1.7 percent and 0.9 percent, respectively. Phase II facilities in three NERC regions are estimated to experience decreases in generation in excess of 1.0 percent as a result of the final rule. The largest is estimated to be in WSCC, where Phase II facilities experience a 4.3 percent reduction in generation. Overall, EPA estimates that pre-tax income will decrease by 1.8 percent for the group of Phase II facilities. The effects of this change are concentrated in a few regions: WSCC and ERCOT each experience reductions in pre-tax income of 10.4 percent, which is driven by a reduction in revenues (not presented in this exhibit) rather than an increase in costs. NPCC and FRCC are estimated to experience a reduction of 4.3 and 4.0 percent, respectively.

Results for the group of Phase II facilities as a whole may mask shifts in economic performance among individual facilities subject to this rule. To assess potential distributional effects, EPA analyzed facility-specific changes between the base case and the post-compliance case in (1) capacity utilization, defined as generation divided by capacity times 8,760 hours, (2) electricity generation, (3) revenue, (4) variable production costs per MWh, defined as variable O&M cost plus fuel cost divided by generation, and (5) pre-tax income, defined as total revenues minus the sum of fixed and variable O&M costs, fuel costs, and capital costs.

Exhibit XI–3 presents the total number of Phase II facilities with estimated degrees of change due to the final rule. This exhibit excludes 17 in-scope facilities with estimated significant status changes in 2010: Ten facilities are base case closures, one facility is a full closure as a result of the final rule, and six facilities changed their repowering decision between the base case and the post-compliance case. These facilities are either not operating at all in either the base case or the post-compliance case, or they experience fundamental changes in the type of units they operate; therefore, the measures presented in Exhibit XI–3 would not be meaningful for these facilities. In addition, the change in variable production cost per MWh of generation could not be developed for 57 facilities with zero generation in either the base case or post-compliance scenario. For these facilities, the change in variable production cost per MWh is indicated as ''n/a.''

EXHIBIT XI–3.—OPERATIONAL CHANGES AT PHASE II FACILITIES FROM THE FINAL RULE (2010) [a]

Economic measures	Reduction			Increase			No change	N/A
	</=1%	1–3%	> 3%	</=1%	1–3%	> 3%		
Change in Capacity Utilization [b]	6	21	25	7	7	11	441	0
Change in Generation	4	6	46	11	5	18	428	0
Change in Revenue	83	30	45	142	8	16	194	0
Change in Variable Production Costs/MWh	38	16	9	145	11	17	225	57
Change in Pre-Tax Income	115	109	213	44	11	15	11	0

[a] For all measures percentages used to assign facilities to impact categories have been rounded to the nearest 10th of a percent.
[b] The change in capacity utilization is the difference between the capacity utilization percentages in the base case and post-compliance case. For all other measures, the change is expressed as the percentage change between the base case and post-compliance values.

EPA estimates that the majority of Phase II facilities will not experience changes in capacity utilization or generation due to compliance with the final rule. Of those facilities with changes in post-compliance capacity utilization and generation, most will experience decreases in these measures. Exhibit XI–3 also indicates that the majority of facilities with changes in variable production costs will experience increases. However, about 85 percent of those increases are estimated to be 1.0 percent or less. Changes in revenues at a majority of Phase II facilities will also not exceed 1.0 percent. The largest effect of the final rule is estimated to be on facilities' pre-tax income: the model projects that over 80 percent of facilities will experience a reduction in pre-tax income, with about 40 percent of the overall total experiencing a reduction of 3.0 percent or greater.

2. Other Economic Analyses

EPA updated its other economic analyses conducted at proposal and for the NODA to determine the effect of changes made to the assumptions for the final rule on steam electric generating facilities. This section discusses changes made to EPA's methodology and assumptions and presents the updated results. For complete results of this analysis, refer to Chapter B2 of the final EBA. For complete results of the proposal and the NODA analyses, refer to the chapters in Part B of the EBA document in support of the proposed rule at *http://www.epa.gov/waterscience/316b/econbenefits/* and DCN 5–3004 of the NODA docket.

It should be noted that the measures presented in this section are provided in addition to the economic impact measures based on the Integrated Planning Model (IPM®) analyses (*see* section XI.B.1). The following measures are used to assess the magnitude of compliance costs; they are not used to predict closures or other types of economic impacts on facilities subject to Phase II regulation.

a. Cost-to-revenue measure.

i. Facility-level analysis. EPA examined the annualized post-tax compliance costs of the final rule as a percentage of baseline annual revenues, for each of the 554 facilities expected to be subject to Phase II of the section 316(b) regulation. This measure allows for a comparison of compliance costs incurred by each facility with its revenues in the absence of the Phase II regulation. The revenue estimates are facility-specific baseline projections from the IPM base case for 2008 (*see* section XI.B.1 for a discussion of EPA's analyses using the IPM).[56]

Similar to the findings at proposal and for the NODA preferred option, EPA estimates that a majority of the facilities subject to the final rule, 413 out of 554 (75 percent), will incur annualized costs of less than one percent of revenues. Of these, 314 facilities incur compliance costs of less than 0.5 percent of revenues. In addition, 94 facilities (17 percent) are estimated to incur costs of between one and three percent of revenues, and 39 facilities (7 percent) are estimated to incur costs of greater than three percent. Eight facilities are estimated to be base case closures.

ii. Firm-level analysis. The firms owning the facilities subject to Phase II regulation may experience greater impacts than individual in-scope facilities if they own more than one facility with compliance costs. EPA therefore also analyzed the cost-to-revenue ratios at the firm level. EPA identified the domestic parent entity of each in-scope facility and obtained their sales revenue from publicly available data sources (the Dun and Bradstreet database for parent firms of investor-owned utilities and nonutilities; and Form EIA–861 for all other parent entities). This analysis showed that 126 unique domestic parent entities own the facilities subject to Phase II regulation. EPA compared the aggregated annualized post-tax compliance costs for each facility owned by the 126 parent entities to the firms' total sales revenue.

Since proposal, EPA has updated the parent firm determination for Phase II facilities. EPA also updated the average Form EIA–861 data used for this analysis from 1996–1998 (used at proposal) to 1997–1999 (used for the NODA) and 1999–2001 (used for the final rule). In addition, EPA made one modification to the sources of revenue data used in this analysis: At proposal, EPA used sales volume from Dun and Bradstreet (D&B) for any parent entity listed in the database. If D&B data were not available, EPA used the EIA database or the section 316(b) survey. For the NODA and final rule analyses, EPA used the D&B database for privately-owned entities only. For other entities, EPA used the EIA database. For the final rule analysis, EPA conducted additional research (*e.g.,* Securities and Exchange Commission 10–K filings; company web sites) to collect revenue data for those firms whose revenue was not reported in either D&B or Form EIA 861.

For the final rule, EPA estimates that of the 126 parent entities, 115 entities (91 percent) will incur annualized costs of less than one percent of revenues. Of these, 105 entities incur compliance costs of less than 0.5 percent of revenues. In addition, 10 entities (8 percent) are estimated to incur costs of between one and three percent of revenues, and only one entity (1 percent) is estimated to incur costs of greater than three percent. The highest estimated cost-to-revenue ratio for the final rule is 6.7 percent of the entities' annual sales revenue (for the proposed rule, this value was 5.3 percent; for the NODA preferred option, this value was 7.4 percent).

b. Cost per household. EPA also conducted an analysis that evaluates the potential cost per household, if Phase II facilities were able to pass compliance costs on to their customers. This analysis estimates the average compliance cost per household for each North American Electricity Reliability Council (NERC) region,[57] using two data inputs: (1) The average annual pre-tax compliance cost per megawatt hour (MWh) of total electricity sales and (2) the average annual MWh of residential electricity sales per household. For the proposal and NODA analyses, EPA used 2000 electricity sales information from Form EIA–861 (Annual Electric Power Industry Report); for the final rule, EPA updated the electricity sales information to 2001.

The results of this analysis show that the average annual cost of the final rule per residential household is expected to range from $0.50 in Alaska to $8.18 in Hawaii. The U.S. average is estimated to be $1.21 per household.

c. Electricity price analysis. EPA also considered potential effects of the final Phase II rule on electricity prices. EPA used three data inputs in this analysis: (1) Total pre-tax compliance cost incurred by facilities subject to Phase II regulation, (2) total electricity sales, based on the Annual Energy Outlook (AEO), and (3) prices by end use sector (residential, commercial, industrial, and transportation), also from the AEO. All three data elements were calculated by NERC region. For the proposal and NODA analyses, EPA used the AEO 2002; for the final rule, EPA updated the data with the AEO 2003.

The results of the final rule analysis show that the annualized costs of complying (in cents per KWh sales) range from 0.007 cents in the SPP region to 0.019 cents in the NPCC region. To determine potential effects of these

[56] EPA used 2008 rather than 2010 baseline revenues for this analysis because 2008 is the first model run year specified in the IPM analyses. EPA used the first model run year because it more closely resembles the current operating conditions of in-scope facilities than later run years (over time, facilities may be increasingly affected by factors other than the Phase II regulation).

[57] There are twelve NERC regions: ASCC (Alaska Systems Coordinating Council), ECAR (East Central Area Reliability Coordination Agreement), ERCOT (Electric Reliability Council of Texas), FRCC (Florida Reliability Coordinating Council), HI (Hawaii), MAAC (Mid-Atlantic Area Council), MAIN (Mid-America Interconnected Network, Inc.), MAPP (Mid-Continent Area Power Pool), NPCC (Northeast Power Coordination Council), SERC (Southeastern Electricity Reliability Council), SPP (Southwest Power Pool), and WSCC (Western Systems Coordinating Council).

compliance costs on electricity prices, EPA compared the per KWh compliance cost to baseline electricity prices by end use sector and for the average of the sectors (the detailed results are presented in Chapter B2 of the final EBA). This analysis projects that the greatest increase in electricity prices will be in the WSCC region (0.3 percent). The average increase in electricity prices is estimated to be 0.16 percent (for the proposed rule, this value was 0.11 percent; for the NODA preferred option, this value was 0.17 percent).

XII. Benefits Analysis

A. Introduction

This section presents EPA's estimates of the national environmental benefits of the final section 316(b) regulations for Phase II existing facilities. The assessed benefits occur due to the reduction in impingement and entrainment at cooling water intake structures affected by this rulemaking. Impingement and entrainment kills or injures large numbers of all life stages of aquatic organisms. By reducing the levels of impingement and entrainment, today's final rule will increase the number of fish, shellfish, and other aquatic life in local aquatic ecosystems. This, in turn, directly and indirectly improves use benefits such as those associated with recreational and commercial fisheries. Other types of benefits, including ecological and non-use values, would also be enhanced. Section D provides an overview of the types and sources of benefits anticipated, how these benefits are estimated, the level of benefits achieved by the final rule, and how monetized benefits compare to costs. The analysis was based on impingement and entrainment data from facility studies. Most of these studies counted losses of fish species only and considered only a limited subset of the species impinged and entrained.

To estimate the economic benefits of reducing impingement and entrainment at existing cooling water intake structures, all the beneficial outcomes need to be identified and, where possible, quantified and assigned appropriate monetary values. Estimating economic benefits is challenging because of the many steps necessary to link reductions in impingement and entrainment to changes in impacted fisheries and other aspects of relevant aquatic ecosystems, and then to link these ecosystem changes to the resulting changes in quantities and values for the associated environmental goods and services that ultimately are linked to human welfare. The methodologies used in the estimation of benefits of the final rule are largely built upon those used for estimating use benefits of the proposed rule (*see* 67 FR 17121) and the Notice of Data Availability (*see* 67 FR 38752). The Regional Analysis Document for the Proposed Section 316 (b) Phase II Existing Facilities Rule (*see* DCN 6–0003), hereafter known as the Regional Study or Regional Analysis, provides EPA's complete benefit assessment for the final rule.

National benefit estimates for this rule are derived from a series of regional studies across the country from a range of waterbody types. Section XII.B provides detail on the regional study design. Sections XII.C through XII.E of this preamble describe the methods EPA used to evaluate impingement and entrainment impacts at section 316(b) Phase II existing facilities and to derive an economic value associated with any such losses. Regional benefits are estimated using a set of statistical weights for each in-scope facility that were developed as part of the survey design. National benefit estimates are obtained by summing regional benefits.

B. Regional Study Design

In its analysis for the section 316(b) Phase II proposal, EPA relied on case studies of 19 facilities grouped by waterbody type (oceans, estuaries/tidal rivers, lakes/reservoirs, and rivers/streams) to estimate the potential economic benefits of reduced impingement and entrainment. For the proposal analysis, EPA extrapolated estimates of impingement and entrainment for each of the case study facilities to other facilities located on the same waterbody type, including those in different regions. However, a number of commenters expressed concern about this method of extrapolation, noting that there are important ecological and socioeconomic differences among different regions of the country, even within the same waterbody type. To address this concern, EPA revised the design of its analysis to examine cooling water intake structure impacts and regulatory benefits at the regional level. This involved the evaluation of impingement and entrainment data collected by the industry for another 27 facilities in addition to the 19 facilities evaluated for proposal (for a total of 46 facilities). Regional results were then combined to develop national estimates.

The Agency evaluated the benefits of today's rule in seven study regions (North Atlantic, Mid Atlantic, South Atlantic, Gulf of Mexico, California, Great Lakes, and Inland) based on similarities in the affected ecosystems, aquatic species present, and characteristics of commercial and recreational fishing activities within each of the seven regions (*see* the background chapter of each study region in Parts B-H of the Regional Analysis Document for maps of the study regions). The five coastal regions (California, North Atlantic, Mid-Atlantic, South Atlantic, and Gulf of Mexico) correspond to those of the National Oceanographic and Atmospheric Association (NOAA) Fisheries. The Great Lakes region includes all facilities in scope of the Phase II rule that withdraw water from Lakes Ontario, Erie, Michigan, Huron, and Superior or are located on a waterway with open fish passage to a Great Lake and within 30 miles of the lake. The Inland region includes the remaining facilities that withdraw water from freshwater lakes, rivers, and reservoirs.

Based on comments on the proposal about study gaps, EPA used available life history data to construct representative regional life histories for groups of similar species with a common life history type and groups used by NOAA Fisheries for landings data. Aggregation of species into groups facilitated evaluation of facility impingement and entrainment monitoring data. DCN 6–0003 provides a listing of the species in each life history group evaluated by EPA and tables of the life history data and data sources used for each group.

To obtain regional impingement and entrainment estimates, EPA extrapolated losses from selected facilities with impingement and entrainment data to all other facilities within the same region. Impingement and entrainment data were extrapolated on the basis of operational flow, in millions of gallons per day (MGD), where MGD is the average operational flow over the period 1996–1998 as reported by facilities in response to EPA's Section 316(b) Detailed Questionnaire and Short Technical Questionnaire. Operational flow at each facility was scaled using factors reflecting the relative effectiveness of currently in-place technologies for reducing impingement and entrainment. DCN 6–0003 provides details of the extrapolation procedure. The goal of the analysis was to provide regional and national estimates, so although there may be variability in the actual losses (and benefits) per MGD across particular individual facilities, EPA believes that this method of extrapolation is a reasonable basis for developing an estimate of regional- and national-level benefits for the purposes of this rulemaking.

C. The Physical Impacts of Impingement and Entrainment

EPA's benefits analysis is based on facility-provided biological monitoring data. Facility data consist of records of impinged and entrained organisms sampled at intake structures. However, factors such as sampling methods and equipment, the number of samples taken, the duration of the sampling period, and the unit of time and volume of intake flow used to express impingement and entrainment, and other aspects of facility sampling programs, are highly variable. The data available covered organisms of all ages and life stages from newly laid eggs to mature adults. Therefore, EPA converted sampling counts into standardized estimates of the annual numbers of fish impinged or entrained and then expressed these estimates in terms of metrics suitable for the environmental assessment and economic benefits analysis.

EPA notes that the facility studies evaluated may under or over estimate impingement and entrainment rates. For example, facility studies typically focus on only a subset of the fish species impacted by impingement and entrainment, resulting in an underestimate of the number of species and total losses. Studies often did not count early life stages of organisms that were hard to identify. In addition, most studies EPA found were conducted over 30 years ago, before activities under the Clean Water Act improved aquatic conditions. In those locations where water quality was degraded relative to current conditions, the numbers and diversity of fish may have been depressed during the monitoring period, resulting in low impingement and entrainment estimates. On the other hand, use of linear methods for projecting losses to fish and shellfish in the waterbody may overstate or understate impacts. Nevertheless, EPA believes that the data from the facility studies were sufficient for developing an estimate of the relative magnitude of impingement and entrainment losses nation-wide.

Using standard fishery modeling techniques,[58] EPA constructed models that combined facility-derived impingement and entrainment counts with relevant life history data to derive estimates of (1) age-one equivalent losses (the number of individuals of different ages impinged and entrained by facility intakes expressed as age-one equivalents), (2) foregone fishery yield (pounds of commercial harvest and numbers of recreational fish and shellfish that are not harvested due to impingement and entrainment), and (3) foregone biomass production (pounds of impinged and entrained forage species that are not commercial or recreational fishery targets but serve as valuable components of aquatic food webs, particularly as an important food supply to other aquatic species, including commercial and recreational species). Estimates of foregone fishery yield include direct and indirect losses of impinged and entrained species that are harvested. Indirect losses represent the yield of these harvested species that is lost due to losses of forage species. Details of the methods used for these analyses are provided in Chapter A5 of Part A of the Regional Analysis document. For all analyses, EPA used the impingement and entrainment estimates provided by the facility and assumed 100% entrainment mortality based on the analysis of entrainment survival studies presented in Chapter A7 of Part A of the Regional Analysis document.

Exhibit XII–1 presents EPA's estimates of the current level of total annual impingement and entrainment in the study regions.

EXHIBIT XII–1.—TOTAL CURRENT ANNUAL IMPINGEMENT AND ENTRAINMENT, BY REGION

Region	Age-one equivalents (millions)	Foregone fishery yield (million lbs)	Biomass production foregone (million lbs)
California	312.94	28.87	43.62
North Atlantic	65.70	1.26	289.12
Mid Atlantic	1,733.14	67.2	110.90
South Atlantic	342.54	18.34	28.31
Gulf of Mexico	191.23	35.81	48.12
Great Lakes	319.11	3.59	19.34
Inland	369	3.53	122.0
Total for 554 facilities [a]	3,449.38	164.97	717.07

[a] National totals are sample-weighted and include Hawaii. Hawaii benefits are calculated based on average loss per MGD in North Atlantic, Mid Atlantic, Gulf of Mexico, California and the total intake flow in Hawaii.

Exhibit XII–2 presents EPA's estimates of annual combined impingement and entrainment reductions associated with the rule, by region.

[58] Ricker, W.E. 1975. Computation and interpretation of biological statistics of fish populations. Fisheries Research Board of Canada, Bulletin 191; Hilborn, R. and C.J. Walters. 1992. Quantitative Fisheries Stock Assessment, Choice, Dynamics and Uncertainty. Chapman and Hall, London and New York.; Quinn, T.J., II. and R.B. Deriso. 1999. Quantitative Fish Dynamics. Oxford University Press, Oxford and New York; Dixon, D.A. 1999. Catalog of Assessment Methods for Evaluating the Effects of Power Plant Operations on Aquatic Communities. Final Report. Report number TR–112013.

EXHIBIT XII–2.—REDUCTIONS IN ANNUAL IMPINGEMENT AND ENTRAINMENT, BY REGION

Region	Age-one equivalents (millions)	Foregone fishery yield (million lbs)	Biomass production foregone (million lbs)
California	66.39	6.10	9.19
North Atlantic	19.34	0.37	84.28
Mid Atlantic	846.37	34.28	54.66
South Atlantic	76.67	5.31	6.31
Gulf of Mexico	89.55	13.84	16.50
Great Lakes	159.52	1.73	8.51
Inland	116.83	1.06	20.90
Total for 554 facilities [a]	1,420.20	64.92	217.09

[a] National totals are sample-weighted and include Hawaii. Hawaii losses are estimates based on average loss rates per MGD at mainland coastal facilities and the total intake flow of the Hawaii facilities.

D. National Benefits of Rule

1. Overview

Economic benefits of today's rule can be broadly defined according to categories of goods and services provided by the species affected by impingement and entrainment at cooling water intake structures (CWIS). The first category includes benefits that pertain to the use (direct or indirect) of the affected fishery resources. The direct use benefits can be further categorized according to whether or not affected goods and services are traded in the market. The ''direct use'' benefits of the 316(b) regulation include both ''market'' commodities (*e.g.,* commercial fisheries) and ''nonmarket'' goods (*e.g.,* recreational angling). Indirect use benefits also can be linked to either market or nonmarket goods and services—for example, the manner in which reduced impingement- and entrainment-related losses of forage species leads through the aquatic ecosystem food web to enhance the biomass of species targeted for commercial (market) and recreational (nonmarket) uses. The second category includes benefits that are independent of any current or anticipated use of the resource; these are known as ''non-use'' or ''passive use'' values. Non-use benefits reflect human values associated with existence and bequest motives.

The economic value of benefits is estimated using a range of valuation methods, with the specific approach being dependent on the type of benefit category, data availability, and other suitable factors. Commercial fishery benefits are valued using market data. Recreational angling benefits are valued using a combination of primary and secondary research methods. For four of the seven study regions, EPA developed original Random Utility Models (RUM) of recreational angling behavior to estimate changes in recreational fishing values resulting from improved fishing opportunities due to reductions in impingement and entrainment. For the remaining three study regions (Inland, North Atlantic, and South Atlantic), EPA used secondary nonmarket valuation data (*e.g.,* benefits transfer of nonmarket valuation studies of the value of recreational angling). Because methodologies for estimating use values for recreational and commercial species are well developed, and some of these species have been extensively studied, these values are relatively straightforward to estimate. Sections XII.D.3 and XII.D.4 briefly summarize EPA's approaches to measuring direct use benefits. A detailed description of these approaches can be found in the 316(b) Regional Analysis document.

Estimating benefits from reduced impingement and entrainment of forage species is more challenging because these species are not targeted directly by commercial or recreational anglers and have no direct use values that can be observed in markets or inferred from revealed actions of anglers. To estimate indirect use benefits from reducing impingement and entrainment losses to forage species, EPA used a simple trophic transfer model that translates changes in impingement and entrainment losses of forage fish into changes in the harvest of commercial and recreational species that are subject to impingement and entrainment (*i.e.,* not the whole food web). Agency benefits estimates are based on projected numbers of age 1 equivalent fish saved under the final rule.

Neither forage species nor the unlanded portion of recreational and commercial species have direct uses; therefore, they do not have direct use values. Their potential value to the public is derived from two alternative sources: their indirect use as both food and breeding population for those fish harvested; and, the willingness of individuals to pay for the protection of fish based on a sense of altruism, stewardship, bequest, or vicarious consumption (non-use benefits). To estimate non-use benefits from reducing losses to forage species, and landed and unlanded commercial and recreational species, EPA explored benefits transfer from nonmarket valuation studies of non-use values of aquatic ecosystem improvements. EPA also explored the transfer of secondary nonmarket valuation data to value losses of threatened and endangered species. These efforts generated evidence that non-use values could occur as a result of this rule, but EPA was unable, by the time of publication of this final rule, to estimate reliable valuations for the resource changes associated with the expected results of this rule. EPA also investigated additional approaches to illustrate public willingness-to-pay for potential aquatic resource improvements that might occur because of this rule, but the Agency did not have sufficient time to fully develop and analyze these non-use benefit approaches for the final rule. Section XII.D.5 briefly summarizes the approaches EPA considered for measuring non-use benefits. Additional details about all approaches explored for estimating benefits can be found in Section XII.F and the 316(b) Regional Analysis document (DCN 6–0003).

As a consequence of the challenges associated with estimating benefits, some benefits are described only qualitatively, because it was not feasible, by the time of publication of this final rule, to derive reliable quantitative estimates of the degree of impact and/or the monetary value of reducing those impacts at the national level.

The remaining parts of Section XII.D below discuss details about discounting future benefits, valuation of recreational fishing, valuation of commercial fishing, potential non-use benefits, and estimation of national benefits.

2. Timing of Benefits

Discounting refers to the economic conversion of future benefits and costs to their present values, accounting for the fact that individuals tend to value future outcomes less than comparable near-term outcomes. Discounting is important when benefits and costs occur in different years, and enables a comparison of benefits to costs across different time periods.

For today's rule, benefits are discounted to calculate benefits in a manner that makes the timing comparable to the annualized cost estimates. The benefits of today's rule are estimated as the typical benefits expected once the rule takes effect. The need to discount arises from two different delays in the realization of benefits.

First, facilities will not immediately achieve compliance. Facilities will face regulatory requirements once the rule takes effect, but it will take time to make the required changes. EPA has assumed, for the purpose of estimating benefits, that it will take one year from the date when installation costs are incurred by a facility until the required cooling water technology is operational. To account for this lag, all benefits are discounted by one year from the date when costs are incurred.

Second, an additional time lag will result between the time of technology implementation and resulting increased fishery yields. This lag stems from the fact that one or more years may pass between the time an organism is spared impingement and entrainment and the time of its ultimate harvest. For example, a larval fish spared from entrainment (in effect, at age 0) may be caught by a recreational angler at age 3, meaning that a 3-year time lag arises between the incurred technology cost and the realization of the estimated recreational benefit. Likewise, if a 1-year old fish is spared from impingement and is then harvested by a commercial waterman at age 2, there is a 1-year lag between the incurred cost and the subsequent commercial fishery benefit. To account for this growth period, EPA applied discounting by species groups in each regional study. EPA conducted this analysis using two alternative discount rates as recommended by OMB: 3% and 7%. The Agency notes that discounting was applied to recreational and commercial fishing benefits only. Non-use benefits are independent of fish age and size and, thus start as soon as impingement and entrainment ceases.

3. Recreational Fishing Valuation

a. Recreational fishery methods for marine regions. For the five coastal regions, EPA's analysis of recreational fishing benefits from reduced impingement and entrainment is based on region-specific random utility models (RUM) of recreational anglers' behavior, combined with benefit function transfer. EPA developed original RUM models for four of the five coastal regions: California, the Mid-Atlantic, the South Atlantic, and the Gulf of Mexico. For the North Atlantic region, EPA used a model developed by the National Marine Fisheries Service (NMFS) by Hicks *et al.* (Hicks, Steinback, Gautam, and Thunberg, 1999. Volume II: The Economic Value of New England and Mid-Atlantic Sportfishing in 1994—DCN 5–1271). Chapter A11 of the Regional Analysis document provides detailed discussion of the methodology used in EPA's RUM analysis.

The regional recreational fishing studies use information on recreational anglers' behavior to infer anglers' economic value for the quality of fishing in the case study areas. The models' main assumption is that anglers will get greater satisfaction, and thus greater economic value, from sites where the catch rate is higher due to reduced impingement and entrainment, all else being equal. This benefit may occur in two ways: first, an angler may get greater enjoyment from a given fishing trip when catch rates are higher, and thus get a greater value per trip; second, anglers may take more fishing trips when catch rates are higher, resulting in greater overall value for fishing in the region. EPA modeled an angler's decision to visit a site as a function of site-specific cost, fishing trip quality, and additional site attributes such as presence of boat launching facilities or fish stocking at the site.

The Agency used 5-year historical catch rates per hour of fishing as a measure of baseline fishing quality in the regional studies. Catch rate is one of the most important attributes of a fishing site from the angler's perspective. This attribute is also a policy variable of concern because catch rate is a function of fish abundance, which is affected by fish mortality caused by impingement and entrainment.

The Agency used the estimated model coefficients in conjunction with the estimated changes in impingement and entrainment in a given region to estimate per-day welfare gain to recreational anglers due to the final rule. For the North Atlantic region, EPA used model coefficients estimated by Hicks *et al.* (1999) (DCN 4–1603).

To estimate the total economic value to recreational anglers for changes in catch rates resulting from changes in impingement and entrainment in a given region, EPA multiplied the total number of fishing days for a given region by the estimated per-day welfare gain due to the regulation. Because of data limitations, EPA was unable to estimate participation models for all regions. For the California and Great Lakes regions, the welfare estimates presented in the following section are based on the estimates of baseline recreational fishing participation provided by NOAA Fisheries. Thus, welfare estimates for these two regions presented in today's rule do not account for changes in recreational fishing participation due to the improved quality of the fishing sites; however, these changes are likely to be small based on results for other regions.

For the North Atlantic, Mid-Atlantic, South-Atlantic, and Gulf regions, estimates are based on an average of baseline and predicted increased fishing days. For these regions, EPA also estimated a trip frequency model, which captures the effect of changes in catch rates on the number of fishing trips taken per recreational season.

b. Recreational Fishery methods for the Great Lakes region. For the Great Lakes region, EPA developed an original RUM model for the state of Michigan, and transferred benefits to other Great Lakes states. EPA's RUM model for the Great Lakes used data from the 2001 Michigan Recreational Anglers survey, and information on historical catch rates at Michigan fishing sites on Lakes Michigan, Huron, Superior, and Erie provided by the Michigan Department of Natural Resources (MDNR, 2002, DCN 4–1863). For the Great Lakes, EPA estimated a single RUM site choice model for boat, shore, and ice-fishing modes. To transfer values from the Michigan study to other Great Lakes states, EPA used harvest information from state-level anglers' creel surveys, and participation information from the U.S. Fish and Wildlife Service's Annual Survey of Fishing, Hunting, and Wildlife-Related Recreation (U.S. Department of the Interior, 2001, DCN 1–3082–BE).

c. Recreational fishery methods for the Inland region. For the Inland region, EPA used a benefit transfer approach to value post regulation recreational impingement and entrainment losses. EPA conducted this analysis for five aggregate species groups: panfish, perch, walleye/pike, bass, and anadromous gamefish. The panfish group includes species commonly classified as panfish, except perch, and includes species that did not clearly fit in one of the other groups. Using estimates collected from ten studies, the Agency calculated measures of central tendency for the marginal value of catching one additional fish for each species group. For detail see Chapter H4, of the Regional Study Document, DCN 6–0003.

The mean marginal value per additional fish caught is $2.55 for panfish, $0.38 for perch, $6.54 for walleye/pike, $4.18 for bass, and $11.95 for anadromous gamefish. EPA combined these marginal values per fish with estimates of recreational fishing losses that would be prevented by the regulation to calculate the value of post regulation recreational fishing benefits.

d. Results. As noted earlier in this section, anglers will get greater satisfaction, and thus greater economic value, from sites where the catch rate is higher, all else being equal. Decreasing impingement and entrainment increases the number of fish available to be caught by recreational anglers, thus increasing angler welfare.

Exhibit XII–3 shows the benefits that would result from reducing impingement and entrainment losses by installing cooling water intake technology under the final regulation. These values were discounted at a 3 percent discount rate and a 7 percent discount rate to reflect the fact that fish must grow to a certain size before they will be caught by recreational anglers and to account for the one-year lag between the date when installation costs are incurred and technology implementation.

The greatest recreational fishing benefits from reducing impingement and entrainment losses occur in the Mid-Atlantic, South Atlantic, and Great Lakes regions. For more detailed information on the models and results for each region, see Chapter 4 in Parts B through H of the 316(b) Regional Analysis document.

EXHIBIT XII–3.—POST REGULATION RECREATIONAL FISHING BENEFITS FROM REDUCING IMPINGEMENT AND ENTRAINMENT LOSSES

Region	Baseline recreational fishery losses (number of fish)	Reduction in recreational fishery losses (number of fish)	Benefits of final rule (million 2002$)		
			0% Discount rate	3% Discount rate	7% Discount rate
California	5,787,661	1,735,668	$3.01	$2.45	$1.91
North Atlantic	916,396	267,536	1.59	1.38	1.17
Mid Atlantic	20,468,540	9,990,333	47.69	43.37	38.48
South Atlantic	4,314,983	985,769	7.49	6.85	6.17
Gulf of Mexico	3,854,850	1,201,806	6.79	6.18	5.53
Great Lakes	4,743,384	2,283,896	15.51	13.95	12.21
Inland	3,188,097	930,610	3.34	2.98	2.58
Total for 554 facilities [a]	44,513,814	17,908,496	87.83	79.34	69.96

[a] National totals are sample-weighted and include Hawaii. Hawaii benefits are calculated based on average loss per MGD in North Atlantic, Mid Atlantic, Gulf of Mexico, California and the total intake flow in Hawaii.

The total for all regions, discounted at three percent, is $79.3 million; and the total for all regions, discounted at seven percent, is $70.0 million.

e. Limitations and uncertainties. Because of the uncertainties and assumptions of EPA's analysis, the estimates of benefits presented in this section may understate the benefits to recreational anglers. In estimating the benefits of improved recreational angling for the California and Great Lakes regions, the Agency assigned a monetary benefit only to the increases in consumer surplus for the baseline number of fishing days. This approach omits the portion of recreational fishing benefits that arise when improved conditions lead to higher levels of participation. However, EPA's analysis of changes in recreational fishing participation due to the section 316(b) regulation for other coastal regions shows that the practical effect of this omission is likely to be very small with respect to the total recreational benefits assessment.

4. Commercial Fishing Valuation

Reductions in impingement and entrainment at cooling water intake structures are expected to benefit the commercial fishing industry. The effect is straightforward: reducing the number of fish killed will increase the number of fish available for harvest. Measuring the benefits of this effect is less straightforward. The next section summarizes the methods EPA used to estimate benefits to the commercial fishing sector. The following section presents the estimated commercial fishing benefits for each region.

a. Methods. EPA estimated commercial benefits by first estimating the value of total losses under current impingement and entrainment conditions (or the total benefits of eliminating all impingement and entrainment). Then, based on review of the empirical literature, EPA assumed that producer surplus is equal to 0% to 40% of baseline losses. Finally, EPA estimated benefits by applying the estimated percentage reduction in impingement and entrainment to the estimated producer surplus to obtain the estimated increase in producer surplus attributable to the rule. This methodology was applied in each region in the final analysis: the North Atlantic, Mid-Atlantic, South Atlantic, Gulf of Mexico, California, Great Lakes, and Inland. Additional detail on the methods EPA used for this analysis can be found in Chapter A10 ''Methods For Estimating Commercial Fishing Benefits'' in the Regional Analysis Document.

The process used to estimate regional losses and benefits to commercial fisheries is as follows:

1. Estimate losses to commercial harvest (in pounds of fish) attributable to impingement and entrainment under current conditions. The basic approach is to apply a linear stock-to-harvest assumption, such that if 10% of the current commercially targeted stock were harvested, then 10% of the commercially targeted fish lost to impingement and entrainment would also have been harvested absent impingement and entrainment. The percentage of fish harvested is based on data on historical fishing mortality rates.

2. Estimate gross revenue of lost commercial catch. The approach EPA

uses to estimate the value of the commercial catch lost due to impingement and entrainment relies on landings and dockside price ($/lb) as reported by NOAA Fisheries for the period 1991–2001. These data are used to estimate the revenue of the lost commercial harvest under current conditions (*i.e.*, the increase in gross revenue that would be expected if all impingement and entrainment impacts were eliminated).

3. Estimate lost economic surplus. The conceptually suitable measure of benefits is the sum of any changes in producer and consumer surplus. The methods used for estimating the change in surplus depend on whether the physical impact on the commercial fishery market appears sufficiently small such that it is reasonable to assume there will be no appreciable price changes in the markets for the impacted fisheries.

For the regions and magnitude of losses included in this analysis, it is reasonable to assume no change in price, which implies that the welfare change is limited to changes in producer surplus. The change in producer surplus is assumed to be equivalent to a portion of the change in gross revenues, as developed under step 2. EPA assumes a range of 0% to 40% of the gross revenue losses estimated in step 2 as a means of estimating the change in producer surplus. This is based on a review of empirical literature (restricted to only those studies that compared producer surplus to gross revenue) and is consistent with recommendations made in comments on the EPA analysis at proposal.

4. Estimate increase in surplus attributable to the Phase II regulations. Once the commercial surplus losses associated with impingement and entrainment under baseline conditions have been estimated according to the approaches outlined in steps 2 and 3, EPA estimates the percentage reduction in impingement and entrainment at a regional level.

b. Results. Exhibit XII–4 presents the estimated commercial fishing benefits attributable to today's rule for each region. The results reported include the total reduction in losses in pounds of fish, and the value of this reduction discounted at 0%, 3%, and 7%. Total commercial fishing benefits for the U.S., applying a 3% discount rate, are estimated to range from $0 to $3.5 million. Applying a 7% rate they range from $0 to $3.5 million.

EXHIBIT XII–4.—ANNUAL COMMERCIAL FISHING BENEFITS [a]

Region [c]	Current (baseline) lost yield (million lbs)	Reduction in lost yield (million lbs)	Benefits (millions of 2002$) [b]		
			0% discount rate	3% discount rate	7% discount rate
California	11.5	2.4	0.7	0.5	0.4
North Atlantic	0.6	0.2	0.1	0.1	0.0
Mid Atlantic	48.7	25.3	1.8	1.7	1.5
South Atlantic	9.6	3.5	0.2	0.2	0.2
Gulf of Mexico	7.6	3.6	0.8	0.7	0.6
Great Lakes	1.6	0.8	0.2	0.2	0.2
Inland U.S.	n/a	n/a	n/a	n/a	n/a
Total for 554 facilities	82.8	37.0	4.1	3.5	3.0

[a] Benefits are upper bound benefits based on 40% of gross revenue. The lower bound is $0.
[b] Discounted to account for lag in implementation and lag in time required for fish lost to I&E to reach a harvestable age. Assumed it will take one year from the date when installation costs are incurred to the date of installation. Thus, all benefits are discounted by one year from the date when installation costs are incurred.
[c] Regional totals are unweighted. National total estimates are weighted and include Hawaii.

c. Limitations and uncertainties. Some of the major uncertainties and assumptions of EPA's commercial fishing analysis include:

- Projected changes in harvest may be under-estimated because the cumulative impacts of impingement and entrainment over time are not considered.
- The analysis only includes individuals that are directly killed by impingement and entrainment, not their progeny, though given the complexities of population dynamics, the significance of this omission is not clear.
- Projected changes in harvest may be too high or too low because interactions with other stressors are not considered.
- EPA used impingement and entrainment data provided by the facilities. While EPA used the most current data available, in some cases these data are 20 years old or older. Thus, they may not reflect current conditions.
- EPA assumes a linear stock-to-harvest relationship (*i.e.*, a 13% change in stock would have a 13% change in landings); this may be low or high, depending on the condition of the stocks. Region-specific fisheries regulations also will affect the validity of the linear assumption.
- EPA assumes that NOAA Fisheries landings data are accurate and complete. However, in some cases prices and/or quantities may be reported incorrectly.
- EPA currently estimates that the increase in producer surplus as a result of the rule will be between 0% and 40% of the estimated change in gross revenues. The research used to develop this range is not region-specific; thus the true value may be higher for some regions and species.

5. Non-Use Benefits

As discussed by Freeman (1993), ''Non-use values, like use values, have their basis in the theory of individual preferences and the measurement of welfare changes. According to theory, use values and non-use values are additive,'' and ''* * * there is a real possibility that ignoring non-use values could result in serious misallocation of resources.'' This statement by Freeman aptly conveys the importance of non-use benefits outlined in EPA's own economic valuation guidance documents. A comprehensive estimate of total resource value should include both use and non-use values, so that the resulting appropriate total benefit value estimates may be compared to total social cost.

It is clear that reducing impingement and entrainment losses of fish and shellfish may result in both use and non-use benefits. Of the organisms which are anticipated to be protected by the section 316(b) Phase II rule, it is projected that approximately 1.8 percent will eventually be harvested by commercial and recreational fishers and therefore can be valued with direct use valuation techniques. The Agency's direct use valuation does not account for the benefits from the remaining 98.2% of the age 1 equivalent aquatic organisms estimated to be protected nationally under today's rule. A portion of the total benefits of these unharvested commercial, recreational, and forage species, can be derived indirectly from the estimated use values of the harvested animals. A percentage of these unlanded organisms become prey or serve as breeding stock in the production of those commercial and recreational species that will eventually be caught, therefore their indirect use value as biological input into the production process is represented in the estimated direct use values of the harvested fish.

EPA was unable to value the non-use benefits associated with this rule. In order to provide an estimate of the quantified (but not monetized) effects of the rule, Exhibit XII–5 summarizes information about total impingement and entrainment losses, and Exhibit XII–6 presents estimates of reductions in impingement and entrainment losses under the final rule.

EXHIBIT XII–5.—DISTRIBUTION OF BASELINE IMPINGEMENT AND ENTRAINMENT

Region[a]	Current I&E of annual age-one equivalents (millions)				I&E of harvested species as a percentage of total I&E
	All species (total)	Forage species	Commercial and recreational species	Harvested commercial and recreational species	
California	312.9	170.6	142.3	14.9	4.8
North Atlantic	65.7	49.7	16.0	0.7	1.0
Mid Atlantic	1,733.1	1,115.6	617.6	28.4	1.6
South Atlantic	342.5	208.1	134.5	6.5	1.9
Gulf of Mexico	191.2	53.5	137.8	8.1	4.2
Great Lakes	319.1	300.8	18.3	0.5	0.2
Inland	369.0	284.8	84.2	0.2	0.1
Total for 554 facilities[a]	3,449.4	2,255.8	1,193.6	62.1	1.8

[a] Regional totals are unweighted. National total estimates are weighted and include Hawaii.

EXHIBIT XII–6.—DISTRIBUTION OF REDUCTIONS IN IMPINGEMENT AND ENTRAINMENT

Region[a]	Reductions in I&E of annual age-one equivalents (millions)				Reduction in I&E of harvested species as a percentage of total reduction in I&E
	All species (total)	Forage species	Commercial and recreational species	Harvested commercial and recreational species	
California	66.4	36.0	30.4	3.2	4.8
North Atlantic	19.3	14.6	4.7	0.2	1.0
Mid Atlantic	846.4	537.5	308.8	13.9	1.6
South Atlantic	76.7	38.5	38.2	1.6	2.0
Gulf of Mexico	89.5	20.5	69.0	3.6	4.0
Great Lakes	159.5	151.7	7.8	0.2	0.1
Inland	116.8	101.2	15.7	0.1	0.1
Total for 554 facilities	1,420.2	928.9	491.3	23.7	1.7

[a] Regional numbers are unweighted. National totals are sample-weighted and include Hawaii.

Lack of direct use values for the unharvested commercial, recreational and forage species means that EPA did not directly value a substantial percentage of the total age-one equivalent impingement and entrainment losses. Given that aquatic organisms without any direct uses account for the majority of cooling water intake structure losses and indirect valuation of these species may only represent a fraction of their total value, comprehensive monetization of the benefits of reduced impingement and entrainment losses is incomplete without developing a reliable estimate of non-use benefits. Although individuals do not use these resources directly, they may value changes in their status or quality. Both users (commercial and recreational fishermen) as well as non-users (those who do not use the resource) may have non-use values for these species. Non-use benefit valuation is challenging, but the existence and potential importance of non-use benefits is supported by EPA's Guidelines for Preparing Economic Analysis (EPA 240–R–00–003) and OMB Circular A–4, Regulatory Analysis, also available as Appendix D of Informing Regulatory Decisions: 2003 Report to Congress on The Costs and Benefits of Federal Regulations and Unfunded Mandates on State, Local and Tribal Entities, OMB, 2003, pp 118–165.

Market valuation approaches are used to estimate use benefits. The theory and practice of nonmarket valuation is well developed, and typically plays a pivotal role in benefit-cost analysis conducted by public and private agencies. Non-use values are often considered more difficult to estimate. The preferred technique for estimating non-use values is to conduct original stated preference surveys, but benefit transfer of values from existing stated preference studies can be considered when original studies are not feasible.

Stated preference methods rely on surveys, which ask people to state their willingness-to-pay for particular ecological improvements, such as increased protection of aquatic species or habitats with particular attributes. The Agency was not able to perform an original stated preference study for this regulation, so benefit transfer was explored as an alternative means to estimate non-use benefits. Benefits transfer involves adapting the findings from research conducted for another purpose to address the policy questions in hand.

One of the specific benefit transfer techniques explored by EPA for estimation of non-use benefits in Phase II of the 316(b) rulemaking was meta regression analysis. Meta regressions are designed to statistically define the relationship between values and a set of resource, demographic and other characteristics compiled from original primary study sources. The resulting mathematical relationship allows the researcher to forecast estimates of non-use values specific to the resource changes projected to occur as a consequence of the final rule. EPA's Guidelines for Preparing Economic Analysis (EPA 240–R–00–003) discusses the use of meta-analysis and notes that this approach is the most rigorous benefit transfer exercise.

The meta analysis conducted by EPA for this rule identifies a set of elements that may influence willingness-to-pay; the analysis found both statistically significant and intuitive patterns that appeared to influence non-use values for water quality improvements in aquatic habitats. However, the Agency encountered various limitations when trying to apply the meta analysis model to this final rule, and these limitations could not be thoroughly analyzed within the publication time-frame established for this rule. EPA therefore does not present estimates of non-use values for this final rule.

Due to the various difficulties associated with estimating indirect and non-use benefits for this rule, final benefits do not reflect reduced impacts to a variety of potential ecological and public services that are a function, in part, of healthy fish stocks and other organisms affected by cooling water intake structures. Examples of other potential ecosystem services that may potentially be adversely affected by impingement and entrainment losses but which could not be monetized include:

- Decreased numbers of ecological keystone, rare, or sensitive species;
- Increased numbers of exotic or disruptive species that compete well in the absence of species lost to I&E;
- Disruption of ecological niches and ecological strategies used by aquatic species;
- Disruption of organic carbon, nutrient, and energy transfer through the food web;
- Decreased local biodiversity;
- Disruption of predator-prey relationships;
- Disruption of age class structures of species; and
- Disruption of public satisfaction with a healthy ecosystem.

The existence and potential magnitude of each of these benefits categories is highly dependent on site-specific factors which could not be assessed.

Today's rule may help preserve threatened and endangered species, but primary research, using stated preference methods, and data collection regarding threatened and endangered species impacts, could not be conducted for the final rule at the national level. As a result, EPA explored other methods for valuing threatened and endangered species. Details about possible non-use benefits valuation approaches are presented in the 316(b) Regional Analysis document (DCN 6–0003).

6. National Monetized Benefits

Quantifying and monetizing reduction in impingement and entrainment losses due to today's final rule is extremely challenging, and the preceding sections discuss specific limitations and uncertainties associated with estimation of commercial and recreational benefits categories (presented in Exhibit XII–7), and non-use benefits. National benefit estimates are subject to uncertainties inherent in valuation approaches used for assessing the three benefits categories. The combined effect of these uncertainties is of unknown magnitude or direction (*i.e.*, the estimates may over or under state the anticipated national-level benefits); however, EPA has no data to indicate that the results for each benefit category are atypical or unreasonable.

Exhibit XII–7 presents EPA's estimates of the total monetized benefits from impingement and entrainment reduction of the final regulation. Although EPA believes non-use benefits exist, the Agency was not able to monetize them. The estimated impingement and entrainment reduction monetized benefits post regulation are $83 million (2002$) per year, discounted at three percent, and $73 million, discounted at seven percent.

EXHIBIT XII–7.—SUMMARY OF MONETIZED SOCIAL BENEFITS

[Millions; 2002$]

Region [a]	Commercial fishing benefits	Recreational fishing benefits	Total value of monetizable impingement and entrainment reductions [b]
Evaluated at a 3 percent discount rate			
California	$0.5	$2.5	$3.0
North Atlantic	0.1	1.4	1.5
Mid-Atlantic	1.7	43.4	45.1
South Atlantic	0.2	6.9	7.1
Gulf of Mexico	0.7	6.2	6.9
Great Lakes	0.2	14.0	14.2
Inland	....	3.0	3.0
Total for 554 facilities	3.5	79.3	82.5
Evaluated at a 7 percent discount rate			
California	0.4	1.9	2.3
North Atlantic	0.0	1.2	1.2
Mid-Atlantic	1.5	38.5	40.0
South Atlantic	0.2	6.2	6.4
Gulf of Mexico	0.6	5.5	6.1
Great Lakes	0.2	12.2	12.4

EXHIBIT XII–7.—SUMMARY OF MONETIZED SOCIAL BENEFITS—Continued

[Millions; 2002$]

Region [a]	Commercial fishing benefits	Recreational fishing benefits	Total value of monetizable impingement and entrainment reductions [b]
Inland	....	2.6	2.6
Total for 554 facilities	3.0	70.0	73.0

[a] Regional benefit estimates are unweighted. National benefits are sample-weighted and include Hawaii.
[b] The monetized benefits of the final rule may be significantly under-estimated due to the inability to monetize the non-use values.

E. Other Considerations

This section presents two additional analyses that consider the benefits and costs of the final rule: (1) An analysis of the costs per age-one equivalent fish saved (equivalent to a cost-effectiveness analysis) and (2) a break-even analysis of the minimum non-use benefits required for total annual benefits to equal total annualized costs, on a per household basis. Each measure is presented by study region.

1. Cost Per Age-One Equivalent Fish Saved—Cost-Effectiveness Analysis

EPA also analyzed the cost per organism saved as a result of compliance with the final rule. This analysis estimates the cost-effectiveness of the rule, by study region. Organisms saved are measured as ''age-one equivalents.'' The costs used for the regional comparisons are the annualized pre-tax compliance costs incurred by facilities subject to the final rule, and the cost used for the national comparison is the total social cost of the final rule (including facility compliance costs and administrative costs).

Exhibit XII–8 shows that the estimated cost per age-one equivalent ranges from $0.07 in the Mid Atlantic region to $1.46 in the Inland region. At the national level, the estimated average cost is $0.27 per age-one equivalent saved.

EXHIBIT XII–8.—COST PER AGE-ONE EQUIVALENT SAVED

Study region [a]	Annual social cost [b] (millions; 2002$)	Age-one equivalents (millions)	Cost/age-one equivalent saved
California	$31.7	66.4	$0.48
North Atlantic	13.3	19.3	0.69
Mid Atlantic	62.6	846.4	0.07
South Atlantic	9.0	76.7	0.12
Gulf of Mexico	22.8	89.5	0.25
Great Lakes	58.7	159.5	0.37
Inland	170.4	116.8	1.46
Total for 554 facilities	389.4	1,420	0.27

[a] Regional benefit and cost estimates are unweighted; total national estimates are sample-weighted and include Hawaii.
[b] The regional costs include only annual compliance costs incurred by facilities. The national cost includes the total social cost of the final rule (facility compliance costs and administrative costs).

2. Break-Even Analysis

Due to the uncertainties of providing estimates of the magnitude of non-use values associated with the final rule, this section provides an alternative approach of evaluating the potential relationship between benefits and costs. The approach used here applies a ''break-even'' analysis to identify what the unmonetized non-use values would have to be in order for the final rule to have benefits that are equal to costs.

The break-even approach uses EPA's estimated or monetized, commercial and recreational use benefits for the rule and subtracts them from the estimated annual compliance costs incurred by facilities subject to the final rule. The resulting ''net cost'' enables one to work backwards to estimate what the unmonetized non-use values would need to be (in terms of willingness-to-pay per household per year) in order for total annual benefits to equal annualized costs. Exhibit XII–9 provides this assessment for the seven study regions. The exhibit shows benefits values using a 3 percent social discount rate. Use of a 7% discount rate would produce somewhat higher breakeven numbers. Section XII.D.5 presents undiscounted benefits and benefits discounted using a 7 percent discount rate.

EXHIBIT XII–9.—IMPLICIT NON-USE VALUE—BREAK-EVEN ANALYSIS

[Million; 2002$]

Study region [a]	Use benefits [b]	Annual social cost [c]	Annual non-use benefits necessary to break even [d,g]	Number of households (millions) [e]	Annual break-even non-use WTP per household [f]
California	$3.0	$31.7	$28.7	8.1	$3.55
North Atlantic	1.4	13.3	11.9	3.9	3.02

EXHIBIT XII–9.—IMPLICIT NON-USE VALUE—BREAK-EVEN ANALYSIS—Continued

[Million; 2002$]

Study region [a]	Use benefits [b]	Annual social cost [c]	Annual non-use benefits necessary to break even [d,g]	Number of households (millions) [e]	Annual break-even non-use WTP per household [f]
Mid Atlantic	45.0	62.6	17.5	9.6	1.82
South Atlantic	7.1	9.0	1.9	3.8	0.50
Gulf of Mexico	6.9	22.8	15.9	5.4	2.92
Great Lakes	14.1	58.7	44.6	8.6	5.17
Inland	3.0	170.4	167.4	20.9	8.01
Total for 554 facilities	82.9	389.4	306.5	60.4	5.07

[a] Regional benefit and cost estimates are unweighted; total national estimates are sample-weighted and include Hawaii.
[b] Benefits are discounted using a 3 percent discount rate.
[c] The regional costs include only annual compliance costs incurred by facilities. The national cost includes the total social cost of the final rule (facility compliance costs and administrative costs).
[d] Annualized compliance costs minus annual use benefits.
[e] Millions of households, including anglers fishing in the region and households in abutting counties. From U.S. Census 2000 (BLS): *http://factfinder.census.gov.*
[f] Dollars per household per year that, when added to use benefits, would yield a total annual benefit (use plus non-use) equal to the annualized costs.
[g] Non-use benefits may also include unmonetized use benefits, *i.e.*, improvements in bird watching.

As shown in Exhibit XII–9, for total annual benefits to equal total annualized costs, non-use values per household would have to be $0.50 in the South Atlantic region and $8.01 in the Inland region. At the national level, the annual willingness-to-pay per affected household would have to be $5.07 for total annual benefits to equal total annualized costs.

While this approach of backing out the ''break-even'' non-use value per household does not answer the question of what non-use values might actually be for the final rule, these results do frame the question for policy-making decisions. The break-even approach poses the question: ''Is the true per household willingness-to-pay for the non-use amenities (existence and bequest) associated with the final rule likely to be greater or less than the ''breakeven'' benefit levels displayed in Exhibit XII–9?'' Unfortunately, the existing body of empirical research is inadequate to answer this question on behalf of the nation as a whole, but EPA is providing the analysis to aid policy makers and the public in forming their own judgment.

XIII. Statutory and Executive Order Reviews

A. Executive Order 12866: Regulatory Planning and Review

Under Executive Order 12866 (58 FR 51735, October 4, 1993), the Agency must determine whether a regulatory action is ''significant'' and therefore subject to OMB review and the requirements of the Executive Order. The Order defines a ''significant regulatory action'' as one that is likely to result in a rule that may:

1. Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or Tribal governments or communities;
2. Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
3. Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
4. Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

Pursuant to the terms of Executive Order 12866, it has been determined that this rule is a ''significant regulatory action.'' As such, this action was submitted to OMB for review. Changes made in response to OMB suggestions or recommendations will be documented in the public record.

B. Paperwork Reduction Act

The Office of Management and Budget (OMB) has approved the information collection requirements contained in this rule under the provisions of the Paperwork Reduction Act, 44 U.S.C. 3501 *et seq.* and has assigned OMB control number 2060.02, or DCN 6–0001. Compliance with the applicable information collection requirements imposed under this final rule (*see* §§ 122.21(r), 125.95, 125.96, 125.97, 125.98, 125.99) is mandatory. Existing facilities are required to perform several data-gathering activities as part of the permit renewal application process. Today's final rule requires several distinct types of information collection as part of the NPDES renewal application. In general, the information will be used to identify which of the requirements in today's final rule apply to the existing facility, how the existing facility will meet those requirements, and whether the existing facility's cooling water intake structure reflects the best technology available for minimizing adverse environmental impact. Categories of data required by today's final rule follow.

- Source waterbody data for determining appropriate requirements to apply to the facility, evaluating ambient conditions, and characterizing potential for impingement and entrainment of all life stages of fish and shellfish by the cooling water intake structure;
- Intake structure and cooling water system data, consisting of intake structure design, cooling water system operational data and relationship of each intake to the cooling water system, and a facility water balance diagram, to determine appropriate requirements and characterize potential for impingement and entrainment of all life stages of fish and shellfish;
- Information on design and construction technologies implemented to ensure compliance with applicable requirements set forth in today's final rule; and
- Information on supplemental restoration measures proposed for use with design and construction technologies or alone to minimize adverse environmental impact.

In addition to the information requirements of the permit renewal application, NPDES permits normally specify monitoring and reporting requirements to be met by the permitted entity. Existing facilities that fall within the scope of this final rule would be required to perform biological monitoring for at least two years, and as required by the Director, to demonstrate compliance. Additional ambient water quality monitoring may also be required of facilities depending on the specifications of their permits. The facility is expected to analyze the results from its monitoring efforts and provide these results in a bi-annual status report to the permitting authority. Finally, facilities are required to maintain records of all submitted documents, supporting materials, and monitoring results for at least three years. (Note that the Director may require more frequent reporting and that records be kept for a longer period to coincide with the life of the NPDES permit.)

All facilities carry out the activities necessary to fulfill the general information collection requirements. The estimated burden includes developing a water balance diagram that can be used to identify the proportion of intake water used for cooling, make-up, and process water. Facilities will also gather data (as required by the compliance alternative selected) to calculate the reduction in impingement mortality and entrainment of all life stages of fish and shellfish that would be achieved by the technologies and operational measures they select. The burden estimates include sampling, assessing the source waterbody, estimating the magnitude of impingement mortality and entrainment, and reporting results in a comprehensive demonstration study. For some facilities, the burden also includes conducting a pilot study to evaluate the suitability of the technologies and operational measures based on the species that are found at the site.

Some of the facilities (those choosing to use restoration measures to maintain fish and shellfish) will need to prepare a plan documenting the restoration measures they implement and how they demonstrate that the restoration measures are effective. Restoration is a voluntary alternative. Since facilities would most likely choose restoration only if other alternatives are more costly or infeasible, EPA has not assessed facility burden for this activity. However, burden estimates have been included for the Director's review of restoration activities.

Some facilities may choose to request a site-specific determination of best technology available because of costs significantly greater than those EPA considered in establishing the performance standards or because costs are significantly greater than the benefits of complying with the performance standards. These facilities must perform a comprehensive cost evaluation study and submit a site-specific technology plan characterizing the design and construction technologies, operational measures and/or restoration measures they have selected. In addition, facilities that request a site-specific determination because of costs significantly greater than the benefits must also perform a valuation of the monetized benefits of reducing impingement mortality and entrainment and an assessment of non-monetized benefits. Site-specific determinations are voluntary. Since facilities would choose site-specific determinations only if other alternatives are more costly, EPA has not assessed a facility burden for these activities; however, EPA has incorporated burden into the activities that the Director will perform in reviewing site-specific information.

The total average annual burden of the information collection requirements associated with today's final rule is estimated at 1,700,392 hours. The annual average reporting and record keeping burden for the collection of information by facilities responding to the section 316(b) Phase II existing facility final rule is estimated to be 5,428 hours per respondent (*i.e.,*, an annual average of 1,595,786 hours of burden divided among an anticipated annual average of 294 facilities). The Director reporting and record keeping burden for the review, oversight, and administration of the rule is estimated to average 2,615 hours per respondent (*i.e.*, an annual average of 104,606 hours of burden divided among an anticipated 40 States on average per year).

Respondent activities are separated into those activities associated with the NPDES permit application and those activities associated with monitoring and reporting after the permit is issued. The reason for this is that the permit cycle is every five years, while Information Collection Requests (ICRs) must be renewed every three years. Therefore, the application activities occur only once per facility during an ICR approval period, and so they are considered one-time burden for the purpose of this ICR. By contrast, the monitoring and reporting activities that occur after issuance of the permit occur on an annual basis. The burden and costs are for the information collection, reporting, and recordkeeping requirements for the three-year period beginning with the effective date of today's rule. Additional information collection requirements will occur after this initial three-year period as existing facilities continue to be issued permit renewals and such requirements will be counted in a subsequent information collection request. EPA does not consider the specific data that would be collected under this final rule to be confidential business information. However, if a respondent does consider this information to be confidential, the respondent may request that such information be treated as confidential. All confidential data will be handled in accordance with 40 CFR 122.7, 40 CFR Part 2, and EPA's Security Manual Part III, Chapter 9, dated August 9, 1976.

Burden means the total time, effort, or financial resources expended by persons to generate, maintain, retain, or disclose or provide information to or for a Federal agency. This includes the time needed to review instructions; develop, acquire, install, and utilize technology and systems for the purposes of collecting, validating, and verifying information, processing and maintaining information, and disclosing and providing information; adjust the existing ways to comply with any previously applicable instructions and requirements; train personnel to be able to respond to a collection of information; search data sources; complete and review the collection of information; and transmit or otherwise disclose the information.

An Agency may not conduct or sponsor, and a person is not required to respond to a collection of information, unless it displays a currently valid OMB control number. The OMB control numbers for EPA's regulations are listed in 40 CFR Part 9. EPA is amending the table in 40 CFR Part 9 of currently approved OMB control numbers for various regulations to list the information requirements contained in this final rule.

C. Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA), as amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), 5 U.S.C. 601 *et seq.*, generally requires an agency to prepare a regulatory flexibility analysis of any rule subject to notice and comment rulemaking requirements under the Administrative Procedure Act or any other statute unless the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Small entities include small businesses, small organizations, and small governmental jurisdictions. For the purposes of assessing the impacts of today's rule on small entities, small entity is defined as: (1) A small business according to RFA default definitions for small business (based on Small Business Administration (SBA) size standards); (2) a small governmental jurisdiction that is a government of a city, county, town, school district or special district with a population of less than 50,000; and (3) a small organization that is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

After considering the economic impacts of today's final rule on small entities, I certify that this action will not have a significant economic impact on a substantial number of small entities. This final rule applies to existing power producing facilities that employ a cooling water intake structure and are design to withdraw 50 million gallons per day (MGD) or more from waters of the United States for cooling purposes. EPA expects this final rule to regulate 25 small entities that own electric generators. We estimate that 17 of the small entities are governmental jurisdictions (*i.e.*, 16 municipalities and one political subdivision), two are private businesses (*i.e.,* one nonutility and one investor-owned entity), and six are not-for-profit enterprises (*i.e.,* rural electric cooperative).

