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and the
State Water Resources Control Board
Nuclear Review Committee

Independent Third-Party Interim Technical Assessment

for the Inshore Fine Mesh Screens for San Onofre Nuclear Generating Station

Prepared by

BECHTEL

Bechtel Power Corporation

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Revision	Date	Affected Sections
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List of Abbreviations and Acronyms

agl	above ground level
APCD	(San Diego) Air Pollution Control District
ATC	Air Pollution Control District Authority to Construct
BLM	Bureau of Land Management
Caltrans	California Department of Transportation
CDFG	California Department of Fish & Game
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CPUC	California Public Utility Commission
EPCRA	Emergency Planning and Community Right-To-Know Act
FAA	Federal Aviation Administration
fps	foot per second
gpm	gallons per minute
GWA	Government of Western Australia
mgd	million gallons per day
NOI	notice of intent
NPDES	National Pollutant Discharge Elimination System
OHP	Office of Historic Preservation
PG&E	Pacific Gas and Electric
PTO	Air Pollution Control District Permit to Operate
RC	Resource Commission
RCRA	Resource Conservation and Recovery Act
RWQCB	Regional Water Quality Control Board
SDRWQCB	San Diego Regional Water Quality Control Board
SPCC	Spill Prevention Control and Countermeasure Plan
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	State Water Resources Council Board
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USMC	U.S. Marine Corps
WDR	Waste Discharge Requirement

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1. Executive Summary

This study summarizes the findings of the first phase of a detailed evaluation to assess viability of adding a fine mesh screening system to initial intake system of the once-through cooling for the San Onofre Nuclear Generating Station (SONGS). Replacing the current screening system with fine mesh screens is one of the suggested technologies in support of the Nuclear Review Committee's initiative to identify strategies to implement the California *Statewide Policy on the Use of Coast and Estuarine Waters for Power Plant Cooling*. This strategy would comply with the Section 316(b), *California Once-Through Cooling Policy*, Phase II rules.

The existing pump house screens have mesh openings of 3/8 in (9.5 millimeters). Fine mesh screens of effective mesh opening of 1 millimeter to 2 millimeters and fish buckets could be installed in the existing screen racks and the entrainment impacts could be reduced. Survival rates for eggs and larvae impinged on the screens can be improved somewhat by the addition of a fish collection and return system to the existing traveling screens at the onshore pump intake. Fish and larvae dislodged from the collection buckets can be discharged back to the open sea through a connection to the existing fish return system. While these changes would improve the capabilities of the existing pump house the design still will not meet the requirements of the Section 316(b), *California Once-Through Cooling Policy*, Phase II rules and would introduce a significant screen failure risk of the screens due to the significant increase of biofouling and debris loading on fine screen panels and mechanical problems for these screens due to very high through screen velocity at SONGS.

The mitigation to this problem is the addition of a new screen house next to the existing pump intake increasing the available screen area to produce the desired low approach velocity to the screens (approach velocity must be less than 1 fps for low debris loading and less than 0.5 fps for high debris loading). The tie-in to the new screen house would be through underground pipe connections to the existing intake suction line and to the existing pump house. Additionally a new fish return system would be added with the new screens that will return captured eggs/larvae and fish impinged on fine mesh to the sea. These additions would result in the SONGS once through cooling system being in compliance with the Section 316(b), *California Once-Through Cooling Policy*, Phase II rules.

Permitting this change is expected to be contentious and have lengthy review processes that are aligned with the California Environmental Quality Act (CEQA)/Environmental Impact Report review process. Despite this improvement regarding entrainment-related losses, the consistent message from all of the interested regulatory agencies was that there were no environmental impact issues or regulatory criteria that would preclude this technology option from securing the necessary construction and operating permits and approvals. That is, there were no fatal flaws in the associated regulatory review process, which would preclude the inshore fine screen intake system from further consideration. The fine mesh screening technology has been reviewed against each of the Phase 1 criterion and the results are summarized below. The overall finding is that although this technology is feasible, there are several significant technical and operational challenges. These key challenges include the need to add a screen house to the existing on shore pumphouse, the potential for significant additional maintenance to maintain the cleanliness of the screens, the contentious permitting process, and the complexities of the construction approach. These are challenges that can be overcome,

that is, they do not represent fatal flaws at this stage of the assessment.

Criterion	Status
External Approval and Permitting	No fatal flaws
Impingement/Entrainment Design	No fatal flaws, but a supplementary screen house will be required.
Environmental Offsets	No fatal flaws.
First-of-Kind-to-Scale	No fatal flaws.
Operability of General Site Conditions	No fatal flaws.
Seismic and Tsunami Issues	No fatal flaws.
Structure and Construction	No fatal flaws.
Maintenance	No fatal flaws.
Conclusion	**Technology is a candidate for Phase 2 review.**

2. Background and Introduction

2.1 Purpose/Scope of Study

This study is performed in accordance with the requirement established by the State Water Resources Control Board (SWRCB) for Southern California Edison (SCE) to conduct a detailed evaluation to assess compliance alternatives to once-through cooling for SONGS. This requirement is associated with the *California Statewide Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling* that established uniform, technology-based standards to implement the Clean Water Act Section 316(b), which mandates that location, design, construction, and capacity of the cooling water intake structures reflect the best technology available for minimizing adverse environmental impacts.

This report describes the detailed evaluation of inshore mechanical fine mesh screens technology for SONGS based on the list of site-specific criteria approved by the review committee. The evaluation process includes critical review of published data and literature, consultation with permitting agencies and technical assessment supported by engineering experience and judgment. No new field data were collected as part of this effort. The results of the evaluation are used to characterize the feasibility of this technology and its possible selection as a candidate for further investigation in a follow-on phase of this study.

