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.

D. Table of Contents

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

[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.

[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.

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-

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.