Of the 25 small entities, one entity is estimated to incur annualized post-tax compliance costs of greater than three percent of revenues; eight are estimated to incur compliance costs of between one and three percent of revenues; and 16 small entities are estimated to incur compliance costs of less than one percent of revenues. Eleven small entities are estimated to incur no costs other than permitting and monitoring costs.

Although this final rule will not have a significant economic impact on a substantial number of small entities, EPA nonetheless has tried to reduce the impact of this rule on small entities. EPA has divided implementation of section 316(b) of the Clean Water Act (CWA) into three phases where the majority of small entities will be addressed in Phase III. Under the Phase III rule, EPA will convene a SBREFA panel that will evaluate impacts to small entities.

D. Unfunded Mandates Reform Act

Title II of the Unfunded Mandates Reform Act of 1995 (UMRA), Public Law 104–4, establishes requirements for Federal agencies to assess the effects of their regulatory actions on State, local, and Tribal governments and the private sector. Under section 202 of the UMRA, EPA generally must prepare a written statement, including a cost-benefit analysis, for proposed and final rules with ''Federal mandates'' that may result in expenditures to State, local, and Tribal governments, in the aggregate, or to the private sector, of $100 million or more in any one year. Before promulgating an EPA rule for which a written statement is needed, section 205 of the UMRA generally requires EPA to identify and consider a reasonable number of regulatory alternatives and adopt the least costly, most cost-effective, or least burdensome alternative that achieves the objectives of the rule. The provisions of section 205 do not apply when they are inconsistent with applicable law. Moreover, section 205 allows EPA to adopt an alternative other than the least costly, most cost-effective, or least burdensome alternative if the Administrator publishes with the final rule an explanation why that alternative was not adopted. Before EPA establishes any regulatory requirements that may significantly or uniquely affect small governments, including Tribal governments, it must have developed under section 203 of the UMRA a small government agency plan. The plan must provide for notifying potentially affected small governments, enabling officials of affected small governments to have meaningful and timely input in the development of EPA regulatory proposals with significant intergovernmental mandates, and informing, educating, and advising small governments on compliance with regulatory requirements.

EPA estimates the total annualized (post-tax) costs of compliance for facilities subject to the final rule to be $249.5 million (2002$), of which $216.3 million is incurred by the private sector (including investor-owned utilities, nonutilities, and rural electric cooperatives) and $23.1 million is incurred by State and local governments that operate in-scope facilities.[59] Additionally, permitting authorities incur $4.1 million to administer the rule, including labor costs to write permits and to conduct compliance monitoring and enforcement activities. EPA estimates that the highest undiscounted post-tax cost incurred by the private sector in any one year is approximately $419.1 million in 2009. The highest undiscounted cost incurred by the government sector in any one year is approximately $43.5 million in 2008. Thus, EPA has determined that this rule contains a Federal mandate that may result in expenditures of $100 million or more for State, local, and Tribal governments, in the aggregate, or the private sector in any one year. Accordingly, EPA has prepared a written statement under § 202 of the UMRA, which is summarized as follows. See Economic and Benefits Analysis, Chapter B5, UMRA Analysis, for detailed information.

1. Summary of Written Statement

a. Authorizing Legislation

This final rule is issued under the authority of sections 101, 301, 304, 306, 308, 316, 401, 402, 501, and 510 of the Clean Water Act (CWA), 33 U.S.C. 1251, 1311, 1314, 1316, 1318, 1326, 1341, 1342, 1361, and 1370. This rule partially fulfills the obligations of the U.S. Environmental Protection Agency (EPA) under a consent decree in *Riverkeeper, Inc. et al.* v. *Whitman,* United States District Court, Southern District of New York, No. 93 Civ. 0314. See section III of this preamble for detailed information on the legal authority of this regulation.

b. Cost-Benefit Analysis

The final rule is expected to have total annualized pre-tax (social) costs of $389.2 million (2002$), including direct costs incurred by facilities and implementation costs incurred by State and Federal governments. The total use benefits of the rule are estimated to be $82.9 million. EPA was not able to estimate the monetary value of non-use benefits resulting from the rule, although the Agency believes non-use benefits may be significant. Thus, the total social costs exceed the total use benefits of the rule by $306.3 million, and the benefit-cost ratio, calculated by dividing total use benefits by total social costs, is 0.2. EPA notes that these analyses are based on a comparison of a partial measure of benefits with a complete measure of costs; therefore, the results must be interpreted with caution. For a more detailed comparison of the costs and benefits of the final rule, refer to section XII.E of this preamble.

EPA notes that States may be able to use existing sources of financial assistance to revise and implement the final rule. Section 106 of the Clean Water Act authorizes EPA to award grants to States, Tribes, intertribal consortia, and interstate agencies for administering programs for the prevention, reduction, and elimination of water pollution. These grants may be used for various activities to develop

[59] In addition, 14 facilities owned by Tennessee Valley Authority (TVA), a Federal entity, incur $10.1 million in compliance costs. The costs incurred by the Federal government are not included in this section.

and carry out a water pollution control program, including permitting, monitoring, and enforcement. Thus, State and Tribal NPDES permit programs represent one type of State program that can be funded by section 106 grants.

c. Macro-Economic Effects

EPA estimates that this regulation will not have an effect on the national economy, including productivity, economic growth, employment and job creation, and international competitiveness of U.S. goods and services. Macroeconomic effects on the economy are generally not considered to be measurable unless the total economic impact of a rule reaches at least 0.25 percent to 0.5 percent of Gross Domestic Product (GDP). In 2002, U.S. GDP was $10.4 trillion (2002$), according to the U.S. Bureau of Labor Statistics. Thus, in order to be considered measurable, the final rule would have to generate costs of at least $26 billion to $52 billion. Since EPA estimates the final rule will generate total annual pre-tax costs of only $389.2 million, the Agency does not believe that the final rule will have an effect on the national economy.

d. Summary of State, Local, and Tribal Government Input

EPA consulted with State governments and representatives of local governments in developing the regulation. The outreach activities are discussed in section III of this preamble.

e. Least Burdensome Option

EPA considered and analyzed several alternative regulatory options to determine the best technology available for minimizing adverse environmental impact. These regulatory options are discussed in the proposed rule at 67 FR 17154–17168, as well as in section VII of this preamble. These options included a range of technology-based approaches (*e.g.*, reducing intake flow to a level commensurate with the use of a closed-cycle cooling system for all facilities; facilities located on certain waterbody types; facilities located on certain waterbody types that withdraw a specified percentage of flow; and the use of impingement and entrainment controls at all facilities). EPA also included consideration of at least four distinct site-specific options, including several proposed by industry. As discussed in detail in section VII., EPA did not select these options because ultimately they are not the most cost-effective among the options that fulfill the requirements of section 316(b). EPA selected the final rule because it meets the requirement of section 316(b) of the CWA that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact, and it is economically practicable. EPA believes the final rule reflects the most cost-effective and flexible approach among the options considered. By providing five compliance alternatives the final rule offers Phase II existing facilities a high degree of flexibility in selecting the most cost-effective approach to meeting section 316(b) requirements. Under the rule, these facilities can demonstrate that existing flow or CWIS technologies fulfill section 316(b), identify design and control technologies, and/or use operational measures or restoration measures to fulfill the rule requirements. The final rule also ensures that any applicable requirements are economically practicable through the inclusion of the site-specific compliance alternative at § 125.94(a)(5). EPA further notes that the compliance alternative specified in § 125.94(a)(4) and 125.99(a) and (b) was included in part to provide additional flexibility to Phase II existing facilities as well as to reduce the burden of determining, implementing, and administering section 316(b) requirements among all relevant parties. Finally, the Agency believes that the rule extends additional flexibility to States by providing that where a State has adopted alternative regulatory requirements that achieve environmental performance comparable to that required under the rule, the Administrator will approve such alternative requirements.

2. Impact on Small Governments

EPA has determined that this rule contains no regulatory requirements that might significantly or uniquely affect small governments. EPA estimates that 17 of the 62 government-owned facilities subject to the final rule are owned by small governments (*i.e.*, governments with a population of less than 50,000). The total annualized post-tax compliance cost for all small government-owned facilities incurring costs under the final rule is $5.4 million, or approximately $316,000 per facility. The highest annualized compliance costs for a small government-owned facility is $1.3 million. These costs are lower than the corresponding costs for large governments and private entities. EPA therefore concludes that these costs do not significantly or uniquely affect small governments, and that today's rule is not subject to the requirement of section 203 of UMRA.

E. Executive Order 13132: Federalism

Executive Order 13132, entitled ''Federalism'' (64 FR 43255, August 10, 1999), requires EPA to develop an accountable process to ensure ''meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications.'' ''Policies that have federalism implications'' is defined in the Executive Order to include regulations that have ''substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.''

This final rule does not have federalism implications. It will not have substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government, as specified in Executive Order 13132. Rather, this rule would result in minimal administrative costs on States that have an authorized NPDES program; would result in minimal costs to States and local government entities that own facilities subject to the regulation; it maintains the existing relationship between the national government and the States in the administration of the NPDES program; and it preserves the existing distribution of power and responsibilities among various levels of government. Thus, Executive Order 13132 does not apply to this rule.

The national cooling water intake structure requirements will be implemented through permits issued under the NPDES program. Forty-five States and the Virgin Islands are currently authorized pursuant to section 402(b) of the CWA to implement the NPDES program. In States not authorized to implement the NPDES program, EPA issues NPDES permits. Under the CWA, States are not required to become authorized to administer the NPDES program. Rather, such authorization (and potential funding to support administration) is available to States if they operate their programs in a manner consistent with section 402(b) and applicable regulations. Generally, these provisions require that State NPDES programs include requirements that are as stringent as Federal program requirements. States retain the ability to implement requirements that are broader in scope or more stringent than Federal requirements. (*See* section 510 of the CWA). EPA expects an average annual burden of 104,606 hours with total average annual cost of $4.8 million for States to collectively administer this rule during the first three years after promulgation.

EPA has identified 62 Phase II existing facilities that are owned by State or local government entities. The estimated average annual compliance cost incurred by these facilities is $372,000 per facility.

Today's rule would not have substantial direct effects on either authorized or nonauthorized States or on local governments because it would not change how EPA and the States and local governments interact or their respective authority or responsibilities for implementing the NPDES program. Today's rule establishes national requirements for Phase II existing facilities with cooling water intake structures. NPDES-authorized States that currently do not comply with the final regulations based on today's rule will need to amend their regulations or statutes to ensure that their NPDES programs are consistent with Federal section 316(b) requirements. *See* 40 CFR 123.62(e).

For purposes of this rule, the relationship and distribution of power and responsibilities between the Federal government and the States and local governments are established under the CWA (*e.g.*, sections 402(b) and 510), and nothing in this rule alters this established relationship and distribution of power and responsibilities. Thus, the requirements of section 6 of the Executive Order do not apply to this rule.

Although Executive Order 13132 does not apply to this rule, EPA did consult with representatives of State and local governments in developing this rule. EPA also met with the Association of State and Interstate Water Pollution Control Administrators (ASIWPCA) and, with the assistance of ASIWPCA, conducted a conference call in which representatives from 17 States or interstate organizations participated. A summary of consultation activities is provided in section III of this preamble. In the spirit of Executive Order 13132, and consistent with EPA policy to promote communications between EPA and State and local governments, EPA also specifically solicited comments on the proposed rule from State and local officials. A summary of the concerns raised during that consultation and subsequent public comment periods and EPA's response to those concerns is provided in section VIII of this preamble and in the response to comment document in the record.

F. Executive Order 13175: Consultation and Coordination With Indian Tribal Governments

Executive Order 13175, entitled ''Consultation and Coordination with Indian Tribal Governments'' (65 FR 67249, November 9, 2000), requires EPA to develop an accountable process to ensure ''meaningful and timely input by tribal officials in the development of regulatory policies that have tribal implications.'' ''Policies that have tribal implications'' are defined in the Executive Order to include regulations that have ''substantial direct effects on one or more Indian tribes, on the relationship between the Federal government and the Indian tribes, or the distribution of power and responsibilities between Federal government and Indian tribes.''

This rule does not have Tribal implications. It will not have substantial direct effects on Tribal governments, on the relationship between the Federal government and the Indian Tribes, or the distribution of power and responsibilities between the Federal government and Indian Tribes as specified in Executive Order 13175. The national cooling water intake structure requirements will be implemented through permits issued under the NPDES program. No Tribal governments are currently authorized pursuant to section 402(b) of the CWA to implement the NPDES program. In addition, EPA's analyses show that no facility subject to this rule is owned by Tribal governments and thus this rule does not affect Tribes in any way in the foreseeable future. Thus, Executive Order 13175 does not apply to this rule.

Nevertheless, in the spirit of Executive Order 13175 and consistent with EPA policy to promote communications between EPA and Tribal governments, EPA solicited comment on the proposed rule from all stakeholders. EPA did not receive any comments from Tribal governments.

G. Executive Order 13045: Protection of Children From Environmental Health and Safety Risks

Executive Order 13045: ''Protection of Children from Environmental Health Risks and Safety Risks'' (62 FR 19885, April 23, 1997) applies to any rule that: (1) Is determined to be ''economically significant'' as defined under Executive Order 12866, and (2) concerns an environmental health or safety risk that EPA has reason to believe may have a disproportionate effect on children. If the regulatory action meets both criteria, the Agency must evaluate the environmental health or safety effects of the planned rule on children, and explain why the planned regulation is preferable to other potentially effective and reasonably feasible alternatives considered by the Agency.

Executive Order 13405 does not apply to this rule because the rule does not concern an environmental health or safety risk that EPA has reason to believe may have a disproportionate effect on children. This rule establishes requirements for cooling water intake structures to protect aquatic organisms.

H. Executive Order 13211: Actions That Significantly Affect Energy Supply, Distribution, or Use

This rule is not a ''significant energy action'' as defined in Executive Order 13211, (''Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use'' (66 FR 28355, May 22, 2001)) because it is not likely to have a significant adverse effect on the supply, distribution, or use of energy. The final rule does not contain any compliance requirements that will:

- Reduce crude oil supply in excess of 10,000 barrels per day;
- Reduce fuel production in excess of 4,000 barrels per day;
- Reduce coal production in excess of 5 million tons per day;
- Reduce electricity production in excess of 1 billion kilowatt hours per day or in excess of 500 megawatts of installed capacity;
- Increase energy prices in excess of 10 percent;
- Increase the cost of energy distribution in excess of 10 percent;
- Significantly increase dependence on foreign supplies of energy; or
- Have other similar adverse outcomes, particularly unintended ones.

EPA analyzed the final rule for each of these potential effects and found that this rule will not lead to any adverse outcomes. Based on the analyses, EPA concludes that this final rule will have minimal energy effects at a national and regional level. As a result, EPA did not prepare a Statement of Energy Effects. For more detail on the potential energy effects of this rule, see section XI.B.1 of this preamble or the *Economic and Benefits Analysis for the Final Section 316(b) Phase II Existing Facilities Rule.*

I. National Technology Transfer and Advancement Act

As noted in the proposed rule, section 12(d) of the National Technology Transfer and Advancement Act of 1995 (NTTAA), Pub. L. No. 104–113, section 12(d), (15 U.S.C. 272 note), directs EPA to use voluntary consensus standards in its regulatory activities unless to do so would be inconsistent with applicable law or otherwise impractical. Voluntary consensus standards are technical standards (*e.g.*, materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standard bodies. The NTTAA directs EPA to provide Congress, through the Office of Management and Budget (OMB), explanations when the Agency decides not to use available and applicable voluntary consensus standards. This rule does not involve technical standards. Therefore, EPA did not consider the use of any voluntary consensus standards.

J. Executive Order 12898: Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations

Executive Order 12898 requires that, to the greatest extent practicable and permitted by law, each Federal agency must make achieving environmental justice part of its mission. E.O. 12898 states that each Federal agency must conduct its programs, policies, and activities that substantially affect human health or the environment in a manner that ensures such programs, policies, and activities do not have the effect of excluding persons (including populations) from participation in, denying persons (including populations) the benefits of, or subjecting persons (including populations) to discrimination under such programs, policies, and activities because of their race, color, or national origin.

Today's final rule would require that the location, design, construction, and capacity of cooling water intake structures (CWIS) at Phase II existing facilities reflect the best technology available for minimizing adverse environmental impact. For several reasons, EPA does not expect that this final rule would have an exclusionary effect, deny persons the benefits of participating in a program, or subject persons to discrimination because of their race, color, or national origin.

To assess the impact of the rule on low-income and minority populations, EPA calculated the poverty rate and the percentage of the population classified as non-white for populations living within a 50-mile radius of each of the 543 in-scope facilities for which survey data are available. The results of the analysis, presented in the Economic Benefits Analysis, show that the populations affected by the in-scope facilities have poverty levels and racial compositions that are quite similar to the U.S. population as a whole. A relatively small subset of the facilities are located near populations with poverty rates (23 of 543, or 4.2%), or non-white populations (105 of 543, or 19.3%), or both (13 of 543, or 2.4%) that are significantly higher than national levels. Based on these results, EPA does not believe that this rule will have an exclusionary effect, deny persons the benefits of the NPDES program, or subject persons to discrimination because of their race, color, or national origin.

In fact, because EPA expects that this final rule would help to preserve the health of aquatic ecosystems located in reasonable proximity to Phase II existing facilities, it believes that all populations, including minority and low-income populations, would benefit from improved environmental conditions as a result of this rule. Under current conditions, EPA estimates over 1.5 billion fish (expressed as age 1 equivalents) of recreational and commercial species are lost annually due to impingement and entrainment at the inscope Phase II existing facilities. Under the final rule, more than 0.5 billion individuals of these commercially and recreationally sought fish species (age 1 equivalents) will now survive to join the fishery each year. These additional fish will provide increased opportunities for subsistence anglers to increase their catch, thereby providing some benefit to low income households located near regulation-impacted waters.

K. Executive Order 13158: Marine Protected Areas

Executive Order 13158 (65 FR 34909, May 31, 2000) requires EPA to ''expeditiously propose new science-based regulations, as necessary, to ensure appropriate levels of protection for the marine environment.'' EPA may take action to enhance or expand protection of existing marine protected areas and to establish or recommend, as appropriate, new marine protected areas. The purpose of the Executive Order is to protect the significant natural and cultural resources within the marine environment, which means ''those areas of coastal and ocean waters, the Great Lakes and their connecting waters, and submerged lands thereunder, over which the United States exercises jurisdiction, consistent with international law.''

Today's final rule recognizes the biological sensitivity of tidal rivers, estuaries, oceans, and the Great Lakes and their susceptibility to adverse environmental impact from cooling water intake structures. This rule provides the most stringent requirements to minimize adverse environmental impact for cooling water intake structures located on these types of waterbodies, including potential reduction of intake flows to a level commensurate with that which can be attained by a closed-cycle recirculating cooling system for facilities that withdraw certain proportions of water from estuaries, tidal rivers, and oceans.

EPA expects that this rule will reduce impingement mortality and entrainment at facilities with design intake flows of 50 MGD or more. The rule would afford protection of aquatic organisms at individual, population, community, or ecosystem levels of ecological structure. Therefore, EPA expects today's rule would advance the objective of the Executive Order to protect marine areas.

L. Congressional Review Act

The Congressional Review Act, 5. U.S.C. 801 *et seq.*, as added by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996, generally provides that before a rule may take effect, the agency promulgating the rule must submit a rule report, which includes a copy of the rule, to each House of the Congress and to the Comptroller General of the United States. EPA will submit a report containing this rule and other required information to the U.S. Senate, the U.S. House of Representatives, and the Comptroller General of the United States prior to publication of the rule in the **Federal Register**. A major rule can not take effect until 60 days after it is published in the **Federal Register**. This action is a ''major rule'' as defined by 5 U.S.C. 804(2). This will be effective September 7, 2004.

Dated: February 16, 2004.

Michael O. Leavitt,

Administrator.

Note: The following appendices A and B will not appear in the Code of Federal Regulations.

Appendix A

Facility ID	Intake ID	EPA assumed design intake flow, gpm (X_{epa}) ($)	Capital cost ($)	Baseline O&M annual cost ($)	Post construction O&M annual cost ($)	Annualized capital [3] + net O&M using EPA design intake flow [2] (y_{epa}) ($)	Net revenue losses from net construction downtime ($)	Pilot study costs ($)	Annualized downtime and pilot study costs [2,4] ($)	Performance standards on which EPA cost estimates are based	EPA modeled technology code	Design flow adjustment slope (m) [1]
Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9	Column 10	Column 11	Column 12	Column 13
AUT0001	....	401,881	322,884	699,866	795,393	141,498	....	....	....	I&E	2	0.8639
AUT0002	....	549,533	5,750,259	68,489	104,063	854,282	6,650,155	290,459	559,082	I&E	12	3.6581
AUT0004	....	239,107	528,427	30,725	104,458	148,969	....	....	....	I	1	1.1604
AUT0011	....	453,758	967,675	55,545	193,660	275,890	....	....	....	I	1	1.1604
AUT0012	....	2,018,917	48,835,329	360,813	989,876	7,582,115	110,716,357	4,933,578	9,315,779	I&E	12	3.6581
AUT0014	....	572,383	2,732,729	91,057	110,893	408,915	....	276,073	22,022	I&E	11	0.7352
AUT0015	....	1,296,872	510,784	....	134,070	206,794	....	....	....	I	5	0.1286
AUT0016	....	301,127	41,613	....	28,195	34,120	....	....	....	I	5	0.1286
AUT0019	....	848,784	11,094,343	271,045	994,876	2,303,416	....	....	....	I	1	1.1604
AUT0020	....	207,514	1,517,779	34,859	42,089	223,327	....	153,333	12,231	I&E	11	0.7352
AUT0021	....	267,138	1,187,727	65,395	263,140	366,851	....	150,000	11,965	I&E	2	0.8639
AUT0024	....	639,702	72,402	....	47,164	57,472	....	....	....	I	5	0.1286
AUT0027	....	404,214	2,362,864	147,563	532,881	721,737	....	....	....	I	1	1.1604
AUT0044	....	457,869	183,653	....	57,997	84,145	....	....	....	I	5	0.1286
AUT0049	....	820,866	6,080,054	196,361	797,241	1,466,543	....	204,745	16,332	I&E	2	0.8639
AUT0051	....	348,052	11,832,011	17,181	50,842	1,718,273	....	....	....	I	4	2.5787
AUT0053	....	147,762	454,296	27,346	108,078	145,413	....	....	....	I&E	2	0.8639
AUT0057	....	56,391	271,166	19,811	65,525	84,322	....	....	....	I	1	1.1604
AUT0058	....	624,376	8,582,766	68,231	225,908	1,379,670	7,092,806	867,072	640,749	I&E	12	3.6581
AUT0064	....	553,145	3,039,302	195,656	695,636	932,709	....	....	....	I	1	1.1604
AUT0066	....	65,571	2,006,184	80,531	63,685	268,790	23,985,660	150,000	1,944,883	I&E	4	2.5787
AUT0078	....	288,792	5,683,876	267,577	1,083,987	1,625,667	....	574,212	45,804	I&E	2	0.8639
AUT0084	....	2,100,000	2,976,122	3,003,550	3,318,577	738,760	....	150,331	11,992	I&E	2	0.8639
AUT0085	....	975,261	23,279,870	341,127	452,608	3,426,011	52,842,026	2,351,844	4,445,953	I&E	4	2.5787
AUT0092	....	2,786,349	929,777	....	269,122	401,501	....	....	....	I	5	0.1286
AUT0095	....	67,369	55,826	120,772	140,422	27,598	....	....	....	I&E	2	0.8639
AUT0106	....	325,449	1,104,684	55,757	223,858	325,383	....	150,000	11,965	I&E	2	0.8639
AUT0110	....	551,114	6,445,617	70,141	104,066	951,636	5,297,741	651,167	478,869	I&E	12	3.6581
AUT0120	....	207,333	2,085,862	55,736	225,656	466,900	....	210,724	16,809	I&E	2	0.8639
AUT0123	....	62,226	106,975	7,021	20,122	28,333	....	....	....	I	1	1.1604
AUT0127	....	104,672	573,136	34,651	118,506	165,457	....	....	....	I	1	1.1604
AUT0130	....	929,723	8,127,384	402,025	1,628,672	2,383,804	....	821,067	65,496	I&E	2	0.8639
AUT0131	....	492,987	3,299,931	195,321	694,407	968,921	....	....	....	I	1	1.1604
AUT0134	....	99,252	3,334,593	8,170	35,218	501,819	238,035	....	19,182	I	3	3.4562
AUT0137	....	401,222	1,916,441	117,385	475,099	630,572	....	193,608	15,444	I&E	2	0.8639
AUT0139	....	369,074	117,095	....	49,945	66,617	....	....	....	I	5	0.1286
AUT0142	....	407,669	9,461,494	66,798	78,036	1,358,342	3,421,735	955,845	351,992	I&E	14	6.9559
AUT0143	....	289,294	971,645	50,004	200,412	288,748	....	150,000	11,965	I&E	2	0.8639
AUT0146	....	213,207	1,618,126	88,506	313,588	455,467	....	....	....	I	1	1.1604
AUT0148	....	1,036,476	12,443,192	....	288,984	2,060,615	....	....	....	I&E	9	5.973
AUT0149	....	848,079	109,389	....	58,838	74,413	....	....	....	I	5	0.1286
AUT0151	....	482,911	1,465,485	95,774	340,264	453,142	....	....	....	I	1	1.1604
AUT0161	....	555,680	1,600,167	101,254	360,434	487,008	....	....	....	I	1	1.1604
AUT0168	....	329,758	5,156,763	39,196	51,388	746,399	492,266	260,480	60,448	I&E	12	3.6581
AUT0171	....	1,189,016	14,989,478	120,512	398,517	2,412,170	15,890,363	....	1,280,547	I&E	7	2.504
AUT0174	....	1,341,997	934,469	1,387,449	1,537,156	282,755	....	150,000	11,965	I&E	2	0.8639
AUT0175	....	258,008	2,505,868	134,658	484,461	706,582	....	....	....	I	1	1.1604
AUT0176	....	1,652,395	6,892,691	425,370	1,533,553	2,089,548	....	....	....	I	1	1.1604
AUT0183	....	118,504	196,689	7,303	21,121	41,823	....	....	....	I	1	1.1604
AUT0185	....	810,911	97,503	....	56,756	70,638	....	....	....	I	5	0.1286
AUT0187	....	1,242,691	257,332	....	107,659	144,297	....	....	....	I	5	0.1286
AUT0190	....	511,950	27,779,896	616,589	191,870	3,530,513	....	....	....	I&E	9	5.973
AUT0191	....	692,335	19,255,865	184,161	66,491	2,623,932	....	....	....	I&E	9	5.973

AUT0192		359,686	959,625	71,963	253,183	317,849				I	1	1.1604
AUT0193		1,006,084	19,112,665	90,728	323,635	2,954,121	3,278,888		264,234	I	3	3.4562
AUT0196		230,120	374,975		10,672	64,060				I	8	0.3315
AUT0197		407,061	4,773,876	248,548	891,410	1,322,554				I	1	1.1604
AUT0202		2,080,399	106,025,028	477,625	769,048	15,387,001				I&E	9	5.973
AUT0203		1,083,174	4,847,332	232,706	851,244	1,308,689				I	1	1.1604
AUT0205		313,218	720,557	37,147	127,449	192,893				I&E	1	1.1604
AUT0208		220,683	3,140,556	27,181	51,205	471,169	3,544,915		285,672	I&E	4	2.5787
AUT0222		156,464	299,274		9,554	52,164				I	8	0.3315
AUT0227		82,468	523,999	30,107	102,249	146,748				I	1	1.1604
AUT0228		147,594	837,743	41,023	163,811	242,064				I&E	2	0.8639
AUT0229		483,349	1,784,794	87,496	391,634	558,253				I&E	2	0.8639
AUT0238		376,148	757,400	51,856	180,342	236,323				I	1	1.1604
AUT0242		1,113,045	8,239,161	291,327	1,039,947	1,921,691				I	1	1.1604
AUT0244		49,980	426,844	22,868	76,413	114,318				I	1	1.1604
AUT0245		491,302	1,459,999	50,879	61,192	218,185		150,000	11,965	I&E	11	0.7352
AUT0254		145,838	353,928	22,339	74,527	102,580				I	1	1.1604
AUT0255		194,919	258,805		10,232	47,080				I	8	0.3315
AUT0261		201,229	943,433	57,335	230,290	307,278		150,000	11,965	I&E	2	0.8639
AUT0264		840,000	21,384,690	1,502,211	185,672	1,728,160	43,525,468	2,160,384	3,679,892	I&E	12	3.6581
AUT0266		653,994	139,380	307,951	351,075	62,969				I&E	2	0.8639
AUT0268		712,677	2,998,753	114,173	417,470	730,253				I	1	1.1604
AUT0273		173,689	994,534	52,039	208,703	298,263		150,000	11,965	I&E	2	0.8639
AUT0277		88,831	1,192,106	45,779	51,021	174,971	186,802		15,054	I&E	4	2.5787
AUT0278		1,642,492	6,410,550	771,895	257,586	398,409		647,624	51,660	I&E	11	0.7352
AUT0284		728,495	3,743,165	208,370	742,487	1,067,059				I	1	1.1604
AUT0292		556,596	2,227,636	99,379	350,087	567,874				I	1	1.1604
AUT0295		359,098	3,584,905	53,365	114,232	571,276	5,005,800		403,399	I&E	4	2.5787
AUT0297		184,293	1,172,223	63,592	255,790	359,096		150,000	11,965	I&E	2	0.8639
AUT0298		897,819	100,769		61,625	75,972				I	5	0.1286
AUT0299		864,873	9,012,107	150,709	127,282	1,259,694	15,622,548	227,612	1,277,121	I&E	12	3.6581
AUT0302		71,413	91,562	6,933	19,813	25,916				I	1	1.1604
AUT0305		762,197	42,822,242	146,012	281,593	6,232,505	49,751,104	4,326,108	4,354,352	I&E	14	6.9559
AUT0308		394,361	3,381,768	151,364	77,961	408,085	3,407,223		274,576	I&E	7	2.504
AUT0309		789,860	81,433		55,577	67,171				I	5	0.1286
AUT0314		1,039,315	2,438,597	134,759	484,839	697,281				I	1	1.1604
AUT0319		468,117	1,326,662	88,025	355,386	456,248		150,000	11,965	I&E	2	0.8639
AUT0321		669,493	2,092,630	88,910	107,698	316,732		150,000	11,965	I&E	11	0.7352
AUT0331		178,562	24,860		21,328	24,867				I	5	0.1286
AUT0333		336,448	786,807	46,794	162,104	227,333				I	1	1.1604
AUT0337		1,110,944	131,046		73,566	92,224				I	5	0.1286
AUT0341		405,256	2,429,275	115,249	412,169	642,794				I	1	1.1604
AUT0345		610,223	5,103,322	267,506	952,013	1,411,106				I	1	1.1604
AUT0349		2,429,925	8,146,829	424,696	1,514,477	2,249,706				I	1	1.1604
AUT0351		301,024	6,389,631	42,269	99,196	966,667	700,911		56,484	I&E	3	3.4562
AUT0358		210,439	2,170,195	117,833	421,759	612,913				I	1	1.1604
AUT0361		433,165	7,652,621	59,105	140,320	1,170,775	893,934		72,039	I&E	3	3.4562
AUT0362		312,830	1,566,464	51,821	185,883	357,091				I	1	1.1604
AUT0364		505,137	5,447,440	170,196	611,090	1,216,487				I	1	1.1604
AUT0365		140,093	445,526	29,331	116,166	150,268				I&E	2	0.8639
AUT0368		83,406	2,715,938	146,752	529,832	769,768				I	1	1.1604
AUT0370		322,374	1,816,861	79,915	289,868	468,633				I	1	1.1604
AUT0379		351,933	41,890		31,041	37,006				I	5	0.1286
AUT0381		50,143	960,912	9,964	22,083	148,931	506,182		40,791	I&E	4	2.5787
AUT0384		146,511	66,229	91,020	104,211	22,620				I&E	2	0.8639
AUT0385		130,966	1,823,217	20,420	25,983	265,149	1,445,463		116,485	I&E	4	2.5787
AUT0387		576,057	5,283,933	122,322	496,655	1,126,646		533,808	42,581	I&E	2	0.8639
AUT0398		537,402	6,842,592	63,631	75,697	986,297	6,440,309		519,001	I&E	4	2.5787
AUT0399		140,486	232,496		9,212	42,314				I	8	0.3315
AUT0401		613,529	578,957		72,110	154,541				I	5	0.1286
AUT0404		291,400	4,124,975	44,642	51,995	594,657	3,259,312		262,656	I&E	4	2.5787
AUT0408		73,728	900,969	13,020	49,057	164,315	803,968		64,789	I&E	4	2.5787
AUT0416		143,562	41,835	96,659	112,954	22,251				I&E	2	0.8639
AUT0423		564,501	29,714,518	122,524	248,148	4,356,303				I&E	9	5.973
AUT0427		148,668	291,697		9,392	50,923				I	8	0.3315
AUT0431		143,775	356,208	20,913	69,450	99,253				I	1	1.1604

Facility ID	Intake ID	EPA assumed design intake flow, gpm (X_{epa}) ($)	Capital cost ($)	Baseline O&M annual cost ($)	Post construction O&M annual cost ($)	Annualized capital[3] + net O&M using EPA design intake flow[2] (y_{epa}) ($)	Net revenue losses from net construction downtime ($)	Pilot study costs ($)	Annualized downtime and pilot study costs[2,4] ($)	Performance standards on which EPA cost estimates are based	EPA modeled technology code	Design flow adjustment slope (m)[1]
Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9	Column 10	Column 11	Column 12	Column 13
AUT0434	....	400,472	763,363	40,353	138,952	207,284	....	....	....	I	1	1.1604
AUT0435	....	183,306	483,907	27,166	107,346	149,077	....	....	....	I&E	2	0.8639
AUT0441	....	108,296	276,983	17,492	57,275	79,220	....	....	....	I	1	1.1604
AUT0446	....	278,043	3,528,075	28,547	111,202	584,973	1,404,150	....	113,155	I&E	4	2.5787
AUT0449	....	487,640	1,738,410	110,263	393,700	530,948	....	....	....	I	1	1.1604
AUT0472	....	239,620	218,958	453,683	511,926	89,417	....	....	....	I&E	2	0.8639
AUT0476	....	233,631	489,074	27,565	93,169	135,237	....	....	....	I	1	1.1604
AUT0483	....	1,146,722	2,715,801	112,654	136,742	410,757	....	274,363	21,886	I&E	11	0.7352
AUT0489	....	211,629	1,477,232	84,570	299,177	424,931	....	....	....	I	1	1.1604
AUT0490	....	405,350	3,527,610	73,321	78,027	506,958	3,548,991	....	286,000	I&E	4	2.5787
AUT0493	....	257,137	1,429,134	51,159	206,956	359,274	....	150,000	11,965	I&E	2	0.8639
AUT0496	....	603,432	1,649,804	57,304	206,130	383,721	....	....	....	I	1	1.1604
AUT0499	....	45,374	171,551	9,346	48,606	63,685	....	....	....	I&E	2	0.8639
AUT0501	....	346,213	115,781	205,027	230,840	42,297	....	....	....	I&E	2	0.8639
AUT0513	....	1,296,772	27,395,451	170,929	603,316	4,332,883	36,923,245	....	2,975,512	I&E	4	2.5787
AUT0517	....	98,553	1,040,022	20,976	72,416	199,516	....	....	....	I	1	1.1604
AUT0518	....	193,413	435,346	28,467	96,388	129,905	....	....	....	I	1	1.1604
AUT0522	....	237,692	856,098	40,165	162,010	243,734	....	....	....	I&E	2	0.8639
AUT0523	....	608,373	7,741,521	....	189,045	1,291,263	....	....	....	I&E	9	5.973
AUT0529	....	422,181	3,402,665	144,308	530,442	870,598	....	....	....	I	1	1.1604
AUT0534	....	70,565	230,241	17,175	56,150	71,756	....	....	....	I	1	1.1604
AUT0535	....	196,084	3,706,283	25,082	66,100	568,710	604,316	....	48,700	I&E	3	3.4562
AUT0539	....	1,056,137	13,978,398	183,682	342,369	2,148,896	2,343,730	1,412,165	301,520	I&E	12	3.6581
AUT0541	....	117,759	3,346,437	108,327	37,393	405,523	27,152,758	169,037	2,201,627	I&E	12	3.6581
AUT0547	....	780,279	9,747,498	118,281	129,393	1,398,937	17,882,815	....	1,441,112	I&E	4	2.5787
AUT0551	....	295,707	823,114	30,125	35,820	122,888	....	150,000	11,965	I&E	11	0.7352
AUT0552	....	1,226,625	133,029	....	80,047	98,987	....	....	....	I	5	0.1286
AUT0553	....	71,128	230,549	10,379	32,023	54,468	....	....	....	I	1	1.1604
AUT0554	....	429,991	8,840,925	249,963	170,468	1,179,253	1,498,242	....	120,738	I&E	3	3.4562
AUT0557	....	37,500	20,033	....	19,881	22,734	....	....	....	I	5	0.1286
AUT0564	....	1,129,749	14,903,816	170,408	396,749	2,348,309	15,236,406	....	1,227,847	I&E	7	2.504
AUT0567	....	441,177	5,817,871	67,488	77,963	838,809	4,139,441	....	333,583	I&E	4	2.5787
AUT0568	....	584,525	2,308,321	342,703	382,141	368,091	....	150,000	11,965	I&E	2	0.8639
AUT0570	....	951,201	4,021,857	164,817	591,048	998,853	....	....	....	I	1	1.1604
AUT0577	....	741,931	10,647,710	113,337	129,884	1,532,542	....	....	....	I&E	7	2.504
AUT0583	....	222,087	2,210,305	36,279	51,245	329,663	9,610,528	....	774,478	I&E	4	2.5787
AUT0585	....	128,015	1,561,382	49,933	54,853	227,225	1,102,473	....	88,844	I&E	4	2.5787
AUT0588	....	396,576	1,788,685	191,759	66,639	129,548	....	180,701	14,414	I&E	11	0.7352
AUT0590	....	147,803	315,803	22,592	75,430	97,801	....	....	....	I	1	1.1604
AUT0599	....	198,681	3,040,887	21,121	104,455	516,288	....	307,205	24,505	I	4	2.5787
AUT0600	....	711,801	1,717,012	80,592	284,636	448,508	....	....	....	I	1	1.1604
AUT0601	....	1,151,214	541,482	677,194	742,753	142,654	....	....	....	I&E	2	0.8639
AUT0603	....	1,228,633	684,562	720,077	802,140	179,529	....	150,000	11,965	I&E	2	0.8639
AUT0607	....	635,364	9,044,216	111,819	226,342	1,402,216	3,693,163	456,845	334,061	I&E	12	3.6581
AUT0611	....	547,114	3,195,898	88,288	320,973	687,709	....	....	....	I	1	1.1604
AUT0612	....	186,464	6,614,075	....	85,670	1,027,365	....	....	....	I&E	13	7.0567
AUT0613	....	493,923	4,341,494	155,354	572,021	1,034,798	....	....	....	I	1	1.1604
AUT0617	....	2,292,812	37,040,390	1,403,836	741,877	4,611,760	2,161,531	1,247,332	273,688	I&E	12	3.6581
AUT0619	....	159,600	62,547	98,454	112,506	22,957	....	....	....	I&E	2	0.8639
AUT0620	....	551,528	2,198,869	264,319	90,714	139,464	....	222,140	17,720	I&E	11	0.7352
AUT0621	....	391,137	2,018,600	70,658	245,595	462,340	....	....	....	I	1	1.1604
AUT0623	....	73,622	267,379	13,006	49,653	74,715	....	....	....	I	2	0.8639
AUT0625	....	562,255	2,841,330	104,168	380,113	680,487	....	....	....	I	1	1.1604

AUT0630		569,211	16,086,712	94,881	227,787	2,423,292	974,792		78,555	I&E	3	3.4562
AUT0631		480,721	11,721,529	77,934	190,232	1,781,179	193,002		15,553	I&E	3	3.4562
AUT0635		72,550	1,057,088	50,149	201,000	301,357		150,000	11,965	I&E	2	0.8639
AUT0638		201,395	2,336,881	50,154	202,851	485,416		236,083	18,832	I&E	2	0.8639
AUT0639		479,860	2,960,066	143,531	527,524	805,439				I	1	1.1604
DMU3244	1	22,222	138,465		27,927	47,641				I	1	1.1604
DMU3244	2	56,250	163,334		33,357	56,612				I	1	1.1604
DMU3310		41,319	25,594	8,793	27,169	22,020				I	1	1.1604
DNU2003		156,944	68,455		30,711	40,458				I	5	0.1286
DNU2010		67,000	1,010,938	11,787	23,430	155,578	543,834		43,826	I	4	2.5787
DNU2011		181,250	2,707,585	21,222	102,473	466,750	5,223,420	273,533	442,756	I&E	12	3.6581
DNU2013		65,000	588,369		24,812	108,583		150,000	11,965	I&E	11	0.7352
DNU2014		42,798	531,997	64,365	22,327	33,707		150,000	11,965	I&E	11	0.7352
DNU2017		38,194	984,494		13,803	153,973				I&E	13	7.0567
DNU2018		44,260	446,336	11,513	13,633	65,668				I&E	11	0.7352
DNU2021		55,750	292,158	18,165	59,671	83,103				I	1	1.1604
DNU2025		120,689	7,720,257		825,174	1,924,365		779,937	62,215	I&E	2	0.8639
DNU2032	Units 1 & 2	156,250								I	5	0.1286
DNU2032	Unit 3	124,306								I	5	0.1286
DNU2032	Unit 4	136,806	143,049		54,324	74,691				I	5	0.1286
DNU2038		41,667	465,858	50,489	58,892	74,730				I&E	2	0.8639
DUT0062	1	72,917	1,069,902	8,527	48,944	192,747	5,279,493		425,455	I&E	4	2.5787
DUT0062	2	156,250	1,922,088	14,312	56,483	315,834	5,279,493		425,455	I&E	4	2.5787
DUT0576	5&6	50,000	1,434,192	51,770	185,694	338,121				I	1	1.1604
DUT0576	7	43,056	866,245	29,000	101,863	196,197				I	1	1.1604
DUT0576	CT	2,083	202,358		25,785	54,596				I	1	1.1604
DUT1002	Screenhouse 1	685,833	166,652	322,571	367,337	68,493				I&E	2	0.8639
DUT1002	Screenhouse 2	685,833	166,652	322,571	367,337	68,493				I&E	2	0.8639
DUT1003		38,500	703,237	15,912	20,989	105,202	236,360		19,047	I	4	2.5787
DUT1006	Unit 1/2	173,611	1,286,341	54,154	153,027	282,018				I	1	1.1604
DUT1006	Unit 3/4	20,833	281,263	12,914	39,309	66,440				I	1	1.1604
DUT1007		242,778	680,059	32,861	39,165	103,129		150,000	11,965	I&E	11	0.7352
DUT1008		60,000	1,016,367	26,935	107,846	225,619		150,000	11,965	I&E	2	0.8639
DUT1011		283,611	1,350,484	76,112	267,481	383,648				I	1	1.1604
DUT1012		173,611	522,205	29,576	100,351	145,125				I	1	1.1604
DUT1014		87,000	920,321	40,859	163,140	253,315		150,000	11,965	I&E	2	0.8639
DUT1022		2,200,000	8,268,801	291,801	1,051,593	1,937,083				I	1	1.1604
DUT1023	CWS #535	478,444	28,961,166	360,609	274,535	4,037,344				I&E	3	3.4562
DUT1023	DWS #536	520,000	39,708,776	97,288	361,137	5,917,486	4,830,432		389,267	I&E	3	3.4562
DUT1029	CRS	638,000	14,391,478	63,709	254,538	2,239,852				I&E	3	3.4562
DUT1029	CR Nuc	680,000	6,740,847	162,470	659,152	1,456,426				I&E	2	0.8639
DUT1029	CRN	68,000	649,893	13,914	16,340	94,956				I&E	11	0.7352
DUT1029	HCT	735,000	4,654,560	159,675	194,358	697,388	21,796,254	667,692	1,809,743	I&E	11	0.7352
DUT1031	1	59,000	808,777	17,797	22,826	120,181				I&E	4	2.5787
DUT1031	2	140,000	1,524,044	24,132	26,017	218,874	5,399,114		435,095	I&E	4	2.5787
DUT1033		240,000	1,076,251	43,293	55,502	165,443		150,000	11,965	I&E	11	0.7352
DUT1034		1,231,944	4,990,608	202,923	820,337	1,327,964		504,175	40,218	I&E	2	0.8639
DUT1036		444,000	753,297	41,568	141,630	207,314				I	1	1.1604
DUT1038		65,972	213,848	12,804	38,918	56,561				I	1	1.1604
DUT1041		188,958	433,167	27,973	94,625	128,325				I	1	1.1604
DUT1043		280,556	36,345		27,042	32,217				I	5	0.1286
DUT1044		756,944	76,726		53,732	64,656				I	5	0.1286
DUT1047		614,306	16,998,704	151,032	103,667	2,372,868	4,783,541		385,488	I&E	7	2.504
DUT1048	HI-1	256,944	1,766,372	113,534	405,813	543,770				I	1	1.1604
DUT1048	HI-2	170,139	473,836	33,127	113,050	147,387				I	1	1.1604
DUT1050		2,104,167	407,068		171,852	229,809				I	5	0.1286
DUT1051		374,000	1,027,013	55,468	193,382	284,137				I	1	1.1604
DUT1057		340,000	2,844,898	35,159	51,102	420,993	7,997,712		644,507	I&E	4	2.5787
DUT1062		670,139	67,658		48,869	58,502				I	5	0.1286
DUT1066		1,712,000	32,777,974	260,695	678,771	5,084,922	845,987		68,175	I&E	3	3.4562
DUT1067	1	63,611								I	5	0.1286
DUT1067	2	31,667								I	5	0.1286
DUT1067	3	69,653	23,159		20,564	23,862				I	5	0.1286
DUT1068		91,528	360,536	56,351	20,060	15,042				I&E	11	0.7352
DUT1072		366,597	691,381	40,319	137,184	195,303				I	1	1.1604
DUT1084		264,583	835,764	54,494	189,863	254,363				I	1	1.1604

Facility ID	Intake ID	EPA assumed design intake flow, gpm (X_{epa}) ($)	Capital cost ($)	Baseline O&M annual cost ($)	Post construction O&M annual cost ($)	Annualized capital[3] + net O&M using EPA design intake flow[2] (y_{epa}) ($)	Net revenue losses from net construction downtime ($)	Pilot study costs ($)	Annualized downtime and pilot study costs[2,4] ($)	Performance standards on which EPA cost estimates are based	EPA modeled technology code	Design flow adjustment slope (m)[1]
Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8	Column 9	Column 10	Column 11	Column 12	Column 13
DUT1085		297,000	2,410,696	159,608	619,834	803,455		243,540	19,427	I&E	2	0.8639
DUT1086	Unit 1	57,292	667,197	29,048	122,691	188,637				I&E	2	0.8639
DUT1086	Unit 2	57,292	667,197	29,048	122,691	188,637		150,000	11,965	I&E	2	0.8639
DUT1088	#4	49,280	865,324	11,129	22,007	134,081				I&E	7	2.504
DUT1088	#5	99,458	1,438,399	12,058	25,232	217,970	1,601,167		129,032	I&E	7	2.504
DUT1093		307,760	9,456,466		33,762	1,380,150				I&E	9	5.973
DUT1097		106,007	2,349,646		242,606	577,143		237,372	18,935	I&E	6	5.0065
DUT1098		71,528	507,025	29,461	99,942	142,669				I	1	1.1604
DUT1100	Units 1 & 2	188,000								I	5	0.1286
DUT1100	Units 3 & 4	188,000	136,878		50,573	70,062				I	5	0.1286
DUT1103	Unit 1 Screenhouse	118,000								I		
DUT1103	Unit 2 Screenhouse	250,000	47,060		31,941	38,642				I	5	0.1286
DUT1103	Hvdc Lake Intake	1,200	34,615		4,734	9,662				I	8	0.3315
DUT1103	Hvdc Separator Dike	1,200	34,615		4,734	9,662				I	8	0.3315
DUT1103	River Intake	7,800	75,587	5,734	15,570	20,597				I	1	1.1604
DUT1109		58,333	873,553	32,385	130,170	222,159		150,000	11,965	I	2	0.8639
DUT1111	Unit 1&2	199,716	764,700	99,547	37,851	47,181				I&E	11	0.7352
DUT1111	Unit 3	189,842	717,221	93,277	35,552	44,391		150,000	11,965	I&E	11	0.7352
DUT1112		193,750	501,403	28,510	96,543	139,421				I	1	1.1604
DUT1113	System 27	1,125,000	6,518,329	281,013	1,001,831	1,648,882				I	1	1.1604
DUT1113	System 67	44,028	181,599		8,508	34,364				I	8	0.3315
DUT1116		355,556	2,886,459	69,804	84,921	426,084		291,604	23,261	I&E	11	0.7352
DUT1118		667,361	140,959		64,789	84,858				I	5	0.1286
DUT1122		120,000	23,134		18,047	21,341				I	5	0.1286
DUT1123	6	111,806	4,071,741	15,536	39,240	603,428				I&E	3	3.4562
DUT1123	7	256,250	5,809,773		431,082	1,258,263				I&E	6	5.0065
DUT1123	8	220,139	5,590,610	27,185	73,721	842,513	1,136,010		91,547	I&E	3	3.4562
DUT1132		1,896,000	3,995,072	197,552	927,311	1,298,568		403,601	32,195	I&E	2	0.8639
DUT1133		213,889	1,180,537	44,631	57,260	180,711		150,000	11,965	I&E	11	0.7352
DUT1138		77,083	264,532	12,475	37,753	62,942				I	1	1.1604
DUT1140	Mc2-4	131,250	334,100	20,512	66,264	93,320				I	1	1.1604
DUT1140	Mc5&6	383,958	1,450,787	82,444	290,867	414,982				I	1	1.1604
DUT1145		178,472	2,702,979	38,035	57,101	403,909	1,565,614	273,068	147,950	I&E	12	3.6581
DUT1146		181,944	325,271	276,184	309,256	79,383				I&E	2	0.8639
DUT1152		399,306	10,606,982	355,225	1,321,682	2,476,653				I	1	1.1604
DUT1156		496,000	16,234,946	67,033	77,047	2,321,504	9,287,608		748,455	I&E	7	2.504
DUT1157	6	110,000	1,262,753	47,827	25,593	157,553				I&E	4	2.5787
DUT1157	7	5,833	305,286	13,438	17,201	47,229				I&E	4	2.5787
DUT1165	1	480,000	9,356,403	220,447	189,951	1,301,645				I&E	3	3.4562
DUT1165	2	489,233					9,426,676		759,662	I&E		
DUT1169		620,000	14,855,719	47,990	185,073	2,252,203	1,896,934		152,867	I&E	3	3.4562
DUT1173		37,986	312,285	18,521	72,119	98,061				I&E	2	0.8639
DUT1179		390,278	1,204,485	74,177	261,241	358,556				I	1	1.1604
DUT1185		225,000	3,496,693	21,560	51,324	527,614	1,266,125		102,032	I&E	7	2.504
DUT1186	Unit 4	62,000	577,654	26,371	88,907	144,780				I	1	1.1604
DUT1186	Unit 5	62,000	577,654	26,371	88,907	144,780				I	1	1.1604
DUT1187	Mt 2&3	147,014								I	5	0.1286
DUT1187	Mt 6-8	500,000	78,370		47,573	58,732				I	5	0.1286
DUT1189	Unit 6 & 8	72,222								I	5	0.1286
DUT1189	Unit 7	80,000	22,427		19,852	23,045				I	5	0.1286
DUT1198		279,511	5,198,159	27,451	92,443	805,093	268,118		21,607	I&E	3	3.4562
DUT1202	Power Plant	36,000	1,154,817		13,668	178,088				I&E	11	0.7352
DUT1202	Filtration Plant	30,000	987,137		13,284	153,830				I&E	9	5.973

ATTACHMENT 8

ATTACHMENT 8

ENROLLED BILL REPORT

AGENCY	BILL NUMBER
RESOURCES	AB 740
DEPARTMENT, BOARD OR COMMISSION	AUTHOR
WATER RESOURCES CONTROL BOARD	Porter, others

BILL SUMMARY (Departmental Bill R(L) 72-19)

As amended November 17, the bill contains and is limited to the mandatory provisions of the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500) which are conditions precedent to California--not the federal Environmental Protection Agency (EPA)--continuing to regulate the discharge of waste into the navigable waters of the State. Section 13372 expressly limits the provisions of AB 740 to actions required under the Federal Water Pollution Control Act, as amended.

As amended November 17, Section 2 of the bill would have reduced the State's grant contribution from the current 25 percent to 10 percent (because Section 202 of the federal bill increases the federal grant share from a 55 percent maximum to a 75 percent mandatory amount). The amendment of November 27 changes the state grant contribution from 10 percent to 12 1/2 percent.

Title IV of the Federal Water Pollution Control Act relates to permits and licenses with respect to the discharge of pollutants into navigable waters (with provisions which supercede the Refuse Act of 1899), and in Section 402 provision is made for delegation of the permit program to states which meet all federal requirements, chief of which are compliance with Sections 301, 302, 306, 307, 308 and 403 of the federal act.

ANALYSIS:

A. Specific Findings:

The purpose of AB 740 is "to avoid direct regulation by the federal government of persons already subject to regulation under state law" pursuant to provisions of the Porter-Cologne Water Quality Control Act, as explained in the policy statement in Section 13370. In areas not involving discharges of pollutants into navigable waters, the regional boards and State Board will continue to exercise their existing Porter-Cologne jurisdiction.

These amendments have been cleared through the Resources Agency and the Cabinet. Opinion #17518 of Legislative Counsel dated 11/27/72, gave the opinion that the Clean Water Bond Law of 1970 could be amended to revise the percentage of grant contribution by the State. This is consistent with Section 2 of the bill.

This is an urgency measure because of the need to resolve as promptly as possible the question whether the federal permit program for the regulation of discharges of pollutants into navigable waters is to be delegated to California, or whether it is to be administered by EPA in default of state authorization by AB 740.

-continued-

RECOMMENDATION

Sign

DEPARTMENT HEAD	DATE	AGENCY HEAD	DATE
Bill B. Dendy	DEC 5 1972	[signature]	DEC 6 1972

B. Fiscal Effect:

The Clean Water Bond Law of 1970, as approved by the electorate, authorized bond issued in the total amount of $250 million, to be used primarily to constitute the State's grant contribution of 25 percent of the cost of waste treatment plants, and to result in increasing the federal grant share to 55 percent. PL 92-500 increases the federal grant share to a mandatory 75 percent, effective October 18, 1972.

AB 740, as amended November 27, would decrease the state grant share from 25 percent to 12 1/2 percent, thereby leaving the local government share of the balance of the cost at 12 1/2 percent.

As of October 18, executed state grant contracts at the rate of 25 percent totaled about $85 million. The unobligated portion of Clean Water Bond funds can help finance twice as many municipal treatment plants at 12 1/2 percent as at 25 percent.

ATTACHMENT 9

ATTACHMENT 9

DECISION AND FINDINGS

BY THE

U.S. SECRETARY OF COMMERCE

IN THE CONSISTENCY APPEAL OF THE

FOOTHILL/EASTERN TRANSPORTATION CORRIDOR AGENCY

AND THE BOARD OF DIRECTORS OF THE

FOOTHILL/EASTERN TRANSPORTATION CORRIDOR AGENCY

FROM AN OBJECTION BY THE

CALIFORNIA COASTAL COMMISSION

DECEMBER 18, 2008

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I. INTRODUCTION

The Foothill/Eastern Transportation Corridor Agency, a California joint powers agency,[1] and its Board of Directors (collectively, TCA or Appellant) propose to construct a toll road extending approximately 16 miles in length, beginning at the existing terminus of State Route 241 (SR-241) in southern Orange County, California, and connecting to Interstate 5 (I-5) at Cristianitos Road in San Diego County, California (collectively, the Project). The southernmost portion of the Project would pass through a portion of Marine Corps Base Camp Pendleton, on lands currently leased by the Department of the Navy to the State of California for use as San Onofre State Beach. The primary purpose of the Project is to provide improvements to the transportation infrastructure system that would help alleviate future traffic congestion and accommodate the need for mobility, access, goods movement, and future traffic demands on I-5 and the arterial network of existing roads connecting with I-5.[2]

The California Coastal Commission (Commission)[3] reviewed the Project pursuant to section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA), and implementing regulations of the Department of Commerce (Department) as set forth at 15 C.F.R. Part 930, Subpart D.[4] The Commission objected to the Project, finding it inconsistent with enforceable policies of the California's Coastal Management Program (Program) related to surfing, public access, environmentally sensitive habitat areas, air quality, and wetlands.[5] The Commission also found that TCA had not provided sufficient information for the Commission to determine whether the Project was consistent with enforceable policies related to water quality, wetlands, archeological resources, and greenhouse gas

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[1] The agency is composed of representatives from Orange County and 12 Orange County cities. See Appellant's Principal Brief of Appeal under the Coastal Zone Management Act, at 5 (Mar. 18, 2008) (hereinafter TCA Initial Brief).

[2] Draft Environmental Impact Statement/Final Supplemental Environmental Impact Report (Dec. 2005) (Draft EIS/SEIR), Appendix to TCA Initial Brief (App.) Vol. 20, Tab 49, at 1-16. The area studied encompasses the southeast part of Orange County and the northernmost part of San Diego County, and the ten cities bordering or in the vicinity of I-5 between its confluence with Interstate 405 in central Orange County and its intersection with Basilone Road in San Diego County. App. Vol. 20, Tab 48, at ES-20.

[3] The Commission is designated as California's "coastal zone planning and management agency" and is endowed with "any and all powers [as] set forth in the [CZMA]." Cal. Pub. Res. Code § 30330.

[4] The Commission's review of TCA's consistency certification is triggered by the Project's need for a Clean Water Act permit pursuant to Section 404, 33 U.S.C. § 1344. The Project also requires authorization from the Federal Highway Administration for its interconnection with I-5.

[5] Letter from Mark Delaplaine, Commission, to Thomas E. Magro, TCA (Feb. 13, 2008), App. Vol. 1, Tab 1.

emissions.[6] TCA filed a timely notice of appeal, requesting an override of the Commission's objection as provided in the CZMA.[7]

The Commission's objection is sustained. As explained more fully below, the record establishes that there is an available and reasonable alternative to the Project that would permit the activity to be conducted in a manner consistent with the enforceable policies of California's Program. Further, the record establishes that the Project is not necessary in the interest of national security. Given these findings, it is not necessary to address the other substantive issues raised by the parties in this appeal. In light of this decision, the Commission's objection to the Project operates as a bar under the CZMA to Federal agencies issuing licenses or permits for the Project. This decision, however, in no way prevents TCA from adopting the alternative discussed in this decision, or other alternatives determined by the Commission to be consistent with California's Program. In addition, the parties are free to agree to other alternatives, including alternatives not yet identified, or modifications to the Project that are acceptable to the parties.

II. STATUTORY FRAMEWORK

The CZMA provides states with Federally approved coastal management programs the opportunity to review a proposed project requiring Federal licenses or permits if the project will affect any land or water use or natural resource of the state's coastal zone. A timely objection raised by a state precludes Federal agencies from issuing licenses or permits for the project, unless the Secretary of Commerce finds that the activity is either:

- "consistent with the objectives of [the CZMA];" or
- "necessary in the interest of national security."[8]

A finding that a project satisfies either results in an override of a state's objection. A license or permit applicant may appeal a state's objection and request that the objection be overridden.

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[6] Id.

[7] Notice of Appeal of Foothill/Eastern Transportation Corridor Agency and the Board of Directors of the Foothill/Eastern Transportation Corridor Agency from the Objection of the California Coastal Commission (Feb. 15, 2008).

[8] 16 U.S.C. § 1456(c)(3)(A) ("No license or permit shall be granted by the Federal agency until the state or its designated agency has concurred with the applicant's certification or until, by the state's failure to act, the concurrence is conclusively presumed, unless the Secretary, on his own initiative or upon appeal by the applicant, finds, after providing reasonable opportunity for detailed comments from the Federal agency involved and from the state, that the activity is consistent with the objectives of this chapter or is otherwise necessary in the interest of national security.").

III. PUBLIC INVOLVEMENT

This case was the focus of substantial public interest and input. The public was afforded the opportunity to comment on the appeal during three designated public comment periods totaling 74 days. Comments from interested Federal agencies were also solicited. As of the date of the closure of the decision record, the Department had received comments—both in support of and in opposition to the Project—from over 30 Members of Congress, dozens of state legislators, numerous national and local organizations, and tens of thousands of individuals from across the United States. The Department also held a 10-hour public hearing in Del Mar, California, on September 22, 2008. In its analysis of this appeal, the Department has considered the comments received and the testimony provided at the public hearing.