2.2 Regulatory History

2.2.1 Federal

The U.S. Enron mental Protection Agency (USEPA) has proposed standards to meet its obligations under the Section 316(b) of the Clean Water Act to issue cooling water intake safeguards. Specifically, this section requires that National Pollutant Discharge Elimination System (NPDES) permits for facilities with cooling water intake structures ensure that the location, design, construction, and capacity of the structures reflect the best technology available to minimize the harmful impacts on the environment. These impacts are associated with the significant withdrawal of cooling water by industrial facilities, which remove or otherwise impact significant quantities of aquatic organisms present in the waters of the United States. Most of the impacts are

to early life stages of fish and shell fish through impingement and entrainment. Impingement occurs when fish and other aquatic life are trapped against the screens when cooling water is withdrawn resulting in injury and often death. Entrainment occurs when these organisms are drawn into the facility, where they are exposed to high temperatures and pressures—again, resulting in injury and death. (USEPA, March 2011)

In response to a consent decree with environmental organizations, the USEPA divided the Section 316(b) rules into three phases. Most new facilities (including power plants) were addressed in the Phase I rules, initially promulgated in December 2001. Existing power plants were subsequently addressed, along with other industrial facilities, in the Phase II rules, issued in February 2004. Since then the rule has been challenged, remanded, suspended, and re-proposed. The current proposed version of the rule dictates that all existing facilities that withdraw more than 2 million gallons per day (mgd) of water from waters of the U.S. and use at least 25 percent of the water they withdraw exclusively for cooling purpose would be subject to:

- Upper limit on the number of fish killed because of impingement and determining the technology necessary to comply with this limit, or

- Reduce the intake velocity to 0.5 feet/second (through-screen) or below, which would allow most fish to avoid impingement.

Large power plants (water withdraw rates of 125 million gallons a day [mgd] or greater) would also be required to conduct studies to help their local permitting authorities (SWRCB) to determine site-specific best technology available for entrainment mortality control. Note this version abandoned the original performance standards approach that mandated the calculation of baseline against which reduction in entrainment and impingement can be measured.

The Section 316(b) Phase II final rule is expected to be issued on July 27, 2012. When the final rule become effective it is likely to include an implementation timeline that would drive the implementation of technologies to address the impingement requirements within 8 years (2020).

2.2.2 State

The SWRCB is responsible for ensuring compliance with the finalized Section 316(b) rules in California and it has been actively pursuing a parallel path regulatory program that is focused on the state's coastal generating stations with once-through cooling systems including SONGS. The SWRCB's *Use of Coastal and Estuarine Waters for Power Plant Cooling (Once-Through Cooling) Policy* became effective on October 1, 2010. This Policy established statewide technology-based requirements to significantly reduce the adverse impacts to aquatic life from once-through cooling. Closed-cycle wet cooling has been selected as best technology available.

Affected facilities, including SONGS, are expected to:

- Reduce intake flow (commensurate with wet closed-cycle cooling system) and velocity to 0.5 feet/second (through screen) or below – Track 1, or

- Reduce impacts to aquatic life comparably by other means – Track 2

This policy is being implemented through a so-called "adaptive management strategy" that is intended to achieve compliance with the policy standards without disrupting the critical needs of the state's electrical generation and transmission system. A Nuclear Review Committee was later established to oversee the stu-

dies that will investigate the ability, alternatives, and costs for both SONGS and the Diablo Canyon Power Plant to meet the policy requirements. This study is a direct outgrowth of that adaptive management strategy to implement this Once-Through Cooling Policy (Bishop 2011).

Current Cooling Water Intake System and Section 316(b) Compliance History

SONGS operates two independent cooling water intake structures to the once trough circulating water systems for Unit 2 and Unit 3. Each unit's design water withdrawal rate is nominally 828,000 gpm or 1,192 MGD. Both units withdraw water from separate, parallel submerged conduits extending 3,183 feet offshore, terminating at a depth of 32 feet in the Pacific Ocean. The submerged end of each conduit is fitted with a velocity cap to minimize fish entrainment by transforming the vertical flow to a lateral flow that encourages a flight response from fish in close proximity to the structure.

The onshore portion of each intake consists of six vertical traveling screens fitted with 3/8 inch mesh panels. The traveling screens through-screen velocity is 3 fps (SCE 2008). Screens are rotated based on the pressure differential between the upstream and downstream faces or manually. A high-pressure spray removes any debris or fish that have become impinged on the screen face. The vertical traveling screens are angled at approximately 30º to incoming flow. This feature, combined with a series of vertical louvers place in the forebay, guides the fish to a quiet zone at the end of the cooling water intake structure. A fish elevator periodically empties captured fish into a 4-foot diameter conduit that returns them by gravity flow to a submerged location approximately 1900 feet offshore. (Tetra Tech, 2008). Also housed in the cooling water intake structure of each unit are four saltwater cooling pumps, each rated 17,000 gpm. These pumps are safety-related and located downstream of the traveling water screens. Operation of one pump is sufficient to supply the saltwater cooling needs for one unit. The total saltwater cooling flow needs for both units is 34,000 gpm. (SONGS, 2004) Along the existing offshore intake pipes, there is a dedicated and Seismic Category I inlet ensuring saltwater cooling water supply of 34,000 gpm.

SONGS is also planning to add a "large marine organism protection device" to reduce the spacing between the exclusion bars to less than 9 inches in conformance with SWRB's *Statewide Water Quality Control Policy on the Use of Coastal and Estuarine Water for Power Plant Cooling*. (Enercon, 2012)

The offshore velocity cap of SONGS cooling water system and onshore angled traveling screen system collectively help to reduce entrainment and impingement impacts on aquatic life. These systems, along with various previous quarterly impingement monitoring programs, represent ongoing measures by SONGS to demonstrate compliance with previously applicable Section 316(b) regulatory guidance. This guidance can be described as an overarching federal regulation (40 CFR 125.90(b)) and broadly expressed state policies and permit language, which collectively required facilities to implement Section 316(b) rules using professional judgment on a case-by-case basis.

2.3 Screening Process (A/B Criteria)

The technology screening process for the Phase I portion of the evaluation will be performed by using a Criteria Set A/B approach that achieves a technically comprehensive assessment while concurrently minimizing the time and effort required. The screening will be initially performed for Set A criteria. If the technology satisfies all of the Set A criteria, it will be evaluated using Set B criteria.

Set A criteria include the following items that are judged to be critical to the screening process:

- External approval and permitting (nonnuclear licensing)
- Impingement/entrainment design
- Offsetting Environmental Impacts

All remaining criteria are grouped into Set B criteria, which are shown below:

- First-of-a-kind to scale
- Operability general site conditions
- Seismic and tsunami issues
- Structural
- Construction
- Maintenance

During the screening process, if any criterion cannot be met, the screening process is suspended, and a summary report for that technology is then prepared.