IV. THRESHOLD ISSUES

Several challenges by TCA to the sufficiency of the Commission's objection must be addressed before the merits of the appeal are considered. TCA argues that the Commission's objection should be dismissed because it is not in compliance with Section 307 of the CZMA.[9] Specifically, TCA argues that: (a) the Project is not located in the "coastal zone," as defined by the CZMA; (b) the California Coastal Act does not authorize the Commission to exercise consistency review of projects located outside of the coastal zone; and (c) the Commission failed to comply with the CZMA and implementing regulations for consistency review of projects located outside of the coastal zone. Further, TCA argues that the Department should override the Commission's objection as procedurally defective because it is grounded in part on insufficient information.

For the reasons set forth below, the Commission's objection is sufficient to withstand dismissal on procedural grounds.

A. Although the Project Is on Federal Land Excluded from the Definition of the Coastal Zone under the CZMA, the Commission Has Consistency Review Jurisdiction over the Project.

TCA argues that the Commission may not review the Project for consistency with its Program because no part of the Project's route runs through the state's "coastal zone," as that term is defined by the CZMA.[10] Specifically, TCA argues that the only portion of the Project located inside the state-defined coastal zone boundary is on lands owned and

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[9] See TCA Initial Brief, at 10-11.

[10] See TCA Initial Brief, at 11-13; Respondent California Coastal Commission's Principal Brief of Appeal under the Federal Coastal Zone Management Act, at 10-11 (Apr. 11, 2008) (hereinafter Commission Initial Brief).

operated by the Federal government as Marine Corps Base Camp Pendleton[11] and this area is excluded from California's coastal zone and outside of the Commission's CZMA-review jurisdiction.

At the outset, it is important to note the distinction between a state's "coastal zone" and its "coastal zone boundary." A state's coastal zone is generally composed of a state's coastal waters and adjacent shorelands.[12] The state's coastal zone boundary generally defines the outer margin of the lands and waters comprising the state's coastal zone. Not all lands inside a state's coastal zone boundary, however, are necessarily considered part of a state's coastal zone. Some lands inside a state's coastal zone boundary may be excluded from a state's coastal zone.

The CZMA provides that "[e]xcluded from the coastal zone are lands the use of which is by law subject solely to the discretion of or which is held in trust by the Federal Government, its officers, or agents."[13] The CMZA implementing regulations provide that "[t]he boundary of a State's coastal zone must exclude lands owned, leased, held in trust or whose use is otherwise by law subject to the discretion of the Federal Government, its officers or agents."[14] These descriptions of Federal lands excluded from a state's coastal zone are further informed by a 1976 opinion by the U.S. Department of Justice's Office of Legal Counsel interpreting the language of the CZMA. The Office of Legal Counsel

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[11] See Letter from Colonel J.B. Seaton, United States Marine Corps, to Thomas Street, National Oceanic and Atmospheric Administration (NOAA), at 1 (May 22, 2008). The land upon which Camp Pendleton sits was acquired by the United States through condemnation in 1942. See United States v. Jenkins, 734 F.2d 1322, 1325 n.2 (9th Cir. 1983). The United States accepted exclusive jurisdiction over the lands in 1943 and 1944. See United States v. Fallbrook Pub. Util. Dist., 110 F. Supp. 767, 771 (S.D. Cal. 1953). In 1971, the United States leased the area in which the Project is proposed to the California Department of Parks and Recreation through 2021 for use as a public park. See Agreement of Lease between the State of California, Department of Parks and Recreation and the United States of America (Sept. 1, 1971), App. Vol. 76, Tab 133. The lease reserved the right of the United States, after consultation with California as to location, to grant future leases and rights of way over, across, in and upon the property, provided, inter alia, that any such easement or right of way be located so as not to unreasonably interfere with the use improvements erected on the leased property by the state. Id. Concurrent jurisdiction over the leased area in question was ceded to California in 1973 and in 1974 for a park and I-5, respectively. See Commission Initial Brief, at 10. In 1998, Congress expressly authorized the Secretary of the Navy to grant an easement through Camp Pendleton to permit the recipient of the easement to construct, operate, and maintain a restricted access highway. See Pub. L. No. 105-261 § 2851 (1998), as amended by Pub. L. No. 107-107 § 2867 (2001), as amended by Pub. L. No. 110-181 § 2841 (2008).

[12] 16 U.S.C. § 1453(1).

[13] Id.

[14] 15 C.F.R. § 923.33(a) (emphasis added). See also NOAA Interim Final Rule Relating to Approval Requirements for State Coastal Zone Management Programs, 43 Fed. Reg. 8,378, 8,388 (Mar. 1, 1978) ("With respect to the commentator's concern about Federal lands leased to private parties, NOAA's position is that the lands themselves, if owned by a Federal agency regardless of whether leased to a private party, are excluded. However, the activities of the private party on those leased lands are subject to the provisions of the State's management program if such activities have effects on the State's coastal zone.").

opined that all lands owned by the Federal government are excluded from the coastal zone.[15] This is true for lands held by the United States as proprietor as well as lands over which the United States and a state exercise concurrent jurisdiction.[16]

In the current case, the Federal government owns in fee all of the land upon which the Project would occur inside the coastal zone boundary. Based on the CZMA and its supporting regulations, this land is excluded from the coastal zone regardless of the lease status upon which the Commission bases its arguments. Accordingly, none of the Project is located in the coastal zone.

While the Project's route is entirely outside California's coastal zone, the Commission properly exercised its right to review the Project for consistency with the enforceable policies of its Program, because the record indicates that the Project affects land or water uses of California's coastal zone.[17] Pursuant to the CZMA, any applicant for a required Federal license or permit to conduct an activity, inside or outside the coastal zone, affecting any land or water use or natural resource of the coastal zone, shall certify to the coastal state that the proposed activity is consistent with enforceable policies of the state's Federally approved coastal management program.[18] A state has six months to review an applicant's consistency certification for compliance with its coastal management program.[19] This review attaches to any "activity" having reasonably

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[15] Memorandum for William C. Brewster, Jr., General Counsel, NOAA, from Antonin Scalia, Assistant Attorney General, Office of Legal Counsel, re: Lands owned by the United States subject to the state planning and regulatory process under the CZMA (Aug. 10, 1976). The memorandum concludes:

> In short, the plain language of the statute appears to exclude all lands owned by the United States, since the United States has full power over the use of such lands and "sole discretion" with respect to such use. This conclusion is supported by the legislative history of the [CZMA]. Nowhere is there any suggestion that Congress intended to exclude some federal land from the Coastal Zone, and hence from State regulation, while including other such land within the Zone. We might add that the results of such an intent would be whimsical; as the submission of the Department of Defense notes, by way of example, part of the Naval base at Sewells Point in Norfolk is subject to exclusive federal legislative jurisdiction, part is subject to concurrent jurisdiction and part is held in a purely proprietary capacity. * * * Accordingly, it is my opinion that the exclusionary clause excludes all land owned by the United States from the definition of the Coastal Zone.

Id. at 12 (footnote omitted).

[16] Id. at 3.

[17] 16 U.S.C. § 1456(c)(3)(A) (providing that "any applicant for a required Federal license or permit to conduct an activity, in or outside the coastal zone, affecting any land or water use or natural resource of the coastal zone" must provide a certification that the proposed activity complies with the enforceable policies of the state's approved program and that such activity will be conducted in a manner consistent with the program) (emphasis added).

[18] Id.

[19] 15 C.F.R. § 930.60; 15 C.F.R. § 930.62.

foreseeable coastal effects, regardless of whether it is located "inside or outside the coastal zone."[20]

Although the extent of the Project's effects is in dispute, the record shows that the Project affects coastal uses and resources to some degree. Effects on coastal uses and resources are not limited to direct effects; rather, effects include "any reasonably foreseeable effect," including "indirect (cumulative and secondary) effects which result from the activity and are later in time or farther removed in distance, but are still reasonably foreseeable."[21] In the present case, the Project has a reasonably foreseeable effect on coastal uses. For example, the Project will affect coastal recreation by developing a portion of San Onofre State Beach, a popular state park used by beachgoers and surfers at Trestles Surf Break. The Project also will have reasonably foreseeable effects on coastal resources. Coastal resources include biological and physical resources (such as vegetation, minerals, and animals) that are found in the state's coastal zone on a regular or cyclical basis.[22] Here, the Project affects, among other things, several coastal species listed as endangered or threatened under the Endangered Species Act,[23] such as the tidewater goby and the coastal California gnatcatcher, which are found in various locations within the coastal zone, and their habitats.[24]

In sum, while the Project's route is wholly outside of the coastal zone, the record shows that the Project nevertheless affects—directly, indirectly, or cumulatively—coastal uses and resources. Consequently, the Commission properly exercised its consistency review jurisdiction over the Project.

B. The California Coastal Act Does Not Bar Consistency Review of Activities Located Outside of the Coastal Zone.

TCA argues that the California Coastal Act restricts the Commission's consistency review jurisdiction to those projects located wholly within the state's coastal zone.[25] In support of its argument, TCA relies upon a 2005 California Supreme Court decision, Sierra Club v. California Coastal Commission.[26]

In Sierra Club, the California Supreme Court held that the Commission lacked the authority to deny a state permit request based upon impacts within the coastal zone

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[20] 16 U.S.C. § 1456(c)(3)(A).

[21] 15 C.F.R. § 930.11(g).

[22] 15 C.F.R. § 930.11(b).

[23] 16 U.S.C. § 1533.

[24] For a more detailed discussion of the effects of the Project see Section V.A.4, infra.

[25] See TCA Initial Brief, at 15-17.

[26] 111 P.3d 294 (Cal. 2005).

arising from development outside the coastal zone.[27] The project at issue was a housing development and access road that straddled the coastal zone.[28] Relying on the plain language of the California Coastal Act, the California Supreme Court found that California state law expressly limits the Commission's state permitting authority to projects or portions of projects occurring within the coastal zone.[29]

Sierra Club is readily distinguishable from the present appeal. The decision was limited to the Commission's exercise of its state permitting authority, which is explicitly circumscribed in the California Coastal Act[30] and distinct from the Commission's Federal consistency review authority under the CZMA. The California Coastal Act explicitly authorizes the Commission to exercise "any and all powers set forth in the Federal Coastal Zone Management Act,"[31] and, as discussed above, the CZMA does not limit Commission's Federal consistency review authority to activities occurring inside the coastal zone, but rather authorizes it to review Federally licensed or permitted activities "in or outside the coastal zone, affecting any land or water use or natural resource of the coastal zone."[32]

In sum, the Commission is not restricted by the California Coastal Act in its Federal consistency review because the Project's route lies entirely outside of the state's coastal zone boundary.

C. The Commission Properly Exercised Consistency Review over the Portion of the Project Lying Outside of the Coastal Zone Boundary.

TCA argues that the Commission lacks jurisdiction to exercise Federal consistency review over the portion of the Project (approximately 14 miles of the proposed toll road) lying outside of California's coastal zone boundary. Specifically, TCA contends that a state is required to describe in its coastal management program the geographic location of activities outside the coastal zone boundary that the state chooses to review and that the Commission failed to do so here.[33] This argument is unpersuasive. The Commission has

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[27] Id. at 301-10.

[28] Id. at 295.

[29] Id. at 300-06.

[30] See Cal. Pub. Res. Code § 30604.

[31] See Cal. Pub. Res. Code § 30330.

[32] 16 U.S.C. 1456(c)(3)(A).

[33] See TCA Initial Brief, at 13-14 (citing 15 C.F.R. § 930.53(a)(1)). In response, the Commission argues that it need not adhere to the geographic-description regulations because NOAA's approval of California's Program under CZMA regulations in effect in 1977 did not include a requirement to specify geographic locations. See Commission Initial Brief, at 11-12. In support, the Commission cites State of California v. Mack, 693 F. Supp. 821 (1988) (holding that NOAA lacks the authority to revisit the contents of an

Footnote continued on next page

automatic authority to review the Project without the need for a further geographic description in its Program, because a portion of the Project (approximately 2 miles of the proposed toll road) lies inside California's coastal zone boundary on excluded Federal lands. This review authority in turn then extends to all physically connected portions of the Project, regardless of whether they occur inside or outside the coastal zone boundary.

As discussed above, pursuant to the CZMA, states with Federally approved coastal management programs may review activities (inside or outside the coastal zone) requiring a Federal license or permit for impacts to land or water uses or natural resources of the coastal zone.[34] States are required to develop a list of Federal license or permit activities affecting coastal uses or resources, which becomes part of the state management program.[35] For activities that occur inside the coastal zone or inside the coastal zone boundary on excluded Federal land, no further geographic description of the area where these activities occur is required.[36] For activities outside the coastal zone boundary, the state must generally describe in its coastal management program the location of such activities.[37]

TCA contends that—even if the geographic description requirement does not apply to the portion of the Project occurring within the state's coastal zone boundary on excluded Federal land—for the portion of the Project lying outside of the coastal zone boundary, the Commission was required to, and failed to, provide the necessary geographic description in its Program. By this reasoning, TCA concludes that the Commission

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approved coastal management program). The Commission's reliance upon Mack is misplaced. The Mack court was addressing the situation where NOAA conditioned a Federal grant on California's amendment of its Program, which is not the case here. The Mack court acknowledged its decision "does not mean that an approved plan is set in stone." Id. at 825. Even after a coastal management program is approved, later changes to the CZMA regulations apply. The failure of this argument by the Commission notwithstanding, the Commission does have jurisdiction over the Project for the reasons set forth above.

[34] 16 U.S.C. § 1456(c)(3)(A).

[35] 15 C.F.R. § 930.53(a).

[36] 15 C.F.R. § 930.53(a)(1) provides in relevant part:

> The geographic location description should encompass areas outside of the coastal zone where coastal effects from federal license or permit activities are reasonably foreseeable. The State agency should exclude geographic areas where coastal effects are not reasonably foreseeable. Listed activities may have different geographic location descriptions, depending on the nature of the activity and its coastal effects. For example, the geographic location for activities affecting water resources or uses could be described by shared water bodies, river basins, boundaries defined under the State's coastal nonpoint pollution control program, or other ecologically identifiable areas. Federal lands located within the boundaries of a State's coastal zone are automatically included within the geographic location description; State agencies do not have to describe these areas. State agencies do have to describe the geographic location of listed activities occurring on federal lands beyond the boundaries of a State's coastal zone.
>
> (Emphasis added).

[37] 15 C.F.R. § 930.53(a).

cannot exercise consistency review authority with respect to the approximately 14-mile portion of the Project outside the coastal zone boundary.

Contrary to TCA's argument, once it is determined that part of an activity is subject to consistency review, the review extends to all physically connected portions of the same activity, even if the activity crosses the coastal zone boundary and continues outside of it. The geographic location description for Federal license or permit activities serves only to notify applicants and Federal agencies that a listed activity located entirely outside of the coastal zone boundary has coastal effects and is subject to Federal consistency review. Where an activity bisects the coastal zone boundary, it would make little sense to divide the activity and subject only that portion of the activity located within the state coastal zone boundary to consistency review. Consistency review attaches to an "activity" with reasonably foreseeable coastal effects regardless of where it occurs,[38] not some piece of an activity that occurs in a specific geographic region.[39]

This holistic approach to consistency review is reflected in recent consistency appeal decisions. Most recently, in the AES Sparrows Point Liquefied Natural Gas, LLC consistency appeal, the Department considered, among other issues, the coastal effects of a terminal and associated pipeline in its entirety, notwithstanding the fact that only a 48-mile portion of the 88-mile pipeline was located in the coastal zone, with the balance situated outside.[40] Notably, this holistic approach is not a vast expansion of a state's jurisdiction, because consistency review of an activity—whether the activity occurs in whole or in part inside or outside the coastal zone—extends only to the activity's reasonably foreseeable effects on coastal uses and resources.

In short, and in accordance with the CZMA and its implementing regulations, if any portion of an activity is subject to Federal consistency review, physically connected portions of the same activity are likewise subject to review to the extent that they impact coastal uses or resources, whether or not the entire project lies in a geographic area described in a state's coastal management program. Here, the Commission has consistency review jurisdiction over the portion of the Project lying inside the coastal zone boundary on excluded Federal land without the need to describe this geographic area in its Program, and the remainder of the Project is a physically connected part of the same activity. Accordingly, the Commission has consistency review jurisdiction over the entire Project.

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[38] 16 U.S.C. § 1456(c)(3)(A) (subjecting to a state's consistency review activities "in or outside the coastal zone" that require Federal permits and affect coastal uses or resources).

[39] This position is consistent with long-standing NOAA policy. See Letter from David W. Kaiser, NOAA, to Mark Delaplaine, Commission (Jan. 26, 2001).

[40] See Decision and Findings by the U.S. Secretary of Commerce in the Consistency Appeal of AES Sparrow Point LNG, LLC and Mid-Atlantic Express, LLC, from an Objection by the State of Maryland, at 28 (June 26, 2008) (hereinafter AES).

D. The Commission Did Not Improperly Base Its Objection on Insufficient Information.

TCA argues that the Commission's objection is procedurally defective because it was based, in part, upon an allegation of insufficient information and included alternative, inconsistent bases for objection. According to TCA, the Commission was barred by the CZMA regulations from objecting based on insufficient information because the Commission did not dispute that "all necessary data and information" had been submitted for purposes of triggering the commencement of its six-month review period.[41] Further, TCA argues that the Commission cannot concurrently raise alternative, inconsistent objections based upon both the lack of information and project inconsistency. TCA's arguments are not persuasive.

In examining this issue, it is not necessary to review the merits of the Commission's objection based on insufficient information. Instead, the Department's inquiry is limited to assessing whether the Commission followed the proper procedures in making its objection.[42] Here, the Commission's objection is procedurally proper.

Under the CZMA regulations, a state is entitled to certain information from applicants in order to evaluate a project for consistency with its coastal management program. This information is defined as "necessary data and information,"[43] and the state's six-month consistency review period does not begin until this information is provided.[44] Contrary to TCA's suggestion, however, a state may also require that an applicant provide it with "other information necessary for the State agency to determine consistency" with the enforceable policies of its coastal management program.[45] If this other information is not provided within the six-month review period, the state may object to the applicant's consistency certification on the basis of insufficient information.[46] To object properly on this basis, the state must describe in its objection the nature of the information requested and the reason such information is necessary to determine consistency.[47]

Based on the foregoing, TCA's argument—that the Commission is barred from objecting based on insufficient information—is rejected. In its objection (and attached Adopted Staff Report), the Commission described the nature of the information that it had

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[41] See TCA Initial Brief, at 17-18 (citing 15 C.F.R. § 930.60).

[42] See AES, at 7.

[43] 15 C.F.R. § 930.58.

[44] 15 C.F.R. § 930.60(a).

[45] 15 C.F.R. § 930.63(c).

[46] Id.

[47] Id.

requested from TCA (related to wetlands, water quality, archeology, and greenhouse gas emissions), as well as the necessity of having such information to determine consistency with California's Program.[48] This description satisfies the requirements for objecting based on insufficient information.[49]

TCA's second argument—that the Commission may not base its objection on alternative, inconsistent bases—is likewise rejected. Specifically, TCA argues that the Commission should not be permitted to object because it lacked sufficient information to evaluate adverse effects, but then also object because Project impacts to resources were inconsistent with the enforceable policies of its Program. Put another way, TCA argues that, if the Commission had enough information to determine that the Project effects were inconsistent with its Program, then by definition the Commission possessed sufficient information. TCA's argument is unpersuasive. The Commission's inconsistency objection related to a number of effects that were not the subject of an insufficient information objection (e.g., surfing, public access, recreation, public views, and environmentally sensitive habitat areas). Additionally, even for those effects covered by both objections, the CZMA regulations explicitly allow a state to "assert alternative bases for its objection."[50] This allows a state agency to object based on inconsistency with the state's coastal management program, as well as insufficient information.[51]

Based on the foregoing, the Commission's objection was proper.

V. THE PROJECT IS NOT CONSISTENT WITH THE OBJECTIVES OF THE CZMA

Pursuant to the CZMA, a state's objection must be sustained unless the activity at issue is consistent with the objectives of the CZMA or otherwise necessary in the interest of national security.[52] These grounds are independent and an affirmative finding on either is sufficient to override. For reasons set forth below, the record establishes that the Project is not consistent with the objectives of the CZMA.

The Project is consistent with the objectives of the CZMA if it satisfies all three regulatory elements required for such a finding: (1) the activity furthers the national interest, as set forth in CZMA sections 302 or 303, in a significant or substantial manner

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[48] See Adopted Staff Report, App. Vol. 1, Tab 2, at 25-26, 127-30.

[49] 15 C.F.R. § 930.63(c).

[50] 15 C.F.R. § 930.63(a); see also AES, at 6-7.

[51] 15 C.F.R. § 930.63(a) ("A state agency may assert alternative bases for its objection, as described in paragraphs (b) [program inconsistency] and (c) [insufficient information] of this section."); see also AES, at 6.

[52] 16 U.S.C. § 1456(c)(3)(A); 15 C.F.R. § 930.120.

(Element 1); (2) the national interest furthered by the activity outweighs the activity's adverse coastal effects, when those effects are considered separately or cumulatively (Element 2); and (3) there is no reasonable alternative available that would permit the activity to be conducted in a manner consistent with the enforceable policies of the state's coastal management program (Element 3).[53] As described in detail below, the Project fails to satisfy Element 3.

A. A Reasonable Alternative to the Project Is Available.

In determining whether Element 3 is satisfied, an alternative is evaluated with regard to the following criteria: (1) consistency with the state's coastal management program; (2) specificity; (3) availability; and (4) reasonableness.[54] The burden of proof for the first two criteria rests with the state; once they have been satisfied, the burden shifts to the appellant to demonstrate that the alternative identified is either unavailable or unreasonable.[55]

In this case, the Commission identified a number of potential alternatives to the Project. TCA raises three challenges to the alternatives identified by the Commission: (1) the alternatives identified lack sufficient specificity; (2) certain alternatives are not available because they would not achieve the Project's primary or essential purpose or they have a financial, legal, or technical barrier; and (3) certain alternatives are not reasonable because coastal use and resource advantages do not outweigh increased cost. TCA's arguments are rejected for the reasons set forth below.

1. The Commission Identified Alternatives Consistent with Its Program.

As previously stated, the initial burden of identifying an alternative rests with the state. A state may identify alternatives during an appeal or the state may adopt alternatives proposed by others in lieu of identifying alternatives itself.[56] In either instance, the state must submit a statement that each alternative would permit the activity to be conducted in a manner consistent with the enforceable policies of the state's coastal management program.[57]

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[53] 15 C.F.R. § 930.121(a) – (c).

[54] Decision and Findings by the U.S. Secretary of Commerce in the Consistency Appeal of Millennium Pipeline Company, L.P. from an Objection by the State of New York, at 23 (Dec. 12, 2003) (hereinafter Millennium); Decision and Findings in the Consistency Appeal of the Virginia Electric and Power Company, at 38 (May 19, 1994) (hereinafter VEPCO)).

[55] Millennium, at 23; VEPCO, at 39.

[56] Millennium, at 21-22 n.62.

[57] 15 C.F.R. § 930.121(c); VEPCO, at 39.

In this case, the Commission identified six alternatives that, if implemented, would permit the activity to be conducted in a manner consistent with the enforceable policies of California's Program.[58] One of those alternatives—the Central Corridor-Avenida La Pata (CC-ALPV) alternative—is discussed in detail in this decision. Because the record shows that this alternative is both available and reasonable, it is unnecessary to examine the remaining alternatives proposed by the Commission.[59] A single available and reasonable alternative is sufficient to render the Project inconsistent with the objectives of the CZMA.

2. The Commission Described the CC-ALPV Alternative with Sufficient Specificity.

A state must describe an alternative with sufficient specificity to show how the proposed alternative could be implemented consistent with the state's coastal management program and to permit evaluation of whether the alternative is available and reasonable.[60] In the current case, the record contains substantial information on the CC-ALPV alternative, and this information is sufficiently specific to show the alternative is both available and reasonable.

The CC-ALPV alternative would be approximately 8.7 miles long and extend the existing State Route 241 south from Oso Parkway to Avenida La Pata in San Clemente.[61] Unlike the Project as proposed by TCA, the CC-ALPV alternative does not intersect with I-5; rather, traffic traveling along the CC-ALPV alternative route would use existing arteries

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[58] Commission Initial Brief, at 37-46.

[59] This decision does not make any determination on the availability or reasonableness of the remaining alternatives, and is made without prejudice to the other alternatives identified by the Commission.

[60] VEPCO, at 39 (citations omitted). In VEPCO, the State of North Carolina objected to a proposal to construct a pipeline that would withdraw up to 60 million gallons a day of potable water from Lake Gaston for the City of Virginia Beach. As an alternative, North Carolina recommended that the City of Virginia Beach obtain the water from another source. Through the course of the appeal, North Carolina identified sixteen alternatives, several of which failed for lack of specificity. For example, the state proposed a "program which balances Virginia Beach's [water] needs against those of other users" without explaining how this balancing approach might work, how the purpose of the project would be achieved, or how the alternative would be consistent with the enforceable policies of North Carolina's coastal management program. Likewise, North Carolina proposed an alternative of expanding the water capacity at an existing reservoir and establishing a "well-designed and regulated program" to ensure the downstream capacity needs were met, but did not describe the program, or what was meant by "well-designed and regulated." Both of these alternatives failed for lack of specificity.

[61] Commission Initial Brief, at 44 n.21.

for several miles in order to connect with I-5.[62] Consequently, the entire route of the CC-ALPV alternative occurs more than a mile outside of the coastal zone boundary.[63]

The CC-ALPV alternative is one of the alternatives examined in detail in the Draft EIS/SEIR, prepared jointly by TCA and the Federal Highway Administration as part of the Federal- and state-level environmental review processes.[64] The record also contains input on the CC-ALPV alternative from the parties,[65] interested Federal agencies,[66] and the public.

Overall, the record provides ample technical, performance, effects, and cost information to evaluate how the CC-ALPV alternative could be implemented consistent with California's Program and whether this alternative is available and reasonable.

3. The CC-ALPV Alternative Is Available.

Because the Commission identified with sufficient specificity an alternative that is consistent with California's Program, the burden now shifts to TCA to demonstrate that the alternative is unavailable or unreasonable.

TCA raises two objections to the CC-ALPV alternative. First, TCA argues that the CC-ALPV alternative is unavailable because it does not adequately improve traffic

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[62] These arteries include Avenida Vista Hermosa (a primary arterial with four travel lanes) and Avenida La Pata (a major arterial with six travel lanes). Draft EIS/SEIR, App. Vol. 20, Tab 49, at 2-46.

[63] A map of various alternatives is provided as Attachment A to this decision. On the map, the CC-ALPV alternative appears in gold. The Project, as proposed by TCA, appears in green and is labeled the A7C-FEC-M alternative.

[64] TCA finalized the state-level SEIR in December 2005, after TCA's board of directors certified the report. App. Vols. 20-32. Until that time, the document was being prepared in conjunction with the EIS pursuant to the National Environmental Policy Act. The EIS is being coordinated by the Federal Highway Administration with input from the Army Corps of Engineers (Corps), the Environmental Protection Agency (EPA), the Fish and Wildlife Service (FWS), TCA, and the California Department of Transportation (Caltrans), following integration procedures in a 1994 environmental streamlining document entitled the "National Environmental Policy Act and Clean Water Act Section 404 Integration Process for Surface Transportation Projects in Arizona, California, and Nevada" Memorandum of Understanding (NEPA/404 MOU), App. Vol. 73, Tab 104. Letter from Wayne Nastri, EPA, to Thomas Street, NOAA, at 1 (May 28, 2008). Unlike the SEIR, the Federal environmental review process and the EIS were still not final at the time the appeal record closed in this case.

[65] TCA Initial Brief, at 42, 44-47; Commission Initial Brief, at 37, 43-44; TCA's Reply Brief of Appeal under the Coastal Zone Management Act, at 19 (May 5, 2008); TCA's Supplemental Brief under the Coastal Zone Management Act, at 15-16 (Oct. 14, 2008); Commission's Supplemental Brief on Appeal under the Federal Coastal Zone Management Act, at 13 (Oct. 11, 2008);

[66] See, e.g., Letter from Steven L. Stockton, Corps, to Joel La Bissonniere, NOAA, at 1 (May 28, 2008); see also TCA Supplemental App. (Supp. App.) Vol. 5, Tab 37; Letter from Thomas J. Madison, Jr., Federal Highway Administration, to Conrad C. Lautenbacher, Jr., NOAA, at 3 (Oct. 7, 2008).

conditions. Second, TCA argues that the CC-ALPV alternative is unreasonable due to community disruption and wetland impacts.[67] Both of these arguments are unpersuasive.

"Availability" refers to the ability of the appellant to implement an alternative that achieves the primary or essential purpose of the project.[68] If an appellant fails to argue or provide evidence that an alternative is "unavailable," the alternative is presumed to be "available."[69]

The primary or essential purpose of the Project in this case is "to provide improvements to the transportation infrastructure system that would help alleviate future traffic congestion and accommodate the need for mobility, access, goods movement and future traffic demands on I-5 and the arterial network in the study area."[70] This is the purpose articulated in the Draft EIS/SEIR, and the record shows TCA, together with the Federal Highway Administration and California Department of Transportation, prepared this document.[71]

The record reflects that the CC-ALPV alternative achieves this purpose by substantially reducing congestion on I-5 and the arterial network. The Draft EIS/SEIR includes an analysis of the amount of traffic relief afforded by each alternative, including the CC-ALPV alternative. Traffic relief is measured in various ways. Table 1 below shows several measures of traffic relief, and compares performance of the CC-ALPV alternative to the projected traffic conditions on I-5, the arterial networks, and the entire system in the year 2025 if no action is taken. All of the information in the table is from the Draft EIS/SEIR.

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[67] TCA Initial Brief, at 46-47.

[68] Millennium, at 24 (citing VEPCO, at 38).

[69] See, e.g., Decision and Findings in the Consistency Appeal of Exxon Company, USA to an Objection from the California Coastal Commission, at 14 (Nov. 14, 1984) (hereinafter Exxon).

[70] Draft EIS/SEIR, App. Vol. 20, Tab 49, at 1-16. The "study area" encompasses the southeast part of Orange County and the northernmost part of San Diego County. See supra note 2.

[71] TCA is identified as the lead agency in the state-level environmental review process leading to the development of the SEIR. App. Vol. 20, Tab 48, at ES-1. TCA's Board of Directors adopted and certified the SEIR upon its completion. See TCA Board of Directors' Resolution, No. F2006-01 (Feb. 23, 2006), App. Vol. 18, Tab 36, at 4 (stating the SEIR "reflects the independent judgment and analysis of the Foothill/Eastern Transportation Corridor Agency."); see also Letter from Thomas Magro, TCA, to Colonel Thomas Magness, Corps, at 6 (Apr. 15, 2008), Supp. App. Vol. 5, Tab 37.

Table 1. Estimated traffic relief for the CC-ALPV alternative compared to projected traffic conditions on I-5 in 2025.

Parameter	Projected Traffic Conditions in 2025	CC-ALPV Alternative
I-5 congestion (percent of traffic experiencing congestion)	15.9	7.8
Arterial congestion (hours of vehicle delay per day)	9,900	8,200 to 8,300
System-wide Travel Time Savings (vehicle hours saved per day)	None	8,000

These data show that the CC-ALPV alternative reduces traffic congestion on I-5 by over 50 percent and arterial delay by approximately 17 percent and creates substantial (8,000 vehicle hours per day) travel time savings on a system-wide basis. TCA argues that this alternative compares unfavorably to the Project, which would reduce I-5 congestion by over 75 percent, reduce arterial delay by approximately 22 percent, and save up to 21,000 vehicle hours per day system-wide.[72]

The standard for availability under the CZMA, however, does not require that an alternative be the top performing alternative or that the alternative perform better than the applicant's proposal. An alternative is available under the CZMA even though it is less ambitious than a proposed project so long as the primary or essential purpose can be

[72] According to data in the Draft EIS/SEIR, the Project would reduce traffic on I-5 experiencing congestion to 2.4 to 3.4 percent, would reduce arterial congestion to approximately 7,700 to 7,900 hours of vehicle delay per day, and would lead to system-wide time savings of approximately 18,000 to 21,000 hours. Draft EIS/SEIR, App. Vol. 20, Tab 48, at ES-46 to ES-47.

achieved.[73] This principle is well-established by Department precedent. For example, in an appeal involving a proposed dock, the Department found that the state's alternative, which would have involved the construction of a small dock of eight slips, was available, even though the developer proposed a larger 18-slip structure.[74] Similarly, in an appeal involving a proposed grocery store complex, the Department found that the state's alternative to the developer's grocery store, strip mall, and adjacent parking lot development was available, even though it would be restricted to a smaller upland area with a smaller footprint than the developer desired.[75] The Department explained that an alternative may be available even though it includes "a less ambitious project."[76] Finally, in a case involving a proposed golf-course irrigation and improvement project, the Department found the state's alternative, involving the construction of an upland lake for golf-course irrigation, was available despite the fact that the alternative would not provide the same level of benefits as the developer's proposal, including run-off filtration and water quality and aesthetic improvements.[77] At bottom, the Department looked to the primary purpose of the project (i.e., golf course irrigation) and found the state's alternative met this purpose. The Department explained that if secondary purposes or site-specific benefits were considered as part of the analysis of availability, it "would likely make site alternatives for all projects unavailable."[78]

TCA relies upon the Department's VEPCO decision to argue that an alternative that does not perform as well as the preferred alternative is not considered available. VEPCO, however, is distinguishable. In VEPCO, the purpose of the project was to supply 60 million gallons of water per day for Virginia Beach to meet a projected water deficit in the year 2030.[79] Thus, the project needed to meet a specific volume threshold in order to meet the primary or essential purpose, and the Department found that an alternative that could not meet this threshold either individually or in combination with other alternatives was unavailable.[80] In the present case, the record does not reflect that a specific threshold of traffic relief is required in order to achieve the primary or essential purpose. Rather, the purpose and need statement adopted by TCA in the Draft EIS/SEIR defines a general need for infrastructure improvement for the purpose of congestion relief and

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73 Decision and Findings in the Consistency Appeal of Davis Heniford from an Objection by the South Carolina Coastal Council, at 14 (May 21, 1992) (hereinafter Heniford).

74 Decision and Findings in the Consistency Appeal of Robert E. Harris from an Objection by the New York State Department of State, at 6, 18-26 (Dec. 2, 1992).

75 Heniford, at 13-15.

76 Id. at 14.

77 In the Consistency Appeal of Yeamans Hall Club from an Objection by the South Carolina Coastal Council, at 5 (August 1, 1992) (hereinafter Yeamans Hall Club).

78 Id. at 6.

79 VEPCO, at 46.

80 Id.

accommodation of the need for mobility on I-5 and the arterial network that is not linked to any specific, quantified threshold of performance.[81]

Further, the Draft EIS/SEIR explicitly states that the CC-ALPV alternative meets the Project's purpose and need.[82] The Draft EIS/SEIR examines a number of alternatives and concludes that eight alternatives, including the CC-ALPV alternative, meet the Project's purpose and need. These alternatives were selected from a much broader array of alternatives that was ultimately narrowed based on a technical evaluation and analysis that took into account the relative performance of the alternatives in relieving traffic congestion, as well as environmental effects and costs. The CC-ALPV alternative was one of those ultimately retained for more detailed analysis in the Draft EIS/SEIR "because of [its] ability to address the purpose and need of the project."[83]

In short, the record shows that the CC-ALPV alternative, although less ambitious than the Project, nevertheless meets the primary or essential purpose of the Project.

There are other reasons that an alternative may not be available, such as whether there is a technical or legal barrier to implementing the alternative and whether the resources to implement the alternative exist.[84] However, TCA bears the burden of demonstrating that an alternative is not available, and TCA has not argued or presented evidence that a technical or legal barrier to the CC-ALPV alternative exists. Nor has TCA argued or presented evidence that it lacks the resources to implement the CC-ALPV alternative.

For the foregoing reasons, the record shows that the CC-ALPV alternative is available.

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[81] The following is the detailed purpose and need statement from the Draft EIS/SEIR, App. Vol. 20, Tab 49, at 1-15, 1-16:

> Need for the Project. Transportation infrastructure improvements are necessary to address the needs for mobility, access, goods movement and projected freeway capacity deficiencies and arterial congestion in south Orange County. Freeway capacity deficiencies and arterial congestion are anticipated as a result of projected traffic demand, which will be generated by projected increases in population, employment, housing and intra- and inter-regional travel estimated by the Southern California Association of Governments (SCAG and San Diego Association of Governments (SANDAG).
>
> * * *
>
> Purpose of the Project. The purpose of the SOCTIIP is to provide improvements to the transportation infrastructure system that would help alleviate future traffic congestion and accommodate the need for mobility, access, goods movement and future traffic demands on I-5 and the arterial network in the study area.

[82] Draft EIS/SEIR, App. Vol. 20, Tab 49, at 1-23 (Table 1.7-1).

[83] Id. at 2-10.

[84] VEPCO, at 38.

4. The CC-ALPV Alternative Is Reasonable.

In addition to determining whether an alternative is "available," the Department also must decide whether an alternative is "reasonable." An alternative is reasonable if the alternative's advantages to the resources and uses of the state's coastal zone exceed the alternative's increased costs, if any.[85] In the present case, the record demonstrates that the CC-ALPV alternative is reasonable, and TCA has not met its burden to demonstrate that it is not.

The CC-ALPV alternative is less costly than the Project. The CC-ALPV alternative has a total cost of $609 million,[86] while the Project would cost $715 million.[87] Neither party has disputed these cost estimates. Consequently, when applying the CZMA's standard for reasonableness, the CC-ALPV alternative does not present any increased costs that need to be offset by advantages to the resources and uses of California's coastal zone.

Nevertheless, the CC-ALPV alternative does present advantages to the resources and uses of California's coastal zone. The record demonstrates that the Project would result in a number of reasonably foreseeable effects to the uses and resources of California's coastal zone. In contrast, the Commission has identified no adverse effects associated with the CC-ALPV alternative, and TCA has failed to demonstrate that the impacts it attributes to the CC-ALPV alternative constitute reasonably foreseeable effects on coastal uses or resources.[88]

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[85] Millennium, at 24; VEPCO, at 38; Yeamans Hall Club, at 6.

[86] The Draft EIS/SEIR originally reported that the CC-ALPV alternative would cost even less. However, subsequent to the Draft EIS/SEIR's publication, new construction occurred in a subdivision in the vicinity of the CC-ALPV alternative's footprint. Thus, TCA added approximately $97 million to the estimated cost of the CC-ALPV alternative to cover the cost of compensating those displaced by the construction. App. Vol. 26, Tab 54, Attachment 6. Even with these added costs, the CC-ALPV alternative remains over $100 million less costly in total costs than the Project.

[87] Supp. App. Vol. 5, Tab 37, at Attachment D (Table 1.1). In examining cost, it is the total cost that is relevant to the Department's analysis. Derivative measures, such as cost-effectiveness, are not considered in the Department's examination of reasonableness. Rather, to the extent effectiveness is relevant, it is considered when determining an alternative's availability. To be "available," an alternative must meet a project's primary or essential purpose and is therefore effective to that extent. Thus, the determination that an alternative is available provides the effectiveness benchmark that is relevant to the Department's determination, and separate measures of effectiveness do not factor into the analysis of reasonableness. See Millennium, at 30 n.96 ("This issue [of reduced efficiency of operations] is not relevant to determining whether a route modification is available unless the inefficiency is of such magnitude as to make construction of the entire project financially infeasible.").

[88] When comparing the relative effects of alternatives, reasonably foreseeable direct, indirect, and cumulative effects to coastal uses and resources are germane to the Department's analysis. See 15 C.F.R. § 930.11 (defining "[e]ffect on any coastal use or resource."). TCA argues that the Department's consideration should not be limited to effects on coastal uses and resources, and cites the Department's

Footnote continued on next page

The Project would have a reasonably foreseeable adverse impact on coastal uses such as recreation and public views. Specifically, the Project would result in the permanent loss of more than 35 acres of the San Onofre State Beach (Park), with over 100 additional acres occupied during construction.[89] The Commission has explained that users of the Park are users of the Trestles Surf Break as well as other coastal recreational resources, such as swimming.[90] Accordingly, adverse impacts to the Park have an indirect, but nevertheless reasonably foreseeable, impact on an important coastal recreational use.[91] The Project would also have a reasonably foreseeable adverse impact on public views—a coastal use—by diminishing the visual quality of trails within the Park, including those leading to the beach.[92] TCA has proposed mitigation for the Project's impacts on the

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Millennium decision for the proposition that the "complete route" of an alternative must be found to be reasonable and available. Millennium, however, explicitly states that "'[r]easonableness' refers to the conclusion that an alternative's advantages to the resources and uses of the state's coastal zone exceed the alternative's increased costs, if any." Millennium, at 24 (emphasis added). The Millennium formulation is a precise articulation of the balancing test. Some consistency appeal decisions have used the vaguer phrase "environmental advantages" as shorthand for the precise formulation, but the application is the same. This scope of review is also consistent with the general standard for consistency review. See Section IV.A, supra.

[89] South Orange County Transportation Infrastructure Improvement Project Recreation Resources Final Technical Report, Vol. 1, at 5-253 (Dec. 2003), App. Vol. 50, Tab. 73. The Park is among the five most visited parks in California, and received approximately 2.4 million visitors in fiscal year 2005-2006. See Adopted Staff Report, App. Vol. 1, Tab 2, at 132.

[90] See Adopted Staff Report, App. Vol. 1, Tab 2, at 135-36 ("[California Department of Parks and Recreation] data suggests that the annual number of campground users during fiscal year 2006-2007 was approximately 108,446 and anecdotal evidence has suggested that many of these users chose to stay at the San Mateo Campground because of its affordability, peaceful and serene natural setting and its proximity to the Panhe Trail which provides easy access to the beach, ocean, and world renowned surf breaks located within the coastal subunits of [the Park].").

[91] See 15 C.F.R. § 930.11(g) ("'[E]ffect on any coastal use or resource' means any reasonably foreseeable effect . . . includ[ing] both direct effects which result from the activity and occur at the same time and place as the activity, and indirect (cumulative or secondary) effects which result from the activity and are later in time or farther removed in distance, but are still reasonably foreseeable."). The Commission also argues that the Project will negatively affect the quality of the Trestles Surf Break by physically altering the delivery of near shore sediment/cobble deposits from the San Mateo Creek watershed that forms the surf break. The parties provided competing expert reports on whether the Trestles Surf Break would be altered, and, on balance, the record shows that the likelihood that the Project will impact the Trestles Surf Break is low. See Letter from Bob Battalio, P.E., Philip Williams & Associates, Ltd., to Mark Rauscher, Surfrider Foundation (Aug. 31, 2007), App. Vol. 1, Tab 3(U); Richard J. Seymour, Ph.D., Review of Documentation Relevant to the Impact of the Foothill-South Project on Surfing Conditions in the Vicinity of San Mateo Creek (May 26, 2008), Supp. App. Vol. 6.3, Tab 72(A); Derrick Coleman, Ph.D., Review and Assessment of Documents Related to the Final Runoff Management Plan, State Route 241 Proposed Extension (July 10, 2008), Id. at Tab 72(B); Howard Chang, Ph.D., P.E., Supplemental Comments on Sediment Issues for San Mateo Creek (Sept. 27, 2008), Supp. App. Vol. 6.1, Tab 56(O). Neither party has claimed the CC-ALPV alternative would have any adverse impact on the Trestles Surf Break.

[92] Under the CZMA, "scenic and aesthetic" qualities are a coastal use. See 15 C.F.R. § 930.11(b); 65 Fed. Reg. 77,124, 77,129 (Dec. 8, 2000). The Commission also claims the Project will be visible from the waters offshore, citing visual simulations provided in the Draft EIS/SEIR. See Adopted Staff Report, App.

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Park,[93] but has not shown that reasonably foreseeable effects on coastal uses can be eliminated. By comparison, neither party has argued or presented evidence demonstrating that the CC-ALPV alternative would have any adverse impact on the coastal recreation or public views.

The Project also would have reasonably foreseeable effects on coastal resources, including impacts to Federally listed species such as the tidewater goby, steelhead trout, and coastal California gnatcatcher.[94] The FWS determined that the Project would likely affect the endangered tidewater goby as a result of project construction and operation, including the permanent loss of 0.07 percent of suitable goby habitat from San Mateo Creek and 0.10 percent of suitable habitat from San Onofre Creek.[95] The FWS take authorization for the Project anticipates up to 50 tidewater goby deaths could occur from the capture and relocation of gobies during construction dewatering at San Mateo and San Onofre Creeks.[96] With respect to the endangered steelhead, although the National Marine Fisheries Service (NMFS) found the Project was unlikely to adversely affect steelhead, it nevertheless voiced concern that the connection of the Project to I-5 occurs directly over San Mateo Creek, just 300 meters upstream of the San Mateo Estuary, which is steelhead critical habitat.[97] Finally, with respect to the threatened coastal

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Vol. 1, Tab 2 at 167-80. TCA admits the Project would be visible to Park visitors, but argues it "would not substantially alter the Trestles 'experience' and surrounding atmosphere." TCA's Response to Staff Report, App. Vol. 8, Tab 20(B), at 74 and Attachment 15.

[93] TCA has proposed avoiding campgrounds, trails, and other facilities for those portions of the Project passing through the Park. TCA Response to Staff Report, App. Vol. 8, Tab 20, at 60-70. TCA also committed to pay $100 million for improvements to the Park and other nearby state parks. See Letter from Maria Levario, TCA, to Mark Delaplaine, Commission (Oct. 4, 2007), App. Vol. 11, Tab 25. This $100 million is not included in the total costs TCA reported in the Draft EIS/SEIR. TCA argues that this park improvement payout constitutes an advantage to coastal uses and resources that the other alternatives cannot match. However, TCA has not demonstrated that a similar payout could not be added to the CC-ALPV alternative, or to any other alternative. To the extent the payout results in benefits to coastal uses and resources, these benefits would appear to be equal if applied to each alternative, and thus does not provide a basis for comparison among alternatives. TCA's decision only to offer the $100 million payout for its preferred alternative does not alter this analysis. To find otherwise would allow an appellant to skew the comparison of alternatives by providing expensive (but fungible) mitigation to only its preferred option.

[94] The FWS Biological Opinion explains that members of each of these species may be found in California's coastal zone on a regular or cyclical basis. See FWS Biological Opinion, Supp. App. Vol. 6, Tab 50, at 28; 40; 51; 68-69; 92; and 112-17; see also 15 C.F.R. § 930.11(b) (explaining that coastal resources include biological resources that are "found within a State's coastal zone on a regular or cyclical basis."). The Project may also affect the Pacific pocket mouse, arroyo toad, and thread-leaved brodiaea (a plant), but the record is less clear on whether the Project's impacts on these species – due to their limited range and, in certain instances, modest level of anticipated Project-related impacts – would have a reasonably foreseeable effect on coastal resources, and these species are not discussed further herein.

[95] FWS Biological Opinion, supra note 94, at 46.

[96] Id. at 166.

[97] NMFS detailed its concern in its comment letter:

Footnote continued on next page

California gnatcatcher, the Project would impact nine observed use areas and approximately 385 acres of Venturan-Diegan coastal sage scrub, which is considered prime gnatcatcher habitat.[98]

By comparison, neither party has identified any adverse effect on the tidewater goby resulting from the CC-ALPV alternative. With respect to steelhead, the record shows that the CC-ALPV alternative crosses one drainage (the San Juan Creek) that steelhead may occupy, but neither party has identified any reasonably foreseeable adverse effect resulting from this crossing.[99] With respect to the coastal California gnatcatcher, the CC-ALPV alternative impacts fewer use areas (seven) and less coastal sage scrub habitat (approximately 178 acres) than the Project, and these impacts would generally occur farther from the coastal zone.[100]

Finally, TCA argues that the CC-ALPV alternative would alter more wetlands (approximately 12 acres) than the Project (less than one acre), and would displace 172 residences and 3 active agricultural operations as opposed to no displacements for the Project.[101] These effects, however, occur outside the coastal zone, and TCA has failed to

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> Under ideal circumstances, and with respect to what is best for the steelhead, the highway connector bridge superstructure * * * would be better positioned someplace other than just upstream of the estuary and directly over San Mateo Creek. There is a risk of accidental fuel spills and/or toxic material spills which could occur from traffic on the [highway connector bridge superstructure], which could result in adverse effects on the creek and estuary. Estuaries in particular have been found to be important for rearing of juvenile steelhead, and are necessary for the acclimation of all adult and juvenile steelhead migrating in and out of the watershed. NMFS believes that the biological integrity of the San Mateo Creek Estuary and vicinity is essential for the survival and recovery of steelhead with the watershed, therefore, a bridge location further from the estuary would have been preferred.

Letter from Rodney McInnis, NMFS, to Thomas Street, NOAA (June 20, 2008).

[98] Draft EIS/SEIR, App. Vol. 25, Tab 53, at 2-9, 2-19.

[99] Supp. App. Vol. 5, Tab 37, at Attachment D (Table 1.1). The CC-ALPV alternative does not cross near the San Mateo Creek Estuary, which caused the general concern with the Project voiced by NMFS.

[100] Draft EIS/SEIR, App. Vol. 20, Tab 48, at ES-232; App. Vol. 20, Tab 49, at 2-161. The FWS recommended that TCA, the Federal Highway Administration, and the California Department of Transportation "continue to explore the feasibility of alignment alternatives that are further [sic] west than the proposed project as we believe that such alignments will have less impact on Federally-listed species, primarily arroyo toad and gnatcatcher." FWS Biological Opinion, at 173. The CC-ALPV alternative is situated farther west than the Project as proposed by TCA.

[101] TCA Response to Staff Report, App. Vol. 8, Tab 20(B), at 103; Draft EIS/SEIR, App. Vol. 20, Tab 48, at ES-16; App. Vol. 21, Tab 49, at 4.4-9, 4.4-10, 4.4-33. The displacements attributed to the CC-ALPV alternative were initially lower. At the time the SEIR analysis was developed only 2 residential displacements resulting from implementation of the CC-ALPV alternative were reported, but the number of displacements subsequently increased due to recent construction in Talega, a subdivision near San Clemente. App. Vol. 21, Tab 49, at 4.4-8, 4.4-9, 4.4-37. Notably, there is no evidence in the record that TCA has attempted to refine the alignment of the portion of the CC-ALPV alternative that currently goes through Talega to avoid or reduce the potential for displacements resulting from this new construction, nor

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demonstrate that any of them would result in a reasonably foreseeable effect on a coastal use or resource.[102] Thus, these purported impacts are not germane to the Department's effects analysis in this appeal.[103]

In sum, not all of the impacts alleged by the parties would result in reasonably foreseeable effects on coastal uses or resources, but for those that do, the record shows the CC-ALPV alternative has fewer effects than the Project. When combined with the CC-ALPV alternative's lower cost, this clearly indicates that the CC-ALPV alternative is reasonable.

B. Conclusion on the Consistency of the Project with the Objectives of the CZMA.

Based on the foregoing, the record establishes that the Project is not consistent with the objectives of the CZMA because a reasonable alternative is available—namely, the CC-ALPV alternative. The Commission stated that the CC-ALPV alternative can be implemented in a manner consistent with California's Program, and has described the alternative with sufficient specificity. The CC-ALPV alternative is available because it satisfies the Project's primary or essential purpose and presents no financial, legal, or technical barrier to implementation. The CC-ALPV alternative is reasonable because it costs less than the Project and presents a net advantage to coastal uses and resources.

This decision in no way prevents TCA from adopting other alternatives determined by the Commission to be consistent with California's Program. In addition, the parties are free to agree to other alternatives, including alternatives not yet identified, or modifications to the Project that are acceptable to the parties.[104]

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has TCA alleged in its briefs that these displacements could not be at least partially mitigated. The Draft EIS/SEIR explains that TCA's preferred alternative was refined to avoid 56 residential displacements, Draft EIS/SEIR, App. Vol. 20, Tab 48 at ES-39, and explains that some effort was made to refine the other alternatives as they were being developed, but it does not appear that additional refinement was attempted in order to avoid the new development in Talega, which occurred after the analysis in the Draft EIS/SEIR. At least one organization prepared a study concluding that the CC-ALPV alternative's impacts on the Talega subdivision could be largely reduced by refining the alignment. See Smart Mobility, Alternatives to the Foothill South Toll Road, at 22.

102 TCA notes that, in light of such effects, the Corps has preliminarily determined that the Project is the "least environmentally damaging practicable alternative" (LEDPA). TCA Initial Brief at 2, 46-47. That preliminary finding, however, is based on the Corps' Clean Water Act § 404 standard and includes the consideration of non-coastal effects not applicable to this appeal. See Letter from Steven L. Stockton, Corps, to Joel La Bissonniere, NOAA, at 1 (May 28, 2008); see also Supp. App. Vol. 5, Tab 37; 40 C.F.R. § 230.10. Thus, contrary to TCA's suggestion, the preliminary LEDPA determination is not controlling of the Department's decision in this case.

103 Potential right-of-way costs associated with taking of residences and businesses were taken into account when comparing the total project cost of the CC-ALPV alternative.

104 See Millennium, at 38 n.125.

VI. THE PROJECT IS NOT NECESSARY IN THE INTEREST OF NATIONAL SECURITY

The second ground for overriding a state's objection to a proposed project is a finding that the activity is "necessary in the interest of national security."[105] A proposed activity is necessary in the interest of national security if "a national defense or other national security interest would be significantly impaired were the activity not permitted to go forward as proposed."[106] The burden of persuasion on this ground rests with the appellant.[107] General statements do not satisfy an appellant's burden.[108]

TCA asserts the Project is necessary in the interest of national security because it will provide a number of national security improvements to Camp Pendleton Marine Corps Base, including redesign and reconstruction of entrance and exit points at the San Onofre Gate to meet current Homeland Security and Anti-Terrorist Force Protection Program guidelines and access improvements to Green Beach, an amphibious landing area. TCA also claims that the Project will provide an alternate route for the Marines to access March Air Force Base, a point of debarkation.

In this analysis, considerable weight is given to the views of the Department of Defense and other Federal agencies with national defense or other essential national security interests.[109] Comments were solicited from the Departments of Defense, Navy, Homeland Security, Transportation, State, Energy, Justice, and the Interior, as well as from the Homeland Security Council, National Security Council, Marine Corps, Nuclear Regulatory Commission, Army Corps of Engineers, Environmental Protection Agency, Federal Highway Administration, and Federal Transit Administration.

None of these Federal agencies raised any national defense or other national security concerns with the possibility that the Project might not go forward. Indeed, the Marine Corps stated that "[it] does not agree that [the Project] is necessary in the interest of national security. From the Marine Corps' perspective, neither the toll road nor its associated infrastructure enhancements are necessary to ensure that a proper security posture exists at Camp Pendleton."[110]

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[105] 16 U.S.C. § 1456(c)(3)(A).

[106] 15 C.F.R. § 930.122.

[107] VEPCO, at 53.

[108] Millennium, at 38-39.

[109] 15 C.F.R. § 930.122.

[110] Letter from Colonel J.B. Seaton, U.S. Marine Corps, to Thomas Street, NOAA, at 4 (May 22, 2008).

Based on the foregoing, the record establishes that the Project is not necessary in the interest of national security.

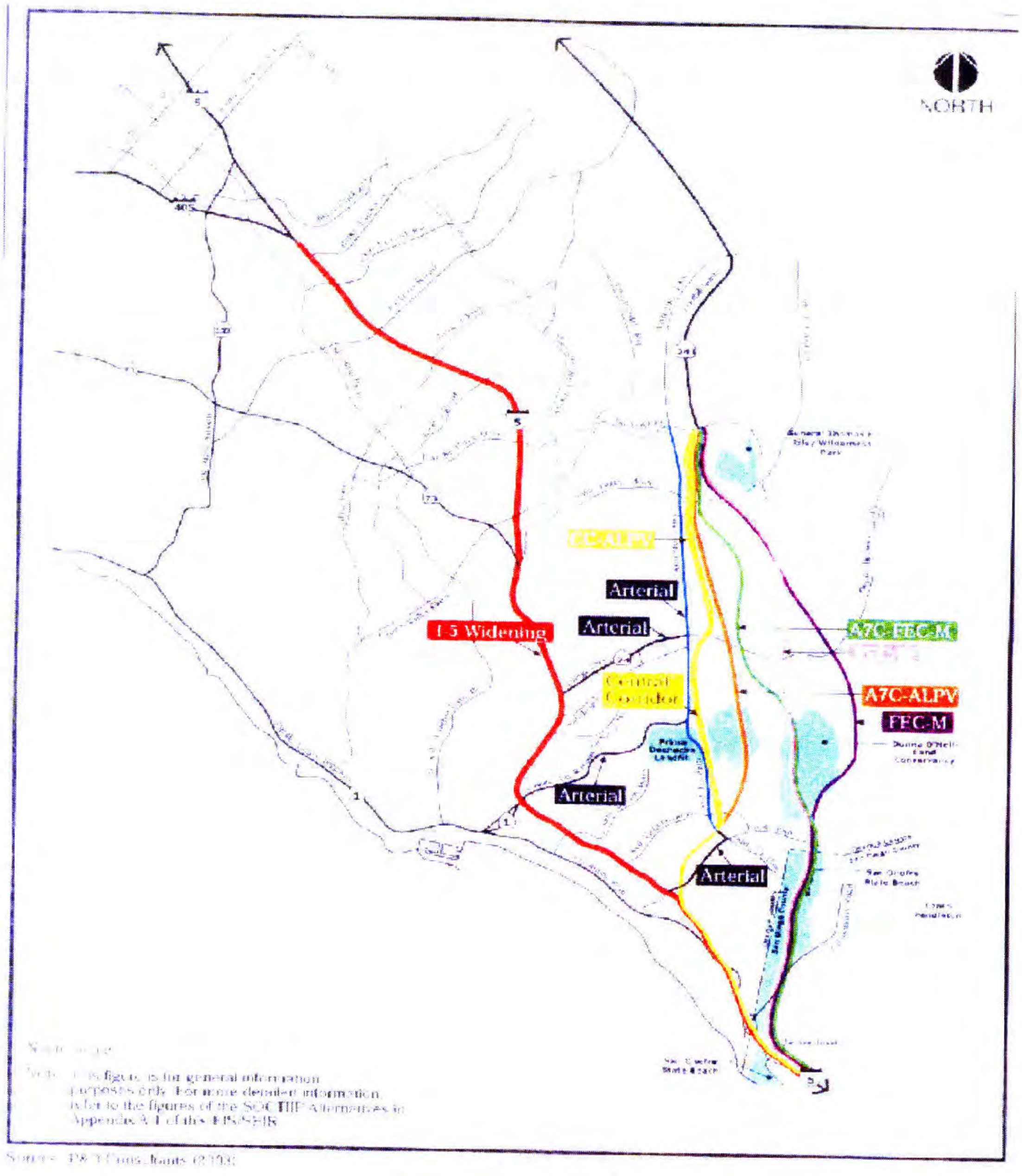
VII. CONCLUSION

The Commission's objection to the Project is sustained. For the reasons set forth above, the record establishes that the Project is not consistent with the objectives of the CZMA. California has identified an available and reasonable alternative that would be consistent with California's Program. The record also does not establish that the Project is necessary in the interest of national security. Given this decision, California's objection to the Project operates as a bar under the CZMA to Federal agencies issuing licenses or permits necessary for the construction and operation of the Project. This decision, however, in no way prevents TCA from adopting the alternative discussed in this decision, or other alternatives determined by the Commission to be consistent with California's Program. In addition, the parties are free to agree to other alternatives, including alternatives not yet identified, or modifications to the Project that are acceptable to the parties.

Carlos M. Gutierrez

ATTACHMENT A

Map of Project alternatives.[111]



Alignments of the Build Alternatives

[111] Draft EIS/SEIR, App. Vol. 20, Tab 49, at Fig. 2.5-1.

ATTACHMENT 10

ENERCON

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April 13, 2010
SRB10-018

David Asti
Corporate Environmental Policy
Southern California Edison

Subject: ENERCON Engineering Assessment of Tetra Tech Outage Determination

Mr. Asti:

In concurrence with Enercon's 2009 "Feasibility Study for Installation of Cooling Towers at San Onofre Nuclear Generating Station" (Enercon Feasibility Study), Enercon reviewed the shutdown estimate provided by Tetra Tech in Chapter 7.N of "California's Coastal Power Plants: Alternative Cooling System Analysis" (Tetra Tech Analysis). Since the focus of the Enercon Feasibility Study was to determine if conversion to closed-loop cooling was technically possible and to provide a conceptual level cost and schedule, a direct comparison to Tetra Tech's shutdown estimate was not provided. This letter provides a direct comparison between Enercon and Tetra Tech's outage requirements, and highlights some of the significant differences between Enercon's conceptual design and Tetra Tech's generic estimation.

The executive summary of the Tetra Tech Analysis states that the report "does not reach any overall conclusions regarding a site-specific feasibility determination" and rather intends to "establish a more precise understanding of the engineering options and associated costs of a once-through cooling system retrofit". Consistent with this intent, the evaluation of closed-loop cooling at San Onofre Nuclear Generating Station (SONGS) does not detail the conversion tasks requiring an outage nor the estimated duration of such tasks. Multiple assumptions are made throughout the Tetra Tech Analysis which have the potential to affect outage duration, but no outage duration extension is assigned. The most significant of these assumptions include the proposed location of the cooling towers in Environmentally Sensitive Habitat, the limited extent of the required condenser modifications, and the indeterminate tie-in to existing supply and return lines.

Cooling Tower Locations

The proposed location of the cooling towers has a significant impact on the installation requirements of the circulating water piping. After discussing seven potential locations in Section 3.2.3.5 of the Analysis, Tetra Tech proposes that cooling towers for Unit 3 be constructed in Area 7:

> *Area 7 is not within the boundaries of the current SCE property. It is an undeveloped coastal bluff overlooking the beach and comprises approximately 800,000 square feet of state park land. Use of the bluff for wet cooling towers is problematic due to the presence of Southern Coastal Bluff Scrub, which has been identified by the California Department of Fish and Game as a rare habitat type.*
>
> *Thus, under the Coastal Act, this area is considered an Environmentally Sensitive Habitat and is subject to limits on development that encroaches upon it…*
>
> *This study… assumes the availability of the coastal bluff area identified as Area 7, with the strong caveat that use of this area would have to overcome substantial hurdles to comply*

> *with Coastal Act provisions. Area 7 is considered in this study only because no other areas were identified that could conceivably accommodate the towers for Unit 3. In the event that Area 7 is unavailable, it is unlikely that a reasonable cooling tower configuration could be developed without significant disruption to facility operations.*

Tetra Tech "assumed placement of long sections [of pipelines] at the foot of the bluff overlooking the beach" and that "supply and return lines would be connected to the existing intake and discharge pipes at some point beyond the seawall". The analysis provides no further detail on pipeline tie-in and the associated outage duration, but does note that "the location of the condensers at SONGS (23 feet below grade level) makes a direct connection to the supply and return lines difficult." The brief description of the proposed pipe routing and tie-in to the existing circulating water system does not provide the appropriate level of detail and a realistic basis for the estimated outage duration required to complete the installation. The sole basis for the outage duration estimated in the Tetra Tech Analysis were historical estimates for similar projects proposed at other facilities.

The impact of the proposed cooling tower location on outage duration is not addressed in the Tetra Tech Analysis. Furthermore, the proposed location is not currently available for cooling tower construction. The proposal to construct cooling towers on an Environmentally Sensitive Habitat implies an acceptable trade-off between impact to the local terrestrial ecology and impact to the local aquatic ecology. As noted by Tetra Tech, the approval of this trade-off by the governing regulatory bodies of California is a significant hurdle to overcome and the acquisition of protected habitat in a California State Park for cooling tower construction is uncertain[12]. In addition, the cooling tower locations proposed by Tetra Tech for both Units would inherently decrease the efficiency of the towers due to the significant recirculation effects of placing the cooling towers perpendicular to the prevailing winds on site.

To avoid construction in Area 7 and recirculation effects, the closed-loop cooling configuration evaluated in the Enercon Feasibility Study sites the towers for both Units on the Mesa Complex east of the SONGS facility. This configuration requires the installation of circulating water tunnels under Interstate 5, the North County Transit District of San Diego Railway line, and old U.S. Highway 101. The tunnels would be routed alongside the facility and would terminate in new pump reservoirs constructed to protect the existing condensers. Tunneling operations near the turbine and reactor buildings would require an outage of approximately 2 to 3 months per Unit. It is likely that underground construction would also be required for installation of the closed-loop cooling configuration evaluated in the Tetra Tech Analysis, due to the location of the condensers, although no outage duration allowance is made for underground work.

Condenser Modifications

Whether the cooling towers are sited on Area 7 or the Mesa Complex, the elevation of the cooling tower basins would be significantly higher than the elevation of the condensers. The impact of a retrofit to closed-loop cooling on the condenser is evaluated in Section 3.2.1 of Tetra Tech's Analysis:

> *…some modifications to the condenser (tube sheet and water box reinforcement) may be necessary to handle the increased water pressures that will result from the increased total pump head required to raise water to the elevation of the cooling tower riser.[1] The*

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[1] The 800,000 square feet identified by Tetra Tech for cooling tower siting as Area 7 are located in San Onofre State Park. As noted in the Enercon Feasibility Study, recent applications for development permits within San Onofre State Park have been denied. The Coastal Commission voted to reject a coastal development permit in 2008 for a toll road near SONGS, in substantial part because construction in that area would have resulted in the loss of land for state park uses and of Environmentally Sensitive Habitat.

> *practicality and difficulty of these modifications depend on the configuration of each unit, but are assumed to be feasible at SONGS.*
>
> [1]|*In this context, re-optimization refers to a comprehensive overhaul of the condenser, such as re-tubing or converting the flow from single to multiple passes. Modifications are generally limited to reinforcement measures to enable the condenser to withstand the increased pressures.*

Tetra Tech's evaluation significantly understates the increased water pressures resulting from a conversion to closed-loop cooling at SONGS. Whereas the existing once-through configuration requires only enough pumping head to overcome flow losses in passing water from the Pacific Ocean through the condenser and returning to the ocean, the closed-loop cooling configuration requires increased pump head to pump the circulating water up to the elevated cooling tower spray headers on the Mesa Complex. The elevation difference between the condenser water boxes and the grade level on the Mesa Complex is over 70 feet, not accounting for the height of the towers themselves (an additional 50 feet). A comprehensive overhaul of the condenser would be required to enable the condenser to withstand the additional pumping head, which is explicitly not considered in the Tetra Tech Analysis. A condenser modification of this sort is unprecedented (i.e., implementation of a condenser redesign of this magnitude has never occurred at an operational nuclear power plant). Due to the condenser configuration at SONGS, any significant increase to the size of the condenser would require a complete disassembly and reconstruction of the turbine building, along with the accompanying modifications/additions to the turbine building following condenser modification.

Reservoirs, as opposed to direct circulating water pipe tie-ins, provide a means to dissipate kinetic energy in the circulating water and avoid increased water pressure in the condensers. Additionally, reservoirs allow significant operational flexibility, whereby the reserve volume in each reservoir acts as a buffer against flow disruptions and equipment failure. The closed-loop cooling configuration in the Enercon Feasibility Study utilizes two circulating water reservoirs (one hot water basin downstream of the condenser and one cold water basin upstream of the condenser) at each unit. These reservoirs would be constructed between the turbine buildings and the seawall. An outage of approximately 56 weeks per unit would be required to construct these circulating water reservoirs due to the proximity of the turbine buildings and reactor buildings, as well as the necessary and frequent use of the area for plant operations.

<u>Closed-Loop Cooling Tie-In and Start-Up</u>

The time required to tie the closed-loop circulating water system into the existing circulating water system is briefly mentioned in the description of outage activities provided in Section 4.4 of the Tetra Tech Analysis:

> *The principal disruption to the output of one or both units will result from the time and complexity of condenser reinforcements and the time needed to integrate the new cooling system and conduct acceptance testing.*

As noted above, no details on tie-in configuration are provided although it is clear that limited consideration was made for the required outage time associated with tie-in. The closed-loop configuration evaluated in the Enercon Feasibility Study requires the installation of three new circulating water pumps in each new circulating water reservoir (12 new pumps in total). In addition, the closed-loop cooling system piping, the existing condenser circulating water pipes, and the discharge canal would need to be tied-in to the reservoirs. The circulating water pump installation and tie-in of the circulating water pipes would require approximately 8 weeks of outage per unit.

The tie-in proposed in the Tetra Tech Analysis would likely take longer than the 8 weeks allowed by the design of the circulating water reservoirs, as tunneling would likely be required to accomplish the direct tie-in briefly referenced by Tetra Tech.

The startup, steady-state operation, and shutdown of the closed-loop cooling system would require significant changes in plant operation. Balancing the circulating water flow between the cooling tower basin, hot water basin, and cold water basin would dramatically increase the potential for flow variability. The control scheme would be highly complicated, require a programmable logic control system and redundant instrumentation, and need to be capable of balancing the closed-loop cooling equipment to meet ambient environmental conditions and plant operation requirements while maintaining adequate inventory in all three basins. As a result of this operational complexity, extensive testing would be required to ensure safety and reliability under the modified operating procedures and plant configuration. Approximately 20 weeks of outage per unit would be required to conduct testing and start-up activities related to the new closed-loop cooling systems.

Summary

The Tetra Tech estimate is based on unrealistic design assumptions, does not account for all known facts relevant to the SONGS's facility, and does not provide a reasonable basis for making regulatory decisions at SONGS. Tetra Tech does not provide a cost baseline for a SONGS retrofit project upon which the agency may reasonably rely. Several assumptions included in the Tetra Tech Analysis materially affected the Tetra Tech estimation of the outage duration required for a retrofit of SONGS to a closed-loop cooling configuration. Although the Tetra Tech estimate of six months does consider a similar outage time required for tie-in and start-up activities alone, the impact of several assumptions on outage time is not included and the overall required outage duration is significantly underestimated. Based on a thorough consideration of the site-specific design constraints at much greater level of detail than was included in the Tetra Tech Analysis, Enercon has determined that the expected outage time to convert SONGS to closed-loop cooling would be significantly greater than 6 months.

The Tetra Tech outage duration estimate of six months is meant to include time for condenser modifications, system tie-in and testing. In the likely event that cooling towers could not be constructed on Environmentally Sensitive Habitat in the state park land adjacent to SONGS, as proposed by Tetra Tech, the towers would have to be located at the Mesa Complex. Construction of tunnels connecting Mesa Complex towers to the SONGS facility would require two to three months of outage per unit. Even if the towers could be constructed in Environmentally Sensitive Habitat, the elevation difference between the SONGS facility and the surrounding coastal bluffs is significant. A direct tie-in of the elevated cooling towers to the existing circulating water system would result in increased water pressure in the condensers and require comprehensive and unprecedented condenser modifications. Significant condenser modifications are avoided in the Enercon Feasibility Study by the construction of circulating water reservoirs, which would require approximately 56 weeks of outage per unit. After construction was complete on the reservoirs, the installation of new pumps and the tie-in of the tunnels and piping would require an additional 8 weeks per unit. Finally, under significantly modified configuration and operation, the testing and start-up of the facility would take approximately 20 weeks per unit. Altogether, an estimated outage duration of 22.6 months would be required to install the conceptual design evaluated in the Enercon Feasibility Study.

Sincerely,

Sam Beaver
Enercon Manager of Projects

ATTACHMENT 11

ATTACHMENT 11

FEASIBILITY STUDY FOR INSTALLATION OF COOLING TOWERS AT SAN ONOFRE NUCLEAR GENERATING STATION

Prepared for Southern California Edison Company

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Attachment 6 – Recycled Wastewater Cooling

EXECUTIVE SUMMARY

The Southern California Edison Company is majority owner and sole operator of the San Onofre Nuclear Generating Station (SONGS), which could potentially be mandated by the United States Environmental Protection Agency and the California State Water Resources Control Board to retrofit to a closed-loop cooling water system. This feasibility study was conducted to determine if closed-loop cooling could be engineered for SONGS given the site-specific constraints and, if closed-loop cooling was possible, to provide a comprehensive description of the major elements necessary to retrofit SONGS Units 2 and 3 to closed-looped cooling. It should be noted that no nuclear stations designed solely for once-through cooling have been converted to closed-loop cooling; any closed-loop conversion design would be unprecedented and would present inherent uncertainties.

Retrofitting SONGS with a closed-loop cooling system would be challenged with insuperable permitting obstacles, unparalleled – "one of a kind" – engineering challenges, adverse environmental impacts likely greater than those imposed by once-through cooling, and initial costs exceeding $3.0 billion. The closed-loop cooling system would be thermodynamically inferior to the present system which would result in a significant reduction in generating capacity up to 191 MWe. The potential for decreased electrical output from a non-carbon emitting source would only serve to undermine the State's ability to meet its greenhouse gas emissions reduction goals under California Assembly Bill AB 32.

Several studies on the possibility of converting SONGS to closed-loop cooling were completed prior to this assessment, with each study concluding that a retrofit of SONGS to closed-loop cooling would be feasible; however, these studies neglected to identify or resolve site-specific land use constraints, environmental impacts (in particular air emission limitations), or conversion cost issues. This feasibility study identifies the substantial land use constraints, initial costs exceeding $3.0 billion dollars and annual costs exceeding $85 million, considerable losses in generation during conversion and during post-retrofit operation, significant adverse environmental impacts, and likely insurmountable permitting obstacles which would be encountered if SCE were to attempt to retrofit SONGS with closed-loop cooling. Each of these issues is summarized below.

Land Use Constraints

The land use issue represents a significant obstacle to the conversion of SONGS to closed-loop cooling. The conversion would involve tunneling beneath Interstate 5, construction of six hybrid cooling towers at the Mesa Complex east of Interstate 5, and the creation of hot and cold water reservoirs immediately adjacent to each unit's turbine building. The feasibility of obtaining the permitting necessary for construction of cooling towers is questionable at best. If permitted, conversion of SONGS Units 2 and 3 to closed-loop cooling would have initial costs exceeding $3.0 billion and would include a construction period spanning a minimum of 66 months.

Cooling tower selection at SONGS is constrained by the limited site available area, the site's proximity to the California coastline and Interstate 5, and by the need to limit visible plume formation. While no cooling tower option could completely satisfy these constraints, hybrid cooling towers are the only technology available with a relatively low industrial profile that

provides the cooling required with limited visible plume formation[1]. Since the size of a cooling tower is directly proportional to the amount of heat that must be rejected, and the heat loads at SONGS are relatively large, the cooling towers required for closed-loop cooling would need to be relatively large. Given the SONGS site constraints, meteorological conditions, and the necessary use of saltwater for makeup, SPX Cooling Technologies sized a linear hybrid cooling tower design with three 15 cell linear hybrid cooling towers per unit. Sufficient space for the six required towers is not available in the area of the SONGS facility located between Interstate 5 and the Pacific Ocean (i.e., the SONGS Coastal Complex); therefore, the towers would have to be located on the southwest corner of the Mesa Complex.

The location of the hybrid cooling towers would require large diameter piping to be tunneled beneath Interstate 5 from the SONGS Coastal Complex to the Mesa Complex. From the tunnel, closed-loop circulating water would be routed beside the seawall and would draw suction from a hot water reservoir and provide cooled water from the cooling tower back to a cold water reservoir. Due to the size constraints of the cold water reservoir, three new vertical wet pit circulating water pumps would be needed to pass cooling water through the condenser. Additionally, three new high volume / high head vertical wet pit pumps would be required to pump circulating water from the hot water reservoir up to the cooling towers. It should be noted that operation of cooling towers at a nuclear power plant with such a large degree of elevation change between the cooling towers and the condenser is unprecedented, and additional engineering design would be required to ensure public safety would not be compromised by the discharge of cooling water across the SONGS seawall during a loss of power event.

Cost Estimate

A cost estimate and an associated construction schedule were developed for the selected wet hybrid cooling towers assuming that all required permits could be obtained for the conversion to closed-loop cooling. The cost of closed-loop conversion would include the initial capital costs, construction outage costs, and continuous operational, parasitic, and maintenance costs. The design, construction, construction outage power production losses, and start-up of closed-loop cooling at SONGS would exceed $3.0 billion, of which approximately $2.4 billion is based on 21.1 months of construction outage per unit. For comparison, $3.0 billion is approximately 50% of the actual capital costs for the construction of both SONGS Units 2 and 3[2]. In addition to these one-time costs, SONGS would incur continuous operational costs for the remaining plant life due to net power losses from the increased circulating water temperature and parasitic losses from the new equipment required for closed-loop cooling, totaling an average annual power generation loss of approximately 143 MWe. The cost of this lost power generation coupled with the maintenance costs for the new equipment would exceed $85 million per year.

Environmental Impacts / Permitting Requirements

Drift impacts due to the operation of cooling towers would be significant, where a total of between 827.8 and 837.2 tons[3] of PM_{10} would be emitted per year by SONGS in closed-loop operation. San Diego County is currently designated by the California Air Resources Board as

[1] Hybrid cooling towers would reduce visible plume occurrence to less than 1% of the year; however, any decrease in driver visibility on Interstate 5 would reduce public safety.
[2] The actual cost of constructing SONGS Units 2 and 3 in the early 1980s was approximately $6.1 billion.
[3] PM_{10} emission variability dependent on the local salinity of the Pacific Ocean.

non-attainment for PM_{10} and $PM_{2.5}$. A major-source Title V air permit would be required from the San Diego County Air Pollution Control District. It is unlikely that SONGS could locate and purchase a sufficient number of PM_{10} emission credits to cover these emissions. Conversion of SONGS to closed-loop cooling would be infeasible if the required drift offsets were not available. It should be noted that due to the limited availability of PM_{10} emission credits and large variability in price, a cost for obtaining the necessary PM_{10} credits has not been included in the cost estimate. If PM_{10} credits were to be available, the $3.0 billion initial cost of converting SONGS to closed-loop cooling would increase significantly to include their purchase.

Additionally, approximately 165 tons of salt would be deposited downwind (south-southwest) of the proposed cooling towers extending across the SONGS Coastal Complex area. This salt deposition would create the need for significant additional maintenance requirements for the existing equipment and facilities and the potential for unplanned unit outages from electrical arcing in the switchyard. Salt deposition may also occur across the nearby Camp Pendleton housing areas to the northeast. Salt deposition across the coastal scrubland habitat could cause adverse impacts to vegetation and habitat.

The conversion from once-through cooling to closed-loop cooling would result in an annual average loss of power generation of approximately 143 MWe at SONGS. If that generating capacity was assumed to be replaced by a natural gas facility, an estimated additional 227,000 tons per year of CO_2 would be emitted to the atmosphere.

Various permits, including a Coastal Development Permit, would be required for the conversion of SONGS to closed-loop cooling. All of these permits would be acquired in accordance with regulatory public participation requirements, which would likely incur intense public opposition due to project cost, adverse aesthetic/visual impacts, air emissions, traffic, and potential ecological impacts. California Public Utilities Commission approval would also be required for recovery of the closed-loop cooling system conversion cost from the ratepayers as well as for ongoing annual costs. Additionally, it should be noted SCE does not own the land on which SONGS is located, and as such, all construction activities necessary for conversion to closed-loop cooling would need to be approved by Marine Corps Base Camp Pendleton. Failure to receive approval from any of these agencies would render the construction and operation of closed-loop cooling at SONGS infeasible.

Conclusion

While conversion of SONGS to closed-loop cooling could be engineered, several significant open issues would need to be addressed before conversion to closed-loop cooling could be considered feasible. First, conversion to closed-loop cooling would require permission to be granted by several local, state, and federal agencies, any of which would have the ability to deny approval. Second, while this report provides a conceptual design for closed-loop conversion, a final detailed design of closed-loop cooling conversion and its resulting effect on SONGS operation would be required. Third, closed-loop cooling would remove an annual average of approximately 143 MWe and a summer daylight peak of approximately 191 MWe of baseload generation from the California electrical system which could decrease grid reliability and increase reliance on carbon-emitting power sources.

1 Background and Introduction

The Southern California Edison Company (SCE) is the majority owner and sole operator of San Onofre Nuclear Generating Station (SONGS). The United States Environmental Protection Agency and the California State Water Resources Control Board are considering adopting regulations which would require SONGS Units 2 and 3 to implement a closed-loop circulating cooling water system. The feasibility of conversion to closed-loop cooling has been investigated by several studies, with each study concluding that a retrofit of SONGS to closed-loop cooling would be feasible; however, these studies neglected to identify or resolve site-specific land use constraints, environmental impacts (in particular air emission limitations), or conversion cost issues. A comprehensive feasibility study is presented in this report, along with an evaluation and comparison of previous studies.

1.1 Regulatory History

The Federal Water Pollution Control Act, 33 U.S.C. §§1251-1387, aims to restore and maintain the chemical, physical, and biological quality of the receiving waters of the United States. During 1977 the Congress enacted the Clean Water act, which establishes a comprehensive regulatory program administered by the United States Environmental Protection Agency (EPA). In 2004, the EPA issued final regulations to implement Section 316(b) of the CWA as it applies to Phase II facilities [Ref. 8.88]. Section 316(b), 33 U.S.C. §1326(b), addresses cooling water intake structures:

> *Any standard established… shall require that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.*

As defined in the EPA's Phase II regulations, Phase II facilities are existing power generating facilities with generating capacity factors greater than 15 percent (i.e., baseload facilities) that have the design capacity to withdraw at least fifty million gallons of water per day (MGD) from waters of the United States and use at least 25 percent of the water they withdraw exclusively for cooling purposes. With regard to the adverse environmental impacts associated with cooling water intake structures (CWIS) at Phase II facilities, the EPA selected "reductions in impingement and entrainment as a quick, certain, and consistent metric for determining performance" [Ref. 8.88]. As defined in the Phase II regulations, impingement takes place when organisms are trapped against intake screens by the force of the water being drawn through the CWIS and entrainment occurs when organisms are drawn through the CWIS into the cooling system. The Phase II regulations require that impingement mortality be reduced by 80 to 95 percent and that entrainment be reduced by 60 to 90 percent from the calculation baseline. The calculation baseline for impingement and entrainment mortality is based on a CWIS designed without consideration of environmental impacts (i.e., located at the shoreline near the surface of the waterbody, having a standard 3/8 inch mesh screen size, and operating at design flow rates). Facility water intake flow is assumed to be directly proportional to impingement and entrainment effects. Therefore, reductions in intake flow rate are considered equivalent to reductions in impingement and entrainment. Conversion of the cooling systems at Phase II facilities to closed-loop cooling would satisfy the performance standards of the Phase II regulations and is used as the benchmark to evaluate other alternatives. Ultimately, the EPA did not recommend closed-loop cooling as the best technology available (BTA) due to significant financial, operational, and environmental impacts.

The Phase II regulations would be implemented through National Pollutant Discharge Elimination System (NPDES) permits [Ref. 8.1]. The Phase II regulations were remanded by the 2nd Circuit Court back to the EPA and subsequently suspended on March 20, 2007 [Ref. 8.89]. On April 2, 2009, the US Supreme Court overturned the decision by the 2nd Circuit Court, allowing the EPA to reinstitute the use of cost-benefit analysis in setting standards and issuing permits under Section 316(b) of the CWA; however, at the time this feasibility study was concluded (September 2009), the Phase II regulations remained suspended.

The regulation 40 CFR §125.90(b) remains in effect, which states that permitting authorities, in the absence of nationwide standards, must implement Section 316(b) on a case-by-case, best professional judgment basis. The California State Water Resources Control Board (SWRCB) has proposed a 316(b) policy that would require the state's coastal generating stations that currently utilize once-through cooling to be either retrofitted with closed-loop cooling or provide the same level of impingement and entrainment reduction as closed-loop cooling [Ref. 8.24]. The proposed policy is based on the requirements outlined in the suspended EPA Phase II Rule and the subsequent guidance provided by court rulings on the Phase II Rule. Within one year of the effective date of the proposed SWRCB policy, existing power plants would be required to submit an implementation plan identifying the compliance alternative chosen by the plant; describing the design, construction, or operational measures that will be undertaken to implement the alternative; and proposing a schedule for implementing these measures.

SONGS Units 2 and 3 utilize once-through cooling systems with capacity factors in excess of 15 percent and use more than 50 MGD of saltwater from the Pacific Ocean for cooling purposes; therefore, SONGS Units 2 and 3 are subject to Section 316(b) impingement and entrainment regulations applicable to Phase II facilities. In the absence of nationwide standards, the SWRCB has proposed state-wide regulations in accordance with 40 CFR §125.90(b).

1.2 Comparison of Previous Studies to Current Findings

The following studies investigated retrofitting SONGS Units 2 and 3 with a closed-loop cooling water system:

- *Assessment of Marine Review Committee Recommendations for SONGS Units 2 and 3*, prepared by PLG, Inc. (formerly Pickard, Lowe, and Garrick) as part of a multi-year study by the independent Marine Review Committee (MRC) under the California Coastal Commission, February 1990 (PLG 1990) [Ref. 8.62]
- *Issues Analysis of Retrofitting Once-Through Cooled Plants with Closed-Cycle Cooling: California Coastal Plants*, prepared by Maulbetsch Consulting for the Electric Power Research Institute (EPRI), October 2007 (EPRI 2007)[Ref. 8.33]
- *Comprehensive Demonstration Study for Southern California Edison's San Onofre Nuclear Generating Station*, prepared by EPRI for SCE submittal to the San Diego Regional Water Quality Control Board, January 2008 (EPRI 2008)[Ref. 8.34]

- *California's Coastal Power Plants: Alternative Cooling System Analysis*, prepared by Tetra Tech, Inc. for California Ocean Protection Council, February 2008 (Tetra Tech 2008) [Ref. 8.83]

The bases and conclusions of each study, as well as a summary of the current findings, are summarized in Table 1.1. The closed-loop cooling analysis in EPRI 2008 is based on the results of EPRI 2007; therefore, the two studies are treated as the same with regards to analytical results.

Each of these studies considered the costs and environmental impacts of a closed-loop cooling retrofit at SONGS. Evaporative, mechanical-draft, rectilinear cooling towers were selected for consideration in all cases. In addition, Tetra Tech 2008 selected plume-abated towers. EPRI 2007 stated that plume abatement would likely be necessary, but based all analysis on basic mechanical-draft towers.

Each study concluded closed-loop cooling could be retrofitted to the SONGS facility. However, several key significant issues were identified for resolution prior to installation of a closed-loop cooling system. The closed-loop cooling installation issues include siting of the structures, air emission impacts, and cost of the retrofit:

- Cooling Tower Siting – As described further in Section 2, the SONGS facility is bounded by the San Onofre State Beach, Marine Corps Base Camp Pendleton (MCBCP), Interstate 5, a North County Transit District (NCTD) of San Diego Railway line, and old U.S. Highway 101. All previous studies assume that some portion of San Onofre State Beach could be aquired for the construction of cooling towers. However, the acquisition of protected habitat in a California State Park is uncertain at best. In addition, the previously proposed cooling tower locations would inherently decrease the efficiency of cooling towers due to the significant recirculation effects of placing the cooling towers perpendicular to the prevailing winds on site. Additionally, since the cooling towers were sited at a significantly higher elevation than the condenser, the kinetic energy in the descending circulating water would cause over-pressurization and, utlimately, failure of the condeners, turbine plant cooling water (TPCW) heat exchangers, and ancillary circulating water system equipment.

  Siting the cooling towers on the Mesa Complex, by installing circulating water tunnels under Interstate 5, the North County Transit District of San Diego Railway line, and old U.S. Highway 101 would address some of the land use issues and recirculation concerns (see Section 3.2). Additionally, reservoirs, as opposed to direct circulating water pipe tie-ins, would provide a means to dissipate kinetic energy built up in the circulating water before it is pumped through the condensers and TPCW heat exachangers.

- Air Emissions – Cooling tower drift (i.e., entrained liquid water droplets in the air stream exiting the tower) at SONGS would consist of water, salt, and dissolved/suspended solids and would be considered fine particulate emissions (PM_{10} and $PM_{2.5}$). All previous studies assume that the increase in PM_{10} and $PM_{2.5}$ air emissions due to closed-loop cooling at SONGS would result in acceptable and permittable air emission levels or could be mitigated. As described in Section 6.1, SONGS is located in an area that has already been designated a non-attainment area for several air pollutants by the EPA and the State of California.

Obtaining the necessary air emission permits or credits to operate cooling towers presents significant cost and feasibility concerns (see Sections 6.1 and 6.7). It is unlikely that SONGS could locate and purchase a sufficient number of PM_{10} credits to cover this quantity of emissions. Conversion of SONGS to closed-loop cooling would be infeasible if the required drift offsets were not available.

- Conversion Costs – Total cost estimates for the project (both units) ranged from approximately $328 million to $1.274 billion. All previous studies include capital cost and operation and maintence cost estimates. PLG 1990 and Tetra Tech 2008 also include replacement power cost estimates for power losses due to the extended outage for closed-loop cooling installation and the thermodynamic and parasitic losses associated with closed-loop cooling operation. Tetra Tech 2008 estimates that the annual cost of conversion to closed-loop cooling would be equal to 9.8% of SONGS annual gross revenue. Both PLG 1990 and EPRI 2007 conclude that conversion could be feasible, but that costs would likely increase the difficulty of the project such that conversion to closed-loop cooling could not be recommended.

  The estimated capital cost of conversion to the closed-loop cooling configuration described in Section 3 is approximately $615 million, including design/engineering, cooling towers, tunneling, construction, testing/startup, and contingency costs (detailed in Section 5.2.1 and Attachment 4). Additionally, assuming a projected cost of electricity of $73.30 per MWhr (Attachment 1, Section 5), the aggregate outage cost for conversion of SONGS to closed-loop cooling would be approximately $2.4 billion (Section 5.2.2). The estimated total one-time cost for conversion to closed-loop cooling is therefore $3.0 billion.

  After conversion to closed-loop cooling, operational and parasitic losses would cost SCE approximately $83 million per year (Sections 5.2.3 and 5.2.4). The estimated operations and maintenance costs of conversion to closed-loop cooling would be $2.8 million (years 1 to 5), $3.8 million (years 6 to 15), and $5.8 million (years 16 to 20) (Section 5.2.5). Due to the limited availability of PM_{10} emission credits and large variability in price, the cost for obtaining the necessary PM_{10} credits is not included in the conversion costs; however, if available, it is also likely that the cost of obtaining and maintaining the necessary permits to operate closed-loop cooling at SONGS would be substaintial.

Table 1.1 Comparison of Feasibility Studies on Closed-Loop Conversion at SONGS

	PLG	Basis	EPRI	Basis	Tetra Tech	Basis	ENERCON	Basis	Report Section
Technology Selection									
Heat Transfer	Evaporative	Saltwater not suitable for dry sections	Evaporative	Dry too large	Hybrid	Freeway hazards	Hybrid	Freeway hazards Visual impact	Section 3.1.1
Air Flow	Mechanical-draft	Insufficient space for natural draft	Mechanical-draft Counterflow	-	Mechanical-draft Counterflow	-	Mechanical-draft Counterflow	Space limitations Plume abatement	Section 3.1
Shape	Rectilinear (24x2 cells)	One tower per Unit	Rectilinear (~40 cells)	81 cells per Unit	Rectilinear (8 cells per tower)	6 towers per unit	Rectilinear (15 cells per tower)	3 towers per Unit 2°C recirculation allowance	Section 3.1
Cycles of Concentration	1.5	Saltwater	1.5	Saltwater	1.5	Saltwater	1.5	Saltwater	Section 4.4
Land Use									
Space (acres)	8	Towers only	Large	4,000 ft x 20 ft diameter	30.08	Areas 1 and 7	14	SPX tower dimensions 1.5 tower width spacing	Section 3.2
Location	Bluffs north and south of Power Block	Tower siting inland of I-5 assumed not feasible	Bluffs north and south of Power Block	No other option	Bluffs north and south of Power Block	Tower siting inland of I-5 assumed not feasible	South Corner of Mesa Complex	Reduced recirculation Land use concerns	Section 3.2.1
Cost									
Capital ($ million)	172	1990 Estimate by GEA Power Cooling Systems, Inc	675	Likely to exceed MCS "Difficult" estimate	593.2	Vendor estimate 'Design-and-Build'	614	Design, procurement and installation estimate	Section 5.2.1
O&M ($ million)	3	3% initial tower cost	8	3% average capital costs	6.4	Year 1 $4/gpm	2.8	Year 1 Labor and parts	Section 5.2.5
Outage ($ million)	125	60 days $0.048/kWhr	-	-	594.8	6 months per unit $72/MWhr	2,427	21.1 months per Unit $73.30/MWhr	Section 5.1.2 Section 5.2.2
Losses ($ million)	28.2	$0.048/kWhr	-	-	80	$84/MWhr	82.7	$73.30/MWhr	Section 5.2.3 Section 5.2.4
Total ($ million)	328.2		683		1,274.4		3,126.5		
Losses									
Thermal Efficiency (MWe)	49.8	Turbine manufacturer performance curves	24	PLG study	64.14	Average efficiency % losses	73.5	PEPSE plant analysis	Section 4.2.2
Parasitic (MWe)	33.6	Required pumping head and fan power	67.61	Required pumping head and fan power	58.54	Required pumping head and fan power	69.4	Required pump/fan power	Section 4.3
Total (MWe)	83.4		91.61		122.68		142.9		
Environmental									
Reduction in Water Use (%)	92	-	94	Generalized saltwater makeup estimate	95	-	95.6	Saltwater operation	Section 4.4
Visual Impact	Considerable	Towers and plume	Contentious and costly issue	Towers and plume	-	-	Low Impact	Tower visibility	Section 6.5.1
Fog	Incremental road hazard increase	High relative humidity	N/A	Plume abatement	N/A	Plume abatement	<1% of historical operating conditions	Plume abatement	Section 3.1.1
Noise (db)	above 50	1 mile from plant	-	-	-	-	Attenuated to acceptable levels	Sound attenuation required	Section 3.1.2 Section 6.5.3
Air Emmissions (lb/hr)	511	0.001% drift eliminator Salt	203 / 4054	0.0005% drift eliminator PM_{10} / Drift	210 / 3982	0.0005% drift eliminator PM_{10} / Drift	210	0.0005% drift eliminator Salt	Section 6.1.1
Conclusion	-		**Difficult**		**Technically and logistically feasible**		**Technologically feasible, not practicable (*Section 7*)**		

1.3 Alternative Technologies

In addition to analyzing closed-loop cooling, both EPRI 2008 [Ref. 8.34] and Tetra Tech 2008 [Ref. 8.83] evaluated alternative technologies for the reduction of entrainment and impingement mortality. EPRI 2008 determined that three alternative technologies, variable speed pumps, aquatic filter barriers, and the relocation of the cooling water intake structure were not feasible at SONGS. While fine mesh traveling screens and narrow-slot wedgewire screens were determined to be feasible at SONGS, only narrow-slot wedgewire screens were determined to be able to meet the performance standard range. However, EPRI 2008 noted that “wedgewire screens are unproven in California for use in an open ocean environment and have never been deployed in a high biofouling open ocean environment” [Ref. 8.34].

Tetra Tech 2008 evaluated the use of fine mesh modified ristroph screens, barrier nets, aquatic filtration barriers, variable speed drives and cylindrical fine mesh wedgewire screens. Tetra Tech concluded each of these technologies would either be infeasible for use at SONGS or would not be able to yield the required reductions in entrainment and impingement mortality.

1.4 Purpose of this Assessment

Given that SONGS could be mandated to retrofit to closed-loop cooling, this report presents a comprehensive feasibility study of all major elements necessary to retrofit SONGS Units 2 and 3 with a closed-loop circulating water system, including the estimated costs of conversion and the environmental impacts.

1.5 Scope and Design Objectives

This Report provides the following:

- A conceptual design, cost estimate, and construction schedule developed for the recommended closed-loop system. The assessment of economic impacts includes initial capital costs, operation and maintenance expenses, and Station capacity impacts associated with the selected configuration.
- An assessment of environmental impacts associated with the proposed changes. Negative and positive impacts are identified, and quantified on a preliminary basis. These include such issues as cooling tower plume and noise generation, site aesthetics, construction related impacts, and intake flow changes.

2 San Onofre Station and Cooling System Description

SONGS is a baseload facility comprised of two active units (Units 2 and 3) and one inactive unit undergoing decommissioning (Unit 1). SONGS is located approximately 2.5 miles southeast of San Clemente, California, occupying approximately 214 acres within the MCBCP. Units 1, 2 and 3 are located in an 83.6-acre area, referred to herein as the Coastal Complex in its entirety, to the southwest of Interstate 5, the NCTD Railway line, and old U.S. Highway 101 (collectively referred to herein as the coastal highways and railway), along the Pacific Ocean Coast. Unit 1 was permanently shut down in 1992, defueled in 1993, and is currently undergoing decommissioning. Units 2 and 3 are located southeast of and immediately adjacent to Unit 1. The remaining 130-acre area, referred to as the Mesa Complex, is located to the northeast of the coastal highways and railway. Administrative, maintenance, and support services are housed on the Mesa Complex; no power-generating activities occur there. Figure 2.1 shows an aerial view of the station layout and surrounding areas.

Figure 2.1 San Onofre Nuclear Generating Station Location

SONGS Units 2 and 3 are pressurized water reactor (PWR) nuclear steam supply systems (NSSS) that produce a net electrical output of 1070 MWe and 1080 MWe, respectively. The main condensers, the turbine plant cooling water system, and the component cooling water system reject heat to seawater drawn from the Pacific Ocean as part of a once-through cooling (OTC) system [Ref. 8.75].

2.1 Cooling Water Intake Structure Description

Two independent cooling water intake structures (CWISs) provide cooling water to SONGS Units 2 and 3. The general arrangement of the intake structures is shown in Attachment 5, Figure 5-1. Cooling water is withdrawn from the Pacific Ocean through two submerged intake conduits, each extending approximately 3100 feet offshore at a bottom depth of 30 feet. The submerged end of each conduit is fitted with a velocity cap to minimize the entrainment of motile fish into the system by converting the vertical flow to a lateral flow, thus triggering a flight response from fish. Water enters the velocity cap at an average velocity of 1.7 feet per second (fps) and with the decreasing diameter of the intake conduit the water velocity increases to 7.6 fps until reaching the exit of the offshore intake box (see Attachment 5, Figure 5-1). Upon reaching the onshore portion of each intake, the withdrawn seawater flows through vertical louvers that guide any entrained fish to a fish elevator at the far end of the intake structure. The fish elevator delivers captured live fish into the fish return line, a common conduit that returns fish unharmed to a submerged location 1800 feet offshore. Behind the louvers in each intake structure are six screen assemblies, each consisting of one traveling bar rake and one vertical traveling screen. The bar rakes remove larger debris (e.g., kelp) where the screens sift the water of small debris larger than 3/8 of an inch in diameter. The screen assemblies are angled approximately 30° to the incoming flow, which further guides fish to the fish elevator. The vertical traveling screens are fitted with 3/8-inch mesh panels and a high pressure spray that removes any debris or fish impinged on the screen face. The forebay pump pit is located downstream of the traveling bar rakes and screens. In this location four circulating water pumps (CWPs), four salt water pumps (SWPs), and two screen wash pumps take suction to provide cooling and service water which results in a 2.8 fps water velocity across the traveling bar rakes and screens [Ref. 8.75].

The four CWPs in each intake structure supply cooling water to remove heat from the main condenser and TPCW heat exchangers under all conditions of power plant loading and design weather conditions. All four CWPs are normally in operation with each CWP discharging to a quadrant of the main condenser. A portion of the flow from each CWP is combined and supplied to the TPCW heat exchangers [Ref. 8.75].

The four SWPs in each intake structure are part of the Saltwater Cooling system, an engineered safety feature (ESF) support system. The saltwater cooling system for each unit consists of two 100% capacity critical trains each containing two SWPs [Ref. 8.75].

The two full-capacity screen wash pumps each have a design capacity of 2500 gpm. These pumps supply water to the traveling bar and screen wash spray nozzles and traveling bar and screen troughs. The screen wash cycle is activated automatically by pressure differential switches when debris builds up on the traveling bars and screen. The screen wash cycle can also be run manually to prevent debris build-up [Ref. 8.75].

2.2 CWIS Flow Description

The suspended EPA Phase II regulations and proposed SWRCB policy would regulate plant cooling water, defined as follows:

> *Water used for contact or noncontact cooling, including water used for equipment cooling, evaporative cooling tower makeup, and dilution of effluent heat content* [Ref. 8.1, §125.93].

Process water, such as the water supplied to the screen wash pumps, is not regulated by the EPA or SWRCB regulations. In addition, water that is used as process water either before or after being used for cooling purposes would not be considered cooling water [Ref. 8.1].

Both EPA and SWRCB state that if nuclear facilities demonstrate that compliance would result in a conflict with a safety requirement established by the Nuclear Regulatory Commission, the Director/Water Board must make a site-specific determination of best technology available for minimizing adverse environmental impact that would not result in a conflict with the Nuclear Regulatory Commission's safety requirement [Ref. 8.88 and 8.24]. The Saltwater Cooling system is designed to automatically provide a cooling water supply for the component cooling water system heat exchangers during power generation, normal and emergency shutdown and cooldown, and during a design basis loss-of-coolant accident [Ref. 8.75]. Using closed-loop cooling water in the Saltwater Cooling system rather than Pacific Ocean water would raise nuclear safety concerns due to unanalyzed operating conditions. Additionally, in the event of cooling tower failure, adequate cooling water for the Saltwater Cooling system could not be guaranteed. Therefore, the Saltwater Cooling system would not be modified for conversion to closed-loop cooling as discussed in Section 3.6.

2.2.1 Design Intake Capacity

The licensed design intake capacity of a facility serves as the baseline for evaluating flow reductions. Licensed design flow is the expected total volume of water likely to be withdrawn from a source waterbody, used during the cooling water intake structure design, consistent with 40 CFR §125.93 and both as reflected in and consistent with the Updated Final Safety Analysis Report (UFSAR [Ref. 8.75]). In each SONGS unit, the normal operation requirements of the OTC circulation water system, with four pumps running for condenser cooling, are 830,000 gpm. Normal operating requirements of the Saltwater Cooling system may be up to 34,000 gpm with two SWPs in operation. As the relatively small capacity (2500 gpm) screen wash pumps only supply process water and operate intermittently, immediately returning much of their flow to the intake structure, the flow requirements of the screen wash system are not considered. Therefore, the total licensed design flow for each SONGS unit is 864,000 gpm. Any current or proposed flow reductions are calculated from this baseline value.

2.2.2 Flow Reductions

As discussed in Section 1.1, the Phase II regulations assume facility water intake flow is directly correlated to impingement and entrainment effects; therefore, reductions in intake flow rate are considered equivalent to reductions in impingement and entrainment. Both planned and unplanned periods of reduced power decrease the actual amount of flow entering each unit’s CWIS. Flow reductions are the percent reduction from the total design intake capacity of 864,000 gpm for each SONGS unit. Five years of operational CWIS data (see Table 2.1 and Table 2.2), indicate an annual flow reduction of 7.7% for Unit 2 and 9.2% for Unit 3.

Table 2.1 SONGS Unit 2 Flow Reduction from Baseline (2003-2008)

Month	Baseline Flow (MG)	Historic Operating Flow (MG)	Flow Reduction
January	38,569	31,795	17.6%
February	35,251	25,384	28.0%
March	38,569	33,317	13.6%
April	37,325	36,561	2.0%
May	38,569	37,780	2.0%
June	37,325	36,462	2.3%
July	38,569	37,780	2.0%
August	38,569	37,780	2.0%
September	37,325	36,562	2.0%
October	38,569	37,781	2.0%
November	37,325	36,562	2.0%
December	38,569	31,722	17.8%
Annual	454,533	419,489	7.7%

*Baseline and historic operating flows listed represent an average of the total aggregate flows for each month; therefore, specific variations in flow rates between each month may be attributable to the differing number of days per month.

**Due to the two leap years occurring during the 6 year period analyzed (2003-2008), the flows for February are based on 28.33 days a month and the annual flows are based on 365.33 days a year.

Table 2.2 SONGS Unit 3 Flow Reduction from Baseline (2003-2008)

Month	Baseline Flow (MG)	Historic Operating Flow (MG)	Flow Reduction
January	38,569	32,706	15.2%
February	35,251	32,628	7.4%
March	38,569	37,780	2.0%
April	37,325	36,561	2.0%
May	38,569	37,780	2.0%
June	37,325	36,499	2.2%
July	38,569	37,779	2.0%
August	38,569	37,780	2.0%
September	37,325	36,090	3.3%
October	38,569	24,957	35.3%
November	37,325	24,930	33.2%
December	38,569	37,453	2.9%
Annual	454,533	412,942	9.2%

*Baseline and historic operating flows listed represent an average of the total aggregate flows for each month; therefore, specific variations in flow rates between each month may be attributable to the differing number of days per month.

**Due to the two leap years occurring during the 6 year period analyzed (2003-2008), the flows for February are based on 28.33 days a month and the annual flows are based on 365.33 days a year.

2.2.3 Flow Reliability

The source of cooling water for SONGS is the Pacific Ocean. The Pacific Ocean is the most reliable source of cooling water at SONGS, promoting the efficient generation of electricity and ensuring an uninterrupted supply of cooling water for nuclear safety-related systems. Although the majority of seawater entering the CWIS is pumped through the main condenser via the Circulating Water system, a smaller portion of intake cooling water also passes through the traveling water screens and flows into Saltwater Cooling system pumps. The Saltwater Cooling system provides the ultimate heat sink for the nuclear safety-related Component Cooling system. The ultimate heat sink is capable of providing sufficient cooling water to shutdown and cooldown both units, or to mitigate the consequences of an accident in one unit and shutdown and cooldown the other unit despite a design basis earthquake, tornado, flood, drought, transportation accident, oil spill, fire, or any credible single failure of any manmade structure [Ref. 8.75]. Therefore, the conceptual design for conversion of SONGS to closed-loop cooling discussed in Section 3.6 does not modify the Saltwater Cooling system.

2.3 Discharge System

After passing through the circulating water system and the saltwater cooling system, the once-through cooling water is combined with low-volume wastes generated by SONGS and discharged. The combined discharge flows through submerged conduits and is released through a diffuser section designed to dissipate the discharge heat. The discharge conduits extend 8500 feet (Unit 2) and 6000 feet (Unit 3) offshore into the Pacific Ocean. Surface water withdrawals and discharges for each unit are regulated by individual NPDES permits CA0108073 for Unit 2 and CA0108181 for Unit 3. The NPDES permit for Unit 1 expired in 2005; any remaining Unit 1 effluent is routed to the Unit 2 or Unit 3 outfalls and discharged under the respective permits [Ref. 8.22].

3 Conceptual Design

There have been no conversions of existing operating nuclear stations from once-through to closed-loop cooling[4]. Due to this uncertainty, an investigative analysis on the impact of closed-loop cooling on plant systems, operation, and electrical output must be considered. Conversion to closed-loop condenser cooling would represent a massive and difficult engineering and construction undertaking, even when site conditions are conducive to the requisite configuration changes. In contrast, the SONGS site – with substantial elevation changes, a general lack of available space, a subsurface primarily composed of sandstone, the collocation of a major interstate and the aesthetically sensitive local environment (among other factors) – poses significant additional site-specific challenges. While the total aggregate uncertainty of these factors is not determined by this conceptual design, the critical obstacles in determining the feasibility and the appropriate configuration of a theoretical closed-loop system at SONGS are discussed in the following sections. Conceptual drawings of the closed-loop cooling configuration and tie-in details are provided in Attachment 5, Figures 5-2 through 5-5.

Conversion of SONGS from a once-through to a closed-loop circulating water system would require significant changes to the circulating water equipment; in addition, numerous ancillary systems are affected either by the downstream reduction in condenser heat rejection or are impacted by the construction and placement of new circulating water equipment. As discussed in Section 3.2, cooling towers would be located on the east side of Interstate 5 and require large diameter piping to be tunneled beneath Interstate 5 from the SONGS Coastal Complex to the Mesa Complex. From the tunnel, closed-loop circulating water would be routed beside the seawall and would draw suction from a hot water reservoir and provide cooled water from the cooling tower to the cold water reservoir. Due to the size constraints of the cold water reservoir, three new vertical wet pit circulating water pumps would be needed to pass cooling water through the condenser, discharging to the hot water reservoir. Likewise, three new high volume / high head vertical wet pit pumps would be required to pump circulating water from the hot water reservoir up to the cooling towers. The circulating water would then be distributed throughout the cooling towers, cooled, and gravity fed back through the circulating water tunnel piping. Sophisticated controls would be required to maintain the necessary water inventory in each basin, and flow resistance equipment would need to be installed to control the massive inertial forces of the circulating water returning from the cooling towers. A basic flow diagram depicting the general arrangement of closed-loop cooling at SONGS is provided in Figure 3.1.

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[4] Palisades Nuclear Generating Station (PNGS) utilizes closed-loop cooling although it initially operated with once-through cooling; however, PNGS was originally designed for closed-loop cooling, and its circulating water system components were sized to accommodate the expected heat rejection capability provided by cooling towers. In this manner, it would more accurate to state that PNGS was first converted from its closed-loop design to operate with once through cooling, and then reverted to operate under it is original closed-loop cooling design.

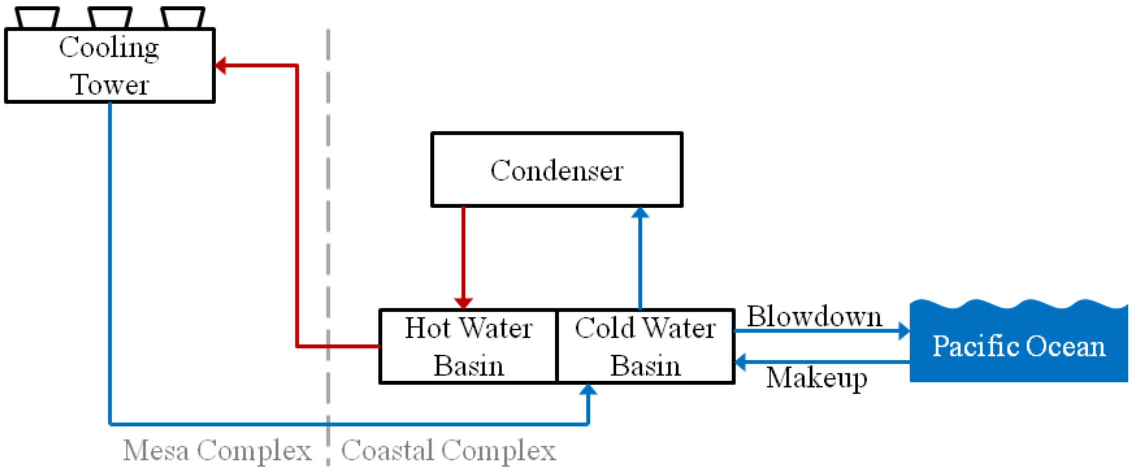

Figure 3.1 Closed-Loop Cooling Flow Diagram

3.1 Cooling Tower Selection

A variety of cooling towers are available to provide the heat rejection required by steam operated power plants. The advantages, disadvantages, and application of the different types of towers are discussed below.

Dry Cooling Towers

Dry cooling towers, which rely totally on sensible heat transfer, lack the efficiency of wet or hybrid towers using evaporative cooling, and thus require a far greater surface area than is available at the SONGS site. Additionally, due to their lower efficiency, dry towers are not capable of supporting condenser temperatures and associated turbine backpressures necessary to be compatible with the Station’s turbine design, and therefore, their implementation at SONGS is not considered technologically feasible.

Natural Draft Cooling Towers

Of the available types of evaporative cooling towers, the natural draft “wet tower” offers the only passive cooling design, in that they rely on the “chimney effect” of the tower to create the required draft for cooling. As a result, natural draft cooling towers can be less costly to operate than comparably sized mechanical or hybrid cooling towers. However, since natural draft towers rely on the “chimney effect” of the tower to create the required draft the tower must be very tall, approximately 450 to 550 feet in height. Due to restrictions on both the height of the cooling tower and its discharge of a dense visible plume, and the relatively long construction schedule, natural draft cooling towers were not considered practical or capable of being permitted for use at SONGS. Figure 3.2 illustrates a typical natural draft cooling tower.

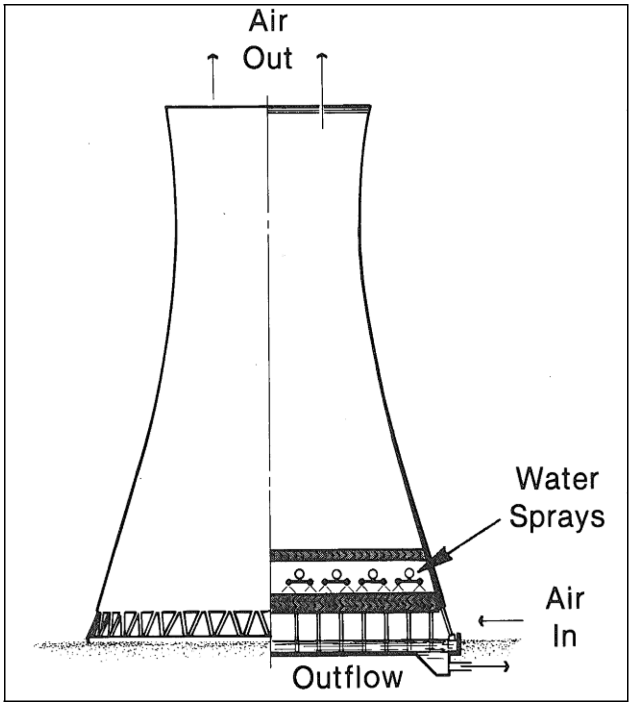

Figure 3.2 Counterflow Hyperbolic Natural Draft Cooling Tower [Ref. 8.80]

Air flow through the tower is produced by the density differential that exists between the heated (less dense) air inside the stack and the relatively cool (more dense) ambient air outside the tower. Since these towers depend on their geometric shape rather than fans for required air flow, they generally have lower operating costs.

<u>Mechanical Draft Towers</u>

Compared to the other types of evaporative cooling towers, a mechanical draft wet cooling tower is typically lowest in initial cost, moderate in footprint, and operates with moderate costs. Due to the need for forced draft fans, this type of tower has slightly higher noise levels than a natural draft tower, although attenuation to acceptable levels is possible at an additional cost. Mechanical draft cooling towers are considered impractical for the SONGS site, because of the risks created by the associated visible plume. In general, visible plumes would adversely impact SONGS personnel and Interstate 5 commuter safety, impede visually oriented security systems, degrade station cooling and electrical transmission equipment, and harm vegetation in the vicinity of the cooling tower plumes. Visible plumes and the necessity of plume abatement are discussed in detail in Section 3.1.1.

Figure 3.3 illustrates the air flow path through a cell of a typical mechanical draft wet cooling tower, and the applicable simplified psychrometric chart.

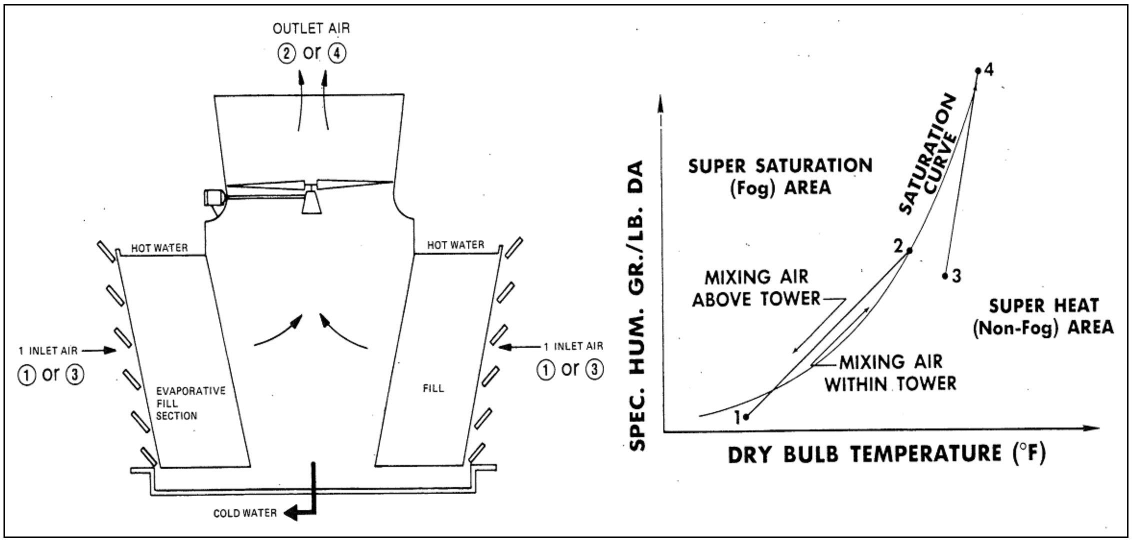

Figure 3.3 Saturation of Air in Typical Mechanical Draft Wet Cooling Tower [Ref. 8.80]

Two cases are depicted in the above figure. Case 1 - Warm ambient air enters the tower at condition 3 and exits saturated at condition 4. After leaving the tower, this saturated air mixes with the ambient air along line 4-3, most of which occurs in the invisible region below the saturation curve of the psychrometric chart. Case 2 - Cool ambient air enters the tower at condition 1, exiting saturated at condition 2 and returning to ambient conditions along line 2-1. As can be seen, most of this mixing occurs in the region of super-saturation, which causes the visible plume to be very dense and very persistent.

Hybrid Cooling Towers

A hybrid cooling tower, also referred to as a "wet/dry" or "plume abated" cooling tower, addresses some of the plume-related issues associated with the mechanical draft wet cooling tower. Basically, a hybrid cooling tower is the combination of the wet tower, with its inherent cooling efficiency, and a dry heat exchanger section used to eliminate visible plumes in the majority of atmospheric conditions. After the plume leaves the lower "wet" section of the tower, it travels upward through a "dry" section where heated, relatively dry air is mixed with the plume in the proportions required to achieve a non-visible plume. Hybrid cooling towers are slightly taller than comparable wet towers due to the addition of the "dry" section. They are also appreciably more expensive, both in initial costs and in ongoing operating and maintenance costs. A potential exists for increased noise due to additional fan load required to draw air in through the dry section, although attenuation to acceptable levels is possible, again at an additional cost.

Figure 3.4 illustrates the air flow path through a cell of a hybrid cooling tower and the applicable simplified psychrometric chart.

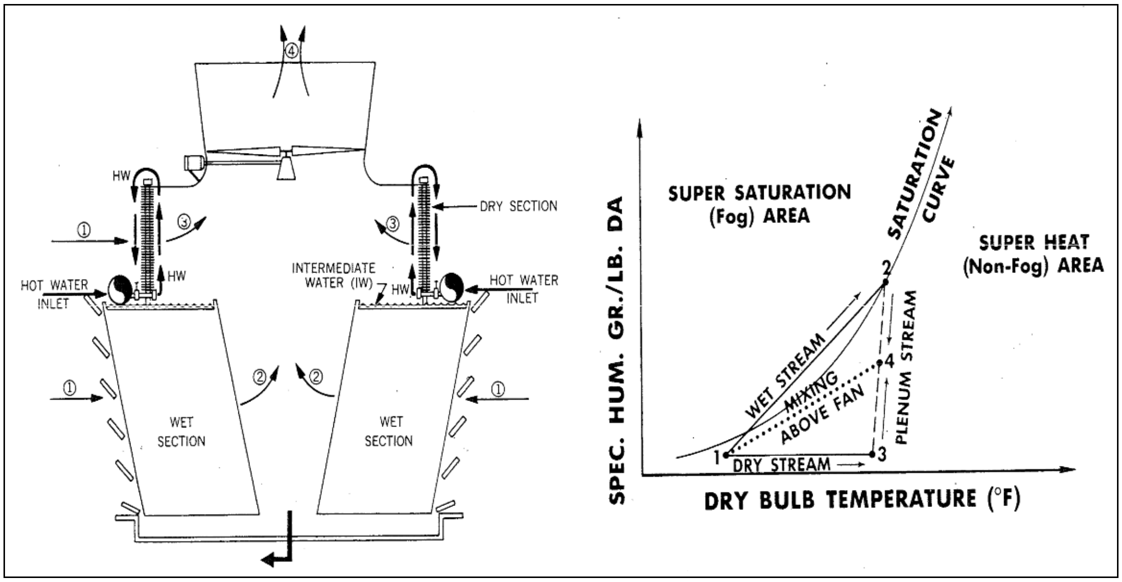

Figure 3.4 Partial Desaturation of Air in a Hybrid Cooling Tower [Ref. 8.80]

A hybrid cooling tower is designed to drastically reduce both the density and the persistency of the plume. Incoming hot water flows first through the dry heat exchanger (finned coil) sections, then through the wet (evaporative cooling) fill section. Parallel streams of air flow across the coil sections and through the fill sections, leaving the coil sections at dry condition 3, and leaving the fill sections at saturated condition 2. These two separate streams of air then mix together going through the fans, along the lines 3-4 and 2-4 respectively, exiting the fan cylinder at sub-saturated condition 4. This exit air then returns to ambient conditions along line 4-1, avoiding the region of super-saturation (visible plume) altogether in most cases.

Cooling Tower Selection

As noted in the discussions above, three cooling tower design constraints limit the selection of cooling towers for use at SONGS. First, SONGS possesses a limited site area available for cooling towers to reject approximately 7.5 billion Btu per hour per unit [Ref. 8.75]. Second, SONGS is located on the California coastline where permitting requirements limit the use of intrusive industrial equipment (see Section 6.7). Third, any visible plume emitted from the cooling tower must be as limited as possible to ensure plant personnel safety and equipment reliability in addition to commuter safety on Interstate 5. While none of the cooling tower options completely satisfies these three constraints, hybrid cooling towers are the only technology available with a relatively low industrial profile that provides the cooling required with limited visible plume formation.

Hybrid cooling towers are available in linear and round configurations. Currently, only a single comparably sized round hybrid cooling tower has been constructed at a new (not existing) facility, and that facility is not located in the United States. Although round hybrid cooling towers are generally more expensive then linear towers and have a limited historic use, the round configuration is sometimes necessary for sites with variable wind direction or where configuration of the available space does not allow favorable placement of linear cooling towers. Due to the predominate occurrence of air flow both to and from the coastline, the configuration of the available space at the Mesa Complex would suitably accommodate linear hybrid cooling towers.