3. Technology Description

3.1 General Description of Existing Cooling Water Intake Structure

SONGS once through cooling intake system for each unit includes a 49-foot-diameter offshore velocity cap, 18-foot-diameter buried intake pipe and the onshore cooling water intake structure within the plant facility. The velocity cap is located 3,183 feet offshore at a local depth of -32 feet mean lower low water. The average inlet velocity at velocity cap is approximately 1.8 fps. Inside the onshore cooling water intake structure, circulating water passes through a series of vanes and angles louvers in front of the flow through traveling screens. The louvers and vanes are designed to guide fish to a quiet water area at the end of the intake where the fish collection and return system is located. There is a fish lift located in front of traveling water screens. The lift consists of a large tray that rests on the bottom of the intake and can be raised via a belt to collect fish in the water column in front of screen. The tray is then tilted to transfer fish and shellfish collected to the fish return system, which transfers them offshore in the Pacific Ocean. (SCE, 2008)

The circulating water for each of the two units, after passing through the bar racks, passes through six traveling screens. It is then pumped through each unit's four circulating water pumps into condensers. The traveling screens have a mesh size of 3/8-in square (9.5 millimeters) and the through screen water velocity is 3.0 fps. It is of note that this through screen velocity is relatively high for this type of application. The total intake system nominal withdraw rate is 828,000 gpm.

3.2 Existing 316(b) Demonstration Study on Using Fine Mesh Screens

In 2008, EPRI conducted studies on feasible entrainment reduction options available to SONGS. (SCE 2008) In this demonstration study, assessments were made on retrofitting existing intake by modifying the screens to include the following features: fine screen panels with fish collection buckets, low-pressure screen spray wash, continuous screen rotation. The fine mesh screens are often designed to meet a 0.5 fps approach velocity, but to support this need it will require adding a new screen house to the existing SONGS pump intake. EPRI assessment concluded that, the retention of dominant species in the area such as anchovy and queenfish was relatively high at 81.3 and 89.8 percent, respectively. However, survival was relatively low resulting in

an overall estimated efficiency of 9.9 and 16.7 percent for these two species. EPRI also noted potential issues with the need for continuous screen operation due to the higher loading may result in biofouling and mechanical problems for these screens. EPRI further concluded that adding a new screen house to provide space for more traveling water screens would result in plant down time of at least one year. Due to the impacts to the shorelines and cost associated with replacement power, EPRI did not evaluate the addition of a new screen house further.

EPRI separately commented that the SONGS is already in compliance with impingement mortality reduction rule, since it has the offshore velocity cap intake paired with the onshore fish return system. (SCE 2008)

3.3 General Technology Description

Inshore (onshore) fine mesh screens technology is intended to achieve significant improvement in impingement mortality and entrainment reduction by replacing the existing coarse screen panels (with 9.5 millimeters) with fine mesh panels. To reduce entrainment of fish egg/larvae, it is expected that screen mesh opening needs to be in the range of no more than 1 to 2 millimeters effective opening. With this retrofit, all organism and debris larger in size than 1 to 2 millimeters would be blocked by and impinged on screens and discharged as debris. The only way to allow reasonable survival to the impinged egg/larvae would be to introduce an individual fish collection and return system to each traveling screens. The existing louver and vanes are intended for juvenile and adult fish and not for the egg/larvae. Collected larval organism and fish would be sent back to the ocean using the existing fish return.

Adding an individual fish collection and return to each screen will involve adding a fish bucket at bottom of each screen panel and introducing two pressure sprays. The low-pressure spray (approximately 10 psi) is designed to push off impinged egg/larvae and fish off screen face and into the return piping. The subsequent high-pressure spray removes the remaining debris from the screens. This operation will result in stress to the collected larval organism and will impact the survival rate. However, these features will result in improvements over existing condition, which has 100 percent administrative loss of larval organism due to entrainment through the existing screen system.

The very compact cooling water intake structure and the angled screen arrangement will not support the addition of more screens or their conversion to another screen type offering greater surface area, unless a new screen house is built nearby. With the current screen arrangement, simply replacing the existing mesh with fine mesh panels will result a significant increase of debris volume on screen panels. It is doubtful the existing screens can take the additional load imposed by this debris, because of very high through screen velocity of 3 fps (roughly 1.5 to 2 fps approach velocity). There have been incidents at power plants that reducing screen mesh from 6 millimeters square to 2 millimeters square (with approach velocities over 1 fps) resulted in the collapse of screen panels.

It should be noted that the evaluation of converting screen panels at the existing traveling water screens focus on the onshore pump house only and there is no change to the offshore intake system.

4. Criterion Evaluation

4.1 External Approval and Permitting – Inshore Fine Screen Intake System

4.1.1 General Discussion

The external approval and permitting assessment focused on identifying the applicable (required) permits and approvals for construction and operation of an inshore fine screen intake system.

The initial assessment effort focused on developing a comprehensive list of potentially applicable permits and approvals at the federal, California, county, and municipal level (as applicable). This applicability of each permit/approval to the proposed inshore fine screen intake option was evaluated. Those permits and approvals that were deemed applicable were subsequently scrutinized to characterize the expected duration and complexity of the regulatory review process. Special attention was directed to identifying environmental impact issues or criteria that would preclude the applicable permit or approval from ever being issued or granted. That is, the focus was to screen each applicable permit or approval for fatal flaws in the associated regulatory review process, which would preclude the inshore fine screen intake system from further consideration.

The assessment also focused on identifying the critical path (longest duration) initial preconstruction permitting processes, that is, those that support site mobilization, physical site access, initial earthwork/ foundations for each cooling system technology option. The duration of the permitting and the approval process, while not a definitive fatal flaw, could later serve as a screening tool if combined with specific schedule limitations.

Permits and approvals that support later stages of construction and operation that are not critical path to the commencement of construction were also included in the assessment since these items could pose significant operational constraints to future SONGS operations.

4.1.2 Detailed Evaluation

This summary list of permits provided the basis for subsequent discussions with key relevant regulatory authorities regarding the applicable permit application needs and the permit review time frames. These discussions were also critical for the identification of potential regulatory or permit-related barriers to implementation - fatal flaws.

The following regulatory authorities were contacted:

- U.S. Army Corps of Engineers (USACE)
- U.S. Marine Corps – Camp Pendleton (USMC)
- California Public Utility Commission (CPUC)
- California Coastal Commission (CCC)
- California State Lands Commission
- State Water Resources Control Board (SWRCB)
- San Diego Regional Water Quality Control Board (SDRWQCB)
- San Diego Air Pollution Control District (APCD)
- San Diego County Department of Environmental Health

The following sections discuss the relevant key permitting/approval processes for the inshore fine screen technology and summarize these findings in Table IFMS-1. This table lists the applicable permits and approvals, determines the critical path review processes and most importantly, highlights those processes that may be fatally flawed.