The size of a cooling tower is directly proportional to the amount of heat that must be rejected from the cooling water. As the heat loads at SONGS are relatively large, the cooling towers required for closed-loop cooling at SONGS would need to be relatively large as well. Given the SONGS site constraints, meteorological conditions, and the necessary use of saltwater for makeup, SPX Cooling Technologies sized a linear hybrid cooling tower design with three, 15 cell linear hybrid cooling towers per unit (see Attachment 1, Section 1). As sized by SPX, each cooling tower cell would be 48 feet × 48 feet, have a discharge height at the top of the fan shroud of approximately 50 feet and require a 250 HP fan for operation. Sufficient space for the six required towers is not available in the Coastal Complex area of the SONGS facility; therefore, the towers would be located on the southwest corner of the Mesa Complex. Refer to Attachment 5, Figure 5-5 for a simplified site layout with the linear hybrid cooling towers.

Allowing for a certain degree of recirculation, SPX sized the cooling towers with a 15°F approach to wet bulb (see Figure 3.5 for definition of “approach”). GEA Power Cooling, Inc. was also contacted for information regarding the implementation of cooling towers at SONGS and independently confirmed the selection of hybrid cooling towers with a 15°F approach to wet bulb. The 15°F approach tower design point was considered the optimum trade-off between total capacity and performance, size, initial cost, and operating costs.

Figure 3.5 indicates the relationship between cooling tower design approach to wet bulb and tower size.

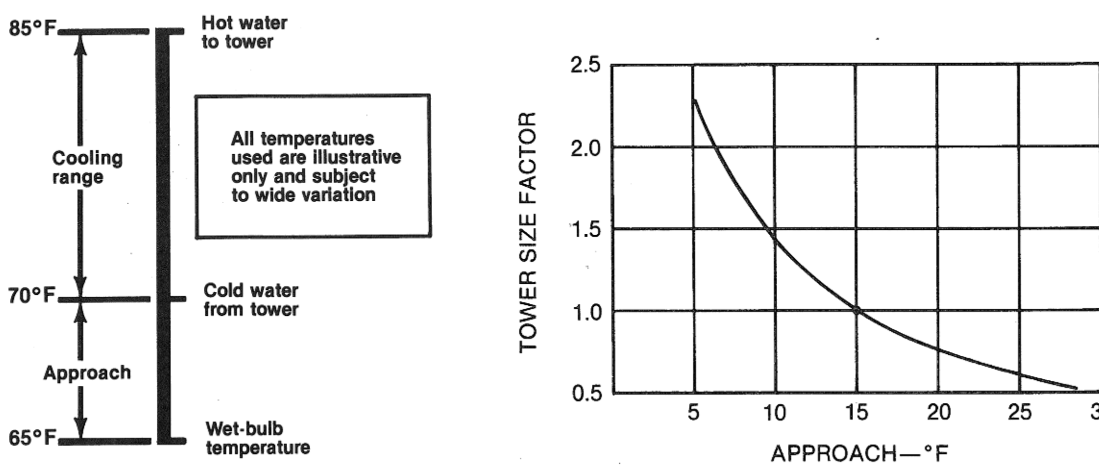

Figure 3.5 Definition of “Approach,” “Cooling Range,” and Relationship of Approach to Tower Size [Ref. 8.80]

The graph on the left shows the relationship of range and approach as the heat load is applied to the tower. Although the combination of range and gpm is fixed by the heat load in accordance with Heat Load = gpm x 8.33 lbs/gal water x range = Btu/min, the approach is fixed by the size and efficiency of the cooling tower.

The graph on the right indicates how, given two towers of equal efficiency, with proportionate fill configurations and air rates, the larger tower will produce colder water; i.e. have a closer approach. Important to note, from a tower cost standpoint, is the fact that the base 15°F approach tower would have had to have been twice as large to produce a 7°F approach, whereas it could have produced a 25°F approach at only 60% of its size.

3.1.1 Plume Abatement

As noted in Section 3.1, mechanical draft cooling towers were not selected due to the risks created by their associated visible plume. In particular, under specific atmospheric conditions at the site, a dense visible cloud of water vapor and entrained water droplets would be emitted from the tower that would have a significant negative effect to plant and commuter safety, along with causing plant operation and equipment reliability issues.

For background, Figures 5-6 through 5-11 in Attachment 5 include images of the plume emitted from Catawba Nuclear Station's mechanical draft cooling towers. Catawba Nuclear Station is similar to SONGS in that it is a two unit PWR producing over 2100 MWe; as such, SONGS would be expected to produce a similar plume if mechanical draft cooling towers were used under comparable meteorological conditions.

The selected cooling towers, linear hybrid towers, have specific attributes that minimize the visual impact of the tower's plume. A hybrid cooling tower generates no visible plume above its design threshold conditions. Based on the historical meteorological data (2004 through 2007) discussed in Section 4.2, hybrid cooling towers would generate a visible plume at SONGS less than 1% of the time. The selected design threshold, or "plume point", is a 32°F wet-bulb temperature coincident with a maximum dry-bulb temperature of 35°F; i.e., the plume will start to become visible when ambient temperatures decrease below the design plume point, although the plume will be much less dense and/or persistent than if generated by a non-plume abated tower. It should noted that a plume generated even 1% of the time has the potential to drift towards Interstate 5 and impact commuter visibility. Any impact to commuter visibility would decrease the public safety and increase SONGS liability.[5]

The potential physical impacts from a tower plume arise primarily from the moisture content, which can cause fogging during winter conditions, the salt content of the entrained moisture which can damage vegetation, and the heat content, which could potentially degrade Station heating, ventilating and air conditioning (HVAC) systems and affect onsite meteorological measurements. Additionally, the physical height of the cooling towers has the potential to disrupt local wind patterns, although the selection of linear hybrid cooling towers with a relatively low tower height would assist in mitigating the effect. The effect the plume would have on the operation and maintenance of SONGS equipment is included in Section 4.6, and detailed discussion the effect drift has on air pollution limits is included in Section 6.1.

3.1.2 Noise Suppression

Noise is energy transmitted through the atmosphere in the form of pressure waves and is expressed in the terms of decibels (dB). An A-scale weighted level (dBA) is often used to

[5] Historically, many severe vehicular accidents have been attributed to the effects of heavy fog on driver visibility. On January 15, 2007, a six car pile-up occurred on Texas Highway 73 due to cooling tower steam from a BASF refinery blowing across the highway, causing a thick fog and decreasing visibility [Ref. 8.48]. The accident left two people with minor injuries. On December 11, 1990, a dense fog on Interstate 75 near Calhoun, TN, caused a 99 car pile-up that killed 12 people and injured 42 others [Ref. 8.98]. The fog was attributed to nearby Bowater Paper Plant, which paid millions of dollars in settlements for the 1990 accident and several other fog-related accidents in the same location.

characterize the ambient sound pressure levels (i.e., noise levels) based on the human ear's perception of the measured sound level [Ref. 8.80]. There are several potential adverse impacts of noise, which include hearing loss, speech interference, sleep interference, physiological responses, and annoyance [Ref. 8.78].

Land uses often associated with noise-sensitive receptors include residential dwellings, mobile homes, hotels, hospitals, nursing homes, educational facilities, and libraries [Ref. 8.78]. As shown in Figure 3.6, the SONGS cooling towers would be located less than a mile away from the new housing at MCBCP. Additionally, several SONGS office buildings would be located directly next to the cooling towers on the Mesa Complex. The Noise Element of the City of San Diego's General Plan sets 65 dBA as the external noise exposure limit for office buildings and 60 dBA as the limit for residential units [Ref. 8.26]. These limits would not be enforced at SONGS, but represent reasonable noise exposure levels.

Figure 3.6 Location of MCBCP Housing near Cooling Towers

Cooling towers generate sound through the use of motors, power transmission units, fans, and cascading water, which typically produces a combined sound level of approximately 70 dBA at a horizontal distance of 50 feet [Ref. 8.80]. The sound level would diminish with distance, losing approximately 5 dBA each time the distance is doubled [Ref. 8.80]. The potential noise impact of the cooling towers on the Mesa Complex is shown in Figure 3.7. The noise levels shown are the levels that would be expected due to cooling tower operation only; noise from the ocean and coastal highways and railway would have additive effects on the total ambient noise in the area. If unmitigated, cooling tower noise would raise the ambient sound level at most Mesa Complex office buildings above the reasonable limit of 65 dBA. Cooling tower noise would fall to approximately 40 dBA before reaching the residential area at MCBCP. Though this level would be below the reasonable limit of 60 dBA, the ambient noise in the residential area would have to be determined by considering the additive noise impact from the cooling towers, ocean, coastal highways, and railway combined. It should also be noted that several endangered species and sensitive species are located on land adjacent to the Mesa Complex, and further studies would need to be conducted to determine if they would be impacted by the increased noise level. In order to mitigate the potential impacts of cooling tower noise, the hybrid cooling towers would be equipped with sound attenuators.

Figure 3.7 Noise impact of cooling towers without sound attenuation

3.1.3 Support and Maintenance

Cooling tower equipment requires extensive support to ensure continuous operation. Additional personnel would be required to perform daily and weekly maintenance routines on the cooling tower. Below is a task breakdown of the activities typically required by personnel to ensure continuous cooling tower operation.

- Check fans, motors, driveshafts, gear reducers
- Check gear reducer oil level
- Check electrical substation, transformers, switchgear

- Monitor local control panel and alarm displays
- Check water level in cold water basin and hot water distribution system
- Check booster pumps and associated instrumentation
- Sample water quality
- Inspect hot water distribution system
- Inspect fill for fouling
- Check gear reducer for leakage
- Adjust water quality

In addition, substantial maintenance would be required for long-term cooling tower operation. Below is a task breakdown of the activities typically required by personnel to ensure long-term cooling tower operation.

- Inspect drift eliminators and fill for clogging
- Check gear reducer oil seals, oil level, and oil condition
- Clean and repaint fans and drivers, drift eliminators, fill, hot water distribution system
- Rebalance fans and driveshafts
- Lighting inspection or replacement
- Inspect keys, keyways, set screws & tighten bolts for fans and drivers
- Change oil and check vent condition for gear reducers
- Check fan blade clearances
- Check for leakage in fill, basin and hot water distribution system
- Inspect general condition and repair as necessary all tower components including cranes and hoists
- Inspect general condition of basin, suction screen and tower casing
- Inspect/repair fans and drivers, and tower access components, including stairs, ladders, walkways, doors, handrails
- Transformer Inspection
- Starting at year 16, replacement of fan blades, fan motors, fan gearbox, fill, drift eliminators

As discussed in Sections 4.6.2 and 6.1.1, salt would be deposited by the cooling tower plume in the SONGS Coastal Complex area, potentially causing electrical arcing in the switchyard. This salt deposition could also adversely affect existing systems and equipment to the extent where additional preventative and correctional maintenance procedures would be required.

3.2 Cooling Tower Siting

The limited space available on the current SONGS property presents a significant challenge for siting cooling towers. The footprint of each tower would be approximately 56 feet wide, 721 feet long, and 50 feet high. Each of the six towers would be placed 1.5 tower widths spacing between parallel towers, thus creating a total impact of at least 14 acres of land. Sufficient space for the six required towers is not available in the Coastal Complex area of the existing SONGS facility; it is unlikely that protected habitat could be acquired from State Parks or used for cooling towers. Therefore, the towers would need to be located on the Mesa Complex. Attachment 5, Figure 5-5 provides an aerial view of the site and overlaying layout of the six cooling towers and the associated piping. Details on the cooling tower siting, including the selection of the Mesa Complex, the location of new closed-loop cooling equipment, relocation of existing facilities, construction spoils, and security issues are discussed in the sections below.

3.2.1 Coastal Complex / Mesa Complex Comparison

The SONGS facility currently occupies two separate areas, the Coastal Complex and the Mesa Complex, as discussed in Section 2 and shown in Figure 2.1. The Coastal Complex area is densely occupied by the Unit 2 and Unit 3 reactors and supporting structures and equipment. An employee parking lot occupies the northwest end of the Coastal Complex area. The northwest end of the Coastal Complex is bounded by the San Onofre Surf Beach area of San Onofre State Beach. The southeast end of the Coastal Complex is bounded by a protected Southern Coastal Bluff Scrub habitat in San Onofre State Beach. Installing cooling towers near the Coastal Complex area would require the relocation of the employee parking lot and the likely implementation of a parking deck and shuttling system, the acquisition of the San Onofre Bluffs and Surf Beach, and the necessary permits to construct cooling towers in the protected Southern Coastal Bluff Scrub habitat.

In addition to these land use concerns, cooling tower installation on the Coastal Complex area would present technical concerns. To minimize recirculation effects, rectilinear cooling towers should be placed with their axis in parallel with the prevailing site winds [Ref. 8.15; Ref. 8.16]. The prevailing winds at SONGS are perpendicular to the coastline (northeasterly and southwesterly, as shown in Attachment 5, Figure 5-10), making parallel placement of cooling towers with respect to the prevailing winds on the Coastal Complex area infeasible. To compensate for the thermodynamic inefficiency of significant recirculation resulting from perpendicular placement of the cooling towers with respect to the prevailing winds, the towers would need to be much larger. The cooling towers that would be required to reject the substantial SONGS heat loads, including recirculation considerations, would be too large for placement on or near the Coastal Complex area, unless large areas of the San Onofre State Beach were acquired. Since it is unlikely that SONGS would be able to obtain San Onofre State Beach land from the State of California to accommodate these towers, siting of cooling towers on the Coastal Complex area is considered infeasible.

If only Unit 2 were to construct cooling towers near the Coastal Complex area the cooling towers would be sized much larger than comparable towers sized for Mesa Complex operation and would require large diameter piping to be extended around the Independent Spent Fuel Storage Installation (ISFSI) at a length equal to or greater than that if the cooling towers were to be sited at the Mesa Complex. As there is no discernable advantage to siting only one unit's towers near the Coastal Complex area, and the recirculation effect on these towers would require much larger cooling towers be constructed than would be required at the Mesa Complex, siting of only Unit 2's cooling towers near the Coastal Complex area is not further considered.

The Mesa Complex would allow placement of the cooling towers parallel to the prevailing winds on site. However, since optimal spacing between parallel cooling towers is one tower length [Ref. 8.15; Ref. 8.16], even towers sited on the Mesa Complex would be impacted by recirculation. Therefore, the cooling towers at SONGS would be designed to account for a minimal amount of recirculation (i.e., recirculation would be present although it would be significantly less than that for towers oriented perpendicular to prevailing winds). This consideration was included in the design and pricing of the cooling towers quoted by SPX (see Attachment 1). In order to account for the cooling needs and recirculation effects at SONGS, SPX selected six linear hybrid towers for conversion to closed-loop cooling, occupying approximately 14 acres of land.

3.2.2 Location of New Closed-Loop Cooling Structures

Conversion of SONGS to closed-loop cooling would require the siting and construction of several structures ancillary to the cooling towers. Specifically, these structures can be broken down into three categories: (1) hot and cold reservoirs, (2) electrical distribution and control, and (3) booster pump skids. The hot and cold reservoir siting would be necessitated by the intake to and discharge from the main condenser, and is detailed in Section 3.3. Two electrical distribution buildings and one power and control building would be located on the Mesa Complex to support cooling tower and booster pump operation. Additionally, two electrical distribution buildings would be located near the common switchgear yard to provide power to the new recirculation pumps. All five electrical buildings are described in detail in Section 3.8.6. Finally, one booster pump skid per unit would be required to house the pumps necessary to pump circulating water from the wet suction of the cooling tower up through the dry heat exchanger. These pumps, and the new structures described above, are overlaid on an aerial view of the site shown in Attachment 5, Figure 5-5.

3.2.3 Relocation of Existing Facilities

The south corner of the Mesa Complex would best accommodate cooling towers at SONGS, due to the relatively close proximity to Unit 2 and Unit 3 when compared to the rest of the Mesa Complex area. The south corner is currently occupied by a Recreational Vehicle (RV) park, an area for security training exercises, and an area for drying kelp removed from the CWISs. These areas would need to be permanently relocated to accommodate cooling tower construction. Facility relocation would need to be evaluated during the detailed design phase; facilities would possibly be condensed to remain at the Mesa Complex or moved to an offsite location.

As noted in Sections 3.3 and 3.4, several existing facilities and equipment would be impacted by the conversion to closed-loop cooling. The siting of the cooling tower in the southwest corner of the Mesa Complex and the routing and depth of the tunneling was selected to allow for most surface structures to remain intact; however, buildings with an extensive underground footprint would need to modified or relocated to a non-impacted area of the site.

3.2.4 Construction Spoils

SONGS sits on the San Mateo Formation of massive thick, bedded sandstone [Ref. 8.75]. The San Mateo Formation is partially covered by a layer of alluvium, which is composed of a variety of loosely-packed materials (silt, gravel, clay, sand, etc.) that have been deposited by water runoff. Conversion of SONGS to closed-loop cooling would require the relocation or removal of approximately 297,210 cubic yards of sandstone and alluvium.

The cooling tower basin dimensions would be 56 feet by 721 feet at an expected depth of 5 feet (see Attachment 1), requiring excavation of approximately 44,870 cubic yards. The 12 foot diameter circulating water pipes would be grouted in place in the tunnels, requiring approximately 1 foot of additional clearance around the circumference of the pipe for a total diameter of 14 feet. The construction of eight circulating water piping tunnels, described in detail in Attachment 2, would require the excavation of approximately 195,820 cubic yards of sandstone and alluvium. The tunneling excavation would include the construction of two entrance shafts and two exit shafts. The entrance shafts would be located at the cooling tower site on the Mesa Complex. Some additional piping would be required to connect the cooling tower outlet with the tunneled piping.

On the Coastal Complex, the portion of circulating water piping running along the seawall to connect to the circulating water reservoirs would be installed by trenching. The circulating water reservoirs and trenched piping at the seawall would require the excavation of an additional 32,950 cubic yards for Unit 2 and 23,570 cubic yards for Unit 3.

The construction of six mechanical-draft, rectilinear, hybrid cooling towers, eight circulating water pipes, and four circulating water reservoirs would therefore require the excavation of approximately 297,210 cubic yards of sandstone and alluvium. For the purposes of determining cooling tower feasibility, it is conservatively assumed that these spoils would be free of pollutants and could either be stored on-site or hauled off-site for disposal. However, during detailed design, it would be necessary to assess the condition of the spoils which could lead to sampling, pollutant separation, and/or costly off-site disposal methods. The cost of spoils disposal is addressed in Section 5.2.1; however, it should be noted that these costs would increase dramatically if the spoils contained pollutants.

3.2.5 Security Issues

Currently, the Protected Area (PA) is located within the Coastal Complex area, encompassing the reactor buildings and connected structures. The existing circulating water intake pipes extend offshore from the SONGS PA into the Pacific Ocean; therefore, the implementation of closed-loop cooling and the associated cooling towers and piping outside the PA would not be expected to significantly increase any security risks. However, as the cooling towers would represent a new point of access to the PA through the new circulating water pipes, a full review of the project design and schedule by qualified security personnel would be required to identify any additional measures necessary to ensure the continued security of the plant. At a minimum, secured grating and a remote monitoring system would be required at the cooling tower collection basins on the Mesa Complex. In addition to these measures, the massive flow rates and dramatic elevation drops within the circulating water pipes inherently serve to protect the security of the plant.

3.3 Reservoir / Pump Pit Construction

To support the closed-loop cooling of each unit, two circulating water reservoirs / pump pits would be constructed between the turbine buildings and the seawall (see Attachment 5, Figure 5-2). Reservoirs, as opposed to direct circulating water pipe tie-ins, provide a means to dissipate kinetic energy built up in the circulating water as it transports through the cooling water system. In this capacity, the placement of a reservoir downstream of the cooling towers protects the condenser and TPCW system from being damaged by the energy accumulated in the circulating water as it descends from the Mesa Complex, and the placement of a reservoir upstream of the cooling towers protects the condenser and TPCW system from similar damage caused by the circulating water during a loss of power event. Additionally, reservoirs allow significant operational flexibility, whereby the reserve volume in each reservoir acts as a buffer against flow disruptions and equipment failure. One set of conceptual operating procedures is discussed in Section 3.7 to investigate the major challenges to the operation of a closed-loop cooling system of this configuration.

The Unit 2 and Unit 3 reservoirs / pump pits are detailed in Attachment 5, Figure 5-3 and Figure 5-4, respectively. For each unit, a relatively shallow (approximately 22 feet deep) hot water basin would collect heated condenser outlet water for the three recirculating water pumps that supply the cooling towers. A relatively deep (approximately 40 feet deep) cold water basin would collect cooled cooling tower outlet water for the three circulating water pumps that supply the condenser.

3.3.1 Existing Facilities and Equipment Interferences

Construction of the circulating water reservoirs / pump pits for each unit would impact nearly all existing structures between the turbine building and the seawall. In the area that would house the reservoirs / pump pits, the TPCW heat exchangers and the seawall are critical structures that should not be impacted in any way that would prevent these structures from functioning as designed after closed-loop conversion. The TPCW heat exchangers provide cooling water to equipment throughout the turbine building; relocation of the TPCW heat exchanges would require extensive rerouting, likely increasing the length of equipment supply lines and reducing the cooling capacity of the system. Figures 5-11 and 5-12 in Attachment 5 highlight those structures and equipment identified as being critical in red. Non-critical structures and equipment that would be impacted are highlighted in green and include structures and equipment which would need to be removed, relocated, or replaced. Structures that would be impacted by the construction of the reservoir / pump pit include the following:

- TPCW Pumps
- Amertap Strainer Section and Pumps
- Caustic Bulk Storage Tank

- Sulfuric Acid Storage Tank
- Bulk Ammonia Storage Tank[6]
- Dirty Lube Oil Storage Tank
- Clean Lube Oil Storage Tank
- Turbine Plant Cooling Water Storage Tank
- Sodium Hypochlorite Tank
- Circulating Water Pumps
- Maintenance Building 1

The Amertap Strainer Section and Pumps and the Circulating Water Pumps would be removed. As detailed in Section 4.5, the Amertap system has been abandoned and its removal would not impact plant operations. The four existing Circulating Water Pumps would be replaced with three new Circulating Water Pumps, located in the cold water basin (see Attachment 5, Figure 5-3 and Figure 5-4). All other identified structures would need to be relocated or replaced after construction. Several smaller structures or structures not clearly identified on the UFSAR plant drawings would also be impacted. These structures are shown in green on Attachment 5, Figures 5-11 and 5-12, but are not listed above.

After installation of closed-loop cooling the cold and hot water basins would restrict access to the intake structure, likely eliminating access needed for alternate emergency conditions and to remove the intake / discharge gates and trash baskets. It should be noted that impacts on access to the intake structure are not accounted for in this design, and while they are not likely to impact the feasibility of a closed-loop cooling retrofit, they may significantly increase the costs of maintaining the intake structure equipment.

3.3.2 Flooding Issues

The cold water basins for each unit would be connected to their respective discharge canals by a 48-inch diameter blowdown / overflow pipe (shown in Attachment 5, Figure 5-3 and Figure 5-4), which would discharge the required blowdown flow calculated in Section 4.4. An adjustable weir wall at the edge of the cooling tower basin and a throttling valve installed in the cooling tower return piping would regulate the flow of circulating water into the cold water basin. During startup and shutdown in particular, there may be some overflow to the cold water basin as the control valves are adjusted. This overflow from the cooling towers would also be discharged through the 48-inch diameter blowdown / overflow pipe. In the event of a closed-loop cooling equipment failure or loss of power, the basins would be designed to flood over the seawall rather than into the plant. It should be noted that additional engineering design would be required to ensure public safety would not be compromised by the discharge of cooling water across the SONGS seawall during a loss of power event.

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[6] Impacts to the Ammonia Storage Tank may require a revision to the SONGS California Accidental Release Prevention Risk Management Plan (CalARP RMP).

3.4 Circulating Water System Piping

Conversion to closed-loop cooling at SONGS would require eight new circulating water pipes which would be 12 feet in diameter to accommodate required operational flow. These pipes would connect the hot and cold water basins on the Coastal Complex to the cooling towers on the Mesa Complex. The substantial elevation change between the Coastal Complex and Mesa Complex areas would present a significant design challenge to the operation of large-diameter piping connecting the two areas. Each cooling tower return pipe would carry 415,000 gpm from the cooling tower basin down to the cold water reservoir, creating a significant inertial force. Flow resistance could potentially be increased by installing a nozzle and butterfly valve in each cooling tower return pipe.

3.4.1 Pipe Routing / Interferences

The routing of these pipes, shown in Attachment 5, Figure 5-5, was based on avoiding several existing structures critical to plant operation that therefore should not be affected by pipe installation.

Critical structures that served as pivot points for the pipe routing are shown in red in Attachment 5, Figures 5-11 and 5-12. These pivot points include the seawall, the diesel generator building for each unit, and the fire water storage tanks. It should be noted that while the seawall would not be relocated post conversion, the foundations would likely need to be rebuilt to ensure the integrity of the structure. Any impacts to the seawall would be addressed during construction of the cold and hot water basins.

Non-critical structures that would be impacted by the installation of the closed-loop cooling pipes are shown in green on Figures 5-11 and 5-12 of Attachment 5. The impacted structures are those that would need to be tunneled beneath. Tunneling beneath structures would be at a low enough depth that surface structures could remain intact; however, buildings with an extensive underground footprint may need to modified or relocated to a non-impacted area of the site. In particular, the soil-structure interaction analysis for the Unit 3 diesel generator building and underground fuel oil tanks would need to be evaluated for potential impact, and underground pipes near the Unit 3 diesel generator building would need to be designed for seismic II/I concerns. Additionally, since the turbine buildings for both Unit 2 and Unit 3 are designed for seismic II/I concerns, piping near each turbine building would need to be evaluated for potential impact. Impacted structures include the following:

- Sewage Treatment Plant
- Maintenance Buildings 2
- Services Building
- K 40/50 Building

Several smaller structures or structures not clearly identified on the UFSAR plant drawings would also be impacted. These structures are shown in green on Figures 5-11 and 5-12 of Attachment 5, but are not listed above. It should be noted that all underground utilities may not be precisely known and careful investigation of those areas impacted by the closed-loop retrofit would be required.

3.4.2 Tie-In Locations

The closed-loop cooling system piping would tie in to the existing condenser circulating water pipes and the discharge canal for each unit, as shown in Attachment 5, Figure 5-3 and Figure 5-4. Cooled water returning from the cooling towers would accumulate in the cold water basin before being pumped to the condenser via three new circulating water pumps. The new circulating water pumps would feed into a common header for each unit, which would tie in to the existing circulating water piping at the location of the existing circulating water pumps. The existing circulating water pumps, which would no longer be in service, would be removed to facilitate the new circulating water system tie-in. The required blowdown flow, discussed in Section 4.4, would be released through a 48-inch diameter pipe connecting the cold water basin to the existing discharge canal, as shown in Figure 5-3 and Figure 5-4 of Attachment 5. The circulating water exiting the condenser flows to the hot water basin via the existing discharge canal and a short connecting pipe between the existing discharge canal and the hot water basin.

3.4.3 Existing CWIS Abandonment

The existing CWIS would be integrated into the new closed-loop cooling system design such that only small sections of existing CWIS piping would no longer be used after conversion to closed-loop cooling, as shown in Figure 5-3 and Figure 5-4 of Attachment 5. The existing intake structure would remain in operation to provide the saltwater cooling water system flow and makeup flow to the condenser inlet through the new makeup pump installed in the existing intake pumpwell. The existing discharge structure would be utilized to discharge the blowdown released from the cold water basin. The discharge pipelines from the condensers would be extended to the hot water basin. The discharge structure between this extension of the condenser outlet pipeline and the location of the new blowdown pipe tie-in would be abandoned. Additionally, at each unit, the four existing circulating water pumps would be removed and replaced by three new circulating water pumps in the cold water basin and three new recirculating water pumps in the hot water basin.

3.5 Tunneling

The eight circulating water pipes transporting cooling water between the condensers and cooling towers would be primarily installed underground by tunneling from the Mesa Complex to the Coastal Complex area. The feasibility, cost, and schedule of tunnel construction have been evaluated by Mr. Robert A. Reseigh, a tunnel project development consultant with over forty years of experience in underground construction. Mr. Reseigh's full evaluation and credentials are included in Attachment 2.

3.5.1 Tunnel Construction with Coastal Highways and Railway in Use

The tunnels would be constructed using an Earth Pressure Balance (EPB) Tunnel Boring Machine (TBM) as the primary tunneling method. The EPB method allows tunneling in wet, soft, or unstable ground and would be necessary for tunneling in the water-permeable San Mateo formation near the Pacific Ocean (see Attachment 2). Tunnels constructed by this method avoid surface disturbance and would not inherently require any disruption of traffic on the coastal highways and railway. Using EPB or similar trenchless tunneling technology, tunnels have been constructed under interstates and/or railroads across the country with no traffic disruption [Ref. 8.41; Ref. 8.45]. Thus, with adequate planning and coordination with transportation authorities, tunnel construction would likely be possible with Interstate 5, the NCTD Railway, and old U.S. Highway 101 in use. Since Burlington Northern Santa Fe (BNSF) Railway is the only railway currently allowed to carry freight on the NCTD Railway line [Ref. 8.75], the BNSF Railway requirements were also considered for the tunneling design.

The California Department of Transportation (CalTrans), the NCTD Railway, and the BNSF Railway would require a full engineering study and geotechnical survey before the circulating water pipeline crossings could be permitted. The estimated cost for these studies is included in the tunneling cost estimate, as noted in Attachment 2, Section 1. General guidelines provided in the CalTrans *Manual for Encroachment Permits on California State Highways* [Ref. 8.21] and the BNSF *Utility Accommodation Policy* [Ref. 8.6] were considered in the tunnel design and construction; however, the general CalTrans and BNSF tunneling guidelines are specified for up to 48-inch and 72-inch diameters, respectively. Conversations with CalTrans and BNSF permitting personnel (Attachment 2, Section 3) confirmed that the large diameter and number of pipeline crossings required for closed-loop cooling conversion at SONGS would demand significantly different tunneling requirements than described in these guidelines. Additionally, each of the eight tunnels would likely require three separate right-of-way encroachment permits for crossing beneath Interstate 5, the NCTD Railway line, and old U.S. Highway 101. Per correspondence with the CalTrans Encroachment Permits Branch Chief, a minimum spacing between pipes of twice the pipe diameter would be required for crossing beneath Interstate 5, a requirement which is incorporated in the proposed conceptual design.

3.5.2 Security Issues

Tunnel construction would require a staff of approximately 60 people (see Attachment 2). The majority of the staff would require site access to both the Mesa Complex and Coastal Complex areas (including the PA). Construction activities would likely require compensatory security measures due to tunneling from the Mesa Complex to the PA. A full review of the project design and schedule by qualified security personnel would be required to identify any additional security measures associated with tunnel construction. At a minimum, temporary remote monitoring systems would be required in the tunneling work sites and a security officer stationed at the tunnel entrance.

3.6 Intake and Discharge Structure Modification

The closed-loop cooling system would be specifically designed to replace only the portion of seawater intake that does not serve engineered safety features (ESF). Therefore the saltwater cooling system (a critical ESF) would continue to operate as currently designed, with the existing intake structure continuing operation to provide saltwater cooling system flow. The makeup water for closed-loop cooling (discussed in Section 4.4) would also be supplied through the existing intake structure, via a new makeup water pump and pipeline installed within the existing pumpwell. As noted in Section 3.3.1, the existing circulating water pumps would be removed from the existing pumpwell and replaced by new circulating and recirculating water pumps in the cold and hot water basins. The reduced flow through the intake structure, from the current 864,000 gpm to the estimated 72,000 gpm, would likely require operational modifications of the traveling screens and fish elevator. No additional structural modifications would be expected beyond the circulating water pump removal and makeup pump and pipeline installation.

The existing discharge structure would continue operation to release low volume plant effluents, saltwater cooling flow, and the blowdown of the closed-loop cooling system (as discussed in Section 4.4). The plant effluent and discharge concentrations are further discussed in Section 4.5.

The cooling towers and auxiliary components of the closed-loop cooling system would not be safety-related equipment. In the event of a failure in the closed-loop cooling system, the plant would be able to achieve safe shutdown without any modification to the current engineered safety features.

3.7 Operation of Closed-Loop Cooling

This section contains a theoretical discussion on one potential set of closed-loop cooling operating scenarios for SONGS. Retrofitting a nuclear power plant from a once-through cooling design to closed-loop cooling has not occurred; therefore, there is a large degree of uncertainty in the operation of any closed-loop cooling retrofit. The site-specific constraints at SONGS further increase the complexity and uncertainty of operational design, due to the unprecedented nature of operating cooling towers at a nuclear power plant where the condenser is significantly lower than the elevation of the cooling tower basin. One theoretical scenario of operational procedures is outlined below in an attempt to provide background on the expected complexity of operating closed-loop cooling at SONGS; however, this scenario is purely theoretical and would require significantly greater design detail than is included within this feasibility study prior to consideration as a legitimate operational scheme.

The startup, steady-state operation, and shutdown of the closed-loop cooling system would require careful consideration during the detailed design phase to resolve challenging issues associated with operating the facility in a closed-loop cooling configuration. Balancing the circulating water flow between the cooling tower basin, hot water basin, and cold water basin would dramatically increase the potential for flow variability (i.e., at times the flow rate of a circulating water pump or recirculating water pump may need to be reduced or stopped to maintain adequate inventory in each basin). The control scheme, discussed further in Section 3.8.8, would be extremely complicated, require a programmable logic control system and redundant instrumentation, and need to be capable of balancing the closed-loop cooling equipment to meet ambient environmental conditions and plant operation requirements while maintaining adequate inventory in all three basins.

3.7.1 Closed-Loop Cooling Start-up

Gradual start-up of the closed-loop cooling system would require individual pumps to be started in sequence, as shown in Figure 3.8. An adjustable weir wall at the edge of the cooling tower basin would also be required. To initiate start-up, the start-up pump and one of the three new recirculating water pumps would begin operation. The start-up pump would provide 277,000 gpm to maintain the water level in the hot water reservoir while the recirculating water pump would supply water to the cooling towers. Cooling water would accumulate in the cooling tower basins to a predetermined level, when the weir wall would be adjusted to allow cooling water to flow back to the cold water basin, where a circulating water pump would be started. A second recirculating water pump would be immediately started to accommodate the increased flow into the hot water basin. The resulting increased flow rate to the cooling towers would raise the basin inventory to an intermediate level, when the weir wall would be adjusted again and a second circulating water pump and a third recirculating water pump would be started. Again, the increased flow to the cooling towers would raise the basin inventory. When the cooling water in the basin reached the design reservoir level, the weir wall would be adjusted to allow the full design flow of 415,000 gpm through each cooling tower return pipe. The third circulating water pump would be started and the start-up pump flow would turned off, completing the startup sequence.

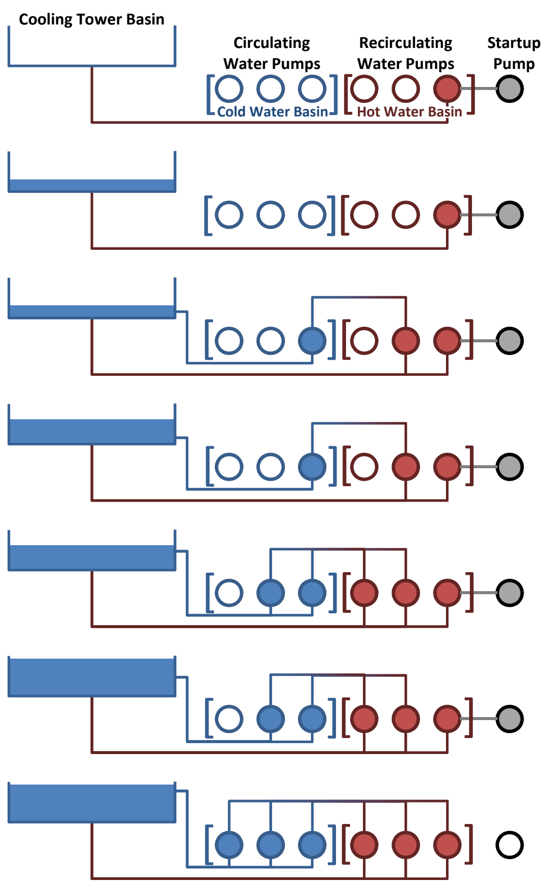

Figure 3.8 Closed-Loop Cooling Startup Sequence

3.7.2 Steady-State Closed-Loop Cooling Operation

The steady-state operation of closed-loop cooling would depend on reliable control of the pump submergence in the hot and cold water basins. Submergence would primarily be maintained by adjusting makeup or blowdown flow through throttling valve adjustments. The adjustable weir wall at the edge of the cooling tower basin and the throttling valve in the cooling tower return piping would provide a secondary method of regulating the submergence level in the cold water basin. In case of a severe loss of inventory in the hot water basin, the start-up pump would be used to provide a large influx of water. In the case of a severe loss of inventory in the cold water basin, the weir wall would be adjusted to provide a large influx of water. While the water available to the start-up pump from the Pacific Ocean is essentially unlimited, the available inventory in the cooling tower basin is finite. A detailed design study would be required to determine whether a secondary means of providing large amounts of water to the cold water basin would be necessary. For example, a spare recirculating water pump used in conjunction with the startup pump could provide the cold water basin with additional water flow. However, an additional recirculating water pump represents a significant cost increase and an additional complexity factor that would need to investigated during the detailed design phase. Likewise, a detailed design study would be required to determine the potential need for variable speed pumps in the system. If the relatively small range of flow variability provided by throttling valves would not accommodate the expected variability in the basin inventories, variable speed pumps would likely be required for at least one recirculating pump, the start-up pump, and/or the makeup pump. Again, variable speed pumps represent a significant cost increase that would need to be investigated during the detailed design phase.

The vendor minimum recommended submergence for both the circulating and recirculating water pumps is 12 feet (see Attachment 1, Section 3). If flow to the cold water basin was suddenly cut off, the minimum recommended submergence would be reached in approximately 2 to 2.5 minutes. Restricted flow to the hot water basin would occur as a result of a circulating water pump deficiency, whereby the resulting cold water basin overflow would provide sufficient submergence for the hot water basin pumps. Deeper reservoirs would provide additional margin, but would also represent additional costs and an extended construction schedule. A detailed design study would be required to determine whether the start-up pump and/or weir wall could provide sufficient emergency water flow to the basins within 2 to 2.5 minutes. If not, deeper reservoirs for additional margin could be necessary.

It should be noted that the extent of steady-state variability of the system in operation is very difficult to predict in theoretical design. Therefore, the system is reasonably expected to be highly unreliable, which could result in frequent plant shutdowns and corresponding power generation losses.

3.7.3 Closed-Loop Cooling Shutdown

Two modes of closed-loop cooling shutdown would be required: routine shutdown (e.g., scheduled outage) and emergency shutdown (e.g., pump failure). In routine shutdown, the blowdown pipe would be fully opened while the makeup pump would be turned off. As the total cooling water inventory in the system decreased, the cooling tower basin weir wall would be adjusted and the circulating and recirculating water pumps would be shut down individually. The routine shutdown sequence would be nearly the opposite of the startup sequence shown in Figure 3.8. In the case of emergency shutdown, the weir wall at the edge of the cooling tower basins would be adjusted to stop flow from the cooling towers and the blowdown pipe would be fully opened. In the event of loss of power to the circulating water pumps, the water inventory remaining in the cooling tower return pipes after the weir wall closed would likely overflow the cold water basin. The cold water basins would be designed to discharge excess flow over the rocky seawall, as described in Section 3.3.2. Check valves would be installed directly downstream of the recirculating water pumps to prevent the water inventory in the cooling tower supply piping from flooding the hot water basin. A detailed water hammer calculation would be required to properly size the check valves and ensure feasibility. In the event of a check valve failure, the hot water basin would also be designed to discharge excess flow over the seawall. It should be noted that additional engineering design would be required to ensure public safety would not be compromised by the discharge of cooling water across the SONGS seawall during a loss of power event.

3.8 Significant System Modifications

The significant equipment and structures necessary for closed-loop conversion are discussed at length in preceding paragraphs. The following section aggregates the impact each of these equipment and structures has on the existing plant systems. As conversion to closed-loop cooling would produce warmer inlet water temperatures under most conditions and thus impact nearly all plant systems, only those systems that could be significantly altered are discussed below.

3.8.1 Pumps

New circulating and recirculating water pumps would be required for closed-loop cooling, representing a significant component of the overall cooling system conversion. Whereas the existing once-through configuration requires only enough pumping head (pressure) to overcome flow losses in passing water from the Pacific Ocean through the condenser and returning to the ocean, the closed-loop cooling configuration requires increased pump head to pump the circulating water up to the elevated cooling tower spray headers on the Mesa Complex and overcome the significant internal flow losses of the cooling tower. The four existing circulating water pumps of each unit would be replaced by three new circulating water pumps and three new recirculating water pumps, as shown in Figure 5-3 and Figure 5-4 of Attachment 5. The four existing circulating water pumps were designed for 38 feet of head. The three new circulating pumps would supply the same volume of cooled water from the cold water basin through the condenser and would also be designed for 38 feet of head. The three new recirculating water pumps would pump the heated condenser outlet water from the hot water basin to the cooling towers on the Mesa Complex, requiring approximately 120 feet of head. At the cooling towers, four additional booster pumps would be required for each tower (12 booster pumps per unit) to pump the circulating water to the dry cooling section at the top of each tower. The cooled water would return from the cooling towers to the Coastal Complex by gravity-driven flow. Single speed pumps are adequate for the closed-loop cooling configuration as a constant circulating water flow rate would be required to provide a flow balance between the Coastal Complex reservoirs and cooling tower basins; Attachment 1, Sections 3 and 4 contains reference information on the proposed new pumps and necessary motors.

One start-up water pump, identical to the new circulating water pumps, would be installed in each existing intake structure to support closed-loop cooling system start-up (discussed in Section 3.7.1). The start-up pump would need to provide the full 277,000 gpm flow rate of one recirculating water pump to support closed-loop cooling start-up; therefore, the smaller capacity makeup pump could not be used for this purpose.

The makeup water pump would be sized to provide the design makeup water flow of 37,848 gpm (discussed in Section 4.4.1). A butterfly valve would be installed downstream of the makeup water pump to throttle the makeup flow across a relatively small range of flow rates. The variable makeup flow rate would be necessary to maintain a steady circulating water inventory in the hot and cold water basins, as described in Section 3.7.2. In cases where more significant basin inventory increases are required, the start-up pump or the weir wall at the edge of the cooling tower basin would be used to provide a large influx of water to the hot or cold water basins, respectively.

The new circulating and recirculating water pumps represent significant additional electrical loads. The existing circulating water pumps have 2500 HP motors. The new circulating and recirculating water pumps would each require an estimated 3400 HP and 11,000 HP, respectively. A dedicated substation, fed directly from the switchyard, would be required for each new pumphouse. Attachment 4 contains reference information on the new transformers and associated electrical switchgear for the pumphouse substations.

Maintenance of the new circulating water and start-up pumps would be similar to that required by the existing circulating water pumps; however, the new recirculating water pumps would require additional maintenance support. It would be expected that pump maintenance support for the new recirculating water pumps would include the replacement of components such as pump impellers, motors, or entire assemblies. Major equipment rehabilitation or replacement is estimated to occur every 20 to 40 years after the equipment is placed into service.

3.8.2 Main Steam Condenser

The main condensers at SONGS were designed for a stable and cold seawater source. The increased condenser water inlet temperature due to the conversion to closed-loop cooling would result in the performance losses detailed in Section 4. To offset these losses, a size increase of the condenser would be required. A condenser modification of this sort is unprecedented (i.e., implementation of a condenser redesign of this magnitude has never occurred at an operational nuclear power plant).

The orientation of the Unit 2 and Unit 3 main condensers is such that the entire turbine building is built on top of, and around, the main condenser. The net result of the main condenser location is that any significant increase to the size of the condenser would require a complete disassembly and reconstruction of the turbine building, along with the accompanying modifications/additions to the turbine building following condenser modification.

Due to the magnitude of this redesign and the lack of any history of a nuclear plant undertaking such a modification, it is concluded that the current cooling water equipment configuration could not be modified in such a way that enhances its cooling performance enough to compensate for closed-loop operational losses.

3.8.3 Saltwater Cooling System

The closed-loop cooling system would be specifically designed to replace only the portion of seawater intake that does not serve engineered safety features. Therefore, in the event of a failure in the closed-loop cooling system, the plant would be able to achieve safe shutdown without any modification to the current engineered safety features. The saltwater cooling system (a critical ESF) would continue to operate as currently designed. No modification to the saltwater cooling pumps or other equipment would be necessary.

3.8.4 Turbine Plant Cooling Water System

Saltwater for the TPCW system is currently supplied by the existing circulating water pumps. The new circulating water pumps tie in at the location of the existing circulating water pumps, requiring no modifications to the TPCW intake. The TPCW system would be affected by the temperatures produced by the new closed-loop cooling water system; however, since the water for the TPCW system is considered cooling water and is not an ESF, nor is it downstream of any ESF designated system, the water would need to be supplied by the cooling towers. The discharge of the TPCW system would be routed to the hot water basin, where it would be combined with the circulating water as it discharges from the condenser to be subsequently pumped to the cooling towers.

3.8.5 Required Mechanical Modifications

The major mechanical modifications associated with conversion to closed-loop cooling would be the installation of six hybrid, mechanical-draft, rectilinear cooling towers (Section 3.1 and 3.2) and the associated circulating water piping (Section 3.4 and 3.5). Two circulating water reservoirs (Section 3.3) would be installed at each unit for the circulating and recirculating water pumps (Section 3.8.1).

The cooled circulating water flow returning from the cooling towers would likely be controlled by a nozzle and a 144” butterfly valve near the end of each circulating water return pipe. Three check valves would be installed on the discharge of each of the three new recirculating pumps, as shown in Figure 5-3 and Figure 5-4 of Attachment 5, to prevent backflow from the cooling towers. A 48” blowdown pipe would connect the cold water basin to the existing discharge canal (Section 3.4.2 and Attachment 5, Figure 5-3 and Figure 5-4); the blowdown flow would be controlled by a 48” butterfly valve.

An adjustable weir wall would be required at the edge of the cooling tower basin to control basin inventory and regulate flow to the cold water basin.

3.8.6 Required Electrical Modifications

Extensive electrical modifications would be required to supply power to the pumps, fans, and other equipment required for closed-loop cooling operation. As shown in Attachment 4, multiple transformers would be required to convert the high capacity, high-voltage power supply to the appropriate voltage levels for necessary cooling tower equipment (i.e., pumps, fans, etc.) on both the Mesa Complex and Coastal Complex areas. Additional switchgear would need to be added to the switchyard for the recirculating pumps. Cables, conduits, and breakers would also need to be installed to connect each series of equipment to its power source. The electrical equipment, along with the material and labor required for installation, are detailed in Attachment 4.

3.8.7 Required Civil Modifications

Six cooling tower basins (Section 3.1 and 3.2) and two circulating water reservoirs (Section 3.3) would need to be constructed for each unit for the conversion to closed-loop cooling. A booster pump skid would be required to support the twelve booster pumps required by each unit's cooling towers for plume abatement operation (Section 3.2). Valve pits would be installed to allow access to the circulating water piping valves and expansion joints (Section 3.8.5). The civil structures, along with the material and labor required for installation, are detailed in Attachment 4.

3.8.8 Required Instrumentation and Control Modifications

Two controller schemes would be required for the operation of closed-loop cooling at SONGS. The interaction of the closed-loop cooling components would require a complex control scheme to ensure a balanced steady-state operation; in particular, the flow rates throughout the circulating water loop would be maintained by pump and valve controls managed by a programmable logic control (PLC) system. The second controller scheme would be required for cooling tower operation.

To manage cooling tower performance, and to safely start-up and shutdown the cooling towers, each cooling tower cell's fan and each booster pump would need to have the ability to be individually operated to control air flow rate and plume abatement for each cell. To accomplish this, the cooling tower controller scheme would be implemented to provide operators the ability to manually and/or automatically control each cooling tower cell.

The cooling tower PLC system would be utilized to reduce tower operating costs while maintaining plume abated operation. Since each cooling tower cell's fan draws air in through both the wet and dry sections, reducing fan speed would reduce the effective cooling capacity of the cooling tower, and thus decrease the net power generated by SONGS (the relationship between circulating water temperature and net power generation is discussed in Section 4.2). To avoid power losses, each cooling tower cell's fan would operate at full speed; however, each of the four booster pumps supplying each cooling tower would be capable of controlling plume abatement by either powering up or powering down each pump as ambient conditions required.

For a given ambient condition, algorithms would determine the optimum number of booster pumps to have in operation to achieve plume abatement. Ambient conditions such as wet-bulb temperature and dry-bulb temperature would be input into the cooling tower PLC. Based on the operating algorithms, the PLC would adjust the flow of hot water through the dry section by controlling the number of booster pumps in operation. Ultimately, the PLC would determine the mix of dry and wet section air such that the resulting combined effluent plume would be sub-saturated/superheated, and hence not visible.

Control equipment would be housed in the Power and Control Building, constructed near the cooling towers as shown in Attachment 5, Figure 5-5. The Power and Control Building, along with the material and labor required for installation, are detailed in Attachment 4.

4 Operational Impacts

SONGS is water-dependent – meaning both that it requires a specific quantity and temperature of water – and currently uses consistently cold seawater from the Pacific Ocean. The Pacific Ocean is the most reliable source of cooling water at SONGS, promoting the efficient generation of electricity and ensuring an uninterrupted supply of cooling water for nuclear safety-related systems. Closed-loop cooling would reduce water use from the Pacific Ocean and provide varying levels of cooling, dependent on the ambient meteorological conditions. Analysis of closed-loop cooling requires consideration of how these changes in water temperature would affect plant systems, operation, and output.

This section provides a preliminary engineering evaluation on the potential impact of converting SONGS from a once-through cooling water system into a closed-loop cooling water system. For this evaluation, the basic plant operational parameters are first defined and then applied to calculate the effects, including the expected power generation loss associated with SONGS operating under a retrofitted closed-loop cooling water design.

Conversion of SONGS to closed-loop cooling would result in a reduction in intake flow from the total licensed design flow of approximately 95.6%. However, an annual average of approximately 143 MWe and a summer daylight peak of approximately 191 MWe of generation would be lost. Additional water treatment would be required for operation of the cooling towers that would require research to identify new treatment technologies to augment the existing liquid radwaste treatment system. Although plume abated technology would be used for the hybrid cooling towers at SONGS in order to limit the visible plume, the entrained moisture and increased heat content would remain and would likely affect the operation of equipment in the vicinity of the cooling towers.

4.1 Procedural Limitations

SONGS equipment operation is governed by a set of procedural limits used to ensure adequate reliability and safety consistent with design specifications. The theoretical closed-loop operation of this equipment must be thoroughly analyzed in order to ensure these procedural limits are not exceeded. If it is expected that these procedural limits may be exceeded, SONGS may be required to operate atypically under various levels of restriction that decrease the net power generated by SONGS.

Changes to the SONGS cooling water equipment that would result in performance gains are restricted by the size and configuration of the equipment within the turbine building, particularly the condenser and the surrounding components. The main condenser for each unit was sized to reflect the use of a stable and cold seawater source. In order to maintain current operational efficiencies, a drastic modification of the condensers (through a size increase) would be required. Condenser modifications of this sort are unprecedented (i.e., implementation of a condenser redesign of this magnitude has never occurred at an operational nuclear power plant). Likewise, due to the physical constraints of the turbine building it is likely that any size increase of the condenser is not possible (see Section 3.8.2). Due to the magnitude of this redesign, the lack of any history of a nuclear plant undertaking such a modification, and the physical constraints of the SONGS turbine building, it is concluded that modification of the current cooling water equipment to compensate for the expected power generation loss is infeasible. In light of this infeasibility, condenser modifications are not considered in the scope of work for this study and thus the SONGS condenser design would be undersized for conversion to closed-loop cooling.

The main condensers are designed to function as the steam cycle heat sink, receiving and condensing exhaust steam from the main turbine and the steam generator feedwater pump turbines. The main condensers also have the capability to condense turbine bypass steam flows of up to approximately 45% of full-load main steam flow without exceeding turbine exhaust temperature limitations. The Unit 2 and Unit 3 main condensers have three steam domes (two low pressure and one high pressure) and two shells with divided water boxes. The main condensers are seawater cooled and located directly beneath the low pressure cylinders of the main turbines [Ref. 8.75]. According to the SONGS Power Operations Operating Instruction [Ref. 8.76], the Low Pressure (LP) turbine vacuum (i.e., the main condenser vacuum) has an instantaneous procedural limit of 8.1 in-Hg and a maximum 10-hr duration procedural limit of 6.0 in-Hg. A Low Vacuum Alarm occurs when the LP turbine vacuum is above the 3.5 in-Hg low vacuum alarm point.

To provide an operational margin against the procedural limit, the maximum 10 hour duration procedural limit of 6.0 in-Hg is evaluated in the performance evaluation of power system efficiency (PEPSE) analysis to ensure instantaneous ambient variations would not cause the procedural limit to be exceeded. Additionally, to evaluate the occurrence of low vacuum alarms impacting SONGS, the low vacuum alarm point of 3.5 in-Hg is evaluated.

4.2 Thermal Performance

Local meteorological data was obtained, reviewed, and analyzed for use as an input to a state-of-the-art site PEPSE model for each unit. The PEPSE model is a power plant performance modeling software that uses, among other things, cooling water intake temperature and flow rates to accurately calculate plant operational parameters and the resulting power generated.

SPX, a leading cooling tower design vendor, supplied the baseline performance of evaporative cooling towers considered here for use at SONGS. Utilizing this range of performance and taking into account the site conditions and operational restrictions present at SONGS, a tower with a 15°F approach (determined using a baseline 13°F approach design and including a 2°F allowance for recirculation) was selected appropriate for evaluation purposes.

4.2.1 Cooling Tower Efficiency / PEPSE Analysis

PEPSE is an industry accepted computer modeling software. The SONGS PEPSE model for each unit was used, along with site meteorological data, to predict performance changes as a function of cooling water inlet temperature. A diagram of the SONGS PEPSE models has been included in Attachment 3, Figures 3-1 and 3-2. Measured inlet water temperatures were combined with the sorted wet-bulb temperatures to yield one coincident data set spanning four years (2004-2007). For each hour of data, the expected gross electrical output of each unit was calculated using the PEPSE correlations for both current once-through operation and theoretical closed-loop operation. The difference between once-through and closed-loop operation was then recorded as the closed-loop operational loss.

4.2.1.1 Meteorological Data Analysis

The performance of any closed-loop cooling water system is primarily driven by the ambient weather conditions at the site and the baseline inlet water temperature values. As discussed in Section 3.1, cooling towers define their performance via an approach to wet bulb temperature. The wet bulb temperature, a meteorological measurement that incorporates both moisture content and temperature of the ambient air, is necessary for closed-loop cooling analysis, as cooling towers utilize an evaporative process to remove heat from the continuously recirculated cooling water. The approach to wet bulb is a value that is based on the size and efficiency of the cooling tower, and essentially represents the cooling ability of the equipment.

Any data set used to predict the performance of SONGS relies heavily on the presence of either wet bulb temperature measurements or a combination of values that can be used to calculate the wet bulb temperature (e.g., dry bulb temperature and relative humidity, dry bulb temperature and dew point, etc.). A thorough review was conducted to normalize the data, ensuring that a uniform data set with no erroneous data is used as the basis for analysis. Particular focus is paid to the review and acceptance of the meteorological data, as even minor errors present in the meteorological data would propagate throughout the analysis. Furthermore, there is almost always some degree of data loss associated with meteorological monitoring. This data loss may be due to a number of causes (equipment failure, biological/human error, etc.).

Wet-bulb temperature is not measured directly by site meteorological instruments; however, wet-bulb temperature was calculated using dry-bulb temperature and dew point temperature, both of which are measured onsite. Five years of meteorological data was provided (2004-2008); upon review a portion of this data contained dew point temperatures which did not correlate well with the measured dry-bulb temperature and relative humidity. The non-correlated data were spread throughout the year, but did not reoccur over the same time period during each year (i.e., non-correlated data did not occur on a particularly day each of the five years measured). These data were appropriately removed to yield a valid meteorological data set spanning all five years.

4.2.1.2 Inlet Water Data Analysis

SONGS provided five years (2003-2007) of inlet water temperatures for Units 2 and 3. These data were normalized to create a uniform hourly data set, removing erroneous data to create a valid data set for analysis. As the intake conditions are nearly identical at both units, the inlet temperatures for Units 2 and 3 were averaged across all five years to provide one complete inlet water temperature data set, regardless of individual unit maintenance outages.

4.2.2 Closed-Loop Operational Losses

SPX provided hybrid cooling tower performance curves for the cooling towers they proposed for SONGS (see Attachment 1 – Section 1). These performance curves were used across the span of wet-bulb temperatures at the necessary cooling range for SONGS to determine the potential closed-loop operational losses. The annual average operational losses for Units 2 and 3 were determined to be 36.7 MWe and 36.8 MWe, respectively.

Predicted monthly and annual closed-loop operational power losses are shown in Table 4.1 and Figure 4.1.

Table 4.1 Closed-Loop Monthly Operational Losses at SONGS

Month	**Unit 2 Power Loss** *(MWe)*	**Unit 3 Power Loss** *(MWe)*
January	31.9	32.0
February	34.9	35.0
March	35.9	36.1
April	38.1	38.2
May	39.5	39.6
June	38.8	38.9
July	39.4	39.5
August	38.6	38.7
September	37.7	37.8
October	36.1	36.2
November	33.0	33.1
December	32.2	32.3
Annual	36.7	36.8

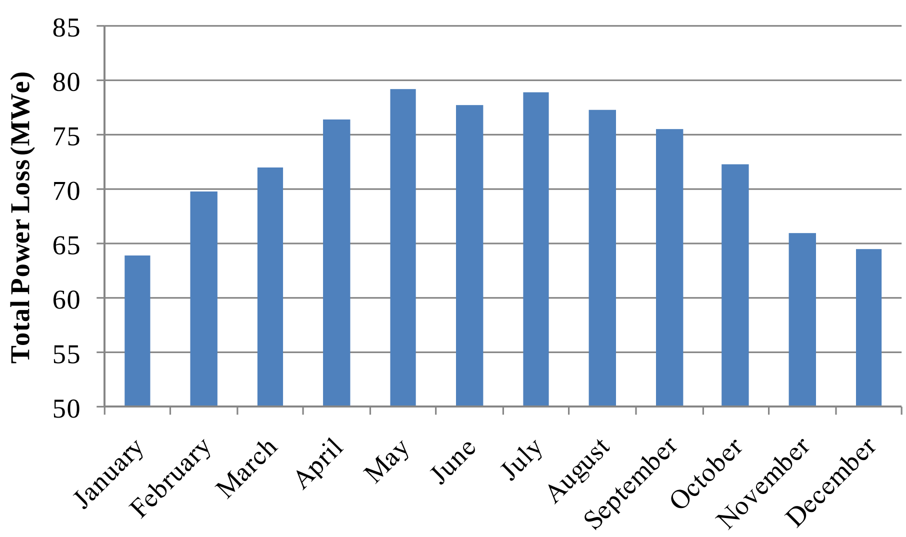

Figure 4.1 Unit 2 and 3 Combined Closed-Loop Monthly Operational Losses at SONGS

On an hourly basis, operational losses would vary significantly between daylight and nighttime hours. Figure 4.2 provides the hourly operational losses for the most impacted 24-hr period spanning July 15th and 16th, 2006, when the maximum hourly operational losses for Units 2 and 3 would have been 60.9 MWe and 61.0 MWe, respectively. These losses represent a 122 MWe loss to the power grid from the facility during the peak demand period. The comparison between the most impacted 24-hr period and the average total power losses for July illustrates the variability in power loss, whereby on any given day in July, power losses at SONGS could be in excess of 40 MWe above average.

Furthermore, these above average power losses would likely occur on the warmest days of the year, when electricity demand is at its highest.

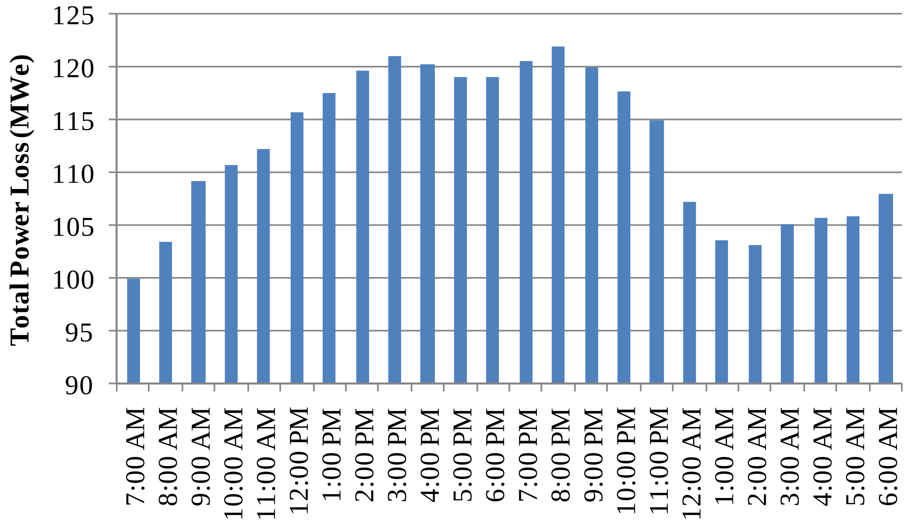

Figure 4.2 Unit 2 and 3 Combined Closed Loop Hourly Operational Losses at SONGS (24-hr period spanning July 15th and 16th, 2006)

4.2.3 Closed-Loop Impact on LP Turbine Limits

As detailed in Section 4.1, both the maximum 10-hr duration procedural limit of 6.0 in-Hg and the low vacuum alarm point of 3.5 in-Hg were evaluated to determine the frequency of excursion. Similar to the closed-loop operational losses analysis, hybrid cooling tower performance curves from SPX were used across the span of wet-bulb temperatures at the necessary cooling range for SONGS to determine the frequency of exceeding either 6.0 in-Hg or 3.5 in-Hg. The results, shown in Table 4.2, were averaged across the entire 5-year wet-bulb data set (2004-2008) to provide the average number of hours either unit at SONGS would be expected to operate beyond the listed limit.