4.1.2.1 Inshore Fine Screen Intake System

The inshore fine screen intake system involves modifying the existing pump house to adding fine mesh screen panels to the existing traveling screens and fish collection and return system. This system can also demand construction of a new screen house, if the modification of the existing screens deems infeasible.

U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers (USACE) is the lead agency for Clean Water Act Section 404 and Section 10 permitting processes, which are focused primarily on impacts to waters of the United States and waterborne navigation. The inshore fine screen system will involve nearshore modification/construction activities, which will pose impacts to USACE jurisdictional waters.

For minor impacts the Corps has established a general permit program (Nationwide Permit) for a host of less significant work processes involving waters of the United States. The significant marine work associated with this cooling system option may preclude any Nationwide Permit permitting process. SONGS would then be faced with securing the more complex individual Section 404/10 permit.

While Section 404 permit review periods can often be lengthy, the USACE representative for the SONGS area explained that all USACE facilities have goal to issue an individual Section 404 permit within 120 days of deeming the associated application complete (Lambert, 2012). This period is a goal, not a statutory commitment. Consequently, in many cases this goal is not realized. These delays are often associated with the mandated consulting processes that need to be pursued with the State Historic Preservation Office, U.S. Fish and Wildlife Service, or National Marine Fisheries Service. In other cases there are extensions of public notice periods or scheduling complications for the public hearing. The applicant for the Section 404/10 permit has to directly pursue consultations with California Coastal Commission (CCC) and SWRCB. Receipt of an individual Section 404 permit is contingent on previous receipt of permits from the CCC and SWRCB.

This difficult situation is impeded further by the understaffed local USACE office (two to three permit writers), so permit review durations have been getting longer. For the more complex and contentious situations, the permitting process can extend to 1–2 years. Hence, the USACE permits are often characterized as the critical path permitting process. Given the significant new marine work associated with this cooling technology option, it is likely that the Section 404 will represent a critical path item to the completion of permitting.

Despite the potential for review periods longer than the 120-day target, the USACE did not see any specific barriers or fatal flaws regarding the Section 404 permitting process for the new inshore fine screen intake system. (Lambert, 2012)

U.S. Marine Corps – Camp Pendleton

SONGS is located on leased property that is part of the USMC Camp Pendleton. Any significant physical improvements to the SONGS facility, such as addition of closed cooling systems are potentially subject to a formal review and approval process by the USMC and U.S. Department of the Navy.

SONGS resides on land that is subdivided into two leases and 9 easements. The SONGS lease grants the USMC and the U.S. Department of the Navy authority to review and improve physical improvements on the subject property (Rannals, 2012). While this authority does not formally extend to offshore properties, the USMC is also interested in nearshore work in the area, since it could potentially impact their marine training activities.

While the inshore fine screen intake system is not expected to demand any additional federal land nor add any significant land-based structures, it is possible that addition of this cooling system technology will pose sufficient land-based alterations to trigger a formal review and approval process. If required, the related application is initially submitted to the USMC/Camp Pendleton (with appropriate site plan drawings and associated written descriptions). This application would be reviewed by the Camp Pendleton staff and the staff would subsequent compile their findings and make a recommendation to the Camp Pendleton Base Commander regarding the application. With this input, the Base Commander would then develop and submit a recommendation to the USMC headquarters and subsequently to the U.S. Department of Navy. The U.S. Department of the Navy would provide the final approval/denial of the proposed new SONGS facility on leased Camp Pendleton property.

While the inshore fine screen intake system may not trigger this formal review and approval process, the associated significant nearshore work could be viewed negatively by the USMC, if it appears to compromise their marine training regimen. It is unclear whether the USMC can (or would choose to) exert influence through their land-based lease and easement arrangement for facilities largely outside of their lease area.

California Public Utility Commission

SONGS is regulated by the California Public Utility Commission (CPUC), which is charged with overseeing investor-owned public utilities. Given the lack of significant county involvement on this federal property, the CPUC will likely be designated the lead agency for the CEQA review process. CEQA is regulatory statute, that requires state or local regulatory agencies to identify, assess, avoid or otherwise mitigate the significant environmental impacts from the proposed action—the addition of new cooling system technology.

The proposed new inshore fine screen intake system may trigger preparation of Environmental Impact Report. The Environmental Impact Report is a detailed report that identifies the potentially significant environmental effects the project is likely to have; identifies feasible alternatives to the proposed project; and indicates the ways in which significant effects on the environment can be mitigated or avoided. This Environmental Impact Report will also be used by other state agencies to support their respective review and approval processes.

Following finalization of the Environmental Impact Report, the CPUC will evaluate whether to certify CEQA compliance. This certification then supports their subsequent decision regarding whether the costs associated with the new cooling system can be reclaimed via a consumer rate base adjustment.

While the CPUC-sponsored review process and decision regarding cost recovery will likely be a lengthy, complex and contentious process, there are no definitive environmental barriers that preclude successfully completion of the CEQA review and a positive record of decision.

California Coastal Commission

The CCC has a broad mandate to protect the coast resources of California that includes the SONGS facility, including the Mesa Complex. Consequently, the CCC's environmental concerns address a broad range of

subject matter include visual resources, land and marine-based biological resources, land use and socioeconomic concerns (for example, recreational use/access). Despite this comprehensive focus, the CCC has little in the way of specific, objective criteria that could be used to effectively screen any of the cooling system technology options from further consideration.

The CCC representatives (Detmer & Luster 2012) indicated that the Commission recognized that there were no great options to the existing once-through cooling system at SONGS. Indeed, CCC believes that almost all of the cooling system technology replacement options present some sort of negative impacts. Given that basis, the CCC may consider options that may present additional onshore or different offshore impacts to help mitigate the offshore environmental consequences of the existing once-through cooling system. The CCC mandate to protect the coastal resources offers this agency some latitude to balance one set of impacts versus another. This evaluation process is on a case-by-case basis, which can be translated into the conclusion that there are few triggers that would automatically preclude any cooling system options from consideration.

The inshore system would essentially retrofit the existing nearshore intake infrastructure and develop a new more effectively screened system. While entrainment impacts have the potential to be more significant for inshore systems, the continued use of the existing offshore intake will avoid this issue. Visual impacts in the coastal zone, a typical key CCC subject area, may be an important factor for this expected low profile nearshore system. Thermal discharge impact matters will also be sideline issues, since they remain largely unchanged with this cooling system option.