Table 4.2 Closed-Loop Monthly Occurrence of LP Turbine Limit Exceedance (Hours)

Month	**Unit 2**		**Unit 3**	
	Alarm Point (3.5 in-Hg)	*Procedural Limit (6.0 in-Hg)*	*Alarm Point (3.5 in-Hg)*	*Procedural Limit (6.0 in-Hg)*
January	10	0	13	0
February	3	0	5	0
March	2	0	2	0
April	14	0	18	0
May	220	0	244	0
June	481	0	495	0
July	590	0	592	0
August	639	0	644	0
September	592	0	594	0
October	365	0	378	0

Month	Unit 2		Unit 3	
	Alarm Point (3.5 in-Hg)	*Procedural Limit (6.0 in-Hg)*	*Alarm Point (3.5 in-Hg)*	*Procedural Limit (6.0 in-Hg)*
November	127	0	139	0
December	7	0	9	0
Annual	3411	0	3491	0

As shown in Table 4.2, the LP turbine would be above the 3.5 in-Hg low vacuum alarm approximately 39% and 40% of the year for SONGS Units 2 and 3, respectively. Neither unit, however, breaches the maximum 10-hr duration procedural limit of 6.0 in-Hg over the five years of meteorological data. Although difficult to quantify, operation above the alarm setpoint for significant durations will certainly have a detrimental impact on affected equipment reliability and service life. Since the low vacuum alarm would be exceeded to such a great extent, reevaluation of this alarm set point and affected equipment operation would need to occur. If not changed to preclude equipment operational impacts, reliable operation of SONGS may ultimately be affected.

4.3 Auxiliary Load Reduction

All forced draft cooling towers require input electricity to perform their cooling operations. This resulting loss of electricity, referred to as parasitic loss, is extremely taxing to the net electrical output of a plant. Cooling tower parasitic losses include those losses directly attributed to the cooling tower equipment (e.g., fans) and any required additional circulating water and recirculating water pump horsepower necessary to overcome the increase in static head.

4.3.1 Parasitic Pump Losses

Three new circulating water pumps per unit would be required to pump the cooled water from the cooling tower through the main condensers. Three additional recirculating water pumps per unit would be required to pump circulating water from the hot water reservoir to the top of the wet section of the hybrid cooling tower. The circulating water pumps and recirculating water pumps would require significant electrical loads. As discussed in Section 3.8.1, the four circulating water pumps would be replaced with three new circulating water pumps; however, since these pumps would operate in a manner similar to the existing circulating water pumps, no additional parasitic losses would be incurred. Conversely, the three additional recirculating water pumps would each require an 11,000 HP motor, for a total of 33,000 HP per unit. Therefore, the new recirculating water pumps would require approximately 24.6 MWe per unit for closed-loop operation. The start-up pump used to supplement the hot water basin inventory during closed-loop cooling start-up (as described in Section 3.7.1) would require the same input power as one new circulating water pump, but would not be in use during steady-state operations and is therefore not accounted for in the parasitic loss considerations.

In addition, the dry section of each cooling tower would require two additional booster pumps per tower, each with a flow capacity of 48,400 gpm at approximately 26 feet TDH. In order to operate the dry section of the cooling tower for plume abatement, each pump would run using approximately 375 HP, for a total of 2250 HP per unit. Therefore, the dry section pumps would require approximately 1.67 MWe per unit for closed-loop plume abated operation.

A makeup pump would be required for each unit to supply 37,848 gpm makeup flow (calculated in Section 4.4). Each makeup pump would require approximately 220 HP, or 0.16 MWe.

The combined parasitic pump losses for closed-loop plume abated operation would be approximately 26.4 MWe per unit.

4.3.2 Parasitic Cooling Tower Losses

As discussed in Section 3.1, the cooling towers selected by SPX for closed-loop operation of SONGS are linear hybrid cooling towers, designed with noise and plume abatement features. In particular, hybrid cooling towers require significant additional electrical loads since they must draw air in through both the wet and dry sections of the cooling tower. Per the SPX design (see Attachment 1 – Section 1), each cell of the hybrid cooling towers would require a 250 HP motor operated fan. As there would be 15 cells per hybrid cooling tower, and 3 hybrid cooling towers per unit, a total of 11,250 HP would be required for fan operation. Therefore, the power consumed by the fans for plume abated cooling tower operation would be approximately 8.4 MWe per unit.

Summing the parasitic losses from the recirculating pumps, dry section pumps, the cooling tower fans necessary for closed-loop plume abated operation would be approximately 34.8 MWe per unit. When a SONGS unit would be online, these parasitic losses would continually draw from the net generating electricity, and, as discussed in Section 3.8.6, would require significant electrical system modification to allow for the distribution of power to the new equipment. Parasitic losses would also draw electricity under the most affected 24-hr period, which when summed together with the 122 MWe operational losses (see Figure 4.3) would result in a total power loss of 191 MWe. This worst case power loss would occur during the warmest conditions when electricity demand is at its highest.

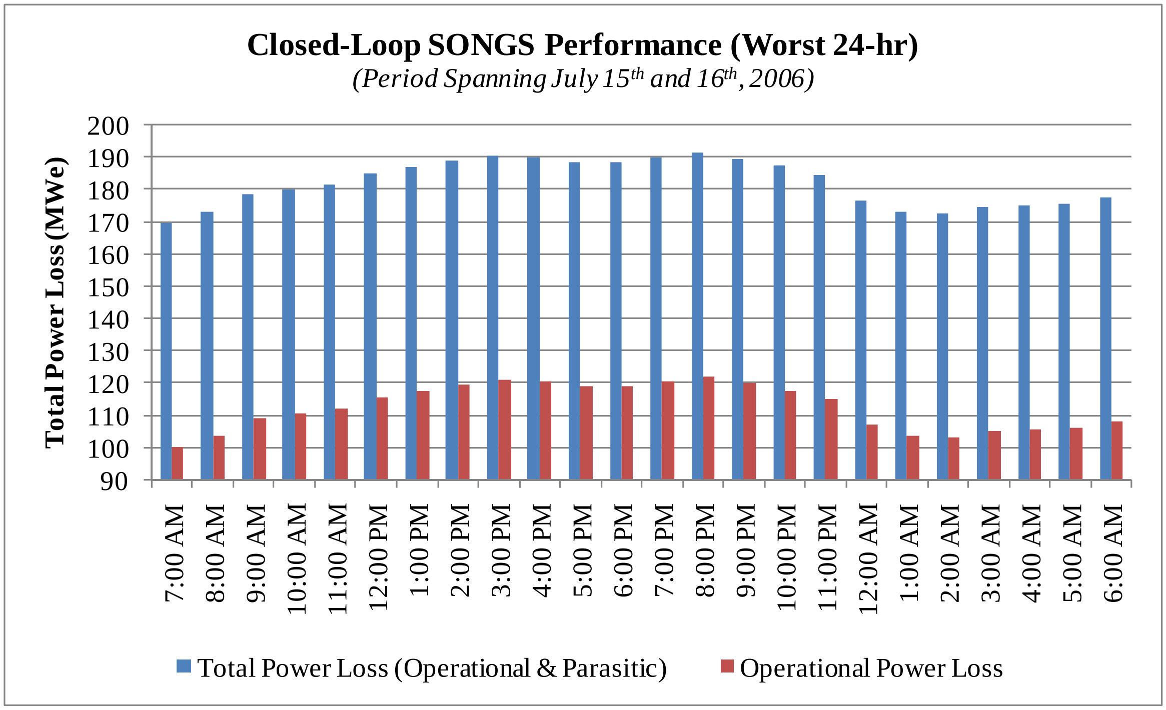

Figure 4.3 Unit 2 and 3 Combined Closed Loop Hourly Operational and Total Power Losses at SONGS (24-hr period spanning July 15th and 16th, 2006)

4.4 Water Consumption

Conversion to closed-loop cooling at SONGS would significantly reduce the water consumption currently required by the OTC system. However, a continuous supply of water would still be required for evaporative cooling tower operation. Evaporation and drift from the cooling tower represent a significant loss of circulating water that must be replenished. The evaporating water leaves the tower as a pure vapor, increasing the concentration of total dissolved solids in the circulating water. Local air quality also contributes to circulating water quality degradation, as the air is effectively washed by the water in the tower (i.e., the cascading water in the cooling tower acts as a scrubber that removes particulates from the atmosphere and concentrates them in the circulating water). To maintain the required water quality for the cooling towers sited at SONGS, a portion of the concentrated circulating water, referred to as blowdown, would be released to the ocean and replaced with sea water. Therefore, a continuous circulating water supply is required to make up the total losses from evaporation, drift, and blowdown.

4.4.1 Seawater Consumption

Saltwater from the Pacific Ocean is currently used in the OTC system at SONGS and would be used for the circulating water in a closed-loop system as well. Water quality in saltwater towers is commonly limited to 1.5 cycles of concentration, meaning that the concentration of TDS in the circulating water is 1.5 times that of the incoming saltwater.

The evaporation and drift flow rates can be estimated using the tower specifications. Evaporation can be approximated by multiplying total water flow rate (gpm) by the cooling range (°F) and 0.0008 [Ref. 8.80]. As discussed in Section 2.2.1, the total circulating water flow rate required by each SONGS unit is 830,000 gpm. The cooling range of the towers at SONGS would be the condenser inlet temperature of 90°F subtracted from the condenser outlet temperature of 109°F:

$$R = T_{\text{Supply}} - T_{\text{Return}} = 109°\text{F} - 90°\text{F} = 19°\text{F} \quad (1)$$

The evaporation flow rate from the cooling towers for each unit at SONGS is therefore estimated as follows:

$$E_{\text{Unit}} = Q_{\text{Unit}} \cdot R \cdot 0.0008 = 830{,}000\,\text{gpm} \cdot 19°\text{F} \cdot 0.0008 = 12{,}616\text{ gpm} \quad (2)$$

The drift rate is calculated by multiplying the vendor specified drift percentage, 0.0005% in this case (see Attachment 1), times the total water flow rate (gpm):

$$D_{\text{Unit}} = \%_{\text{Drift}} \cdot Q_{\text{Unit}} = 0.0005\% \cdot 830{,}000\,\text{gpm} = 4.2\text{ gpm} \quad (3)$$

The required blowdown to maintain 1.5 cycles of concentration, $C_{1.5}$, is estimated using the expected evaporation and drift rates [Ref. 8.80]:

$$B_{\text{Unit}} = \frac{E_{\text{Unit}} - \left[(C_{1.5} - 1) \cdot D_{\text{Unit}}\right]}{(C_{1.5} - 1)} = \frac{12{,}616\,\text{gpm} - 0.5 \cdot 4.2\,\text{gpm}}{0.5} = 25{,}228\,\text{gpm} \quad (4)$$

The makeup flow required per unit for cooling tower operation at SONGS is the sum of tower water losses due to evaporation, drift, and blowdown:

$$M_{\text{Unit}} = E_{\text{Unit}} + D_{\text{Unit}} + B_{\text{Unit}} = 12{,}616\,\text{gpm} + 4.2\,\text{gpm} + 25{,}228\,\text{gpm} = 37{,}848\,\text{gpm} \quad (5)$$

Figure 4.4 provides a per unit closed-loop flow cycle, including makeup, evaporation, drift, and blowdown flowrates.

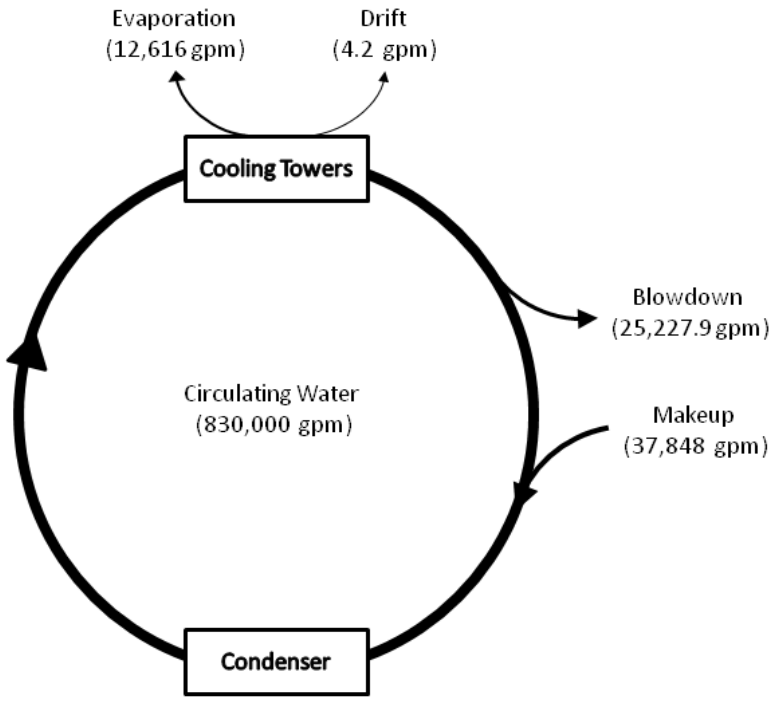

Figure 4.4 SONGS per Unit Closed-Loop Flow Cycle

The total makeup flow required by SONGS is double the makeup flow required by each unit:

$$M_{\text{Total}} = 2 \cdot M_{\text{Unit}} = 2 \cdot 37{,}848\ \text{gpm} = 75{,}696\ \text{gpm} = 109\ \text{MGD} \qquad (6)$$

As described in Section 2.2.1, the total licensed design flow for each SONGS unit is 864,000 gpm. Therefore, the reduction in intake flow from total licensed design flow would be approximately 95.6%.

4.4.2 Recycled Wastewater Consumption

Consideration has been given to the use of recycled wastewater as an alternative to using seawater as makeup water for a closed-loop cooling system. The use of recycled wastewater as makeup for cooling towers at California coastal power plants has been studied [Ref. 8.35]. Consistent with the results of that study, cooling tower operation at SONGS would be maintained at six cycles of concentration, meaning that the concentration of TDS in the circulating water is 6 times that of the incoming recycled wastewater.

The estimated evaporation and drift rates are unaffected by the allowable cycles of concentration; therefore, the values are identical to those calculated for saltwater tower operation in Section 4.4.1:

$$E_{\text{Unit}} = 12{,}616\ \text{gpm} \qquad D_{\text{Unit}} = 4.2\ \text{gpm}$$

The required blowdown to maintain 6 cycles of concentration, C_6, is estimated using the expected evaporation and drift rates [Ref. 8.80]:

$$B_{\text{Unit}} = \frac{E_{\text{Unit}} - [(C_6 - 1) \cdot D_{\text{Unit}}]}{(C_6 - 1)} = \frac{12{,}616\ \text{gpm} - 5 \cdot 4.2\ \text{gpm}}{5} = 2{,}519\ \text{gpm} \qquad (7)$$

The makeup flow required per unit for cooling tower operation at SONGS using recycled wastewater is the sum of tower water losses through evaporation, drift, and blowdown:

$$M_{\text{Unit}} = E_{\text{Unit}} + D_{\text{Unit}} + B_{\text{Unit}} = 12{,}616\ \text{gpm} + 4.2\ \text{gpm} + 2{,}519\ \text{gpm} = 15{,}139\ \text{gpm} \qquad (8)$$

The total makeup flow required by SONGS is double the makeup flow required by each unit:

$$M_{\text{Total}} = 2 \cdot M_{\text{Unit}} = 2 \cdot 15{,}139\ \text{gpm} = 30{,}278\ \text{gpm} = 43.6\ \text{MGD} \qquad (9)$$

The feasibility of the recycled wastewater option depends primarily on the distance between the plant and the nearest wastewater treatment facility able to provide adequate makeup flow.

Recycled Wastewater Availability and Feasibility

The NPDES water discharge permits for wastewater treatment facilities (WWTFs) within Orange, Riverside, and San Diego counties indicate that three facilities within 35 miles of SONGS could each provide sufficient makeup flow for closed-loop cooling towers. The 35 mile radius was chosen as the minimum distance encompassing at least two WWTFs capable of providing sufficient makeup flow to SONGS. The discharge flow rates and distance from SONGS for the three WWTFs with sufficient flow rates are shown in Table 4.3.

Table 4.3 Wastewater Treatment Facilities Discharging 50+ MGD within 35 Miles of SONGS (Based on NPDES Water Discharge Permits)

NPDES	Facility	Direct Distance [miles]	Discharge Flow [MGD]
CA8000188	**Eastern Municipal Water District Temescal Creek Discharge**	**24.9**	**58**[1]
	San Jacinto Valley RWRF	24.6	11[2]
	Moreno Valley RWRF	24.6	16[2]
	Perris Valley RWRF	24.6	11[2]
	Sun Valley RWRF	24.6	3[2]
	Temecula Valley RWRF	24.6	12[2]
CA8000408	**Orange County Water District Ground Water Replenishment System Advanced Water Treatment Facility**	**31.6**	**100**[1]
CA0110604	**Orange County Sanitation District Reclamation Plant 1 & Treatment Plant 2**	**33.1**	**232**[1]
	Outfall 001	29.9	480[3]
	Outfall 002	29.4	168[3]
	Outfall 003	29.5	130[3]

Discharge Flow Basis:

1. Average Design Flow
2. Treatment Capacity Flow
3. Outfall Capacity Flow

The NPDES permits, discharge flow rates, and distance from SONGS for all WWTFs within a 35 mile radius of SONGS are shown in Attachment 5, Table 5-2.

The total facility or outfall discharge flows are based on average design flows, treatment capacities, or outfall capacities listed in the NPDES permits, as noted in the tables. The distance from SONGS is based on either the facility address or the outfall GPS coordinates listed in the facility's NPDES permits. Thus, the discharge flows and direct distances listed may differ from the actual discharge flows and/or actual tie-in locations for transport to SONGS.

The Eastern Municipal Water District (EMWD) Temescal Creek Discharge facility and outfalls are located approximately 15 miles east of SONGS. Pipelines directly connecting SONGS and the Temescal Creek Discharge would have to be installed through the mountainous terrain of Cleveland National Forest. Tunneling through the Cleveland National Forest is likely infeasible due to the difficulty of obtaining the numerous required permits and the considerable costs for such an installation. If pipelines were rerouted around Cleveland National Forest, the required piping length would increase to over 46 miles. In addition, if the EMWD Temescal Creek Discharge consistently discharges less than 75% of the permitted flow (i.e., if the discharge flow rate is intermittent), the facility would not be a reliable source of recycled wastewater for SONGS.

The Orange County Water District (OCWD) Groundwater Replenishment System, Advanced Water Treatment Facility (AWTF) is located 31.6 miles northwest of SONGS.

The entire wastewater discharge volume of the facility is used to replenish the Orange County Groundwater Basin and seawater barrier [Ref. 8.7]; therefore the OCWD AWTF could not provide recycled wastewater for makeup flow at SONGS.

The Orange County Sanitation District (OCSD) Reclamation Plant No. 1 (RP1) and Treatment Plant No. 2 (TP2) have a combined capacity of 232 MGD. Water discharged from OCSD RP1 is pumped to OCSD TP2, to be either treated further or discharged via a combined discharge pipe to the ocean. Water treatment from OCSD is typically secondary, although a blend of primary and secondary treatment is necessary when storm flows are present. The combined discharge piping for these two plants is located approximately 30 miles from SONGS. Currently, OCSD RP1 and TP2 supply 110 MGD of treated water to the OCWD AWTF and plan to eventually supply 150 MGD. Additionally, the California Department of Health Services limits the reuse of water supplied to each of these WWTFs by the Santa Ana River Interceptor [Ref. 8.7], which eliminates an additional 30 MGD of recycled wastewater availability from the total flow. Therefore, only approximately 50 MGD or less would be available for long term supply of recycled wastewater for SONGS.

Assuming recycled wastewater could be transported through 30 miles of heavily-developed California coastline, recycled wastewater from OCSD RP1 and TP2 would need to undergo a series of further treatments to meet the cooling tower manufacturer's required water quality. This treatment would be similar to that of the 90 MGD recycled wastewater treatment plant located at the Palo Verde Nuclear Generating Station [Ref. 8.68], albeit utilizing approximately half of the flow rate (43.6 MGD). Using Palo Verde's recycled wastewater treatment plant for comparison, if recycled wastewater from OCSD RP1 and TP2 was utilized, the water treatment system required by SONGS would occupy approximately 16 acres. Additionally, cooling tower blowdown would likely need to be transported back to OCSD as the discharge of concentrated chemical contaminants (water disinfection by-products, endocrine disrupters, pharmaceuticals, etc.) is not permitted. As a result of the considerable costs, the numerous permits required, the reliability of the discharge flow rate, and the site area limitations at SONGS, using recycled wastewater from OCSD RP1 and TP2 is likely infeasible.

Due to the anticipated difficulty in obtaining sufficient wastewater flow from one WWTF, the option of combining the discharge flow of several smaller WWTFs was considered. As this option would require a network of piping connecting smaller WWTFs to SONGS, only the facilities with ocean outfalls are considered for this option as constructing a network of pipes connecting inland facilities would pose the same construction concerns discussed above. A pipe transporting recycled wastewater from the WWTFs to SONGS would likely tie in to the existing WWTF discharge lines near the coastline. As shown in Figure 4.5, a 15 mile pipeline running along the coastline to the northwest could potentially transport 63 MGD of recycled wastewater from the Aliso Creek Ocean Outfall (33 MGD) and the San Juan Creek Ocean Outfall (30 MGD) to SONGS. A 28 mile pipeline running along the coastline to the southeast could potentially transport 51 MGD of recycled wastewater from the Oceanside Ocean Outfall (23 MGD) and the Encina Ocean Outfall (28 MGD) to SONGS. As the combination of multiple outfalls would not significantly reduce the piping distance required to obtain necessary recycled wastewater for SONGS, the limitations on construction discussed for single source recycled wastewater would still apply.

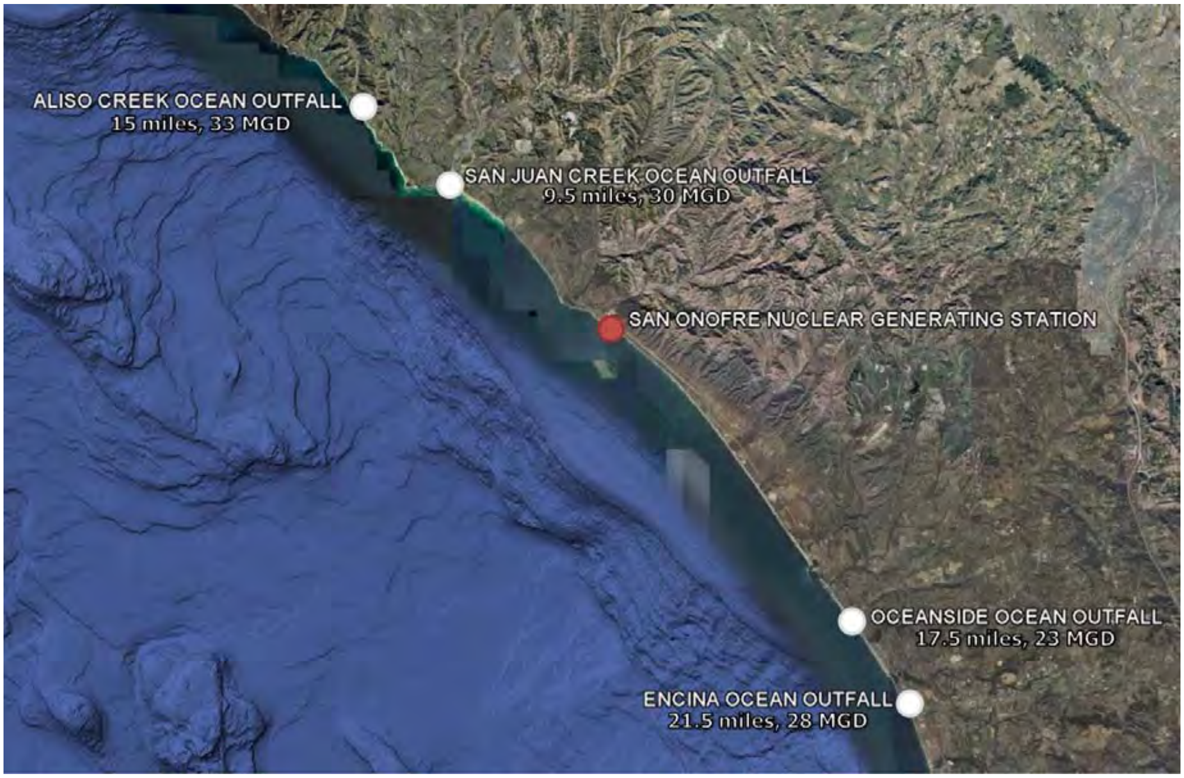

Figure 4.5 Map of Potential Recycled Wastewater Sources

4.5 Circulating Water Treatment

The existing once-through circulating water cooling system receives a minimum of chemical, mechanical, and heat water treatment. Biocides, specifically sodium hypochlorite, are added to minimize fouling of the condensers, with quantities limited by the concentrations allowed by the discharge permit. With a closed-loop cooling system, water treatment requirements are dramatically increased. The cooling tower fill is subject to fouling, as are the dry heat exchanger sections. Both the quantities and frequency of biocide injections must be increased significantly to maintain the tower fill in proper condition.

Additionally, increased water treatment is necessary due to the higher concentrations of dissolved solids, chemicals, and biological agents in the system resulting from constant recirculation of the condenser cooling water. The cooling towers act as air washers as well as distilleries, constantly evaporating large quantities of water and leaving behind the non-volatile residues. The actual concentrations of these agents are wholly based on 1.5 cycles of sea water concentration, as discussed in Section 4.4.1.

Unlike the simple injections of biocide required for the once-through configuration, a closed-loop configuration typically utilizes several chemicals, each with specific attributes requiring revision to the current business plan. Chemical treatment is broken into three subsections: deposition, corrosion, and biological.

<u>Deposition</u>

There are two forms of deposition: (1) sedimentation, which is usually mitigated through piping design, and (2) scaling. The prevention of scaling is not straightforward, and in some cases scaling may even be necessary in a piping system to prevent corrosion. For example, a thin uniform coating of calcium carbonate provides corrosion protection for internal surfaces of piping; therefore this type of scaling is desirable and should be left intact where possible. Problems arise when scaling becomes too thick and reduces heat transfer within the condenser or cooling tower. Scaling is kept under control through the use of pH control and dispersants.

Corrosion

Corrosion is the erosion of material due to chemical reactions with its surroundings. Corrosion is mitigated through proper piping design and material selection, along with an aggressive chemical treatment program using pH control and corrosion inhibitors.

Biological

Biological growth, or biofouling, is difficult to chemically treat as it attempts to inhibit a dynamic biological process. The biological process promotes corrosion through the breakdown of chemical components and the creation of localized acids. In a closed-loop cooling system, where the concentration of nutrients is increased, biofilms tend to increase on the piping internal surfaces and cooling tower fill. Control of biofilms usually involves the application of biocides and a surfactant-type biodispersant to disrupt the biomatrix, which allows better penetration of the antimicrobial. Additional chemical treatments such as biodetergents may also be necessary depending on local biological organisms and conditions.

Major closed-loop cooling water chemicals typically include:

Chemical type	Use/Function
sodium hypochlorite	biocide
surfactant	biocide aid
sulfuric acid	pH control
dispersant	scale prevention
phosphate	corrosion control

Heat treatments, similar to those conducted under once-through operation, would also be required in closed-loop operation; however, since additional chemical treatments would maintain biological growth in the closed-loop configuration, heat treatments would only need to be applied to the traveling water rakes and screens. To accomplish this, heaters would need to be placed in-line with the current screen wash system for the traveling rakes and screens, to apply heat treatments on an as-needed basis.

Condenser Cleaning and Maintenance with Closed-Loop Cooling

SONGS Units 2 and 3 were originally installed with an Amertap ball cleaning system to maintain the condenser tubes at a low level of fouling. Due to installation complications, this system was eventually abandoned in place and was not used beyond initial plant startup. To maintain condenser cleanliness, SONGS performs heat treatments by periodically increasing the condenser inlet water temperature to eliminate biological buildup. During a heat treatment, the circulating water is heated by recirculating a portion of the condenser discharge back through a portion of the intake structure. As noted previously, under closed-loop cooling nutrients in the circulating water would be concentrated, allowing for the greater potential of biological fouling in the condenser. To mitigate this risk, and following on current operating experience, SONGS would continue to perform heat treatments as necessary to maintain proper condenser cleanliness. Differing from the current procedure, the heat treatment would be administered by reducing the number of cooling tower fans in operation, thus reducing cooling efficiency and recirculating much warmer water back to the condenser.

4.5.1 Micro and Macro Fouling Control System

Each unit would require a steady state blowdown flow of approximately 25,200 gpm when running at full load. The concentration of the circulating water would be 1.5 times normal seawater. Thus, the blowdown would have a concentration of about 52,500 ppm TDS given an average seawater concentration of 35,000 ppm TDS [Ref. 8.32]. This blowdown stream would be harmful to local marine life and as such must be mixed with the seawater as it is introduced into the ocean to reduce its TDS concentration.

The blowdown would be mixed with non-concentrated Saltwater Cooling system water before being discharged out of current offshore discharge structure. As discussed in Sections 2.2.1 and 3.8.3, the Saltwater Cooling system would remain unaltered in the closed-loop cooling configuration and continue to draw in and discharge 34,000 gpm of non-concentrated saltwater from the pacific ocean. Combining this discharge with the 1.5 times concentrated blowdown would result in a combined discharge concentration of approximately 1.2 times. (25,200 gpm at 1.5 times combined with 34,000 gpm at 1.0 times results in a discharge salinity of approximately 1.2 times). This diluted discharge would then be sent through the current outfall configuration, facilitating rapid mixing by discharging through the existing series of offshore diffusers. The coupling effect of the dilution and the outfall diffusers would thus limit any adverse affects to local marine life.

4.5.2 Low Volume Waste Effluents

The San Onofre Offsite Dose Calculation Manual (ODCM) [Ref. 8.77] Table 1-1 lists the following credited radioactive liquid release points:

Batch release points:

- Primary plant makeup storage tanks
- Radwaste primary tanks
- Radwaste secondary tanks
- Miscellaneous waste condensate monitor tanks
- Blowdown processing system neutralization sump
- Full flow condensate polishing demineralizer sumps (high conductivity, low conductivity) and hold up tanks
- Component cooling water sump
- Storage tank area sump
- Steam generator blowdown

Continuous release points:

- Turbine plant sump
- Blowdown processing neutralization sump
- Steam generator blowdown bypass line
- Steam generator blowdown
- Auxiliary building sump

As required by the Unit 2 and Unit 3 NRC Operating Licenses, discharges from the ODCM-credited release points are strictly controlled in accordance with established site procedures and programs to ensure that they are well below the limits in federal NRC regulations (10 CFR 20 for instantaneous concentration limits and 10 CFR 50 for dose limits) at all times. The waste liquids are treated as necessary prior to discharge to the discharge conduit of either Unit 2 or Unit 3. Seawater used in the once-through circulating water system serves the additional function of providing dilution of the treated liquid waste to meet the concentration limits in NRC regulations (10 CFR 20).

In closed-loop operation, the waste liquids would be released to the discharge conduit of either Unit 2 or Unit 3 in a manner similar to once-through operation; however, the circulating water discharge would be reduced from a minimum flowrate of 555,000 gpm per unit during releases of the treated contents from a radwaste tank to the blowdown rate of 25,228 gpm (Section 4.4). Based on SONGS operating experience, the reduction in the circulating water discharge flowrate by more than a factor of 20 would result in concentrations of certain isotopes in the treated water from a typical radwaste primary or secondary tank that would exceed NRC 10 CFR 20 limits at the point of discharge, and would thus violate the NRC Operating Licenses. In addition, the change in operating practices would not meet the requirement to maintain dose as low as is reasonably achievable. SONGS would be required to research, identify, and install new treatment technologies (if available) to augment the existing liquid radwaste treatment system, in order to maintain and control liquid radioactive releases at the current levels. These modifications would need to be studied in further detail to determine the magnitude of impact to plant operations and project costs and schedule.

4.6 Cooling Tower Plume Emissions

As discussed in Section 3.1, while hybrid cooling towers reduce the potential for visible plume formation, they do not totally eliminate the potential for plumes to occur. Likewise, while the majority of airflow discharged from the hybrid cooling tower contains evaporated water, a small portion of drift is emitted in the cooling tower plume. As the drift droplets evaporate, the dissolved and suspended solids (in particular, dissolved salts) in the circulating water are released as airborne particles.

Cooling tower drift is defined as the emitted percentage of the circulating water from the cooling tower that is entrained in the exhaust air stream and emitted from the cooling tower. Drift droplets are any water droplets and dissolved and suspended solids they contain that are entrained in the air and emitted from the cooling tower fan shrouds.

The following section details the effect the plume and the resulting drift deposition have on the operation and maintenance of SONGS equipment. For a detailed discussion of drift and its effects on air pollution limits, see Section 6.1.

4.6.1 Plume Abatement Efficiency

The plume abatement offered by hybrid cooling towers transforms the plume from its visible state into being invisible. This process is discussed in detail in Section 3.1.1, which states that the cooling tower selected by SPX for SONGS would produce a visible plume less than 1 percent of the time. During times when a visible plume is produced, however, site operations at both the Mesa Complex and the Coastal Complex would need to account for this decrease in visibility.

The safety of plant personnel at SONGS is paramount, and such consideration must be made to notify and prepare personnel for abnormally low levels of visibility when they are to occur. While SONGS personnel are relatively accustomed to coastal fogging, meteorological conditions creating a visible plume would not necessarily align with coastal fogging and would generally occur during the morning hours where travel to and from SONGS generally occurs. Secondly, SONGS security systems that require visibility as a means of detection may be impacted to a level possibly exceeding that of natural occurring coastal fogging. Additional security impacts are discussed in detail in Section 3.5.2; however, particular attention on how the decreased visibility might impact security would need to be analyzed.

Plume abated hybrid cooling towers represent current state-of-the-art technology with respect to abatement of a visible vapor plume. These towers would greatly reduce the potential for plume formation that could impact SONGS personnel safety or security; however, since the risk of plumes impacting these areas exists, the degree to which they are impacted must be evaluated.

4.6.2 Plume Impact on Plant Systems

As discussed in Section 4.6, cooling tower drift contained within the plume has the potential to deposit dissolved solids, particularly salt, across the Mesa Complex and Coastal Complex. Additionally, even though the cooling tower plume is often rendered invisible, the entrained moisture and increased heat content remains and has the potential to affect the operation of equipment in the vicinity of the cooling tower. The following is a list of impacts to plant systems attributable to hybrid cooling tower operation:

- Interference with Station operations, safety and systems, under worst case meteorological conditions.
- Entrained moisture and increased heat content would impact SONGS meteorological measurements and HVAC equipment, requiring increased maintenance and causing degraded performance.
- Interference with plant visual-oriented security systems.

- Associated salt deposition could cause unplanned outages due to electrical arcing in the switchyard[7].
- Associated salt deposition could damage the sensitive equipment used in the SONGS meteorological monitoring system, requiring additional system maintenance and possibly the installation of a new meteorological tower.
- Associated salt deposition could cause damage to vegetation in the area.
- Long-term shadow from plume can harm vegetation.

Additional discussion on how cooling towers would affect air quality, local vegetation, and site aesthetics are detailed in Sections 6.1, 6.4, and 6.5, respectively.

[7] Closed-loop cooling at Brayton Point Power Station Unit 4, utilizing a salt water spray cooling canal, operated for less than one month before a succession of flashovers on the resistance grade insulators occurred. Resulting research on how salt deposition impacts electrical equipment indicated that salt deposition leads to arcing, causing electrical equipment to fail [Ref. 8.42].

5 Closed-Loop Cooling Conversion Cost Estimates

Included within this section are estimates of the construction and outage durations and the costs of various aspects of the conversion of SONGS Units 2 and 3 to closed-loop cooling. Due to the limited availability of PM_{10} emission credits and large variability in price, the significant cost of obtaining the necessary PM_{10} credits has not been included in the cost estimate. An estimated construction and outage schedule was developed incorporating the design and construction of each unit, discussed in Section 5.1. In order to minimize the overall construction duration and cost, the estimated schedule would allow for phasing of the various tasks in order to take advantage of labor availability, scheduled refueling outages, and allow for flexible work sequencing. It should be noted that the estimated schedule represents a shortest-case scenario, and does not take into account any impacts that could occur from outside forces such as unforeseen regulatory or licensing impacts. The duration of the required unit construction outages, based on a timeline of critical milestones that must be worked with the associated unit off-line, is discussed in Section 5.1.2, and is utilized to determine the resulting lost generating capacity, expressed in MWe.

The overall construction schedule for the conversion would extend approximately 66 months from the start date with engineering work beginning approximately 3 months prior to tunneling construction and 12 months prior to general construction. Of these 66 months, both SONGS Units 2 and 3 would require a construction outage of approximately 21.1 months.

In Section 5.2, the capital costs of the initial conversions are quantified, including design, procurement, implementation, and startup activities, based on the construction schedule for the conceptual design. The new towers and pumps would require an appreciable amount of power to operate (i.e., parasitic losses) which would effectively reduce each unit's output power to the distribution grid. Power consumption of the required new components was estimated from preliminary vendor data, and total MWe parasitic losses were determined. Likewise, the conversion would create less than optimum operating parameters for the existing turbine/condenser, resulting in reduced unit output to the grid under most operating conditions. Finally, the new cooling towers and pumps would require operations and maintenance personnel support, and service, repair, and replacement of components; based on input from potential supplying vendors, these costs are approximated.

The design, construction, construction outage power production losses, and start-up of closed-loop cooling at SONGS would cost approximately \$3.0 billion, of which approximately \$2.4 billion is based on 21.1 months of construction outage power production losses per unit. The total annual cost of operating closed-loop cooling at SONGS would be more than \$85 million each year for the first five years of operation and the average annual costs would increase with additional years of operation. These annual costs include operations and maintenance costs, the power losses associated with the new condenser operating parameters, and the parasitic power losses due to the new equipment required for closed-loop cooling.

5.1 Construction and Outage Duration

The overall construction schedule for the conversion (see Attachment 4) would begin with tunnel construction. The total length of construction would extend approximately 66 months from the start date with engineering work beginning approximately 3 months prior to the start of tunneling construction and 12 months prior to start of general construction activities. The construction start date would be limited by the requirement of having all permitting completed and in place prior to mobilization. Likewise, the construction start date would be restricted if specifications, procurement, and design engineering were not completed as scheduled. Considering the conceptual nature of the current design parameters and the unknown effects of outside forces, the scheduling of many tasks represents a best-case scenario and could be significantly impacted.

5.1.1 Online Construction Schedule

As discussed in Section 3, the SONGS cooling towers would be sited at the Mesa Complex with tunneling to take place to connect the cooling tower with the condenser by a series of large bore circulating water pipes. To this extent, Mesa Complex activities and those activities conducted near the Coastal Complex which would not be impactive to operation could be conducted with each unit online. The following is a brief description of the major online construction activities, each of which is broken into sub-task descriptions set forth in the construction schedule (see Attachment 4).

Site Clearing and Mobilization

Construction of the hybrid tower would entail significant excavation at the Station. The area surrounding each cooling tower basin, the area near the tunneling entrance and exit, and equipment laydown areas would be cleared and excavated during the online construction. Also, several non-essential structures located on the SONGS Coastal Complex that would interfere with construction would be removed. Total site clearing and excavation would be expected to last approximately 4 months.

This construction would be limited primarily to previously impacted areas; however, the significant alteration of these areas would alter the flow pattern of runoff from precipitation events. The volume of runoff and the silt load of the runoff would likely increase due to the lack of trees and vegetation to hold the soil and slow the transport of water. Standard techniques for runoff control would be implemented, such as silt fences and grading to control the flow of runoff during construction.

Basin Construction

As discussed in Sections 3.2 and 3.8, each unit would require three 56 feet wide and 721 feet long cooling tower basins. These basins would be aligned in parallel and would have a minimum spacing of 1.5 tower widths. As shown in Attachment 4, construction of the basins for the hybrid cooling towers would be expected to last approximately 32 weeks per unit.

Cooling Tower Construction

As discussed in Section 3.1, each unit would require three 15 cell linear hybrid cooling towers (45 cells total per unit). Each cell would be 48 feet × 48 feet and have a discharge height at the top of the fan shroud of approximately 50 feet. As shown in Attachment 4, construction of the hybrid cooling towers would be expected to last approximately 20 months per unit, with construction on the Unit 3 cooling tower beginning approximately 3 months prior to the start of Unit 2 cooling tower construction.

Tunneling Construction

As discussed in Section 3.5, the eight circulating water pipes transporting cooling water between the condensers and cooling towers would be primarily installed by tunneling methods. Each concrete pipe would be installed during the excavation of each 14 feet diameter tunnel. As shown in Attachments 2 and 4, construction of the eight tunnels for the circulating water pipes would be expected to last approximately 170 weeks per unit, with construction on Unit 2's tunnels beginning 6 months prior to the start of Unit 3 tunnel construction.

5.1.2 Outage Construction Schedule

In contrast to those activities outlined in Section 5.1.1, due to the proximity of several construction activities to nuclear safety-related equipment and the impact on or removal of equipment necessary for power generation (i.e., circulating water pumps, TPCW, etc.) would require extended construction unit outages. Approximately 22.6 months of continuous outage for the construction and implementation of closed-loop cooling would be required for each unit. Beginning in 2012, each unit will have a planned refueling outage lasting 45 days occurring every two years. Subtracting the planned refueling outages from the construction outage duration, each unit would require a non-planned construction outage of approximately 21.1 months. To mitigate the effect this outage would have on the regional electrical grid, the construction schedule would stagger the start of each construction outage by 6 months. Therefore, the planned outages for each unit would coincide for approximately 16.7 months. The outage construction schedule is detailed in Attachment 4, including a breakdown of activity specific subtasks. Each of the major construction activities that would require a unit to be in an outage are described below.

Tunneling Completion

As discussed in Section 3.5, tunneling activities near the turbine and reactor buildings would require an outage. For tunneling completion approximately 2 to 3 months of outage would be required per unit.

Reservoir Construction

As discussed in Section 3.3, two circulating water reservoirs (one hot water basin and one cold water basin) would be constructed between the turbine buildings and the seawall at each unit. An outage would be required to construct these circulating water reservoirs due to the proximity of the turbine buildings and reactor buildings, as well as the necessary and frequent use of the area for plant operations. Therefore, the construction of the circulating water reservoirs would require approximately 56 weeks of outage per unit.

Circulating Water Pump Installation / Tie-in

As discussed in Section 3.4, each unit would require three new circulating water pumps installed in the cold water basin and three new recirculating water pumps installed in the hot water basin to replace the four existing circulating water pumps. Since the circulating water pumps are required for plant operation, the existing circulating water pumps could only be removed when the unit would be offline. The new circulating water pumps and recirculating water pumps that would be required to run each unit under closed-loop cooling would need to be installed during the construction of the circulating water reservoirs. In addition, the closed-loop cooling system piping and the existing condenser circulating water pipes and the discharge canal would need to be tied-in to the new circulating water reservoirs for each unit. The circulating water pump installation and tie-in of the circulating water pipes would require approximately 8 weeks of outage per unit.

Closed-Loop Cooling Plant Start-Up

Approximately 20 weeks of construction outage per unit would be required to conduct testing and start-up activities related to the new closed-loop cooling systems.

5.2 Cost of Converting to Closed-Loop Cooling

This section estimates the costs for the five major aspects of converting SONGS Units 2 and 3 to closed-loop cooling:

- initial capital costs
- construction outage costs
- costs due to new condenser operating parameters
- costs due to parasitic losses
- operation and maintenance costs, including water treatment costs

The capital costs of the closed-loop conversion are described including design, procurement, implementation, and startup activities, as detailed in Attachment 4. The duration of the required unit outages determined in Section 5.1 is used to determine the cost of lost generating capacity by applying a projected price per MWhr of $73.30 (Attachment 1, Section 5). Additionally, the price per MWhr is used to estimate both the parasitic losses associated with the pumps and cooling tower fans and the ongoing operational efficiency losses associated with operating beyond the original condenser design conditions. Finally, ongoing operation and maintenance to sustain closed-loop equipment operation is estimated over the expected lifespan of each piece of equipment.

5.2.1 Initial Capital Costs

The initial capital costs to convert SONGS to closed-loop cooling includes the cost of engineering design; the selection, procurement, and installation of major equipment (i.e., cooling towers, pumps, valves, etc.); and the costs of closed-loop construction, including the tunneling required to connect the cooling towers located on the Mesa Complex with the seaside hot and cold water reservoirs. Capital cost estimation was done in such a way as to minimize the necessary assumptions, and relied instead on well-developed conceptual designs to greatly increase the accuracy of the estimates. Attachment 4 lists the components and construction activities necessary for closed-loop operation, providing a high level of detail to the conceptual design estimation.

Three estimation techniques were used to determine the initial capital costs:

(1) Vendor provided budgetary estimates

Industry leading vendors were contacted for quotations on the major equipment and material components to allow for as accurate an estimation as possible, with the correspondence, reference material, and quotations provided in Attachment 1.

(2) Third-party detailed construction estimates

Since tunneling from the Mesa Complex to the Coastal Complex required a unique engineering solution, a nationally recognized consultant was used to determine a conceptual design, cost, and schedule for tunneling construction (Attachment 2). Spoils disposal was estimated in the tunneling evaluation at a subcontractor rate of $15/ton. The listed subcontractor rate was also used to estimate the cost of additional spoils disposal from cooling tower and circulating water reservoir excavation.

(3) Computational estimation utilizing national production rates and cost factoring

Remaining cooling equipment and construction activities were estimated using Craftsman Book Company's 2009 National Construction Estimator software. The 2009 National Construction Estimator is a construction cost estimating database that provides detailed cost estimates for the construction industry including piping, concrete, industrial equipment, electrical systems, and other heavy construction components.

The capital cost estimate contained in Attachment 4 combines these resources to produce a conceptual analysis of cost and schedule duration. The major cost centers were defined and presented in line item format in order to provide flexibility in the application of cost. Some of these line items would be equally shared by both Units 2 and 3 as several of the required construction activities would be common between both units. If separated, these common costs would not simply be cut in half. An engineering, design, and inspection cost adder of 15% was added to estimates which were not quoted for turn-key construction [Ref. 8.85].

The anticipated direct capital cost (presented in 2009 US dollars) for the conversion for both SONGS Unit 2 and Unit 3 is collectively estimated at a minimum of $492 million without contingency application or any escalation over time. Application of the recommended contingency would add an additional $123 million (based on 25% for conceptual estimates [Ref. 8.85]). The escalation of cost over the project schedule was not calculated as part of this report but would represent a significant increase when calculated over the anticipated duration of approximately 5 years. Total estimated direct capital costs for the conversion are thus $615 million.

5.2.2 Construction Outage Costs

From the construction schedule discussed in Section 5.1 and detailed in Attachment 4, SONGS Units 2 and 3 would require approximately 18.7 months of continuous outage for the construction and implementation of closed-loop cooling. Beginning in 2012, each unit will have a planned refueling outage lasting 45 days occurring every two years. Subtracting the planned refueling outages from the construction outage duration, each unit would require a non-planned construction outage of approximately 21.1 months. Since Unit 2 and Unit 3 generate a net electrical output of approximately 1070 MWe and 1080, respectively, a 21.1 month construction outage would result in approximately 16,481,000 MWhr and 16,635,000 MWhr of lost electrical generation, respectively. Assuming a projected cost of electricity of $73.30 per MWhr (see Attachment 1, Section 5), the aggregate outage cost for conversion of SONGS to closed-loop cooling would be approximately $2.4 billion.

As noted in Section 5.1.2, the estimated schedule represents a best-case scenario, and does not take into account any impacts that could occur from outside forces.

5.2.3 Costs Due to New Condenser Operating Parameters

As discussed in Section 4.2, SONGS is water-dependent, requiring a specific quantity of cooling water at a specific design temperature, here consistently cold seawater. Below this design temperature SONGS has the capability of marginally increasing its electrical production; however, above this design temperature SONGS produces significantly less electricity and could ultimately impact its low pressure turbine procedural limit. To analyze the effect closed-loop cooling would have on SONGS electrical generation a state-of-the-art PEPSE model for each unit was used. As discussed in Section 4.2, the annual average continuous operational losses for Units 2 and 3 were determined to be 36.7 MWe and 36.8 MWe, respectively.

Since closed-loop cooling performance is reliant on the ambient meteorological conditions, operational losses vary based on seasonal temperature at SONGS. Since a static standard cost of electricity is applied, the variability in operational losses does not alter the cost determination (i.e., the average cost per MWhr is applied to the average power loss). Utilizing a $73.30 per MWhr projected cost of electricity and a generating capacity factor of 90%, closed-loop cooling operational losses would cost SONGS approximately $42 million per year.

5.2.4 Parasitic Losses (Costs) Attributable to New Components

As discussed in Section 4.3, the equipment necessary to operate closed-loop cooling at SONGS would require significant input electricity, referred to as parasitic losses. Cooling tower parasitic losses would include those from cooling tower equipment and the additional recirculating water pumps and booster pumps necessary to supply circulating water to the cooling towers. Closed-loop conversion of SONGS utilizing hybrid cooling towers located on the Mesa Complex would require a continuous 34.8 MWe per unit aggregate parasitic loss. Utilizing a $73.30 per MWhr projected cost of electricity and a generating capacity factor of 90%, closed-loop cooling parasitic losses would cost SONGS approximately $40 million per year.

5.2.5 Support and Maintenance Costs

Additional operations and maintenance costs for the components necessary to convert SONGS to closed-loop cooling are estimated by identifying the major tasks for each component, and then based on operational experience and input from vendors, quantifying the estimated required man-hours and associated costs.

Due to the large number of active components, as well as the sheer size of the towers and their hot water distribution system, appreciable support would be required. The anticipated manpower required for support of each unit's cooling towers is approximately $301,000, and is detailed in Attachment 4 – Table 4-2.

In addition substantial maintenance would be required for cooling tower operation. The detailed monthly, quarterly, and annual labor and material maintenance requirements are listed in Attachment 4 – Table 4-3, and total $750,000 in years 1-5, $1,250,000 in years 6-15, and $2,250,000 in years 16-20 for each unit.

Maintenance of the new circulating water pumps are not considered an additional closed-loop cost as the new pumps would operate at the same flow rate and head as the existing pumps, and would therefore be captured by the current maintenance program. Maintenance cost of the new recirculating water and booster pumps is separated into long-term rehabilitation and replacement costs. Rehabilitation costs for major equipment are estimated to be 35 to 45 percent of replacement costs depending on the condition of the equipment. It is likely only the pumps and motors would be replaced in kind; therefore, the replacement cost should include all engineering and structural modification costs as well as the equipment costs [Ref. 8.84].

Based on an assumed operating life of 20 years, it was estimated that one of the recirculating water pumps (approximately $4,400,000/pump) and four of the booster pumps (approximately $8,000/pump) would require rehabilitation or partial replacement. Maintenance of each unit's closed-loop cooling startup and makeup pump is not accounted for due to the unknown usage factor and limited operational flowrate, respectively. Hence, on an average annual basis over the assumed 20 year life span, pumping maintenance costs would be approximately $220,000/year per unit.

As discussed in Section 4.5, additional chemicals would be injected into the makeup circulating water to prevent micro and macro fouling of the main condenser and cooling towers. The current water quality maintenance system is installed to service the main condensers periodically, and would require additional operational support to provide continuous service as well as inject other effluent streams. To control micro and macro fouling, approximately 60 gallons of commercial bulk sodium bisulfite would be required each day to adequately dechlorinate. This would result in an additional water treatment cost of $150,000/year per unit.

<u>Summary of Additional Support and Maintenance Cost (per year, SONGS total cost)</u>

To support the equipment necessary for continuous closed-loop operation, significant operation and maintenance would be incurred. Below is a summation of these annual costs including labor and material for the hybrid cooling towers, recirculating and booster pumps, and water treatment.

Years 1 - 5	$2,842,000/year
Years 6 - 15	$3,842,000/year
Years 16 - 30	$5,842,000/year

6 Environmental Impacts / Permitting Requirements

There would be several potential environmental impacts and regulatory challenges associated with conversion to closed-loop cooling resulting from retrofit construction activities, system modifications, disruption of operations, permitting amendments, and operation of a closed-loop cooling system. Evaluations of the closed-loop cooling issues at SONGS are provided in the following sections and briefly discuss identified regulatory issues, applicable regulations, potential impacts related to cooling system conversion, and potential costs.

Several air quality considerations would need to be evaluated with respect to the installation of cooling towers at SONGS. Direct emissions from construction would increase emissions of ozone precursors from worker vehicle emissions. Direct emissions from operation of the cooling towers would result in atmospheric salt plume drift, plume visibility impacts, emissions (i.e., PM_{10} and $PM_{2.5}$) and vapor. Indirect emissions, including criteria pollutants and greenhouse gas emissions, would result from the need to replace an annual average power generation loss of approximately 143 MWe. If that generating capacity was assumed to be replaced by a natural gas facility, an estimated additional 227,000 tons per year of CO_2 would be emitted to the atmosphere.

Cooling tower drift impacts would likely be significant as between 827.8 and 837.2 tons of PM_{10}, depending on the local salinity of the Pacific Ocean, would be emitted per year by SONGS in closed-loop operation. San Diego County is currently designated by the California Air Resources Board as non-attainment for PM_{10} and $PM_{2.5}$. A major-source Title V air permit would be required from the San Diego County Air Pollution Control District. It is unlikely that SONGS could locate and purchase a sufficient number of PM_{10} emission credits to cover these emissions. Due to the limited availability of PM_{10} emission credits and large variability in price, a cost for obtaining the necessary PM_{10} credits has not been estimated. If PM_{10} credits were to be available, the cost of converting SONGS to closed-loop cooling would increase significantly to include their purchase. Additionally, approximately 165 tons of salt would be deposited downwind of the proposed cooling towers extending across the SONGS Coastal Complex area, and may also occur across the nearby Camp Pendleton housing areas to the northeast. Salt deposition across the coastal scrubland habitat could cause adverse impacts to vegetation and occupied habitat.

Various permits, including a Coastal Development Permit, would be required for the conversion of SONGS from once-through cooling to closed-loop cooling. All of these permits would be acquired in accordance with regulatory public participation requirements, which would likely incur intense public opposition due to project cost, adverse aesthetic/visual impacts, air emissions, traffic, and potential ecological impacts. California Public Utilities Commission approval would also be required for recovery of the closed-loop cooling system conversion cost from the ratepayers as well as the ongoing annual costs. Additionally, it should be noted SCE does not own the land on which SONGS is located, and as such, all construction activities necessary for conversion to closed-loop cooling would need to be approved by Marine Corps Base Camp Pendleton. Failure to receive approval from any of these agencies would render the construction and operation of closed-loop cooling at SONGS infeasible.

6.1 Air Quality Considerations

The Federal Clean Air Act (CAA) (USC § 7401) requires the adoption of National Ambient Air Quality Standards (NAAQS) to protect the public health, safety, and welfare from known or anticipated effects of air pollution. The NAAQS are occasionally updated, and current standards are set for criteria pollutants SO_2, CO, NO_2, O_3, PM_{10}, $PM_{2.5}$, and Pb. The EPA has designated all areas of the United States as either "attainment," "nonattainment," or "unclassified" with respect to the NAAQS. An attainment designation means that the air quality of the area is better than the NAAQS. A nonattainment designation means that a primary NAAQS has been exceeded more than three separate times in three years in a given area. An area is designated as unclassified when sufficient data are not available to classify it as either attainment or nonattainment. If an area is redesignated from nonattainment to attainment, the CAA requires a revision to the State Implementation Plan (SIP), called a maintenance plan, to demonstrate how the air quality standard would be maintained for at least ten years.

The California Air Resources Board (CARB) has the authority to enforce regulations to both achieve and maintain the NAAQS. CARB has established additional standards, known as the California Ambient Air Quality Standards (CAAQS), which are generally more stringent than the NAAQS. CARB is responsible for the development, adoption, and enforcement of the state's motor vehicle emissions program, as well as the adoption of the CAAQS. CARB also reviews operations and programs of the local air districts and requires each air district with jurisdiction over a nonattainment area to develop its own strategy for achieving the NAAQS and CAAQS. The local air district has the primary responsibility for the development and implementation of rules and regulations designed to attain the NAAQS and CAAQS, as well as the permitting of new or modified sources, development of air quality management plans, and adoption and enforcement of air pollution regulations. CARB, similar to the EPA, designates areas as either "attainment" or "nonattainment" based on compliance or noncompliance with the CAAQS. CARB considers an area to be in nonattainment if the CAAQS have been exceeded more than once in three years.

The San Diego Air Pollution Control District (SDAPCD) is the agency responsible for protecting public health and welfare through the administration of federal and state air quality laws and policies within the San Diego Air Basin (SDAB). Included in the SDAPCD's tasks are the monitoring of air pollution, the preparation of the San Diego County portion of the SIP, and the promulgation of rules and regulations. The SIP includes strategies and tactics to be used to attain and maintain acceptable air quality in the county; this list of strategies is called the Regional Air Quality Strategies (RAQS). SDAPCD regulations require that any equipment that emits or controls air contaminants be permitted (Permit to Construct or Permit to Operate) prior to construction, installation, or operation. The SDAPCD is responsible for review of applications and for the approval and issuance of these permits.

The status of state and federal designations for San Diego County as of the 2007 annual report are listed in Table 6.1 [Ref. 8.2; Ref. 8.39].

Table 6.1 Air Quality Designations in San Diego County 2007

Category	Federal Designation	State Designation
Ozone (1-hour)	Attainment	Nonattainment

Category	Federal Designation	State Designation
Ozone (8-hour)	Nonattainment	Nonattainment
Carbon Monoxide	Attainment	Attainment
PM_{10}	Unclassifiable	Nonattainment
$PM_{2.5}$	Attainment	Nonattainment
Nitrogen Dioxide	Attainment	Attainment
Sulfur Dioxide	Attainment	Attainment
Lead	Attainment	Attainment
Sulfates	(no federal standard)	Attainment
Hydrogen Sulfide	(no federal standard)	Unclassifiable
Visibility	(no federal standard)	Unclassifiable

As noted in Table 6.1, the SDAB currently meets the federal standards for all criteria pollutants except 8-hour O_3 and meets state standards for all criteria pollutants except 1-hour and 8-hour O_3, PM_{10}, and $PM_{2.5}$. SDAB was designated as an O_3 attainment area on July 28, 2003, and a maintenance plan was approved. On April 15, 2004, the EPA issued the initial designations for the 8-hour O_3 standard, and the SDAB was classified as "basic" nonattainment. Basic is the least severe of the six degrees of O_3 nonattainment. The SDAPCD submitted an air quality plan to the EPA in 2007; the plan demonstrated how the 8-hour O_3 standard would be attained by 2009. The SDAB is currently classified as a state "serious" O_3 nonattainment area and a state nonattainment area for PM_{10} and $PM_{2.5}$. The SDAB currently falls under a federal "maintenance plan" for CO, following a 1998 re-designation as a CO attainment area [Ref. 8.2].

Plume visibility impacts would also need to be considered, particularly with respect to the proximity of Interstate 5, located between the SONGS Coastal Complex and the cooling tower sites on the SONGS Mesa Complex, as well as impacts on the adjacent MCBCP.

There would be no greenhouse gas emissions directly attributable to the operation of the closed-loop cooling system described in Section 3. All greenhouse gas emissions considered are based on replacing any power lost with power generated by an offsite natural gas-fired generating unit.

6.1.1 Atmospheric Salt Plume Drift

Cooling tower drift is defined as circulating water that is entrained in the exhaust air stream and emitted from a cooling tower. Air emissions typically result from entrainment of liquid water in the air stream which is carried out of the tower as drift droplets. Drift in the exiting airflow can be reduced with various types of drift eliminators.

Drift droplets are water droplets that may contain dissolved and/or suspended solids that are entrained in the air and emitted from the cooling tower stack. Generally the concentration of the dissolved solids in the drift is the same as that in the circulating cooling water. Particulate matter <10 microns in diameter (PM_{10}) forms when cooling tower drift evaporates to form salt crystals. Drift becomes regulated as the criteria pollutant PM_{10} when the liquid droplets evaporate to form crystals.

The conceptual cooling tower design for SONGS Units 2 and 3 would result in an expected 4.2 gpm of cooling water loss from each unit through drift, as calculated in Section 4.4. Since sea water would be used as the coolant, loss of coolant water to plume drift in droplet form would also result in loss of entrained salt that would impact surrounding structures and vegetation.

The following calculations have been developed to estimate the quantities of salt that would be released in cooling tower drift.