The CCC consideration of these issues and their follow-on approval process is mostly aligned with the CEQA process. That is, any application for a coastal development permit will be dependent on information that is generated by associated Environmental Impact Report development process. Consequently, the CCC permit review process will also be aligned with CEQA and consequently its duration will mirror the CEQA timeline (6 months–1 year). That period offers evidence that the coastal development permit could be a critical path permitting process.

California State Lands Commission

Construction efforts in subaqueous lands associated with any cooling system modifications will be evaluated/approved by the California State Lands Commission. This review and associated lease approval process can follow three different tracks as shown below:

- **Categorical Exemption** – applicable to those situations where there are no significant environmental impacts and there are no substantive changes in the existing land use. It is unlikely that this option would apply to any of the potential cooling system options that require marine work.

- **Mitigated Negative Declaration** - applicable for work which poses minor environmental impacts, during noncritical seasons, for limited period of time. The current SONGS Marine Mammal Screening retrofit work has been reviewed and approved via Mitigated Negative Declaration.

- **Environmental Impact Report/CEQA Process** – applicable for work that could potentially generate significant environmental impacts, uses heavy construction equipment, and/or will continue over a significant time periods (months). This review process is not fast-track and could extend for a year.

The State Lands Commission evaluates each project individually and determines the appropriate review/approval path. As the inshore fine screen intake option will obviously result in a significant addition of cooling system infrastructure to subaqueous lands, SONGS will not be able to pursue the largely administra-

tive *categorical exemption* path or the streamlined *mitigated negative declaration* process. This option will invoke the longer, more complex Environmental Impact Report/CEQA review process.

Commission representatives (DeLeon 2012 and Oggins, 2012) explained the current process for nonnuclear coastal power plant lease holders to develop and implement their "implementation plan" to meet California's Once-Through Cooling Policy performance goals has been very slow. Most of these facilities have requested extensions to continue to evaluate the potentially available mitigation strategies. This experience offers evidence that the associated CEQA review will not be an expeditious process. A review period of at least a year is a distinct possibility.

Despite this expected lengthy review process, the inshore fine screen intake marine work in subaqueous lands does not appear to offer any specific impacts or regulatory considerations that represent fatal flaws.

State Water Resources Control Board - San Diego Regional Water Quality Control Board

While the SWRCB has overall permit authority for California's two active nuclear power stations, the SDRWQCB has the follow-on inspection and enforcement role for the issue permits. For SONGS, the SWRCB expects to modify the existing NPDES permit in support of the proposed inshore fine screen intake system. The lack of significant disruption to local land surfaces is expected to negate any need for new waste discharge requirements permit for construction impacts to jurisdictional streambed areas and possibly avoid the need to seek coverage under the general storm water permit for construction activity.

Inshore fine screen intake system construction activities will potentially generate significant, temporary water quality and marine habitat (intertidal and subtidal) impacts. Adding the fine screen panels will likely result in some localized turbidity impacts and temporary and permanent loss of the biological productive nearshore marine habitat area.

Operationally, while the inshore fine screen intake system will reduce impingement influences. This system will continue to use the offshore intake system and it will not reduce the overall water withdrawal or discharge rates. Consequently, the entrainment impacts and the thermal discharge impacts to aquatic life will remain largely unchanged.

Given that the cooling water withdrawal and discharge rates will remain essentially unchanged any revisions to the current SONGS NPDES permit will be limited to compliance provisions of Section 316(b), *California Once-Through Cooling Policy*, Phase II requirements. There will ostensibly be no changes to the current water treatment system, as this option is still a once-through system that now boasts an inshore fine screen intake system.

Both the SWRCB and SDRWQCB representatives (Jauregui, 2012 and Morris, 2012) explained that there are no obvious regulatory barriers regarding issuance of this revised NPDES permit for any of the cooling system options currently under consideration, including the relocation of the SONGS offshore intake to an inshore location. While the SDRWQCB and SWRBC indicated that they would not necessarily preclude cooling system options from consideration, even if these options fall short of full compliance with the performance criteria tied to Section 316(b), *California Once-Through Cooling Policy*, Phase II rules (that is, through-screen velocity less than 0.5 feet/sec and entrainment/impingement levels equivalent that associated with a closed-cooling cycle system), the shift to an inshore fine screen intake offers marginal benefits over the existing intake system, but it certainly falls well short of the entrainment-related benefits of a closed-cycle cooling system.

The SWRCB is ultimately a political body (9 individuals), whose members are interested in reviewing information/evidence as possible from the applicant and from their own technical staff regarding the feasibility and impacts of various cooling system alternatives. Consequently, none of the SWRCB permits represent a fatal flaw or critical path permitting process to inshore fine screen intake system despite its limited benefits relative to the existing system at SONGS.

San Diego Air Pollution Control District

SONGS is located within the San Diego APCD, a state-designated, non-attainment area for PM-10 and PM-2.5, that is, the District has failed to achieve compliance with the state ambient air quality standards for these pollutants (Annicchiarico, 2012). In addition to this air quality compliance issue, there are also local concerns regarding visibility impacts on the nearest visibility sensitive areas, so-called Class I areas that are comprised of national parks (over 6000 acres), wilderness areas (over 5000 acres), national memorial parks (over 5000 acres), and international parks that were in existence as of August 1977. While these situations may have ramifications for those cooling system options that generate significant particulate emissions (closed cooling cycle systems), air quality permits/approvals are not expected to play an appreciable role for the inshore fine screen intake system—a system that is not expected to generate any additional operational air emissions.

San Diego County Department of Environmental Health

As SONGS is located entirely on leased federal property that is part of the USMC Camp Pendleton, any significant physical improvements to the SONGS facility are not subject to San Diego County review. The review process is essentially delegated to the USMC and U.S. Department of the Navy. Consequently, most of the San Diego County Departments (Planning, Public Works, Building Division) do not directly regulate SONGS.

Despite the fact that the county oversight for SONGS is constrained, there are six separate ongoing county-led regulatory programs at this facility (Mache, 2012). County Environmental Health Department has received CalEPA approval to be the Certified Unified Program Agency responsible for management of the following programs:

- California Aboveground Storage Tank Program – mandates development and implementation of a Spill Prevention and Countermeasure Control Program (SPCC) and tank inspections.
- California Underground Storage Tank Monitoring Program – addresses fuel storage and leak detection in Mesa Complex and power block area.
- Hazardous Waste Storage and Treatment – includes small proprietary oil separation facility.
- Medical Waste Disposal – a county ordinance makes this an Environmental Health Department responsibility.
- Clean Air Act 112r Risk Management Plan – addresses onsite aqueous ammonia storage
- Hazardous Material Business Plan – addresses storage of greater than 55 gallons of chemicals with potential for offsite impacts and addresses the facility's Emergency Planning and Community-Right-to-Know (EPCRA) responsibilities.

The inshore fine screen intake system will likely not demand any additional chemical additives or force the relocation of any existing chemical and fuel storage systems. Routine maintenance and cleaning of the intake system could produce an additional waste stream composed primarily of debris and vegetative materials around the facility's more robust screen system. These maintenance wastes and other aspects of the inshore fine screen intake system operation will not present any obvious county-sponsored regulatory barriers or represent critical path permitting processes.

Other Regulatory Agencies

In addition to the key regulatory agencies described above, there are a number of regulatory agencies that could potentially play a role in the permitting of the various cooling system technology options. The U.S. Fish and Wildlife Service, California Department of Fish & Game, and California Office of Historic Preservation, for example, often play significant regulatory roles in power plant upgrade projects. Construction and operation of the inshore fine screen intake system may pose some temporary and permanent impacts to sensitive marine habitat, while offering only limited reductions of impingement and entrainment impacts. These attributes will make the U.S. Fish and Wildlife Service and California Department of Fish & Game service key parties to CEQA review process, but are not expected to trigger the need to secure a 2081 Incidental Take Permit because of the lack of marine-based endangered species (Enercon). Since this option primarily involves nearshore work and underwater facilities, it is unlikely the cultural or historic resources (land-based) will be impacted.

Installation of this more robust inshore screening system will not alter the overall profile of the SONGS facility and certainly not require significantly tall or large construction equipment. These considerations will preclude significant interactions with California Department of Transportation (Caltrans) (roadway crossings, encroachments, oversized vehicles) and the Federal Aviation Administration (FAA), whose focus would be limited to aviation obstruction impacts posed by tall new permanent or temporary features (less than 200 feet above ground level).

Finally, the California Energy Commission (CEC) will be largely excluded from the permitting processes primarily, because the relocation of the intake to a nearshore location will provide only a very limited improvement in the overall efficiency of the SONGS facility that is well short of the 50 MW threshold for CEC review.

4.1.2.2 Summary

The external approval and permitting assessment for the inshore fine screen intake system identified a list of potentially applicable federal, state and local permits and approvals that not surprisingly focused on its impacts to the marine environment. The efforts to conduct a successful CEQA review and secure the USACE Section 404 permit, CCC Coastal Development Permit, State Lands Commission Lease, NPDES permit modification will represent the primary regulatory challenges.

These permits are all expected to be contentious and have lengthy processes that will be aligned with the CEQA/Environmental Impact Report review process. The primary difficulty appears to be that the inshore system poses construction impacts to the sensitive and productive marine habitats, and offers only some limited benefits regarding impingement, which are already partially mitigated by the existing offshore intake system and nearshore traveling screen system. Despite failure to show incremental environmental improvements, the consistent message from all of the interested regulatory agencies was that there were no environmental impact issues or criteria that would preclude this technology option from securing the necessary construction and operating permits and approvals. That is, there were no fatal flaws in the associated regulatory

review process, which would preclude the inshore fine screen intake screen system from further consideration.

The assessment also indicated that the Section 404 permit and the CPUC-sponsored CEQA review process will likely represent the critical path review and approval processes (approximately 12 month) for the inshore fine screen intake system. This critical path process does not represent a barrier to development of this cooling technology system.

4.2 Impingement/Entrainment Design

4.2.1 General Discussion

There are six flow-through-type traveling water screens per unit with a flow through screen velocity of 3 fps. In addition, the existing traveling screens have mesh openings of 3/8 of an inch (9.5 millimeters), which is not a barrier to fish eggs or larvae. With the installation of fine mesh screen panels at the existing pump house that have mesh openings of 1 to 2 millimeters, the entrainment impacts can be reduced. Survival rates for eggs and larvae impinged on the screens can be improved by the addition of a fish collection and return system to the existing traveling screens at the onshore pump intake. Fish and larvae dislodged from the collection buckets can be discharged back to the open sea through the existing fish return system. Past studies (SCE, 2008) indicated that while the exclusion rate for the larval organism is high when using the fine mesh system, the survival rate is relatively low for two dominant species in the area, anchovy and queenfish - approximately 9.9 and 16.7 percent, respectively. Nonetheless, any improvement in entrainment over the existing condition is a plus, since currently the entrainment loss is administratively 100 percent.

However, use of the fine mesh screen panels will also result in a substantial increase of debris loading on the converted screens. The existing screens may not be able to handle this increase, as has happened on some power projects, which experienced screen failures following a screen mesh retrofit from coarse mesh to finer mesh of 2 millimeters square. The mitigation to this problem demands the addition of a new screen house next to the existing pump intake to produce the desired low approach velocity (approach velocity must be less than 1 fps for low debris volume and less than 0.5 fps for high volume). The tie-in to the new screen house would be through underground pipe connections to the existing intake suction line and to the existing pump house. All the new screens in the screen house will be continuously rotating and comes with fish collection and return system. Pipeline rerouting will also consider the need for and preserve the function of thermal shock treatment for offshore pipeline bio-fouling control.

4.2.2 Detailed Evaluation

The fine screen mesh proposed will have rectangular slot screens, such as either 1 millimeter x 4 millimeters or 2 millimeters x 6 millimeters. This creates effective mesh opening of 1 to 2 millimeters, which reduces entrainment of fish egg and larvae. The rectangular mesh size has better hydraulic performance in terms of reduced head loss since it has a larger screen open area as compared to the square mesh of 1 millimeter x 1 millimeter or 2 millimeters x 2 millimeters.

With the fine mesh in place, egg/larvae impinged on screen mesh will need to be collected and returned back to the ocean. As the current louver and vane arrangement provide no benefits in this regard, each traveling screen will need to be equipped with a fish collection and return system and need to rotate continuously. Two pressure sprays will be installed. The low-pressure spray (approximately 10 psi) is expected to push off collected fish and egg/larvae to the return piping. A follow-on high-pressure spray is employed to dislodge debris.