Circulating Water Quality:

Cycles of Concentration = 1.5

Salinity of Ocean Water = 33.2 to 33.7 parts per thousand (ppt) [Ref. 8.32]

Salinity of Drift = 49.8 to 50.55 ppt ≈ 0.416 to 0.422 lb/gal

Salt Loss Per Unit:

Drift Rate = (0.0005%) (830,000 gpm) = 4.2 gpm

Salt in Drift = (4.2 gpm) (0.416 to 0.422 lb/gal) ≈ 1.75 to 1.77 lb/min

Maximum Annual Salt Loss per Unit:

(24 hr/day) (60 min/hr) (365 day/yr) (90% generating capacity factor)

= (473,040 min/yr) (1.75 to 1.77 lb/min)

= 827,820 to 837,281 lb/yr

= 413.9 to 418.6 tons/year

Maximum Annual Facility Salt Loss:

(413.9 to 418.6 tons/year) (2 Units) = 827.8 to 837.2 tons/year

Wind speed and direction information collected by the onsite meteorological tower was used to evaluate potential depositional data from the conceptual design location for cooling towers. The wind rose for SONGS (Attachment 5, Figure 5-10) shows the dominant wind direction for the period 2004-2008 to be from the north-northeast and the dominant wind speed to be in the range of 2 to 4 m/s (4.4 to 8.8 miles/hour). Winds are from the north-northeast and toward the SONGS Coastal Complex area and switchyard approximately 20 percent of the time.

Given the dominant wind direction from the north-northeast, approximately 20 percent of the total calculated salt deposition, or between 165.6 and 167.4 tons of salt, would be deposited downwind (south-southwest) of the proposed cooling towers. Deposition of this drift volume would be over Interstate 5, the railroad tracks, and the SONGS Coastal Complex and switchyard.

As discussed in Section 6.4.4, there are no Critical Habitat areas within three miles of the Mesa Complex. However, the habitat surrounding SONGS that would receive most of the salt deposition is occupied habitat for endangered species such as the California gnatcatcher. In addition, the cooling towers would be located in close proximity to much of San Onofre State Beach and the new MCBCP housing.

6.1.2 Plume Visibility Impacts

As indicated in Figure 5-10 of Attachment 5, wind patterns would cause drift and vapor plume to be driven toward Interstate 5 a significant portion of the time. Section 3.1.1 discusses the plume abatement recommended for SONGS Units 2 and 3. Plume-abated hybrid cooling towers represent current state-of-the-art technology with respect to abatement of a visible vapor plume. These towers would greatly reduce the potential for plume formation that could impact traffic flow on Interstate 5 or MCBCP facilities and activities. Similarly, these towers would significantly reduce the potential visibility impacts on the adjacent (west) coastline. As noted in Section 3.1.1, a visible plume would occur less than one percent of the time when utilizing linear hybrid cooling towers at SONGS; however, a plume generated even less than one percent of the time would have the potential to drift towards Interstate 5 and impact commuter visibility. Any impact to commuter visibility would decrease public safety and increase SONGS liability.

Federal air quality regulations address visibility impairment in terms of regional haze. Regional haze is visibility impairment produced by a variety of sources and activities that emit fine particles and their precursors and that are located across a broad geographic area [Ref. 8.40]. Visibility impacts are measured in terms of deciviews, an atmospheric haze index that expresses changes in visibility [Ref. 8.40]. The referenced federal visibility regulations further require states to take steps to reduce emissions of nitrogen oxides, sulfur oxides and fine particulates, particularly with respect to emissions of these pollutants in aerosol form. Conversion of SONGS to closed-loop operation would be contingent on satisfying requests for documentation (visibility reduction expressed in deciviews) of the impact of cooling tower installation on any Clean Air Act Class I areas (national parks and wilderness areas) within 50 miles of the facility.

6.1.3 Greenhouse Gas Emissions

As discussed in Section 4, power losses from Units 2 and 3 due to operation of the closed-loop cooling system would total approximately 143 MWe (annual average) due to reduced thermal efficiency, pumping requirements, and cooling tower power requirements. Replacing this lost power would likely result in additional greenhouse gas emissions from fossil fuel powered (coal, natural gas, or diesel fuel) generating sources, including emissions of nitrogen oxides (NOx), sulfur dioxide (SO_2), carbon monoxide (CO), volatile organic compounds (VOCs) and fine particulate matter (PM_{10}). The levels of these pollutants would vary, depending on the specific fuel(s) used to generate this replacement power.

Table 6.2 summarizes indirect greenhouse emissions in the event 143 MWe were to be replaced with electricity generated by combustion of natural gas or distillate oil. Emission rates are shown on a per hour basis in pounds/hour (lb/hr) and tons/year (T/yr)[8], prior to controls. The emissions shown below are based on AP-42 emission factors [Ref. 8.87, Table 3.1-1].

[8] Short tons based on a 90% generating capacity factor.

Table 6.2 Greenhouse Gas Emissions from Replacement of Parasitic Power Loss

Pollutant	Emissions (lb/hr)	Emissions (T/yr)
Natural Gas:		
NOx	156.0	615.0
CO	40.0	157.7
SO_2	1.6	6.3
VOCs	1.0	3.9
PM	3.2	12.6
CO_2	53,633.2	211,422.1
Diesel Fuel:		
NOx	429.1	1691.5
CO	1.6	6.3
SO_2	1.6	6.3
VOCs	0.2	0.8
PM	5.9	23.3
CO_2	76,549.2	301,756.9

It should be noted that the emissions calculated in Table 6.2 do not include anticipated emissions from construction. Additional greenhouse gas emissions would be generated during the modification of the plant systems, excavation and disposal of soils and construction debris, and construction of the cooling towers and associated systems. Construction emissions would result from excavation equipment and vehicles used for material transportation, in addition to emissions from construction worker vehicles. Additional unexpected emissions could result from traffic congestion from site workers, outage workers, construction vehicles, and excavated materials transport occurring over the construction period. The emissions from these construction sources could be significant, but localized, and would cease after construction was completed; however, closed-loop conversion would be contingent on obtaining a construction air permit for these activities.

6.1.4 Permitted Emissions

The EPA has designated San Diego County as being in non-attainment status for the 8-hour ozone standard and unclassifiable for PM_{10}. The state of California classifies San Diego County as being in non-attainment status for both the 1-hour and 8-hour ozone standards, particulate matter (PM_{10} and $PM_{2.5}$) and unclassifiable for hydrogen sulfide and visibility [Ref. 8.2].

Operation of cooling towers at SONGS would result in emissions of PM_{10} and $PM_{2.5}$ (water vapor and drift) and would potentially impact visibility. If SDAPCD required SCE to obtain air quality permits for these facilities it would be necessary to conduct a New Source Review (NSR) of the impacts of particulate emissions on ambient air quality prior to construction of the cooling towers. Computer dispersion modeling conducted as part of the NSR process would likely show a localized increase in ambient fine particulate levels in the immediate vicinity of the cooling towers. As noted above, SDAPCD is already designated non-attainment by the state of California for PM_{10} and $PM_{2.5}$. Visibility issues associated with cooling tower generated plumes would also have to be addressed for permitting purposes. Additional drift offset or mitigation measures could be required by the regulatory authority, given the SONGS coastal location and surrounding cultural features. If available, drift offset costs would likely be substantial. If SONGS were required to obtain air quality permits, upon completion of cooling tower construction, an operating permit application would have to be submitted to the SDAPCD, per the District's Rule 1410 [Ref. 8.65, Regulation XIV, Rule 1410] in order to obtain an air quality operating permit.

Based on the salt loss calculations shown in Section 6.1.1, a significant tonnage of PM_{10} emission reduction credits (between 827.8 and 837.2 T/yr) would have to be purchased. Review of cost data for 2007 [Ref. 8.8] indicates that a total of 402.73 tons of PM_{10} emission reduction credits were purchased in California during that year, where costs ranged from $49/T to $1,293,151/T. The average cost was $97,442/T and the median cost was $43,000/T. Total PM_{10} purchases in the SDAPCD were 0.3 tons at a cost of $100/T. Based on this cost data and the relatively small number of tons purchased in 2007, both in the district and throughout the state, it is unlikely that SONGS could locate and purchase a sufficient number of PM_{10} credits to cover this volume of emissions. Conversion of SONGS to closed-loop cooling would be infeasible if the required drift offsets were not available. It should be noted that due to the limited availability of PM_{10} emission credits and large variability in price, a cost for obtaining the necessary PM_{10} credits has not been estimated. If PM_{10} credits were to be available, the cost of converting SONGS to closed-loop cooling would increase significantly to include their purchase.

6.1.5 Vapor

Although closed-loop cooling towers at SONGS Units 2 and 3 would be of the plume-abatement type, significant vapor loss would still be anticipated, even if plumes were rendered completely invisible. Cooling towers continuously release water vapor and a small amount of liquid into the air. This vapor loss consists of pure water and is a result of evaporation. Per Section 4.4, water vapor loss would be approximately 12,616 gpm per unit. Since the water vapor released would be in pure form it would not represent the hazard to vegetation and structures over time that losses due to drift (salt water) would represent. This vapor/fine droplet release would need to be included in $PM_{2.5}$ and PM_{10} emission calculations for air permitting purposes.

6.2 Wastewater Discharge Considerations

A basic description of the operational differences pertaining to cooling water, and more specifically, the wastewater released from the cooling systems is provided in this introduction.

In the OTC system used currently, sea water is brought in from the ocean and passes through a series of trash racks and screens that remove debris and prevent fish and shellfish from entering the cooling system. Specialized fish return systems are used to collect and return aquatic organisms to minimize the impacts on the marine ecological communities. As described in Section 2.2.1, the normal operation requirements of the OTC circulation water system, with four circulating water pumps running for condenser cooling, are 830,000 gpm for each unit. Normal operating requirements of the Saltwater Cooling system are up to 34,000 gpm, with two SWPs in operation. As the relatively small capacity (2500 gpm) screen wash pumps only supply process water and operate intermittently, immediately returning much of their flow to the intake structure, the flow requirements of the screen wash system are not considered. Therefore, the total licensed design flow for each SONGS unit is 864,000 gpm.

The NPDES permit limits pollutants and temperatures of wastewater discharges back into the ocean. In the circulating water discharge there is some plate-out of salts, minerals, and aquatic organisms which cause scale formation and fouling of heat transfer surfaces. The various chemicals injected to reduce the negative effects of fouling are minimized to comply with the release limits of the NPDES permit. As discussed in Section 4.5.2, the NPDES permit also limits whole effluent toxicity, total residual chlorine, toxic pollutants, residual heat, total suspended solids, oil, grease, wastewater flow, pH, non-carcinogenic pollutants, carcinogenic pollutants, and metal cleaning wastes. Chemicals added to the system would be required to meet the needs of SONGS's systems and also meet these limits for release, or the NPDES permit would require modification.

In a closed-loop cooling system, several operational changes would affect the cooling water returned to the ocean as wastewater. As described in Section 3.6, multiple changes to the circulating water system would be required for conversion to a closed-loop cooling system. After being sent through the condensers, the cooling water would be sent to the new hybrid cooling towers where the water would be cooled, and returned to the condensers. Since hybrid cooling towers rely on evaporative cooling to decrease the circulating water temperature, a small portion of the circulating water would evaporate in the hybrid cooling tower. As shown in Section 4.4, the evaporation rate would be approximately 12,616 gpm for each unit. Small volume losses would also occur due to tower drift; approximately 4.2 gpm per unit.

The closed-loop system at SONGS would require approximately 37,848 gpm of makeup water flow for each unit. Closed-loop cooling systems concentrate the chemicals, minerals, and salts found in the source water body (Pacific Ocean) with each cycle of concentration. The ocean water that is not sent back to the condenser for reuse or lost to evaporation and drift is discharged back to the ocean and is referred to as blowdown.

6.2.1 Cooling Tower Blowdown

Blowdown wastewater is the water returned from the cooling towers to the ocean. As shown in Section 4.4, the blowdown flow would be approximately 25,228 gpm for each unit.

With a closed-loop cooling system, water treatment requirements are dramatically increased. The cooling tower fill is subject to fouling, as are the dry heat exchanger sections. Both the quantities and frequency of biocide injections must be increased significantly to maintain the tower fill in proper condition. Additionally, increased water treatment is necessary due to the higher concentrations of dissolved solids, chemicals, and biological agents in the system resulting from constant recirculation of the condenser cooling water. The cooling towers act as air washers as well as distilleries, constantly evaporating large quantities of water and leaving behind the nonvolatile residues. The actual concentrations of these agents is based in part on the number of cycles of sea water and potential fouling conditions, as discussed in Section 4.4.1 and 4.5.

The operating conditions for the cooling towers at SONGS would limit recycle rates to 1.5 cycles of concentration. This limitation would be necessary due to the high concentration of salts and minerals found in the ocean water. With a starting salinity of 33.2 to 33.7 ppt for the ocean water and combining with 1.5 cycles of concentration, the blowdown wastewater being returned to the ocean would be approximately 49.8 to 50.55 ppt. The majority of chemicals, salts, metals, and minerals concentrate in the evaporative cooling process. Blowdown wastewater discharge to the ocean would be required to meet the NPDES limits.

Although the current NPDES permits for Units 2 and 3 do not have salinity or total dissolved solids (TDS) limits, the concentration of salinity could pose a localized impact on marine life in the immediate area around the discharge structures due to higher TDS. Plant effluent salinity increases to approximately 49.8 to 50.55 ppt could require an anti-degradation analysis and potential discharge structure modification to achieve greater dilution over a greater area of the ocean. The blowdown discharge salinity would be a factor for modification of the NPDES permit.

If converted to closed-loop cooling as described in Section 3, the blowdown discharge temperature would be dependent on the ambient wet-bulb temperature. The cooling towers were designed such that under worst case conditions (defined as a wet-bulb of 75°F) the blowdown discharge would be 90°F. The SONGS Units 2 and 3 NPDES permits require that the maximum temperature of thermal discharges from Units 2 and 3 not exceed the natural temperature of the receiving waters by more than 25°F ($\Delta T \leq 25°F$). The NPDES permit [Ref. 8.22] states that the mean surface temperature of the ocean near the site varies from 73°F in August to 56°F in January. Under worst case conditions, it is possible the $\Delta T \leq 25°F$ limit imposed by the NPDES permit could be exceeded, even if only briefly.

6.2.2 NPDES Permit Modification

NPDES permits specify the limits for release of wastewater to the ocean. The current NPDES permits for SONGS Units 2 and 3 are NPDES Permit Nos. CA0108073 and CA0108181 [Ref. 8.22]. 40 CFR 122.44(d) requires that the permits include water quality-based effluent limits. These permits are also required to use the USEPA criteria guidance provided under the Clean Water Act Section 304(a). New permit modification applications would need to be submitted to the California Water Resources Board and would need to consider system modifications, operational programs, and procedures associated with the installation and operation of cooling towers at SONGS. Additionally, the new permit modification applications would need to estimate the effluent pollutant concentrations and thermal discharge characteristics. The NPDES permits also limit whole effluent toxicity, total residual chlorine, toxic pollutants, residual heat, total suspended solids, oil, grease, wastewater flow, pH, non-carcinogenic pollutants, carcinogenic pollutants, and metal cleaning wastes. Chemicals added to the system would be required to meet the needs of the plant systems and also meet these limits for release. The feasibility of closed-loop cooling would depend on the ability of SONGS to meet these NPDES permit limits.

6.3 Solid Waste Generation

Suspended solids in the circulating water would accumulate over time in the cooling tower basins, circulating water basins, and circulating water piping. Periodically, the accumulated solids would need to be removed and disposed of at an offsite landfill. The quality of the material removed is highly dependent on the nature of the intake water, the chemicals used for cooling tower maintenance, and the materials used for construction. In addition to the solid waste sludge that would need to be periodically removed from the closed-loop cooling system, there would be a large one-time generation of waste material during construction activities. Both periodic and one-time closed-loop waste streams are discussed in this section.

6.3.1 Solid Waste Generated from Construction Activities

The site preparation and digging required for the installation of cooling tower basins and new circulating water lines would involve the disturbance and disposal of large amounts of soil. In some situations, the soil could be contaminated with oil or other organic substances from prior use. If soil contamination is present, spoils generated from conversion to closed-loop cooling would present an additional cost for retrofit operations.

6.3.1.1 Tunnel Construction

Tunnel construction is discussed in Sections 3.2.4, 3.5, and 5.1.1. The most significant solid material generated during closed-loop conversion of SONGS Units 2 and 3 would come from the construction of the eight tunnels required to circulate cooling water between the condensers and the cooling towers. As described in Section 3.2.4, tunnel construction would require the excavation of approximately 195,820 cubic yards of sandstone and alluvium. As discussed in Section 5.1.1, the material excavated from tunneling activities would likely be non-contaminated and could possibly be reused as fill or building materials (i.e., sand, gravel, rock). The material could also be spread onsite; however, due to land use constraints, transporting and disposing of the material offsite would most likely be required. The material would be expected to meet non-contaminated fill material criteria and available disposal sites would have to be found to receive the material.

6.3.1.2 Other Construction Activities

As discussed in Section 3.2.4, the total amount of excavation materials is estimated to be as much as 297,210 bank cubic yards of sandstone and alluvial material, including the tunnel spoils discussed above. As discussed in Section 6.3.1.1, some of this material could be suitable for fill, but would likely require an offsite disposal location which would need to be identified. Other types of non-hazardous solid waste would include scrap building materials, debris from the removal/relocation of existing structures/equipment that would be impacted by the conversion to closed-loop cooling, and general trash that would be generated during construction. The amount of these materials would vary during the construction but this waste stream would cease after construction was complete. A limited amount of hazardous material could potentially be generated during construction. The facility does maintain a hazardous waste permit; however, disposal under this permit would require additional cost for the proper tracking and disposal of hazardous materials.

6.3.2 Solid Waste Generated from Operations

Salt, water treatment chemicals, and other suspended solids in the circulating water would continuously accumulate in the cooling tower basins, circulating water basins, and circulating water piping throughout closed-loop cooling operation. The volume of solid waste sludge accumulated would depend on the salinity of the intake water, the cycles of concentration, and the water treatment processes used to maintain cooling tower operation and meet discharge regulations. Periodically, the accumulated solids would be removed and transported to a disposal facility. In addition to solid waste removed from the circulating water system, additional sludge may need to be removed from any required water treatment equipment, such as brine concentrators, side-stream softeners or other blowdown reduction processes.

Waste solids generated from cooling tower operations would be non-hazardous and could likely be disposed at a local offsite landfill. The material would likely be in a sludge form once removed from the basins and would either require dewatering before transportation offsite for disposal or would be solidified at the disposal facility; however, solidification would be significantly more expensive. Wastewater generated from dewatering would likely be discharged with the cooling water waste stream as part of the amended NPDES permit, discussed in Section 6.2. Solid waste generated by closed-loop cooling operation would continuously impact SONGS operations, requiring periodic offsite disposal of accumulated suspended solids over the entire lifespan of the closed-loop cooling system.

6.4 Habitat and Species Impacts

If converted to closed-loop cooling, the plant liquid effluent would be more concentrated, resulting in higher salinity and total dissolved solids. Modifications to the discharge structure to accommodate the decreased flow rate could be required to address salinity and thermal issues (see Section 3.6); however, offshore construction could disrupt aquatic resources.

In addition, closed-loop cooling would impact terrestrial resources during both construction and operations. Likewise, noise associated with construction and operation of closed-loop cooling would pose additional impacts. Utilizing cooling towers could have deleterious effects on terrestrial habitats adjacent to the site due to salt deposition. Potential impacts to species and habitat could occur to the coastal California gnatcatcher habitat immediately adjacent to the site. Additionally, arroyo toad and least Bell's vireo habitat could also be affected by salt deposition from the plume.

6.4.1 Aquatic Resources

SONGS's two generating units draw in approximately 1.7 million gallons of ocean water per minute to condense non-radioactive main steam. The SONGS once-through cooling system has existing technologies currently in place that reduce impingement mortality by an estimated 94.2% in terms of finfish numbers and 97.7% by weight. These reductions are at the high end of the 80%-95% reduction range required by the now suspended CWA 316(b) Phase II Rule. Impingement mortality reduction is achieved through the use of an offshore intake with a velocity cap combined with an on-shore fish return system (FRS). In addition to modifications to the intake structures, SCE committed to restore 150 acres of coastal wetland, costing $86 million. This acreage was determined by the California Coastal Commission (CCC) to be sufficient to offset entrainment losses of Units 2 and 3. The restoration plan was developed and approved by the CCC in compliance with conditions stated in the Coastal Development Permit for the facility [Ref. 8.70].

6.4.1.1 Construction Impacts to Aquatic Resources

SONGS currently has two functional intake and discharge systems. As discussed in Section 3.6, no modification of the cooling water intake structure would be anticipated beyond the replacement of the circulating water pumps. Discharge structure modification could be required to ensure adequate dilution of all plant effluents. The most likely impacts on the marine environment would be from dust or stormwater runoff due to construction of the cooling towers. Conversion of SONGS to closed-loop cooling would require that dust and stormwater runoff effects be mitigated through SONGS' existing programs and standard construction Best Management Practices (BMP).

6.4.1.2 Operational Impacts to Aquatic Resources

As described in Section 6.2, the cooling tower blowdown could create adverse impacts to the marine environment and aquatic resources. These identified impacts would result from higher than ambient salinity of the blowdown discharge and the potential for exceeding the NPDES thermal discharge limits.

Giant kelp is a species of marine brown alga found along the Pacific coast of North America from central California to Baja California. The closest stand of Macrocystis is the San Onofre kelp bed, 656 feet down-coast of the Unit 2 diffusers at a depth of about 40 to 50 ft. The aerial extent of a kelp bed canopy is highly variable. In 1990, canopy measurements of the kelp bed varied from zero to 76.3 hectares; however, since 1966, the canopy has averaged 11.7 hectares [Ref. 8.70]. Warmer water temperatures tend to negatively affect kelp survival as does pollution and coastal development. Human influences on giant kelp tends to be greater in southern California due to the concentration of the State's population within this region [Ref. 8.70], which may contribute to variations in the size of the kelp canopy.

Over 170 acres of artificial reef have been created in the nearby waters by SCE as mitigation for kelp losses due to increased turbidity in the area of San Onofre kelp bed resulting from discharge operations at SONGS [Ref. 8.70]. High salinity brine discharges have been indicated to be toxic to certain aquatic communities, potentially including but not limited to kelp and sea urchins. Most studies of salinity impacts on marine ecologies have focused on lower than ambient salinity impacts, but little research has been conducted on higher salinity discharges. One recent study indicated that salinity increases within 10 percent of ocean ambient appeared to have no adverse impact on kelp spores, but did have an observed adverse impact on sea urchin development [Ref. 8.79]. Thus, there would be a potential for adverse impacts of the cooling tower blowdown on marine organisms. There could also be impact from drift deposition on the near-shore area around SONGS. Both drift deposition and blowdown discharges could require additional research and modeling to ensure the impacts are localized.

6.4.2 Terrestrial Resources

Description of terrestrial vegetation near SONGS by Odgen [Ref. 8.59] indicated the portion of the San Onofre State Park immediately south of SONGS consists of disturbed coastal sage scrub habitat that occurs in small areas that have been trampled or cleared by former activities. Non-native herbaceous species such as mustard (Brassica sp.) have invaded these areas in substantial amounts. Sage scrub regeneration in these areas is evident with scattered young specimens of coyote brush and California sagebrush [Ref. 8.59].

Much of the lands on which cooling tower construction would take place have already been significantly altered. This ruderal habitat near the site contains nonnative plant species including mustard, brome grass (Bromus spp.), tocalote (Centaurea melitensis), and the naturalized giant coreopsis (Coreopsis gigantea) [Ref. 8.59].

Diegan coastal sage scrub is the predominant native vegetation association immediately south of SONGS. The association is typically found on dry sites, such as steep, south-facing slopes or clay rich soils that are slow to release stored water. California sagebrush (Artemisia californica) is the dominant shrub species onsite, forming a dense, nearly monotypic stand. Scattered specimens of coyote brush (Baccharis pilularis) and bladderpod (Isomeris arborea) also occur throughout this vegetation community onsite. The stature of this vegetation onsite is somewhat diminutive (2 to 3 ft) due to the wind-pruning effect of the moist, salty sea breezes [Ref. 8.59].

Because the actual site has limited habitat, it is not conducive to diverse wildlife utilization. Table 5-2 of Attachment 5 lists reptile and mammal species observed on the site during a survey for the SONGS Operating License Stage Environmental Report for SONGS [Ref. 8.74].

MCBCP, which occupies the majority of the SONGS vicinity, is the largest remaining tract of the land in coastal southern California that has little development or direct human influence, except for frequent military training operations. MCBCP supports several ecosystems including:

- Estuarine and beach ecosystems
- Riparian ecosystems
- Shrublands
- Grasslands
- Oak Woodlands
- Wetlands

Approximately 18 miles of undeveloped coastline exists within the borders of MCBCP. The limited area of natural coastline left in southern California makes the MCBCP shoreline of special interest. Habitats of the coast are divided roughly into four zones. The intertidal zone is regularly inundated by the ocean, while strand or beach is subject to wave action and deposition and removal of sand and gravel.

Riparian ecosystems on MCBCP contain a wide variety of habitat types including woodlands, fresh water marshes and open water areas. Within the vicinity of SONGS, waters associated with the San Mateo and San Onofre watersheds including San Mateo Creek and San Onofre Creek, respectively, provide riparian habitat. Due to the arid climate of southern California, water is a limiting factor to vegetation growth. Habitat characteristics are vastly different in riparian areas where water is more plentiful. Winter deciduous trees such as willows, cottonwoods, alders, and sycamores tend to dominate riparian habitat [Ref. 8.95].

Shrublands in the vicinity of SONGS are composed of two types. Chaparral types are dominated by evergreen species with small, thick, leathery, dark green, sclerophyllous leaves while coastal sage scrub habitat is dominated by species that lose all or most of their large, grayish-green leaves during summer months. Chaparral types are more abundant in cooler areas with higher annual precipitation consistent with higher elevations. Coastal sage scrub and specifically Diegan coastal sage scrub is common in the vicinity of SONGS as it is usually identified with warmer areas with a predominant drought season [Ref. 8.95]. Species associated with Diegan coastal sage scrub include: California sagebrush (Artemisia californica), coyote brush (Baccharis pilularis) and bladderpod (Isomeris arborea) [Ref. 8.59].

A detailed list of plant species identified near Units 2 and 3 were presented in Appendices 2A-1 and 2A-2 of the SONGS Units 2 and 3 Operating License Stage ER [Ref. 8.74]

Grasslands are also common on MCBCP. Although many grass and forb species have been introduced, grasslands cover about 30 percent of the base. They are usually located along coastal terraces and cover rolling hills with deeper soils [Ref. 8.95].

As previously mentioned, vegetation in southern California is limited by water availability. Although not typically conducive to extensive forest growth, some oak species are particularly adapted to such climates. However, oak forests in the vicinity of SONGS are only found in areas where drought is somewhat ameliorated by other characteristics. For instance, oaks woodlands are protected from the maximum intensity of the sun on north-facing slopes and have more access to water below rock faces or bouldery areas where runoff is concentrated or in areas where deep soils hold more moisture [Ref. 8.95].

6.4.2.1 Impacts Associated with Construction

Construction impacts to terrestrial resources are associated with loss of habitat due to grading and filling, storm water runoff, sedimentation, fugitive dust, and noise. Cooling towers on the SONGS Mesa Complex would be placed in a previously disturbed location which would negate the issue of habitat loss; however, erosion, sedimentation, and fugitive dust would be expected. Additional attention on mitigating these impacts would be necessary, and could be controlled by implementing BMPs.

The BMPs that would be employed at SONGS would be incorporated in a site-specific construction Stormwater Pollution Prevention Plan (SWP3) using appropriate state or local specifications prior to initiating construction. Among the general measures that would be considered for inclusion in the SWP3 are:

- Minimize the area to be disturbed and use silt fences or other sediment controls.
- Phase construction activity to minimize the duration of soil exposure and stabilizing exposed soil as quickly as possible after construction. Temporary cover BMPs include temporary seeding, mulches, matrices, and blankets and mats while permanent cover BMPs include permanent seeding and planting, placing sod, channel stabilization, and vegetative buffer strips.

- Control stormwater flowing through the site by diversion ditches or berms to direct runoff away from unprotected slopes.
- Establish perimeter controls such as vegetative buffer strips supplemented with silt fences and fiber rolls around the perimeter of the construction to help prevent soil erosion and stop sediment from mobilizing and entering the ocean.
- Control fugitive dust by watering the construction site as needed.
- Schedule periodic and regular inspection and maintenance of all BMPs put into place.

Wildlife typically avoid roadways where activity and noise increase [Ref. 8.86]. Noise and machinery activity would be expected to displace mobile species beyond the actual construction area, similar to animal movement away from areas of vehicle traffic along highway systems. Heavy equipment such as scrapers and bulldozers typically emit noise at levels within the 70 to 90 dBA range at distances of 100 feet. A small percentage of habitat at SONGS would be expected to be disturbed and ample habitat would be available adjacent to the construction site, which would provide refuge for displaced animals. Avoidance behavior surrounding construction sites would partially offset the risk of wildlife colliding with equipment or vehicles. Construction noise would not continuously impact the surrounding wildlife, but would be anticipated to impact terrestrial resources over the 66 month construction duration.

Erosion, sedimentation, fugitive dust, and noise impacts to terrestrial resources from the construction of closed-loop cooling would require additional mitigation measures by SONGS. It should be noted that while construction impacts would be considered one-time, they would last over the 66 month construction duration.

6.4.2.2 Impacts Associated with Operation

Impacts of closed-loop operation to terrestrial resources would include cooling tower noise and the vapor plume emitted from the cooling towers. Of these, the primary concern for terrestrial resources would be salt deposition caused by the cooling tower plume. Although detailed plume models have not been performed to indicate deposition rate per hectare, negative effects associated with salt deposition to some terrestrial vegetation and habitat in the vicinity of SONGS would be likely. The effect salt deposition would have on the surrounding environment would need to be investigated further to determine how severely the terrestrial resources would be harmed.

6.4.3 Threatened and Endangered Species

Twenty-three species currently protected under the Federal Endangered Species Act (ESA) have geographic ranges within the vicinity (6-mile radius) of SONGS. The vicinity includes primarily the northwest corner of MCBCP in San Diego County and the southwest corner of Orange County. Table 5-2 of Attachment 5 lists protected species and the designated protective status.

Areas of MCBCP that provide habitat for two mammalian, one amphibian, seven avian, two fish, two invertebrate, and three federally listed plant species (as well as one avian and one plant candidate species for listing under ESA) have been identified through surveys of

MCBCP. Of the 19 species identified on MCBCP, 13 protected species have been identified as residents within the vicinity of SONGS [Ref. 8.95; Ref. 8.92]. Endangered marine reptiles and mammals identified within the vicinity of SONGS are mostly transient and only migrate through the vicinity.

Terrestrial Species

Bald eagles have been federally delisted but remain listed as endangered by the state [Ref. 8.15]. In 1995 and 1996, but not since, sightings were documented on MCBCP in the Santa Margarita estuary and in Cocklebur Creek [Ref. 8.95]. Bald eagles are highly mobile and would not likely be affected by construction or operation of cooling towers.

Brown pelicans are listed endangered by the state and federal government, although it has been considered for delisting by both [Ref. 8.15]. Although brown pelicans are known to fly along the coast of MCBCP, they do not typically use MCBCP as a breeding site. The closest known nesting colony to San Diego County is on Los Coronados Islands off Tijuana, Mexico. However, pelicans have been identified feeding in estuary waters and roosting on MCBCP [Ref. 8.95].

Coastal California gnatcatchers are federally endangered and listed as a species of special concern by the state of California [Ref. 8.15]. Coastal California gnatcatchers have been identified as year round inhabitants of MCBCP in predominantly coastal sage habitat and occasionally chaparral and riparian habitats [Ref. 8.95]. The little unaltered habitat onsite consists predominantly of coastal sage community and could provide habitat for gnatcatchers. However, there are indications that gnatcatchers generally avoid crossing even small areas of unsuitable habitat [Ref. 8.58]. Interstate 5 bisects areas where gnatcatchers have been identified and the plant site. Additionally, a focused survey in 1994 failed to identify coastal California gnatcatchers immediately adjacent to the SONGS site. A possible reason credited within the study was that coastal scrub shrub vegetation onsite was denser than coastal scrub shrub vegetation in habitat that was utilized by gnatcatchers and was therefore considered to be of lower quality to the species. Although general habitat requirements for coastal California gnatcatchers appear to be located at SONGS, plant density may be such that the species does not take advantage of its existence, or habitat fragmentation may affect accessibility [Ref. 8.59].

Suitable habitat for coastal California gnatcatchers has been identified adjacent to SONGS. Noise associated with construction could affect gnatcatcher behavior and flight patterns over the 66 month construction duration. Furthermore, increased vehicular activity would increase the likelihood for collisions with gnatcatchers. Although it is not anticipated salt deposition would directly affect gnatcatchers, it is possible suitable habitat could be affected (Section 6.4.2.2).

Least Bell’s vireo is a small diurnal songbird species that is federally and state listed endangered [Ref. 8.15]. They are found throughout the MCBCP in riparian habitat [Ref. 8.95]. Identified habitat includes dense brush, mesquite, willow-cottonwood forest, streamside thickets, and scrub oak in arid regions but often near water [Ref. 8.58]. Least Bell’s vireo has been identified in the riparian areas along San Onofre Creek, which is approximately one mile from SONGS. Although a detailed plume analysis has not been performed, salt deposition to least Bell’s vireo habitat is possible.

Southwestern willow flycatchers are listed endangered by both the federal and state government [Ref. 8.15]. The breeding range includes southern California, Arizona, New Mexico as well as parts of Nevada, Utah, and Texas [Ref. 8.93]. On MCBCP, southwestern willow flycatchers inhabit riparian woodlands consisting of willow-dominated habitats with a dense understory. They are diurnal and usually nest from June through the end of July. Southwestern willow flycatchers were identified within the plant vicinity in 2002, 2003, and 2004 bird surveys [Ref. 8.95]. However, suitable habitat is not located on the site. Furthermore, the USFWS has critical habitat mapped within 50 miles of SONGS but not within the vicinity [Ref. 8.92]. Southwestern willow flycatchers would not likely be affected by localized impacts associated with operation of cooling towers at SONGS.

Western snowy plovers are small shorebirds that are listed threatened by the federal government. Habitat for western snowy plovers consists of beaches, dry mud or salt flats, sandy shores of rivers, lakes and ponds. USFWS has critical habitat mapped about 2 miles northwest of SONGS between SONGS and San Mateo Point [Ref. 8.92] near the northwest boundary of MCBCP. USMC surveys in 1996, 1998, and 2000 reveal snowy plover nesting locations only in the southeast corner of the base [Ref. 8.95]. Western snowy plovers would not likely be affected by localized impacts associated with operation of cooling towers at SONGS.

Pacific pocket mice are listed as endangered by the federal government and as a species of special concern by the state [Ref. 8.95]. Preferred habitats include coastal strand, sand dune, ruderal vegetation on river alluvium, and open coastal sage scrub on marine terraces [Ref. 8.59]. Populations have been identified on base, northwest of SONGS [Ref. 8.95]. Trapping surveys in habitat similar to that found on SONGS property failed to identify Pacific pocket mice in 1994 [Ref. 8.59], and as such they are not anticipated onsite. Although a detailed plume analysis has not been performed, salt deposition to Pacific pocket mice habitat is possible.

Stephen's kangaroo rat (SKR) is listed endangered by both the federal and state government [Ref. 8.15]. Suitable habitat is characterized as sparse grasslands with a high percentage of bare ground. Although SKR have been identified in the vicinity of SONGS [Ref. 8.95], suitable habitat is not located onsite.

Thread-leafed brodiaea is listed by the USFWS as a threatened species but by the California Department of Fish and Game as an endangered plant [Ref. 8.15]. The plant is a perennial herb with a flowering stem arising from an underground bulb. Thread-leafed brodiaea grows in heavy clay soil and is often in association with vernal pools and floodplains [Ref. 8.58]. NatureServe [Ref. 8.58] indicates the plant is associated with vernal pool complexes but USFWS has designated critical habitat inland of the plant [Ref. 8.15] and surveys on MCBCP have revealed thread leafed brodiaea inland of SONGS along San Onofre creek [Ref. 8.95]. Although thread-leafed brodiaea has been identified within the vicinity of SONGS [Ref. 8.95], suitable habitat has not been identified onsite. However, thread-leafed brodiaea in the vicinity of SONGS could be affected by increased salinity associated with cooling tower deposition.

Aquatic Species

Arroyo toads are federally listed endangered and listed by the state as a species of special concern [Ref. 8.15]. Sandy soil is necessary for burrowing and hibernating. However, for breeding and laying eggs, suitable habitat consists of rivers with shallow, gravelly pools adjacent to sandy terraces [Ref. 8.58]. On MCBCP, arroyo toads have been located in drainage basins throughout the base [Ref. 8.95]. It is anticipated that salt deposition from the cooling tower plume would reach San Onofre creek, which is habitat for arroyo toad populations.

Riverside fairy shrimp and San Diego fairy shrimp are listed as federally endangered species, although neither has been assigned special status by the state [Ref. 8.15]. Both fairy shrimp species share similar suitable habitat characteristics consisting of vernal pools that are temporary by nature. A base-wide survey identified 81 vernal pool complexes that contained either one or both species on MCBCP [Ref. 8.95]. Vernal pools have been mapped within a mile northwest of the site. Although changes in intake velocities and discharge composition and velocities would not affect fairy shrimp, salt deposition from the cooling tower plume could affect vernal pool salinity concentrations, thus affecting fairy shrimp habitat.

The tidewater goby is federally listed as an endangered species but considered a fish species of special concern in California [Ref. 8.15]. Tidewater gobies are found in waters 25-100 cm deep and are usually restricted to coastal brackish water habitats [Ref. 8.58] as found in many lagoons on MCBCP. One such lagoon exists within the vicinity of SONGS (approximately 1 mile northwest), but suitable habitat for tidewater gobies has not been identified onsite [Ref. 8.95]. Tidewater gobies do not have a marine life history phase [Ref. 8.58] and are therefore, not expected near the intake or discharge of SONGS. Tidewater gobies would not likely be affected implementation of closed-loop cooling at SONGS.

Steelhead trout are considered a partially anadromous salmonid. They are listed as endangered by the federal government and have been historically located in streams and rivers of Los Angeles, Orange and San Diego counties. After one to four years in freshwater, steelhead trout migrate to marine environments [Ref. 8.95]. Sexually mature steelheads migrate back to freshwater prior to spawning. The USFWS has San Mateo creek and San Onofre creek listed as critical habitat for steelhead trout [Ref. 8.15]. A single juvenile steelhead was observed in San Mateo Creek on USMCB (within the vicinity of SONGS) in 1999. Ongoing monitoring by USMC has been conducted to determine if steelhead trout routinely make use of San Mateo Creek and existing pools. As of 2005, no other steelhead trout have been identified on base [Ref. 8.95].

6.4.4 Critical and Sensitive Habitats

Critical and important habitats are those areas that are managed by a state for species that are listed at the state level as endangered, threatened, or of concern. Although MCBCP contains several uninterrupted hectares of intact habitat that is utilized by threatened and endangered species [Ref. 8.95] an amendment to the Endangered Species Act in 2004 prevents the USFWS from designating military lands as critical habitat if the areas are covered by an approved INRMP that provides a conservation benefit to the species.

MCBCP published an INRMP to aid in the management and conservation of natural resources under the Base's control in October 2001. Updates to the INRMP are ongoing, and the latest published version is from March 2007.

Section 6.4.3 indicated habitat for coastal California gnatcatchers, least Bell's vireo, thread-leafed brodiaea, arroyo toads, fairy shrimp, and the Pacific pocket mouse could be affected by salt deposition associated with the operation of cooling tower at SONGS. A detailed analysis would be required to determine the likelihood that salt deposition in these areas would be impactive. If impactive, the feasibility of operating SONGS with closed-loop cooling would need to be determined by governing regulatory agencies.

6.5 Impacts to State Parks

As described in Section 2, SONGS Units 2 and 3 are located on the Pacific coast of Southern California in northern San Diego County. The site is located entirely within the boundaries of the MCBCP near the northwest end of the 18-mile shoreline. The largest single leaseholder on MCBCP is the state of California Department of Parks and Recreation, which accounts for approximately 2000 acres, leased from the Department of Navy in 1971 for a 50-year term [Ref. 8.95, p. 2-30]. The California State Park facility created from the lease is San Onofre State Beach. Also, within a 6-mile vicinity of SONGS is San Clemente State Beach, as shown in Figure 6.1.

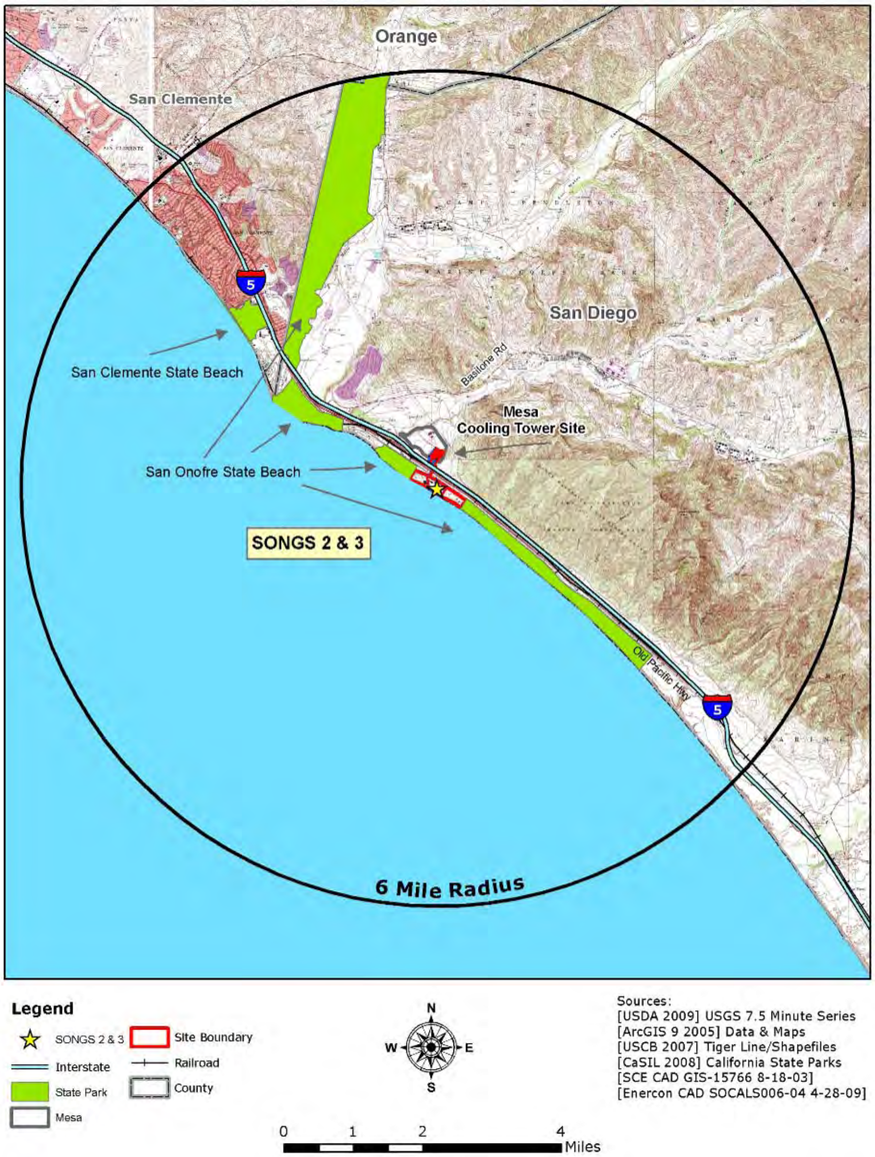

Figure 6.1 California State Parks, 6-Mile Radius

As discussed in Section 3, the cooling towers would be located in the Mesa Complex. The location of the Mesa Complex in relation to nearby San Onofre State Beach and San Clemente State Beach can be seen in Figure 6.1.

The physiography of the SONGS vicinity and San Onofre and San Clemente State Beach are typical of the region, with a rather narrow, gently sloping, coastal plain extending seaward from the uplands. The plain is terminated at the beach and forms a line of sea cliffs, which have been straightened over long distances by marine erosion. Sea cliffs in the immediate vicinity of SONGS reach a height of 60 to 100 feet above mean sea level, and are separated from the ocean by a narrow band of beach sand. In places, ephemeral streams are actively eroding gullies into the seaward portions of the coastal plain, and several deeply incised barrancas have been formed [Ref. 8.75, p. 1.2-2].

Public access to the beach adjacent to the Coastal Complex seawall is provided by an improved walkway. The walkway permits transit between open beach areas upcoast and downcoast from the site [Ref. 8.74, p. 2.1-2]. Public passage between sections of San Onofre State Beach north and south of the SONGS Coastal Complex was granted through a February 16, 1982, amendment to the coastal development permit with the CCC. This walkway is open to the public except when closure is necessary for reasons of public safety or plant security [Ref. 8.10].

The San Onofre State Beach includes 3.5 miles of sandy beaches with six access trails cut into the bluff above. The beach also contains the Bluffs Campground along Old Highway 101, the Trestle and San Onofre Surf Beaches, and the San Mateo Campground. The San Mateo campground lies inland within the San Mateo drainage, immediately adjacent to and along the north side of the creek. From July 1, 2007, to June 30, 2008, the state beach had 2,750,957 visitors with 218,750 of those camping [Ref. 8.17, p. 28].

The state beach's two campgrounds have a total of 380 campsites [Ref. 8.66]. The Bluffs Campground has approximately 221 camp sites with parking for an RV at each site. Some sites have electrical hook-ups for RV's, but no sewer hook ups. The campground has a dump station. Each site is restricted to no more than eight people. Camping is limited to no more than seven consecutive days per season, which includes off-season and peak season. Typically, the campground is closed from December to March. San Mateo Campground has approximately 157 total camp sites with electrical and water RV hook-ups at 67 of the sites. The campground also has a dump station. Each site is restricted to no more than eight people [Ref. 8.78, p. 4-93]. No person is permitted to camp at the campground for more than 30 days total in a year [Ref. 8.16, pp. 2, 5].

To the north of San Onofre State Beach is San Clemente State Beach, which stretches for a mile with two trails following scenic ravines providing access. Recreation activities include swimming, snorkeling, surfing, and fishing. The San Clemente campground sits high on the bluffs and has 160 camp sites including 72 RV sites [Ref. 8.17, p. 3]. According to the San Clemente State Beach General Plan, there are plans to expand the total number of campsites to 300 and to increase day-use parking to 1200 spaces [Ref. 8.18, p. 7]. From July 1, 2007, to June 30, 2008, the state beach had 594,693 total visitors including 160,217 campers [Ref. 8.20, p. 28].

The cooling tower structures would not be expected to affect the aesthetics at San Clemente State Beach due to the distance northwest of the potential cooling tower site, and the sea cliffs and surrounding topography (see Figure 6.1). Because of the size of the cooling towers and Mesa Complex location, the structures would be lower in height than the existing Unit 2 and 3 reactor domes. However, the size of the cooling tower structural footprint would have the potential to cause a visual impact on the immediate landscape setting. The elevation of the land surrounding the Mesa Complex is higher than most of the topography within the 6 mile vicinity, restricting the majority of aesthetic impact to the San Onofre Creek watershed. Interstate 5 travelers, North County Transit District train riders, SONGS workers, and visitors to San Onofre State Beach would be the most impacted by the aesthetics of the proposed cooling towers. This existing topography, atmospheric conditions, and structure height minimizes the potentially negative impact for the populace located in the city of San Clemente and the rest of the MCBCP.

Regarding state park aesthetics, only intermittent locations in the San Onofre Bluffs and San Onofre Surf Beach would have a line-of-site view of the structures and any possible plumes. However, the use of plume-abated hybrid cooling towers would reduce the likelihood of plume formation.

While the construction of the cooling towers would not take place within the boundaries of the San Onofre State Beach, potential impacts to State Beach areas could include diminished visual aesthetics. The San Onofre State Beach Revised General Plan describes the existing and planned land use policies for the San Onofre State Beach facilities. The scenic resources of San Onofre State Beach are of great importance. San Onofre's policy on its scenic resources is that the State Beach shall be protected from all degrading and undesirable intrusions. This policy focuses on scenic detractions due to developmental practices within the borders of the San Onofre State Beach [Ref. 8.19, p. 27]. The San Onofre State Beach policy for terrestrial habitat, specifically general vegetation management, is to preserve and perpetuate representative examples of natural plant communities common to the area and the region through mitigation practices. The mitigation plan does not address restriction of offsite sources which could degrade area resources [Ref. 8.19, pp. 22, 53].

The San Onofre State Beach is leased from the U.S. Navy and is not subject to land-use regulation by the county or the state. The Coastal Commission would review the cooling tower plans, however, to determine their consistency with the Coastal Act (see Section 6.5.2.and Section 6.7.3). Any development must be consistent with the requirements of the Federal Coastal Zone Management Act. It is the U.S. Navy's responsibility to enforce such consistency [Ref. 8.19].

During construction, areas of the San Onofre State Beach would likely be affected by increased noise (see Section 6.5.3), increased traffic, and increased dust. The affects of construction on the state beaches are discussed in Section 6.5.4.

6.5.1 View Shed Aesthetics

Aesthetics near the site could be affected by the cooling tower structures themselves, vapor plumes, increases in fog due to the cooling towers, and salt deposition.

Plume-abated cooling towers are relatively short and compact, with a height of approximately 50 feet. The cooling towers would be located on the east side of Interstate 5, in the area known as the Mesa Complex, as shown in Attachment 5, Figure 5-5. Without taking into account the change in base elevation, the cooling towers would be much shorter than the reactor buildings, which are approximately 190.8 ft tall [Ref. 8.74, Figures 3.1-2, 3.1-3, 3.1-4]. Accounting for the change in base elevation, the cooling towers would still be approximately 40 feet shorter than the reactor buildings. Current structures on the site use building and station materials complimentary to the seacoast environment where appropriate, along with the application of appropriate textural and color treatments that are integrated into the design of the facility [Ref. 8.74, p. 3.1-1]. The cooling towers could also incorporate features that are appropriate to the seacoast environment.

A view shed analysis was performed for a 6-mile and 50-mile radius based on the cooling tower location, U.S. Geological Survey National Elevation Datasets (NED), and ESRI Geographical Information System (GIS) view shed analysis processes [Ref. 8.94; Ref.

8.97]. The analysis within a 6-mile radius of the site reveals that the cooling tower structures and any emitted plumes would be most visible to viewers located on the adjacent hillsides of the San Onofre Creek drainage inside MCBCP and along Basilone Road. The view would diminish the further northeast one traveled on Basilone Road, with virtually no potential view of the structures at the bottom of the San Onofre Creek drainage. The structures and plumes would also be visible to rail traffic and vehicle occupants traveling along Interstate 5 as traffic passes west of the proposed facility. Finally, the probability of structure visibility would be high for individuals looking back toward land from the Pacific Ocean, opposite the location of the structures.

The cooling towers would be located on the Mesa Complex plateau at approximately 100 feet above the shoreline. As the distance from the cooling tower location increases, the angle of vision occupied by the cooling tower structures would decrease significantly. Because of the ocean front cliffs, angle of coastline, and inland topography, none of the San Onofre State Beach areas southeast of the San Onofre Creek drainage outlet would have a view of the proposed cooling tower structures at the level of the water. On top of the cliffs, the SONGS employee parking lot in the northwest area of the Coastal Complex but southeast of the San Onofre Creek drainage would have a direct view of the structures. Also located on top of the cliffs but southeast of the SONGS Coastal Complex, the northeast corner of the San Onofre State Beach Bluffs would have a view of the cooling towers. However, the larger portion of the San Onofre Bluffs cliff-top area located further southeast would not be in line-of-site view of the cooling towers.

Because of the angle of the coastline northwest of the cooling tower structures, viewers located along the beach front from the San Onofre Creek drainage outlet to the beginning of San Mateo Point would have an intermittent view of the cooling towers. This would include a portion of the San Onofre Surf Beach facilities. Inland locations to the north and northwest would have little or no view of the cooling towers, including the San Onofre State Beach San Mateo campground. This is due to the elevated topography of the ridgeline above the San Onofre Creek drainage. Approximately 3 miles in distance, the San Clemente State Beach and most of the City of San Clemente would have no view of the cooling towers. There is one elevated location in northeast San Clemente, approximately 4.3 miles northwest of the cooling tower location, where viewers would potentially see the structures.

For parks located along the coastline outside of the 6-mile radius but within the 50-mile region, the angle of the coastline curves to the southwest. If all atmospheric conditions are pristine at both the site of the cooling towers and at the viewer location, the nearest state beach to the southeast where viewers could potentially see the cooling tower structures or plume would be at intermittent locations in Carlsbad State Beach. Carlsbad is located approximately 22 miles in distance from the proposed location of the cooling towers. Although the structures could be visible because of the distance and angle of view, they would be difficult to see without visual aide devices. At Torrey Pines State Natural Reserve, (approximately 35 miles away), viewers could also potentially see the cooling towers but they would not be visible form Torrey State Beach. Inland from the coast, from the cities of Carlsbad to La Jolla, several elevated locations along the Interstate 5 corridor could also potentially offer views of the cooling towers. The potential would also exist from the highest points of Santa Catalina Island, approximately 40 miles distant. Finally, if atmospheric conditions and lack of vegetation cover permits, the higher elevations in Cleveland National Forest, approximately 9 miles in distance, could allow intermittent views of the cooling towers.

6.5.2 Coastline Visibility

Because of the angle of the coastline, various state park facilities within the 50-mile region located south of SONGS would have intermittent views of the cooling towers. These views would diminish with distance from the site, but the cliff tops associated with San Onofre State Beach would have the greatest view of the structures. From the Pacific Ocean looking back toward the coastline, if atmospheric conditions permitted, the potential would exist for the structures to be seen from approximately 6-miles at sea until the curvature of earth would eliminate the view of the cooling towers on the horizon.

While the conversion of SONGS to closed-loop cooling would not take place on California State Park lands, portions of the project to construct cooling towers on the Mesa Complex would be located on and traverse California Coastal Zone regulated lands. This zone also extends 3 miles offshore. The California Coastal Act of 1976 contains provisions which require protection of visual resources in coastal areas. The Coastal Act includes specific policies regarding such subjects as public access to the shore, protection of terrestrial and marine habitat, visual resources, land form alteration, and agricultural lands. These policies are the standards that are applied to the planning decisions affecting the coastal zone made by local authorities and the California Coastal Commission. Development in areas adjacent to environmentally sensitive habitat areas, parks and recreation areas should be sited and designed to prevent impacts that would significantly degrade those areas, and should be compatible with the continuance of those habitat and recreation areas [Ref. 8.83, pp. 3-3, 3-6, 3-7].

The Interstate 5 viewpoint, North County Transit District railway, and Old Highway 101 within San Onofre State Park would provide the only public views in the area. Generally, the views from Interstate 5 do not include direct views of the beach or shoreline because of obstruction by the coastal bluffs. Views from Interstate 5 to the west are over various disturbed and undisturbed open lands to the Pacific Ocean. A few canyons, such as Las Pulgas Canyon, allow limited views of the beach and shoreline. Because the cooling towers would be to the east of Interstate 5, the structures would not be expected to obstruct coastline visibility from the transportation routes in the area.

The cooling towers plumes could result in additional fogging that would decrease visibility. However, when properly operated, the hybrid cooling towers would capable of virtually eliminating visible fogging problems resulting from cooling tower operation.

6.5.3 Noise Impacts

In addition to the current noise produced by SONGS, noise would be generated in all phases of the conversion from once-through to closed-loop cooling. Noise would be produced during the construction phase as well as in the operational phase of the closed-loop cooling systems.

6.5.3.1 Current Noise Impacts of the Operational Units

SONGS is currently classified as heavy industry for noise. Routine activities at this facility are normally expected in the 65 to 75 dBA range. Based on the location of this industrial facility along Interstate 5, the Pacific Ocean, and the military activity in the area, as related to sensitive receptors, the noise levels are not significant. Currently the nearest residence is approximately 1.25 miles from the SONGS Coastal Complex, on the MCBCP. Noise at the state parks is not significantly affected by the operational units since it blends in with the Interstate 5 traffic noise and the constant noise from the ocean. Noise produced during operation is generally low level and continuous in nature, such as running pumps and spinning electrical generators. Occasional short-term noises, such as emergency siren testing or starting of emergency diesel generators, are higher in dBA but infrequent.

6.5.3.2 Construction Noise during the Change to Closed-Loop Cooling

During construction, the highest levels of noise would come from the heavy machinery that would be used to carry out activities such as moving dirt, lifting heavy objects, and drilling pipe tunnels for the circulating water pipelines. In addition, there would be an increase in vehicular traffic due to increased workforce transportation, supply trucks, and related business travel. Noise would increase during periods of shift change and during special construction activities. Increased traffic volume would impact the noise levels during the construction, but the impact would not last beyond the 66 month construction phase.

Construction noise would be influenced by some high dBA equipment such as air-driven hammers, pile drivers, emergency sirens, and outdoor loudspeaker communications. These activities would be of short-term duration and infrequently used. The use of this equipment would be scheduled to create minimal noise impacts by limiting the time of day or duration of the use. Some loud noises would be required to accomplish the work tasks and could not be eliminated.

The proposed location of the new hybrid cooling towers is at the current Mesa Complex. This location would move the construction activities closer to the sensitive receptors at the MCBCP housing area but further from the state parks. Construction in this area could increase the noise level to the sensitive receptors. Working during daylight hours and scheduling noise producing activities so that they would not occur during the normal sleep hours of the receptors would be required. As part of all activities that involve noise, the work would be required to be performed under all applicable health and safety rules and regulations. Hearing protection for workers would be a part of the required program and would be followed.

6.5.3.3 Operational Noise during Plant Operations using Closed-loop Cooling

Noise levels would increase in the vicinity of the Mesa Complex due to the operation and location of the cooling towers. As discussed in Section 3.1.2, the hybrid cooling towers would be equipped with sound attenuators in order to mitigate the noise impacts.

By maintaining the current plant availability factors, the cooling towers would be expected to be operating approximately 90 percent of the time. Most of year, the hybrid mode would be used, resulting in the loudest noise level for the majority of the year. The noise levels would fall off with distance and is consistent with expected industrial facilities located in rural to urban areas. The noise level at the state parks would not produce a noticeable increase as the traffic and ocean noise would still dominate the noise produced and heard by park guests. With the nearest resident at approximately 3800 ft away from the proposed cooling tower site, there would not be a significant change to the background noise levels that currently exist.

An actual noise survey would need to be performed to supply calculated values for noise before conversion of SONGS to closed-loop cooling. California CEQA requirements would need to be verified for the addition of the cooling tower noise and the resulting final total operational noise levels at the sensitive receptor and state parks. By regulation, the project would result in a significant impact if the installation of closed-loop cooling caused substantial, or potentially substantial, adverse changes in the ambient noise conditions within the area affected by the project (e.g., increase long-term ambient noise by 5 to 10 dBA; or short-term ambient noise by 20 dBA) and these changes affected noise-sensitive receptors [Ref. 8.78, pp. 5-68].

An increase in the long-term ambient noise level of 5 to 10 dBA is generally considered significant. This is because most people consider these noise level changes from an existing level as “substantially louder” to “twice as loud” [Ref. 8.78, pp. 5-68]. The total noise level at the sensitive receptors would be essentially the same as the current level. The operational noise level at the state parks would not be expected to change. The impact of this conversion to closed-loop cooling would not be expected to cause a significant impact due to noise.

6.5.4 Other Construction Impacts

Construction activities for the conversion of SONGS to closed-loop cooling would result in elevated noise and dust levels and traffic on roads. Additionally, the erection of cranes and buildings could affect aesthetic qualities of San Onofre State Park.

Cooling tower construction activities would require a large number of temporary employees and contractors. SONGS currently has a developed campground with approximately 250 full service camping spots at the Mesa Complex, operated specifically for temporary employees and contractors during high demand periods, such as planned reactor fuel outages. However, the cooling towers required for conversion to closed-loop cooling would be located on this campground; therefore, the campground would no longer be available for housing temporary workers.

Construction workers would likely look for commercial RV camping options within the vicinity and region for housing. The San Onofre State Beach and San Clemente State Beach restrict the number of days that visitors can stay, with no more than 30 days allowed a year. The San Clemente State Beach Campground allows no more than 7 consecutive days during peak season (March 1 through November 30) and 14 consecutive days during off-season. The Bluffs Campground and the San Mateo Campground at San Onofre State Beach allow a maximum stay of 15 consecutive days [Ref. 8.16, pp. 2, 5]. Thus, visitors to the campgrounds would not be competing for temporary housing with construction workers from the cooling tower construction.

Visitors traveling to the state parks could experience increased traffic as construction workers would commute from San Clemente and Oceanside to the SONGS site. Because interstate and state highways are constructed to support much heavier traffic loads than local roads, construction workers would likely have minimal impact on the interstate and state highways in the area.