The increased debris loading of this revised system will be a major operational issue. Experience indicates that when screen mesh openings are artificially reduced to a level of 2 millimeters and lower, the increase of debris loading on screen panels can cause them to collapse. The very compact cooling water intake structure and the angled screen arrangement will not support the addition of more screens or their conversion to a screen-type offering greater surface area. Rotating screens at a higher speed, such as 40 ft/minute, will improve debris handling, but with the current high through screen velocity of 3 fps, the operation of fine screen mesh could result in screen damage due to overloading. From debris handling point of view the screen approach velocity needs to be less than 1 fps for low loading and less than 0.5 fps for high loading. Currently, SONGS has an approach velocity of 1.5 to 2 fps with a through screen mesh velocity of 3 fps. As described further in Section 4.5, to secure the full benefits of fine mesh screen technology, it will be necessary to increase the number of screens to reduce the approach flow velocity. This increase dictates the need for a new screen house that will include all the new screens positioned to the side of the existing pump house. The connection between the new screen house to the existing intake suction line and the existing pump house will be through pipe rerouting. The addition of new screen house will also need to preserve the current thermal treatment operation for offshore pipeline bio-fouling mitigation.

4.3 Offsetting Environmental Impacts – Inshore Fine Screen Intake System

4.3.1 General Discussion

The environmental offsets are an environmental management tool that has been characterized as the "last line of defense" after attempts to mitigate the environmental impacts of an activity are considered and exhausted (GWA, 2006). In some cases significant unavoidable adverse environmental impacts may be counterbalanced by some associated positive environmental gains. Environmental offsets, however, are not a project negotiation tool, that is, they do not preclude the need to meet all applicable statutory requirements and they cannot make otherwise "unacceptable" adverse environmental impacts acceptable within the applicable regulatory agency.

In some cases, regulatory agencies may be so constrained by their regulatory foundation that offset opportunities are limited or unavailable. The San Diego APCD, for example, has the regulatory authority to offset new air emissions in their district from previously banked emission reductions as long as the new emission sources meet appropriate stringent emission performance criteria. The APCD cannot offset new air emissions with reductions in the impingement and entrainment impacts to aquatic life or reductions in land disturbance. In other cases, the regulatory agencies, such as the California Coastal and State Lands Commissions, have a more broad-based, multidisciplinary review process that supports a more flexible approach to using environmental offsets to generate the maximum net environmental benefit.

With these considerations in mind, the following assessment of offsetting environmental impacts focuses on identifying both positive and negative construction and operational environmental impacts associated with the construction and operation of inshore fine screen system from a broad range of environmental evaluation criteria.

4.3.2 Detailed Discussion

The following sections evaluate the air, water, waste, noise, marine and terrestrial ecological resources, land use, cultural and paleontological resources, visual resources, transportation, and socioeconomic issues associated with construction and operation of the inshore fine screen system. Given the wide range of environmental impact subject areas under consideration, the systematic approach used in the Diablo Canyon License Renewable Application process was used (PG&E, 2009). Consequently, following discussion of the individ-

ual environmental subject areas, the related consequences are categorized as having either positive or negative small, moderate or large impact significance. The specific criteria for this categorization are shown below:

- **Small:** Environmental effects are not detectable or are minor, such that they will not noticeably alter any important attribute of the resource

- **Moderate:** Environmental effects are sufficient to noticeably alter, but not significantly change, the attributes of the resource.

- **Large:** Environmental effects are clearly noticeable and are sufficient to change the attributes of the resource.

The results of these evaluations and impact categorization are subsequently summarized in the Table IFMS-2.

Air

The air quality impacts associated with installation of the inshore fine screen system are small given that the primarily marine-based nature of the associated construction activities. There will be little or no opportunity to generate fugitive dust from land disturbance activities, as the primary activity will involve marine work. Some additional vehicle-related air emissions can be expected from the small number of outage workforce personal vehicles and over-the-road project construction vehicles. Self-propelled earthmoving equipment will be unnecessary, but there may be some emission sources on temporary offshore platforms or barges. Construction supplies and inshore fine screen and piping-related equipment deliveries may be significant in the early phases of construction.

The inshore fine screen system is not expected to offer any significant change in SONGS overall plant efficiency. Consequently, there will be no significant change in SONGS power generation rates, nor any related variation in greenhouse gas or other pollutant emissions from replacement fossil power sources.

Surface Water

Inshore system construction activities are primarily marine-based and they have the potential to generate significant water quality impacts. Construction of the inshore fine screen system and connecting piping will result in localized turbidity impacts from disruption of the local seabed—a moderate negative impact. These construction efforts are not expected to result in any land-based disturbance or storm water-related impacts.

The inshore fine screen intake system will not change the overall cooling water withdrawal or discharge rates.

Groundwater

Given the primarily marine construction environment associated with the installation of the inshore fine screen system, no significant additional groundwater resources will be needed.

The inshore fine screen system is not expected to require any additional groundwater resources.

Waste

Constructions-related waste, including marine bed sediment and recyclable metals associated with surplus piping and the inshore fine screen system, will be generated during the outage. Marine dredge spoil volumes could be considerable. The final disposition of these materials has not been determined. Most of the piping and related wastes are expected to have salvage value and therefore, not represent a burden to offsite disposal facilities. Disposal of the marine sediment, whether directed to an onsite or offsite disposal area, will represent a moderate construction negative impact.

Physical inspection and cleaning of this intake system, as part of the maintenance program, is likely to generate additional biological wastes. The new inshore location may make this increase significant. Collection and disposal of these marine wastes, therefore, can be categorized a moderate operational negative impact.

Noise

Previous studies have concluded from consultations with the County of San Diego County, City of San Clemente and Camp Pendleton, that noise levels are expected not to exceed 70 dBA at the nearest public receptor (Tetra Tech, 2008). Noise impacts from construction activities for the inshore fine screen system are not expected to be significant for land-based locations, since the primary work areas will be in a nearshore location. Buffer areas around offshore construction zones will likely be established for safety reasons, but that will also serve to reduce noise impacts to offshore noise receptors (watercraft) and shoreline recreational areas (for example, San Onofre State Beach). Given the remaining potential for noise impacts to the public along the immediate shoreline recreational areas, the construction activities could pose a small negative impact.

Operational noise levels are expected to be largely unchanged following installation of the new inshore fine screen system.

Land Use

Construction activities associated with this system are primarily near or onshore and these activities could temporarily preclude normal recreational activities in waters in the immediate construction areas. As mentioned above, buffer zones will be created and maintained during the course of construction for the safety of the workforce and public. The potential temporary restriction of normal public access in these marine areas represents a small negative impact for this cooling technology option.

The inshore fine screen system may represent a change in land use in areas occupied by the existing intake system (which did include some nearshore components) and in previously undeveloped subaqueous areas. The inshore location of the intake is not expected to impact waterborne traffic. Given these impacts, operation of this underwater system is expected to offer a small term negative impact.