6.6 Assessment of Cultural Resources

Conversion to closed-loop cooling at SONGS would require extensive excavation and construction activities which would need to be evaluated for potential impact to cultural resources. The review program of the California State Historic Preservation Office (SHPO) is a planning process that helps protect California's historic and cultural resources from the potential impacts of projects that are funded, licensed, or approved by federal agencies. Under Section 106 of the National Historic Preservation Act (NHPA) of 1966, the SHPO's role in the review process is to ensure that effects or impacts on properties eligible for or already listed on the National Register of Historic Places (NRHP) are considered and avoided or mitigated during the project planning process. In addition, the SHPO can review and advise communities on local preservation environmental reviews, under the provisions of the CEQA. The environmental review program includes the following:

- **Section 106 of NHPA.** The California SHPO reviews projects when a federal agency is involved with the project. It is the federal agency's responsibility to seek comments about the project from the SHPO.
- **Sections 5024 and 5024.5 of the CPRC.** These sections define the roles of state agencies in developing policies relevant to preserving and maintaining state-owned historical resources. The SHPO reviews projects when a state agency is involved with the project. It is the state agency's responsibility to seek comments about the project from the SHPO for any project with the potential to affect historical resources.
- **California Environmental Quality Act (CEQA).** Sections 21000 et seq. of the CPRC, with guidelines for implementation in the California Code of Regulations Title 14, Chapter 3, Sections 15000 et seq., require that state and local public agencies identify the environmental impacts of proposed discretionary activities or projects, and identify alternatives and mitigation measures that would substantially reduce or eliminate significant effects to the environment. Historical resources are considered a part of the environment, and a project that may cause an adverse effect to a historical resource is a project that may have a significant effect on the environment. The definition of historical resource is provided in Section 15064.5 of the CEQA guidelines.

Two historic registers track California's historical resources. The NRHP is the official federal listing of significant historic, architectural, and archaeological resources. The California Register of Historical Resources (CRHR) is the list of significant historic and prehistoric resources throughout California. In addition, some local government jurisdictions in the vicinity (6-mi radius) of SONGS maintain registers of their own. For example, SONGS is located in San Diego County, which maintains the San Diego County Local Register of Historical Resources (LRHR). Orange County does not have an LRHR.

Construction of the cooling towers, circulating water pipeline tunnels, and circulating water pipelines would be confined primarily to the onsite Coastal Complex and Mesa Complex, but the tunnels connecting these two areas would require offsite construction. The precise locations for building material laydown areas and heavy equipment parking areas have not been designated, but it is expected that they would be inside the boundaries of the Coastal Complex and Mesa Complex. As a result, the entire Coastal Complex and Mesa Complex would be defined as areas of potential effect (APE) on cultural resources. The third APE would be the offsite area slated for pipeline tunnel construction. This APE would be defined as the total width of each underground pipeline gallery plus 100 ft of clearance on each side of each gallery. Most of the offsite pipeline tunnel APE has been disturbed by past highway, railroad, and berm construction. The berm is an elongate, grass-covered strip of sloped open land that separates the Mesa Complex from Interstate 5. This man-made earthen berm was built to protect lower-lying SONGS Coastal Complex from floods or alluviation. The portion of the berm within the offsite pipeline tunnel APE has been disturbed by past excavation and fill activities [Ref. 8.63].

SCE has implemented a formal corporate screening process to protect cultural resources and other aspects of the environment from ground-disturbing activities. This screening process would apply to construction of the cooling towers and their associated pipelines, as well as any operations and maintenance activities that might intrude undisturbed soil [Ref. 8.71; Ref. 8.72].

6.6.1 Prehistoric Archaeological Sites

Several cultural resource surveys have been conducted in the Coastal Complex on the SONGS site and in its vicinity. A recent records search for these areas indicates that no prehistoric archaeological sites have been identified in the Coastal Complex APE. The entire Mesa Complex APE was surveyed for cultural resources in 1973 by Isham and Ezell [Ref. 8.44]. No prehistoric archaeological sites were identified within its boundary during this survey. The portion of the berm within the offsite pipeline tunnel APE was also examined as part of the Mesa Complex survey. The number, locations, and characteristics of prehistoric archaeological sites in the rest of the offsite pipeline tunnel APE and in the vicinity of SONGS are unknown pending access to state cultural resource records.

Two prehistoric archaeological sites (CA-SDI-1074 and CA-SDI-4916) were identified well outside of the APE boundaries but within 0.5 mi of SONGS. They are described briefly in Table 6.3. At this time, their eligibility for listing on the NRHP, CRHR, or LRHR is unknown or undetermined.

Table 6.3 Cultural Resources within 0.5 Miles of SONGS [Ref. 8.4]

Site Number	Site Type/ Constituents	Cultural/ Temporal Affiliation	Site Location	NRHP Status	CRHR Status	LRHR Status
Prehistoric Archaeological Sites						
CA-SDI-1074	Surface shell and artifact scatter	Prehistoric	Approximately 0.5 miles northwest of SONGS (Outside APEs)	UOU	UOU	UOU
CA-SDI-4916	Small surface artifact scatter of flake tools and lithics	Prehistoric	Approximately 0.25 miles east of SONGS (Outside APEs)	UOU	UOU	UOU
Historic Period Archaeological Sites						
P-37-024480	Wooden culvert beneath Amtrak railroad mainline	Historic Period (1943)	Approximately 350 feet east of SONGS (Outside APEs)	UOU	UOU	UOU
P-37-024481	Wooden box culvert beneath Amtrak railroad mainline	Historic Period (1943)	Approximately 0.25 miles northwest of SONGS (Outside APEs)	UOU	UOU	UOU

Notes:
APE - Area of Potential Effect (historical resources).
CRHR - California Register of Historical Resources.
LRHR - San Diego County Local Register of Historical Resources.
NRHP - National Register of Historic Places.
UOU - Unknown or undetermined at this time.

6.6.2 Historic Period Archaeological Sites

Several cultural resource surveys have been conducted in the Coastal Complex on the SONGS site and in its vicinity. A recent records search for these areas indicates that no Historic Period archaeological sites have been identified in the Coastal Complex APE. The archaeological survey by Isham and Ezell [Ref. 8.44] noted that the east portion of the Mesa Complex APE had been disturbed by past military operations. However, they did not identify any Historic Period archaeological sites during their survey of the Mesa Complex. No Historic Period archaeological sites have been identified in the berm portion of the offsite pipeline tunnel APE [Ref. 8.44].

Two Historic Period archaeological sites (P-37-024480 and P-37-024481) were identified well outside of the Coastal Complex APE boundary but within 0.5 miles of SONGS [Ref. 8.4]. They are described briefly in Table 6.3. At this time, their eligibility for listing on the NRHP, CRHR, or LRHR is unknown or undetermined.

6.6.3 Historic Sites

A number of cultural resource surveys have been conducted in the Coastal Complex on the SONGS site and in its vicinity. A recent records search for these areas indicates that no historic sites have been identified in the Coastal Complex APE or any other location within 0.5 miles of SONGS [Ref. 8.4].

In 1973, only two standing structures were present in the Mesa Complex APE. These were small, wood-framed buildings that military personnel had used as sanitation facilities. Both were located on the eastern side of the Mesa Complex near an unimproved dirt road that delimited the area boundary. Neither was identified as a significant historic property [Ref. 8.44]. The buildings and other man-made features completed in the Mesa Complex since that time are less than 50 years old and do not qualify as historic sites.

Isham and Ezell [Ref. 8.44] did not identify any historic sites in the protective berm portion of the offsite pipeline tunnel APE.

6.6.4 Traditional Cultural Properties

A traditional cultural property is defined "...as one that is eligible for inclusion in the [NRHP] because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community's history, and (b) are important in maintaining the continuing cultural identity of the community" [Ref. 8.60].

Several cultural resource surveys have been conducted in the Coastal Complex on the SONGS site and in its vicinity. A recent request sent to the California Native American Heritage Commission (NAHC) indicates that no traditional cultural properties have been identified in the Coastal Complex APE. However, it is unclear as to whether responses were received in regard to an NAHC request for follow-up consultations with Native American groups and individuals [Ref. 8.4]. Therefore, the presence of traditional cultural properties within the Coastal Complex APE, Mesa Complex APE, offsite pipeline tunnel APE, and the vicinity of the SONGS site remains uncertain pending consultations with the NAHC and Native American groups.

6.6.5 Impacts of Converting to Closed-Loop Cooling

As described in the previous sections, no prehistoric or historic archaeological sites, historic sites, or traditional cultural properties are known to be located in the onsite Coastal Complex and Mesa Complex APEs or in the offsite pipeline tunnel APE at SONGS. Therefore, construction and operation of the cooling towers and pipelines is not expected to have adverse impacts on such historical resources within these APEs.

In addition, past widespread construction in the Mesa Complex has resulted in extensive disturbance of the soil. The southwest portion of the offsite pipeline tunnel APE has been disturbed by past highway construction, railroad installation, and landscaping. The northwest portion of the offsite pipeline tunnel APE has been disturbed by past protective berm construction. Therefore, if any cultural resources were ever present in these areas, they would not be expected to be present today because of these past disturbances.

Although this land has previously been disturbed, the California SHPO would have to be consulted to ensure that any cultural resources in the vicinity of the construction activities (cooling towers and underground pipe tunnels) are identified and protected. A consultation letter would be prepared and submitted to the SHPO describing the potential project. SONGS would work directly with the SHPO to address any concerns related to cultural resource impacts.

Several archaeological sites (prehistoric and historic) are known to be present in the area surrounding the APEs. For these sites, adverse impacts would occur only as a result of soil-intrusive activities. For cooling tower construction and operations, SCE would not conduct soil-intrusive activities at any location outside the boundaries of the three specified cultural resource APEs. Therefore, construction and operation of the cooling towers and pipelines would result in no adverse impacts to archaeological sites in outlying areas.

6.7 Regulatory Permitting

The conversion of an existing power plant's cooling system from once-through cooling to a closed-loop cooling tower configuration would involve considerations and reviews across a range of regulatory programs. A number of state and local agencies would be involved in the review and permitting of a cooling system retrofit at an existing nuclear power plant. In addition, federal agencies would likely become involved where federal issues arise, such as endangered aquatic species, nuclear safety, navigable and harbor waters, military zones, etc. The following discussion provides an overview of the programs and agencies that would be involved and highlights the specific aspects that would need to be addressed as part of a closed-loop cooling system conversion.

The lead California agency for a power plant conversion project at SONGS would likely be the CPUC in consultation with the California Energy Commission (CEC) along with other federal agencies including the NRC. The roles of CPUC, CEC, state, and federal agencies were evaluated, and additional information was solicited from several agencies concerning the regulatory requirements for converting the current cooling system to closed-loop cooling. In addition to several regulatory agencies, input from MCBCP, CalTrans, and the NCTD Railway would be required. A list of regulatory agencies and consulted entities is presented in Attachment 5, Table 5-3. An estimated cost for documents, permits, modification of existing permits, and regulatory support for the conversion from an OTC system to a closed-loop cooling system is presented in Attachment 5, Table 5-4.

The cooling towers would be located on the Mesa Complex of the SONGS site (Attachment 5, Figure 5-5). Like the SONGS Coastal Complex area, this property is owned by the Department of Navy and controlled by MCBCP. The Department of the Navy lease requires authorization from MCBCP before SCE does any significant development at the SONGS site. After a briefing by SCE on the issue on May 8, 2009, Camp Pendleton expressed the following concerns that could result in the rejection of the construction of cooling towers on the SONGS Mesa for the following reasons: 1) salt drift from the cooling towers would adversely impact the San Onofre Base Housing complex and a new water treatment plant that MCBCP is considering constructing, 2) cooling towers would disrupt training operations in the area of the base adjacent to the SONGS Mesa where the cooling towers would be constructed, 3) cooling towers at SONGS could impact base flight operations in the San Onofre area, 4) cooling towers would likely adversely impact protected habitat on the base, and 5) construction of eight 12 ft. diameter tunnels for the cooling tower supply and discharge lines would need to go through Camp Pendleton land that is not currently leased to SONGS.

The tunneling associated with the pipelines required for conversion to closed-loop cooling would not only cross MCBCP land not currently leased to SONGS, but would also cross easements held by NCTD for the railway and CalTrans for Interstate 5 and old U.S. Highway

101 (see Attachment 5, Figure 5-5). As discussed in Section 3.5.1, a full engineering study and geotechnical survey would be required before the circulating water pipeline crossings could be permitted. Additionally, each of the eight tunnels would be likely to require three separate right-of-way encroachment permits for crossing beneath Interstate 5, the NCTD Railway line, and old U.S. Highway 101.

Proposed California State Senate Bill (SB 42) would require OTC power plants be converted to a closed-loop cooling tower configuration. Section 6 was completed to evaluate the environmental impacts and the permitting feasibility of retrofitting SONGS Units 2 and 3 in compliance with SB 42, if it is passed into law. Consultations, permits, and permit modifications could be required by several state and federal agencies. The following sections discuss each agency identified that may have jurisdiction impact or oversight on this project. In some cases, additional information/clarification from specific regulatory agencies was solicited and evaluated. These initial inputs were deemed critical in evaluating the regulatory feasibility of this potential project.

6.7.1 California Environmental Quality Act

The CEQA is a statute requiring state and/or local (jurisdictional) agencies to identify the significant environmental impacts of proposed development actions and to avoid or mitigate those impacts, if feasible.

A public agency must comply with specific environmental review requirements when it undertakes an activity defined by CEQA as a "project." This action or project undertaken by a public agency or a private proponent that may cause either a direct physical change in the environment or a reasonably foreseeable indirect change in the environment must first receive (discretionary) approval from an appropriate jurisdictional, governmental agency.

This required environmental review imposes both procedural and substantive requirements. At a minimum, the Lead (i.e. jurisdictional public) Agency must prepare an Initial Study (IS) of the project and its environmental effects. Depending on the potential project effects identified, either a simple Negative Declaration (ND) may be prepared – indicating no adverse environmental effects – or a more substantial, supplemental review would be required. This could either take the form of a Mitigated Negative Declaration (MND) – if anticipated project impacts are relatively minor, involve only a few issues, and can be mitigated to a “less than significant level” – or a more comprehensive Environmental Impact Report (EIR), which covers a wider range of environmental issues. A proposed project may not be approved if feasible alternatives or mitigation measures cannot be identified to substantially lessen the significant environmental effects of the project, unless the Lead Agency issues a Statement of Overriding Considerations.

As discussed in Section 6.4, conversion of SONGS to closed-loop cooling could impact the habitats for several threatened and endangered species. If impacted, additional review would be required to assess feasible alternative or mitigation measures that would substantially lessen the environmental impact. If no alternative or mitigation measure was feasible, closed-loop cooling would require the Lead Agency to issue a Statement of Overriding Consideration; otherwise conversion of SONGS to closed-loop cooling would be infeasible.

6.7.2 California Public Utilities Commission

Pursuant to Article XII of the Constitution of the State of California, the CPUC oversees the regulation of investor-owned public utilities, including SCE. Since SONGS is regulated under CPUC, reasonable costs associated with the project could be reclaimed from the CPUC through a consumer rate base adjustment. The CPUC would likely be the Lead Agency for CEQA compliance in evaluation of SCE's conversion to closed-loop cooling. The CPUC would direct the preparation of an Environmental Impact Report (EIR), which it would ultimately use in conjunction with other non-environmental information developed during the formal proceeding process to act on any SCE application for recovery of costs for implementation of the closed-loop conversion project. Under CEQA requirements, the CPUC would determine the adequacy of the Final EIR and, if adequate, would certify the document as complying with CEQA. If it approves a project with significant and unmitigable impacts, it must state the reason in a "Statement of Overriding Considerations," which would be included in CPUC's decision on the application.

In addition to the CPUC using the EIR as part of their specific approval process, this document could also be used by other California agencies as defined by CEQA Guidelines Section 15381, including the California Department of Transportation and the California Department of Parks and Recreation, as part of their respective discretionary actions and approval process.

Regulation of SONGS by the CPUC is limited by federal laws and regulations governing atomic and nuclear energy. A power plant that uses radioisotopes in the production of energy is required to comply with the federal Atomic Energy Act (42 U.S.C. Section 2011). The NRC is responsible for issuance of operating licenses under the Atomic Energy Act and for enforcing the requirements of the Act and the licenses. Federal regulations (e.g., 10 CFR Parts 20, 50, 51, 71, and 72) also govern the possession, handling, storage, and transportation of radioactive materials from a nuclear power plant.

For these reasons, the CPUC EIR would analyze solely for informational purposes project activities that are exclusively regulated by the federal government through the Atomic Energy Act and other regulations. The scope of CEQA, as stated in CEQA Guidelines [Section 15131(a)], is also limited such that the economic and social effects of a project cannot be treated as significant effects on the environment.

To comply with CEQA, SONGS would be required to prepare and submit a Proponent's Environmental Assessment (PEA) that would describe the Proposed Action, No Project Alternative, and a No Action Alternative. Estimated costs associated with PEA preparation and regulatory requirements for PEA completion are presented in Attachment 5, Table 5-4. If CPUC did not concur with SONGS CEQA, and did not allow a consumer rate base adjustment assessment to recoup closed-loop construction costs, it would be economically infeasible to retrofit SONGS to closed-loop cooling.

6.7.3 California Energy Commission

The Warren-Alquist Act grants the CEC the exclusive authority to license new power plants with capacity greater than 50 MWe or repower projects that increase the facility capacity by 50 MWe or more. As part of this process, the CEC is required to make findings regarding the project's conformance with applicable laws, ordinances, regulations, and standards (LORS). The CEC also serves as the lead state agency for CEQA compliance for new power plants or repower power projects. The Warren-Alquist Act also includes specific provisions for compliance with the California Coastal Act, including specific CEC requirements for coordination with the California Coastal Commission (CCC).

If an existing power plant was originally licensed by the CEC, a modification to the cooling system would require an amendment to the original decision, including an assessment of compliance with CEQA. If the facility was not originally licensed by the CEC, a modification to only the cooling system would not require CEC permitting or approval. SONGS Units 2 and 3 each have a generating capacity greater than 50 MWe and each unit has a CEC license.

The CEC would likely be a participant with the CPUC on the conversion to closed-loop cooling at SONGS. The CEC would not require any specific permits for this conversion, but additional costs would be incurred by SONGS to amend CEC's original decision.

6.7.4 California Coastal Commission

The Coastal Act of 1976 permanently established the CCC, which in partnership with local county and municipal planning authorities, plans and regulates development in the coastal zone. Development within the coastal zone can proceed only subsequent to issuance of a coastal development permit issued by an approved local coastal program or, in limited circumstances, by the CCC itself. Where the CCC issues a permit, the commission or the local coastal planning agency must comply with CEQA and may serve as the lead agency for a CEQA analysis; however, for conversion of SONGS to closed-loop cooling, the CPUC would likely be the lead agency. An exception to the CCC's permitting authority is provided under the Warren-Alquist Act for new power plants or those projects involving an increase of 50 MW or more. In these cases, the CCC participates in the CPUC's review process but does not have independent permitting authority. The CCC's role (under Section 30413[d] of the Coastal Act) is to provide to the CPUC a report describing what measures are necessary for the proposed project to conform to Coastal Act policies. The CPUC must then adopt those measures as part of any approval, unless it finds that the measures are infeasible or would cause greater adverse environmental harm.

6.7.4.1 California Coastal Act

On land, the coastal zone varies in width from several hundred feet in highly urbanized areas up to five miles in rural areas and it extends three miles offshore. The coastal zone established by the Coastal Act excludes San Francisco Bay, where development is regulated under the McAteer-Petris Act. The Coastal Act includes specific policies regarding such subjects as public access to the shore, protection of terrestrial and marine habitat, visual resources, land form alteration, and agricultural lands. These policies establish the standards applied to the planning decisions affecting the coastal zone made by local authorities and the CCC. The CCC is the designated coastal management agency for the purpose of administering the federal Coastal Zone Management Act, which grants regulatory control over all federal activities and federally licensed, permitted, or assisted activities to those agencies when coastal resources are affected.

Implementation of the California Coastal Act is carried out through a partnership between the CCC and local planning authorities, consisting of approximately 15 counties and 60 municipalities. These entities prepare local coastal programs (LCPs), which include land use plans (zoning maps, zoning ordinances, and other legal instruments) that are consistent with the policies established by the act and approved by the CCC. Development within the coastal zone can then proceed only subsequent to issuance of a coastal development permit by local planning authority, and for any submerged portion of a project, by the CCC itself under its retained jurisdiction.

Projects larger than 50 MWe are subject to the exclusive siting authority of the CEC. The Coastal Act includes the following statements of policy regarding development within the coastal zone. These policies could affect the conversion of a power plant from OTC to a closed-loop cooling system.

- Regarding electrical generating facilities the Coastal Act specifically states, "Notwithstanding the fact electrical generating facilities … may have significant adverse effects on coastal resources or coastal access, it may be necessary to locate such developments in the coastal zone in order to ensure that inland as well as coastal resources are preserved and that orderly economic development proceeds within the State."
- Development in the coastal zone shall not interfere with the public's right of access to the sea.
- Coastal areas that are well suited for water-oriented recreational activities that cannot be readily provided at inland water areas shall be protected for such uses.
- Upland areas necessary to support coastal recreational uses shall be reserved for such uses, where feasible. Marine resources shall be maintained, enhanced, and, where feasible, restored. Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters.
- Development in areas adjacent to environmentally sensitive habitat areas, parks, and recreation areas shall be sited and designed to prevent impacts that would significantly degrade those areas, and shall be compatible with the continuance of those habitat and recreation areas.
- California Code of Regulations (CCR) Section 30250 establishes policy that new residential, commercial, and industrial development shall be located within, contiguous with, or in close proximity to existing developed areas able to accommodate it or, where such areas are not able to accommodate it, in other areas with adequate public services and where it will not have significant adverse effects on, either individually or cumulatively, coastal resources.
- The scenic and visual qualities of coastal areas shall be considered and protected as a resource of public importance. Permitted development shall be sited and designed to protect views and, along the ocean and scenic coastal areas, to minimize the alteration of natural land forms, to be visually compatible with the character of surrounding areas, and, where feasible, to restore and enhance visual quality in visually degraded areas.

- Industrial facilities shall be encouraged to locate or expand within existing sites and shall be permitted reasonable long-term growth, consistent with the policies of the Coastal Act.

Where new or expanded coastal-dependent industrial facilities cannot feasibly be accommodated in a manner consistent with the polices of the Coastal Act, such facilities may still be permitted if (1) alternative locations are infeasible or more environmentally damaging; (2) to do otherwise would adversely affect the public welfare; and (3) adverse environmental effects are mitigated to the maximum extent feasible.

The conversion of SONGS to closed-loop cooling and the addition of several new structures with a significant impact on the scenic and visual qualities of the coastal areas would be inconsistent with several Coastal Act policies. The effects of the conversion, and the overall consistency with the Coastal Act policies would have to be determined prior to conversion of SONGS to closed-loop cooling.

6.7.4.2 Closed-Loop Cooling System Permit Requirements

SCE currently maintains a CCC permit for SONGS. An amended Coastal Development Permit for SONGS Units 2 and 3 was issued by the CCC on February 16, 1982 (No. 6-81-330-A). Conversion to a closed-loop cooling system would require the modification of this permit. As the CPUC would likely be the lead agency in permitting conversion of SONGS to closed-loop cooling, SONGS would have to work directly with CPUC to address any concerns related to potential impacts and any CCC permit requirements. An estimated cost to modify the current CCC permit and provided regulatory support is presented in Attachment 5, Table 5-4. If conversion of SONGS could not be reconciled with the CPUC, conversion of SONGS to closed-loop cooling would be infeasible.

It should be noted that recent activities requiring a CCC Permit near SONGS have been rejected. The Coastal Commission voted unanimously to reject a coastal development permit in 2008 for a toll road on-ramp near San Onofre [Ref. 8.11]. The toll road on-ramp would have had significantly less aesthetic and environmental impacts than conversion of SONGS to closed-loop cooling. The Marine Review Committee has recommended, and SONGS is implementing, wetlands restoration, an offshore kelp reef, and funding for the fish hatchery in Carlsbad to compensate for impingement and entrainment impacts and offshore turbidity impacts. The CCC is on record that these mitigation measures that SONGS is taking meet the required performance standards, offsetting the offshore impacts from the plant [Ref. 8.12].

6.7.5 California Department of Fish and Game

The California Department of Fish and Game (CDFG) maintains native fish, wildlife, plant species and natural communities for their intrinsic and ecological value and their benefits to people. This includes habitat protection and maintenance in a sufficient amount and quality to ensure the survival of all species and natural communities. The department is also responsible for the diversified use of fish and wildlife including recreational, commercial, scientific and educational uses.

The CDFG may play various roles under the CEQA process. The Department is always a Trustee Agency, but under certain circumstances it may also be a Lead Agency or a

Responsible Agency. Also, by state law CDFG has jurisdiction over the conservation, protection, and management of wildlife, native plants, and habitat necessary to maintain biologically sustainable populations. The CDFG shall consult with lead and responsible agencies and shall provide the requisite biological expertise to review and comment upon environmental documents and impacts arising from project activities.

As discussed in Section 6.4, conversion of SONGS to closed-loop cooling could impact the habitats for several threatened and endangered species. If impacted, the CDFG could require additional review of each endangered and threatened species habitat to determine alternative or mitigation measures to lessen the environmental impact. If the CDFG acted as the Lead Agency, and no alternative or mitigation measure was feasible, the CDFG would have to issue a Statement of Overriding Consideration or conversion of SONGS to closed-loop cooling would be infeasible.

6.7.5.1 California Fish and Game Code – Section 2081, California Endangered Species Act, Incidental Take of Listed Species

Section 2080 of the Fish and Game Code prohibits "take" of any species that the Fish and Game Commission determines to be an endangered or threatened species. Take is defined in Section 86 of the Fish and Game Code as "hunt, pursue, catch, capture, or kill, or attempt to hunt, pursue, catch, capture, or kill." The California Endangered Species Act (CESA) allows for take incidental to otherwise lawful development projects and emphasizes early consultation to avoid potential impacts to rare, endangered, and threatened species and to develop appropriate mitigation planning to offset project caused losses of listed species populations and their essential habitats. If a proposed project could result in the catch or kill of any species listed, the project proponent is required to obtain a Section 2081 Incidental Take Permit. Should the conversion to closed-loop cooling involve a “take” of a state-listed species, the required 2081 permit should be obtainable through compliance with the MCBCP’s Integrated Natural Resource Management Plan (INRMP).

6.7.5.2 Integrated Natural Resource Management Plan

The location of the proposed cooling towers for SONGS Units 2 and 3 is on the Mesa Complex of the facility (Attachment 5, Figure 5-5). This area is not included in the NRC operating licenses for SONGS Units 2 and 3. This land utilized for the administrative operations of certain SONGS activities is within the boundaries of MCBCP and is leased through the Department of the Navy.

MCBCP maintains an INRMP, which was developed to provide the foundation of ecosystem management goals and objectives to direct management and stewardship of the lands entrusted to the Marine Corps by the American people. This INRMP documents and assists the development, integration, and coordination of natural resources management on Camp Pendleton. Further, it describes Camp Pendleton’s natural resources management programs and how those programs provide for: (1) the conservation and rehabilitation of natural resources; (2) the sustainable multipurpose use of the resources, which include hunting, fishing, trapping, and non-consumptive uses; and (3) public access to military installations to facilitate the use of these resources, subject to safety requirements and military security. MCBCP works with the CDFG, United States Fish and Wildlife Service (USFWS), and the Department of Defense (DOD) as well as local entities to ensure compliance with the INRMP is maintained [Ref. 8.95, Section 1.4]. Additional details related to INRMP and potential impacts from the conversion of SONGS to closed-loop cooling are presented in Section 6.4.

6.7.5.3 Closed-Loop Cooling System Permit Requirements

As referenced above, ecological management for MCBCP, including the Mesa Complex, is maintained through the INRMP which is reviewed on an annual basis. Based on maintaining the INRMP, no additional CDFG permits (e.g. 1602, 2081) should be needed for this project. SCE has met with MCBPC representatives concerning the implementation of closed-loop cooling at SONGS and the Marines are preparing their response to this proposed action. A consultation letter would be prepared and submitted to CDFG to inform the agency of the potential project and get feedback on any issues or questions they may have concerning this project. Impacts related to the construction and operation of the cooling towers to the INRMP would have to be evaluated and mitigation measures could be necessary to limit potential impacts. SONGS would work directly with the CDFG and MCBCP to address any concerns related to potential ecological impacts. Estimated costs associated with addressing impacts to the INRMP and regulatory support is presented in Attachment 5, Table 5-4.

6.7.6 California State Historical Preservation Office

As discussed in Section 6.7.4, the Mesa Complex has previously been disturbed including the construction of several buildings and other facilities used by SCE. Although this land has been disturbed, under CEQA the California SHPO would have to be consulted to ensure that any cultural resources in the vicinity of the construction activities (cooling towers and underground pipe tunnels) are identified and protected. Details related to the assessment of cultural resources are presented in Section 6.6.

SONGS would work directly with the SHPO to address any concerns related to cultural resource impacts. Since SHPO would provide input to the Lead Agency, the cultural resource impact recommendation would influence the Lead Agency's decision on whether alternative or mitigation measures were feasible, and whether or not the Lead Agency would issue a Statement of Overriding Consideration. If alternative measures were infeasible and no Statement of Overriding Consideration was issued, conversion of SONGS to closed-loop cooling would be infeasible.

Estimated costs associated with developing a cultural resource investigation and regulatory support are presented in Attachment 5, Table 5-4.

6.7.7 California State Lands Commission

The California State Land Commission (SLC) has jurisdiction and control over public trust lands, which can generally be described as all ungranted tidelands and submerged lands and beds of navigable rivers, streams, lakes, bays, estuaries, inlets, and straits in the state. These lands include a wide section of tidal and submerged land adjacent to the state's coast and offshore islands, including bays, estuaries, and lagoons, and are managed by the SLC under a multiple-use policy for water-related commerce, navigation, fisheries, recreation, open space, and other recognized public trust uses.

In its administration of surface leases on public trust lands, the SLC considers numerous factors in determining whether a proposed use is appropriate, including the protection of natural resources and other environmental values as well as preservation or enhancement of the public's access to state lands.

Where a lease is issued, the SLC can serve as the lead agency for CEQA analyses, but it is believed that the CPUC would be the lead agency if the decision is made to proceed with this project. The SLC also comments on Environmental Impact Reports (EIRs) for land use changes within its jurisdiction and on projects that affect state lands. The SLC also conducts a review of applications submitted to the CCC.

SONGS would work directly with the SLC to address any concerns related to visual impacts. Since SLC would provide input to the Lead Agency, the visual impact recommendation would influence the Lead Agency's decision on whether alternative or mitigation measures were feasible, and whether or not the Lead Agency would issue a Statement of Override Consideration. If alternative measures were infeasible and no Statement of Override Consideration was issued, conversion of SONGS to closed-loop cooling would be infeasible.

Estimated costs associated with regulatory support are presented in Table Attachment 5, Table 5-4.

6.7.8 California State Parks

The California State Parks (CSP) is responsible for protecting and maintaining all state owned parks in California. Currently there are hundreds of parks in the CSP system covering over 1.4 million square miles and 280 miles of coastline [Ref. 8.17]. There are four state park areas adjacent to SONGS and information on these parks is presented below.

6.7.8.1 Local Park Information

SONGS is located between San Onofre State Beach and San Onofre Surf Beach.

San Onofre State Beach is a rare 3000-acre scenic coastal-canyon park with high environmental value and recreational use. The park includes three distinct areas: San Onofre Bluffs, San Onofre Surf Beach, and San Mateo Campground.

San Onofre Surf Beach offers a world renowned and historical surf break. The beach is strictly available for day-use with no camping.

San Onofre Bluffs offers camping and day-use parking along Old Highway 101 adjacent to the sandstone bluffs. The beach below is popular with swimmers and surfers with six rugged dirt access trails cut into the bluff above. All campsites include a fire pit and picnic table.

San Mateo Campground lies a short distance inland from the 3.5 miles of sandy beaches within San Onofre State Beach. A 1.5 mile Nature Trail connects the campground to Trestles Beach, a world class surfing site. San Mateo Creek flows just east of the campground outward toward the ocean creating key riparian and wetland habitats, which host some rare and even endangered species.

6.7.8.2 Closed-Loop Cooling System Permit Requirements

Like the other California agencies, CSP must follow the CEQA requirements and could have some questions or comments on the placement and operations of cooling towers in the vicinity of four of their parks. SONGS would work with the CSP under the CEQA process to address any concerns related to potential ecological impacts. SONGS would likely continue to maintain beach access between San Onofre State Beach and San Onofre Surf Beach as required by CSP and MCBCP [Ref. 8.4].

Since CSP would provide input to the Lead Agency, their recommendation would influence the Lead Agency's decision on whether alternative or mitigation measures were feasible, and whether or not the Lead Agency would issue a Statement of Override Consideration. If alternative measures were infeasible and no Statement of Override Consideration was issued, conversion of SONGS to closed-loop cooling would be infeasible.

The estimated costs associated with regulatory support are presented in Attachment 5, Table 5-4.

6.7.9 Air Pollution Control District – San Diego

In California, the CARB develops statewide air quality standards, but authority to enforce the requirements of the CAA and its implementing regulations, as well as state and local air pollution laws and regulations, rests with the 35 regional air pollution authorities known as the Air Pollution Control Districts / Air Quality Management Districts (APCDs/AQMDs). APCDs/AQMDs are established by a county or larger regional area, issue all permits and approvals required by the CAA, and are responsible for establishing individual airshed plans.

As discussed in Section 6.1, the CARB has the authority to enforce regulations to both achieve and maintain the NAAQS. CARB has established additional standards, known as the CAAQS, which are generally more stringent than the NAAQS. CARB is responsible for the development, adoption, and enforcement of the state's motor vehicle emissions program, as well as the adoption of the CAAQS. CARB also reviews operations and programs of the local air districts and requires each air district with jurisdiction over a nonattainment area to develop its own strategy for achieving the NAAQS and CAAQS.

The local Air Pollution Control Districts / Air Quality Management Districts (APCDs/AQMDs) have the primary responsibility for the development and implementation of rules and regulations designed to attain the NAAQS and CAAQS, as well as the permitting of new or modified sources, development of air quality management plans, and adoption and enforcement of air pollution regulations. CARB, similar to the EPA, designates areas as either "attainment" or "nonattainment" based on compliance or noncompliance with the CAAQS. CARB considers an area to be in nonattainment if the CAAQS have been exceeded more than once in three years.

6.7.9.1 San Diego Air Pollution Control District (SDAPCD)

As described in Section 6.1, the SDAPCD is the agency responsible for protecting public health and welfare through the administration of federal and state air quality laws and policies within the SDAB. The monitoring of air pollution, preparation of the San Diego County's portion of the SIP, and promulgation of rules and regulations are included in the SDAPCD's tasks. The SIP includes strategies and tactics to be used to attain and maintain acceptable air quality in the county; this list of strategies is called the Regional Air Quality Strategies (RAQS). SDAPCD regulations require that any equipment that emits or controls air contaminants be permitted (Permit to Construct or Permit to Operate) prior to construction, installation, or operation. The SDAPCD is responsible for review of applications and for the approval and issuance of these permits.

The SDAB has recently been designated as an attainment area with respect to the Federal Ozone (O_3) standard. As a result of this change, the (de minimis) emissions levels for Nitrogen Oxides (NOx) and volatile organic compounds (VOC) that would trigger a full conformity analysis have increased from 50 to 100 tons. The statuses of state and federal designations for San Diego County as of the 2007 annual report are listed in Section 6.1.

6.7.9.2 Closed-Loop Cooling System Permit Requirements

Sea water would be used in the closed-loop cooling systems at SONGS, impacting vegetation in a down-wind direction with salt deposition. Plume visibility impacts would also need to be considered, particularly with respect to the proximity of Interstate 5, located between the SONGS Coastal Complex and the proposed cooling towers east of the facility, as well as impacts on the adjacent MCBCP. Salt emissions (PM_{10}) from the cooling towers (both units with a generating capacity factor of 90%) were calculated to be up between 827.8 and 837.2 tons per year (see Section 6.1 for calculations). Currently there may not be enough emission credits for PM_{10} in the San Diego region and those that are available would be very expensive. SCE contacted the SDAPCD to discuss the impacts of operating cooling towers at SONGS and how such cooling towers could be permitted as well as the availability of additional emission credits. Per conversations with SDAPCD staff, only approximately 160 tons of PM_{10} offset credits are currently available. Therefore, it is unlikely that SONGS could locate and purchase a sufficient number of PM_{10} credits to cover between 827.8 and 837.2 tons per year of emissions generated by the cooling towers. Conversion of SONGS to closed-loop cooling would be infeasible if the required PM_{10} credits were not available.

6.7.10 State Water Quality Control Board

Created by the state legislature in 1967, the five-member State Water Quality Control Board (SWQCB) protects water quality by setting statewide policy, coordinating and supporting the regional water board efforts, and reviewing petitions that contest regional board actions. The SWQCB is also solely responsible for allocating surface water rights and works in close coordination with California's nine Regional Water Quality Control Boards (RWQCB) to preserve, protect, enhance and restore water quality. Major areas of focus include:

- Stormwater

- Wastewater treatment
- Water quality monitoring
- Wetlands protection
- Ocean protection
- Environmental education
- Environmental justice
- Clean up contaminated sites, including brownfield sites
- Low-impact development

6.7.10.1 Regional Water Quality Control Boards

California's nine RWQCBs are semi-autonomous agencies, each consisting of nine part-time board members appointed by the governor and confirmed by the California State Senate. Regional boundaries are based on watersheds and water quality requirements are based on the unique differences in climate, topography, geology and hydrology for each watershed. Each RWQCB makes critical water quality decisions for its region, including setting standards, issuing waste discharge requirements, determining compliance with those requirements, and taking appropriate enforcement actions.

These RWQCBs are also responsible for implementing the requirements of the Porter-Cologne Water Quality Control Act and the U.S. Clean Water Act (CWA), including CWA Section 316(b), which governs cooling water intake structures. Each RWQCB implements the requirements of the CWA and Porter-Cologne through the issuance of NPDES permits, which include standards set forth in each RWQCB's Basin Plan as well as State Water Quality Control plans such as the Thermal Plan, Ocean Plan, and California Toxics Rule (CTR).

6.7.10.2 National Pollution Discharge Elimination System Permit

Pursuant to Section 402 of the Federal Clean Water Act (CWA) and Section 13370 of the California Water Code (CWC), the EPA approved the California state program to issue and enforce NPDES permits for pollutant discharges to surface waters of the state. The regional board is responsible for implementing the NPDES permit program pursuant to the CWA at the facility regulated under this Order. Pursuant to Section 13263, Article 4, Chapter 4 of the CWC, the Regional Boards are required to issue Waste Discharge Requirements for discharges that could affect the quality of the state's waters. Limitations, prohibitions and provisions of this Order were established pursuant to Sections 208 (b), 257, 258, 301, 302, 303 (d), 304, 306, 307, 316, 403, 405, and/or 503 of the CWA and implementing regulations in Title 40 of the Code of Federal Regulations (40 CFR), including the NPDES program implementing regulations. This action to adopt an NPDES permit is exempt from the requirements of the California Environmental Quality Act (CEQA, Public Resources Code Section 21100, et seq.) in accordance with Section 13389 of the CWC.

NPDES permits issued to power plants address the operation of cooling water intake structures that withdraw water from surface waters of the state as well as the direct discharge of cooling water and other wastewaters.

SONGS Units 2 and 3 lie within the jurisdiction of the San Diego RWQCB. This agency is responsible for issuing the facility's NPDES permits (each unit has its own permit). These permits describe the outfalls used to plant operations related to the intake and discharge of wastewaters, effluent limits of chemical concentrations in the waste stream, and monitoring / reporting requirements. It should be noted that naturally occurring metals that would be drawn in by the make-up water flow would be concentrated in the closed-loop circulating water system. Closed-loop cooling blowdown would then discharge these concentrated metals to the Pacific Ocean, and thus would need to be reviewed against the California Ocean Plan limits for each metal to ensure compliance. Due to the closed-loop cooling cycles of concentration, it is likely that several California Ocean Plan limits may be exceeded, possibly requiring additional costly treatment of blowdown prior to discharge.

6.7.10.3 Closed-Loop Cooling System Permit Requirements

Since conversion of a once through cooling system to a closed-loop cooling system would require a major modification to the facility's NPDES permit, the San Diego RWQCB would have a major role in permitting power plant conversions. The most significant issue from operating the cooling tower systems would be that it would generate elevated saline blowdown concentrations discharged to the Pacific Ocean for disposal.

Closed-loop operation of SONGs would be subject to NPDES permit requirements, such that if cooling tower blowdown concentrations did not meet the permit requirements SONGS would be forced to investigate costly additions to the closed-loop design. Estimated costs to modify the existing NPDES permits and regulatory support are presented in Attachment 5, Table 5-4.

6.7.11 United States Army Corps of Engineers

The United States Army Corps of Engineers (USACE) is responsible for investigating, developing and maintaining the nation's water and related environmental resources. The Los Angeles District encompasses 226,000 square miles in four states, protects 420 miles of Southern California shoreline from Morro Bay to the Mexican border and supports nine military bases. Established in 1898, the district has been recognized for providing engineering services for the southwest for more than 100 years.

6.7.11.1 USACE Section 404 Permit Requirements

Section 404 of the U.S. Clean Water Act regulates the discharge of dredged, excavated, or fill material in wetlands, streams, rivers, and other U.S. waters. The USACE is the federal agency authorized to issue Section 404 Permits for certain activities conducted in wetlands or "other waters of the U.S." Depending on the scope of the project and method of construction, certain activities may require this permit. Examples include ponds, embankments, and stream channelization. A Regional General Permit (RGP) is pending that would give the state the lead for most Standard Individual 404 permits, enabling this function to be handled during the state permitting process.

6.7.11.2 Closed-Loop Cooling System Permit Requirements

It is likely that the discharge structures for SONGS Units 2 and 3 would require minor diffuser modifications to accommodate the reduced discharge flow from a closed-loop cooling system. There could be some minor costs in responding to any USACE questions or comments concerning conversion of SONGS to closed-loop cooling and these costs have been included in Attachment 5, Table 5-4. It should be noted that, if significant modifications to the intake structure, discharge structure or both would be required, there would be significant cost issues related to obtaining the proper USACE permits.

6.7.12 United States Fish and Wildlife Service

The United States Fish and Wildlife Service (USFWS) issues permits under various wildlife laws and treaties at different offices at the national, regional, and/or wildlife park levels. Permits enable the public to engage in legitimate wildlife-related activities that would otherwise be prohibited by law. Service permit programs ensure that such activities are carried out in a manner that safeguards wildlife. Additionally, some permits promote conservation efforts by authorizing scientific research, generating data, or allowing wildlife management and rehabilitation activities to go forward.

Permits are handled by permitting programs in International Affairs (Management Authority), Endangered Species, Law Enforcement, and Migratory Birds.

- Endangered Species – The various USFWS regional offices administer native endangered and threatened species permits under the Federal Endangered Species Act (FESA; except permits for import and export). Permits are issued to qualified applicants for the following types of activities: enhancement of survival associated with Safe Harbor Agreements and Candidate Conservation Agreements with Assurances, incidental take associated with Habitat Conservation Plans, recovery, and interstate commerce. Permits for import and export are issued by International Affairs (Division of Management Authority).
- Migratory Birds – The various USFWS regional offices administer permits for qualified applicants for the following types of activities: falconry, raptor propagation, scientific collecting, rehabilitation, conservation education, migratory game bird propagation, salvage, depredation control, taxidermy, and waterfowl sale and disposal. These offices also administer permit activities involving bald and golden eagles, as authorized by the Bald and Golden Eagle Protection Act and migratory birds under the Migratory Bird Treaty Act [Ref. 8.57].

As discussed in Section 6.7.5, ecological management for MCBCP including the Mesa Complex is maintained through MCBCP's INRMP, which is reviewed on an annual basis. Based on maintaining the INRMP, it is expected that no additional USFWS permits would be needed for conversion of SONGS to closed-loop cooling. A consultation letter was prepared and submitted to USFWS to inform the agency of the potential project and get their feedback on any issues or questions they may have concerning this project. SONGS would work directly with the USFWS, CDFG, and MCBCP to address any concerns related to potential ecological impacts. Only minor regulatory support costs would be expected from addressing any potential USFWS questions or concerns. These estimated costs are presented in Attachment 5, Table 5-4.

6.7.13 United States Nuclear Regulatory Commission

A nuclear facility's design, such as SONGS Units 2 and 3, is understandably more complex than a typical fossil-fueled facility and incorporates additional systems that require cooling in addition to the main condenser. Auxiliary and safety systems, such as component cooling, used fuel storage, and emergency cooling, may operate in parallel with the main condenser system with dedicated pumps and supply lines. These systems may also be integrated as part of the facility-wide cooling system. In either case, special consideration must be given to ensure these systems could continue to operate as intended following conversion to closed-loop cooling.

The Energy Reorganization Act of 1974 established the NRC and tasked the agency with the oversight of commercial nuclear operations, material and waste management, and decommissioning activities. Accordingly, the NRC exercises broad regulatory authority over commercial nuclear power plants to protect public health and safety and maintains rigorous design criteria to meet these goals. The NRC has also developed environmental protection regulations under the provisions of the National Environmental Policy Act (NEPA). Any major modification proposed for an existing facility would be subject to NRC review and approval to ensure compliance with all applicable safety and environmental regulations and standards.

NRC regulations 10 CFR 50.59, 10 CFR 50.90, and 10 CFR 51 govern proposed changes to a nuclear plant. These regulations specify when prior NRC review and approval of plant changes is necessary. As part of the cooling tower retrofit, SCE would perform a 10 CFR 50.59 evaluation in accordance with the guidance provided in Revision 1 of NEI 96-07 and Regulatory Guide 1.187, both dated November 2000.

6.8 SONGS Property Restrictions

As described in Section 2, SONGS is located on the Pacific coast of Southern California in northern San Diego County. The site is located entirely within the boundaries of the MCBCP near the northwest end of the 18 mile shoreline. The property upon which the station is built is under lease and easement agreements from the Department of Navy (DoN) until May 12, 2024 [Ref. 8.95, p. 2-31]. The SONGS Coastal Complex is bounded on the west by the Pacific Ocean, on the east by Interstate 5 and the North County Transit District of San Diego (NCTD) railroad right-of-way and on the northwest and southeast by San Onofre State Beach [Ref.8.75, pp. 1.2-1 and 2.2-4]. The SONGS Mesa Complex is bounded on the southwest by Interstate 5 and the NCTD railroad right-of-way and on all other sides by MCBCP. The cooling towers and the associated pipelines would be located as shown in Attachment 5, Figure 5-5.

A number of long-term leases and easements have become part of the land use on the MCBCP. An estimated 3600 acres of leased land is no longer available for training [Ref. 8.95, p. 2-28]. Future requests for non-military projects and leases on MCBCP are evaluated, with regards to potential impacts to the base. Lease reviews require applicants to meet the following conditions:

- Proposal cannot adversely affect training.
- Proposal cannot degrade MCBCP quality of life.
- Proposals must be environmentally non-degrading.
- Proposal must ensure safety of operating forces.
- Construction must be consistent with MCBCP architecture.

Lessees are required to manage the natural resources on the lands leased for their use, consistent with the philosophies and supportive of the objectives of the MCBCP. Each lessee that manages and/or controls use of lands leased from the base is required to generate and submit a natural resources management plan for their leased lands for approval by the base within one year of establishment of their lease or renewal [Ref. 8.95, pp. 2-28 and 2-29].

SONGS's real estate rights on MCBCP are vested in nine DoN-issued easements and two leases totaling 438 acres [Ref. 8.95, p. 8]. The leased land outside the Coastal Complex, including the Mesa Complex, consists of nine parcels ranging from 1.3 to 69.3 acres [Ref. 8.31, p. 6].

The SONGS exclusion area is roughly formed by two semi-circles with radii of 1970 feet each, centered on the Unit 2 containment and a point 134 feet southeast of the Unit 3 containment, with a tangent connecting the landward arcs and the seaward arcs of the two semi-circles [Ref. 8.75, p. 2.1-1]. SCE has authority to control all activities within the exclusion area, including the exclusion or removal of personnel and property, by grant of easement from the United States made by the Secretary of the Navy pursuant to the authority of Public Law 88-82. All mineral rights in the land portion of the exclusion area are held by the United States Government [Ref. 8.75, p. 2.1-3]. As specified in SONGS Unit 2 and Unit 3 Coastal Development Permit, SCE is required to provide public access between the two parts of San Onofre State Beach around the Coastal Complex.

An easement has been granted by the DoN to CalTrans for operating Interstate 5 on MCBCP in the immediate vicinity of SONGS. This easement is used for the construction, operation, and maintenance of Interstate 5 and has been granted in perpetuity [Ref. 8.95, p. 2-31]. In addition, NCTD owns and operates a commuter rail train system that runs along the coastal area of the Base. NCTD's railroad corridor is contained within a 100-foot right-of-way easement granted to NCTD in perpetuity by the DoN [Ref. 8.95, p. 2-32].

Tunneling associated with the pipelines required for conversion to closed-loop cooling would cross MCBCP land not currently leased to SONGS, including easements held by CalTrans for Interstate 5 and NCTD for the railroad (see Attachment 5, Figure 5-5). Conversion to closed-loop cooling and the associated construction and tunneling would require additional real estate agreements from the DoN.

7 Conclusion

This feasibility study was conducted to determine if closed-loop cooling could be engineered for SONGS given the site-specific constraints and, if closed-loop cooling was possible, to create a conceptual design to estimate the cost of conversion.

As discussed in Section 3, there have been no conversions of operating nuclear stations from once-through to closed-loop cooling. Disregarding the inherent uncertainty of such a retrofit, conversion at an ideal site location would represent a massive engineering and construction undertaking. The SONGS site is not ideal for conversion, with significant elevation changes, a general lack of available space and the collocation of Interstate 5, a NCTD Railway line, and old U.S. Highway 101, thereby posing significant additional site-specific challenges. To determine feasibility, the engineering aspects and the environmental impacts of conversion to closed-loop cooling were considered.

Engineering aspects of the conversion include the selection and siting of the most appropriate cooling tower technology at SONGS. A conceptual design, cost estimate, and construction schedule was developed for the selected wet hybrid cooling towers. The costing of closed-loop conversion includes the initial capital costs, outage costs, and continuous operational, parasitic, and maintenance costs.

The environmental impacts associated with conversion of SONGS to closed-loop cooling include cooling tower plume and noise generation, site aesthetics, construction related impacts, and intake flow. It should be noted that SCE does not own the land on which SONGS resides, and as such all construction activities necessary for conversion to closed-loop cooling would need to be approved by MCBCP. Additionally, since between 827.8 and 837.2 tons of PM_{10} emissions would be discharged annually from the hybrid cooling towers, it is doubtful that SONGS could locate and purchase a sufficient number of PM_{10} emission credits for closed-loop operation. It is likely that due to permitting and land use constraints conversion of SONGS to closed-loop cooling would be infeasible.

As discussed in Section 5, the design, construction, construction outage requirements, and start-up of closed-loop cooling at SONGS would cost approximately $3.0 billion and would take a minimum of 5 years. It should be noted that due to the limited availability of PM_{10} emission credits and large variability in price, a cost for obtaining the necessary PM_{10} credits has not been included in the cost estimate. If PM_{10} credits were to be available, the $3.0 billion initial cost of converting SONGS to closed-loop cooling would increase significantly to include their purchase.

In addition to these onetime costs, SONGS would incur continuous operational, parasitic, and maintenance costs of more than $85 million per year. Closed-loop cooling would remove an annual average of approximately 143 MWe, and a summer daylight peak of approximately 191 MWe, from the California electrical system, which could decrease grid reliability[9].

[9] In 1999 and 2000, the California Independent System Operator (CA ISO) investigated the role that Diablo Canyon and SONGS play in maintaining grid reliability. The CA ISO found that SONGS provides substantial grid reliability benefits as a result of its location between the SCE and San Diego Gas & Electric (SDG&E) service territories. Moreover, significant transmission reinforcements would be needed if SONGS were shut down [Ref. 8.49].

7.1 Closed-Loop Cooling Engineering Assessment

Conversion to closed-loop condenser cooling represents a massive engineering and construction undertaking, even without the significant site constraints set forth by the considerable elevation changes, collocation of Interstate 5, a NCTD Railway line, and old U.S. Highway 101, and general lack of available space at SONGS.

To provide adequate cooling capacity while avoiding the formation of a visible plume during the majority of meteorological conditions, hybrid cooling towers would be selected for SONGS closed-loop conversion. These hybrid cooling towers would be located on the east side of Interstate 5 and would require large diameter piping to be tunneled beneath Interstate 5 from the SONGS Coastal Complex to the Mesa Complex. From the tunnel, closed-loop circulating water would be routed beside the seawall and would draw suction for a hot water reservoir and provide cooled water from the cooling tower back to a cold water reservoir. Due to the size constraints of the cold water reservoir, three new vertical wet pit circulating water pumps would be needed to pass cooling water through condenser. Additionally, three new high volume / high head vertical wet pit pumps would be required to pump circulating water from the hot water reservoir up to the cooling towers. The circulating water would then be distributed throughout the cooling towers, cooled, and gravity fed back through the circulating water tunnel piping. It should be noted that operation of cooling towers at a nuclear power plant with such a large degree of elevation change between the cooling towers and the condenser is unprecedented, and additional engineering design would be required to ensure public safety would not be compromised by the discharge of cooling water across the SONGS seawall during a loss of power event.

The closed-loop cooling system would be specifically designed to replace only the portion of seawater intake that does not serve engineered safety features. In particular, the saltwater cooling system would continue to operate as currently designed, with the existing intake structure continuing operation to provide saltwater cooling system flow.

The overall construction schedule for the conversion would extend approximately 66 months from the start date with engineering work beginning approximately 3 months prior to tunneling construction and 12 months prior to general construction. The construction start date is schedule to take place after the steam generator replacement projects at each unit have been completed. Of these 66 months, both SONGS Units 2 and 3 would require a construction outage of approximately 21.1 months. Conversion of SONGS to closed-loop cooling would be a “first-of-a-kind” construction project, and thus the current schedule would likely increase as a detailed engineering design investigates and addresses currently unknown design issues.

The cost of converting SONGS Units 2 and 3 to closed-loop cooling can be broken down into five categories: initial capital costs including engineering, procurement and construction, costs of replacement power during the construction outages, costs due to parasitic losses, and maintenance costs. The capital costs of the closed-loop conversion include design, procurement, implementation, and startup activities. In addition, a recommended contingency of 25% is included to account for the inherent uncertainty associated with any conceptual cost estimate produced before a detailed design is finalized. The outage, operational, and parasitic costs were determined by calculating the cost of lost electrical generation by applying a projected price of $73.30 per MWhr (see Attachment 1, Section 5). Finally, ongoing maintenance costs were determined by aggregating typical maintenance costs of the closed-loop cooling equipment for each year of the equipment's lifespan. Table 7.1 provides a basic summary of one-time costs associated with converting SONGS to closed-loop cooling, as well as a breakdown of the major components that comprise each cost determination. A detailed description of the costs presented in Table 7.1 is included in Attachment 4.

Table 7.1 One-Time Costs of Conversion to Closed-Loop Cooling at SONGS

Capital Costs - Design	**Estimated Cost**
Design Engineering and Modification Packages	$ 19,508,000
Capital Costs - Procurement	**Estimated Cost**
Linear Hybrid Cooling Towers (6)	$ 219,240,000
Circulating Water Pumps (6)	$ 12,960,000
Recirculating Water Pumps (6)	$ 26,400,000
Startup Pump (2)	$ 4,320,000
Subtotal	$ 262,920,000
Capital Costs - Construction	**Estimated Cost**
Tunneling	$ 122,851,000
Construction / Installation	$ 85,367,000
Field Service Testing, Commissioning, Startup and Training	$ 1,000,000
Subtotal	$ 209,218,000
Capital Costs - Total Work Scope	**Estimated Cost**
Subtotal	$ 491,646,000
Recommended Contingency (25%)	$ 122,912,000
Capital Cost Subtotal	$ 614,558,000
Construction Outage Costs	**Estimated Cost**
21.1 Month Construction Outage @ $73.30 per MWhr	$ 2,427,403,000
Total One-Time Costs	**$ 3,041,961,000**

Table 7.2 summarizes the projected annual costs associated with the ongoing operation of closed-loop cooling at SONGS. A breakdown of the major components that comprise each cost determination is included. A detailed description of the costs presented in Table 7.2 is included in Attachment 4.

Table 7.2 Annual Costs of Conversion to Closed-Loop Cooling at SONGS

New Condenser Operating Parameters Cost	Estimated Cost
Continuous 73.5 MWe Loss @ $73.30 per MWhr	$ 42,476, 000
Parasitic Losses Cost	**Estimated Cost**
Continuous 69.6 MWe Loss @ $73.30 per MWhr	$ 40,222, 000
Operations and Maintenance Costs*	**Estimated Cost**
Cooling Tower Support	$ 602,000
Cooling Tower Maintenance	$ 1,500,000
Pump Maintenance	$ 440,000
Water Treatment	$ 300,000
Subtotal	$ 2,842,000
Total Annual Costs	**$ 85,540,000**

*Costs for Years 1 – 5; for Years 6 - 15 add $1,000,000; for Years 16 – 20, add $3,000,000.

7.2 Closed-Loop Cooling Environmental / Permitting Assessment

Several significant environmental impacts and regulatory challenges would be associated with conversion from once-through cooling to closed-loop cooling at SONGS. The retrofit construction, system modifications, disruption of operations, permitting amendments, and operation of a closed-loop cooling system would transfer the predominant impacts from aquatic ecosystems to terrestrial ecosystems.

The potential environmental impacts of conversion to closed-loop cooling at SONGS would require CCC approvals and include, but are not limited to, the following:

- Land disturbance that could result in adverse impact to air quality, terrestrial ecosystems, and archeological and historic resources.
- Generation of excavation construction debris and other solid waste requiring offsite disposal and commitment of construction landfill resources.
- Transportation related impacts due to construction debris disposal, equipment and materials transport, and site workers that could cause traffic congestion and increased local air emissions.
- San Onofre State Beach aesthetics issues during construction that may be viewed as a negative to park users.

Best management practices could minimize the impacts to terrestrial habitats and species during construction due to stormwater runoff and fugitive dust emissions. A cultural resources survey would be required for the areas disturbed by construction, but there would be no impacts anticipated to sites of significant archeological concern.

The most significant construction impacts are related to the excavation and offsite disposal of soils and rock from the construction and installation of cooling towers, eight circulating water pipes, and four circulating water reservoirs. Total construction excavation debris would be approximately 297,210 bank cubic yards of sandstone and alluvial material. One or more suitable offsite construction debris disposal sites would need to be identified to receive this material which could result in additional potential impacts to terrestrial resources. In addition, assuming 20 cubic yard transport loads, this would result in approximately 20,800 truck shipments away from the site, which does not include any other equipment transportation.

This, added to additional construction vehicular traffic, could result in periods of traffic congestion on Interstate 5 and/or local roadways, particularly during weekends when high recreational use of state beaches occurs. Additional transportation related air emissions would result from construction activities throughout the 66 month construction duration, but the effects would be localized.

Impacts during cooling tower operation would be significant, especially those related to cooling tower drift. Based on the engineering estimates of drift for hybrid plume abated cooling towers, between 827.8 and 837.2 tons per year of PM_{10} would be emitted. Approximately 165 tons of salt would be deposited downwind (south-southwest) of the proposed cooling towers extending across the SONGS Coastal Complex area and switchyard, causing significant additional maintenance requirements and lead to arcing. Salt deposition across the nearby Camp Pendleton housing areas to the northeast could result in additional corrosion problems. Salt deposition across the coastal scrubland habitat could cause adverse impacts to vegetation and habitat, although these impacts would likely be minor due to the salt tolerance already existing in most of the nearby terrestrial ecosystems. The SDAPCB could potentially require SONGS to purchase PM_{10} emission reduction credits to account for the significant cooling tower PM_{10} emissions. Based on 2007 PM_{10} emission reduction credits cost data in California, it seems doubtful that SONGS could locate and purchase a sufficient number of credits to cover the expected volume of emissions, if required to do so by SDAPCD.

The conversion from once-through cooling to closed-loop cooling would result in an annual average loss of baseload power generation of 143 MWe at SONGS Units 2 and 3. If that generating capacity was conservatively assumed to be replaced by a natural gas facility, an estimated additional 227,000 tons of CO_2 per year would be emitted to the atmosphere.

Closed-loop cooling systems concentrate the chemicals, minerals, and salts found in the source water body (Pacific Ocean) with each cycle of concentration. It is likely that modification of the discharge structure diffusers would be required to address the salinity and thermal NPDES permit limits and dilute the impacts of SONGS discharges which could temporarily disrupt aquatic resources during discharge structure modification.

The construction and operation of a closed-loop cooling system at SONGS would create significant regulatory and permitting challenges. The radiological liquid waste effluent treatment system would require modification to achieve compliance with NRC liquid effluent limits under 10 CFR 20.

Various permits would be required for the conversion of SONGS from once-through cooling to closed-loop cooling. All of these permits would need to be acquired in accordance with regulatory public participation requirements, and would likely incur intense public opposition due to project cost, aesthetics, air emissions, traffic, reduced coastal access, and potential ecological impacts. In addition to the permit requirements, CPUC would have to approve the one-time costs of conversion to closed-loop cooling as well as the ongoing annual costs. Failure to receive approval from any of the governing agencies would render the construction and operation of closed-loop cooling at SONGS infeasible.

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