Marine Ecological Resources

Reconfiguring inshore fine screen system will result in significant localized turbidity impacts and some temporary and permanent loss of the biological productive nearshore marine habitat area – a moderate negative impact.

Operationally, the inshore fine screen system will reduce the impingement/entrainment-related cooling system impacts, assuming the addition of a new screen house. This system will not, by itself, reduce the overall

water withdrawal or discharge rates. However, the system continues to withdraw water from its existing offshore location so entrainment and impingement impacts will be significantly reduced by the fine screen and associated reduced flow through velocity. The thermal discharge impacts to aquatic life will remain largely unchanged. Collectively, this system is expected to offer at least a moderate positive operational impact relative to the current condition.

Terrestrial Ecological Resources

Construction activities associated with the inshore fine screen system are primarily marine-based and consequently present little impact to land areas. There will be no construction impacts to terrestrial natural habitat areas or areas with significant ecological value or sensitivity. Operation of the inshore fine screen system will similarly present no new threat to these resource areas.

Cultural and Paleontological Resources

Since installation of the inshore fine screen will be confined to subaqueous lands, there is little or no potential to discover new cultural or paleontological resources in these developed areas. Operation of this system will similarly pose no new threat to cultural or paleontological resources.

Visual Resources

All construction equipment will be low profile, that is, the construction support features and equipment will not extend above the height of local facility structures.

The inshore fine screen system will be mostly submerged and present no permanent change in external profile of the facility.

Transportation

Increased commuting traffic from the construction workforces and construction deliveries could worsen the existing level of service on local roads during the plant outage. While the associated construction period means that related traffic impacts will not be transitory, the necessary workforce is not expected to be large. Consequently, the transportation-related construction impacts should be considered a small negative impact.

Operationally, the inshore fine screen system will increase maintenance and service requirements, but any related maintenance staff increases are expected to be minimal. Therefore, there are limited or no operational transportation impacts for this system.

Socioeconomic Issues

While there will be some additional construction-related employment opportunities associated with installing this technology, these opportunities are not expected to significantly strain local community resources (for example, housing, school, fire/police services, water/sewer).

Operational maintenance staff levels may increase slightly in response to increase cleaning and marine waste management demands associated with the inshore fine screen, but not result in any related community service or resource concerns.

4.3.2 Summary

Table IFMS-2 summarizes the air, water, waste, noise, marine and terrestrial ecological resources, land use, cultural and paleontological resources, visual resources, transportation, and socioeconomic environmental offsets for the inshore fine screen system. With the addition of a new screen house, the construction impacts could be characterized as having moderate negative impact significance in that some of this work may be conducted on previously disturbed subaqueous land. Construction practices will involve marine-based work, which will generate increased turbidity in the local seawater, produce marine spoils waste, and potentially result in permanent and temporary losses of additional biologically productive nearshore marine habitat. Theses impacts are not offset by the limited employment opportunities that may be gained during this same period.

The new fine screen mesh system continues to use the existing velocity cap that is situated in fairly deep water that currently mitigates some of the impingement and entrainment impacts. The new fine screen system, reduces the through screen velocity and adds a fish return system. There is no coincident reduction of cooling water withdrawals, so no change in thermal discharge impacts. Thus, collectively, there are some moderate positive operational environmental attributes with the inshore fine screen system to offset the moderate construction-related negative impact associated with the disruption of additional marine habitats and localized water quality degradation

4.4 First-of-Kind to Scale

4.4.1 General Discussion

This technology is commercially available and can support the large amounts of water withdrawal rates associated with once-through cooling systems with appropriate maintenance provisions. Fine mesh screens have been installed and are operating at Big Band (0.5 millimeters mesh) and Brayton Point Generating Station (1 millimeter mesh).

4.4.2 Detailed Evaluation

The detailed evaluation is as follows:

- This technology, as modified, does not constitute a first-of-kind to scale. The addition of the new screen house is also not a first-of-kind in scale issue.

- The environmental attributes of fine mesh screens have been extensively studied, and they are operating in large power stations, such as Big Band and Brayton Point.

- The fish collection and return system typically includes two pressure sprays. The low-pressure spray gently moves egg, larvae and fish off screen face and fish bucket, and then the follow-on high-pressure spray dislodges the remaining debris clinging to the screen mesh.

- Fine mesh screens will result in significant increases in debris loading. As the screen surface area cannot be increased, a variable frequency driver will be added to generate continuous screen rotation at speeds up to 40 feet per minute. The addition of a new screen house will address this issue.

4.5 Operability General Site Conditions

4.5.1 General Discussion

While the new inshore fine screen technology can be integrated into the existing system by replacing the screen panels with fine mesh and by adding the associated individual fish collection and return system, the high approach and through screen velocities can cause screen panel damage or rupture due to the fact that the fine mesh will practically block most organism or debris in the incoming flow. This is a potential fatal flaw if implemented in the existing cooling water intake structure. The only way to avoid this potential fatal flaw is to install a new screen house structure that can accommodate more traveling water screens, which will reduce the approach and through screen velocities. This new screen house structure would be connected to the existing offshore suction line and pump intake, through intake piping rerouting.

The new screen modification will not adversely affect the screens serving the safety-related auxiliary saltwater pumps. If a new screen house is installed to accommodate more traveling water screens, the existing intake pump house will remain functional, so that this seawater supply pump in the existing intake can remain continuously operational.

4.5.2 Detailed Evaluation

The detailed evaluation is as follows:

- With use of fine mesh screen panels on the existing six traveling screen per unit, there will be insufficient screen surface area to support continuous operation for debris handling. The high through screen velocity could result in screen panel damage during high debris loading events. Consequently, the shift to fine mesh screens will have to be paired with the addition of a new screen house that will accommodate more traveling screens. The fish collection and return system will have continuously rotating screens that encourage collected fish, egg and larvae to be washed off the screen via the low-pressure sprays and returned to the sea via the fish return line. To ensure appropriate minimum flow depth inside the fish return line, flush water will be made continuously available.

- The screen modification will not affect the existing flow thru screens for the auxiliary saltwater pumps since they are located in a separate facility.

- Continuously operated traveling water screens will increase the maintenance and other necessary service to these screens, when compared to the existing intermittently operated screens.

4.6 Seismic and Tsunami Issues

4.6.1 General Discussion

The design criteria will be similar to the existing structures using the current licensing basis. The system can properly be designed to withstand design seismic requirements, and wave forces, as applicable.

4.6.2 Detailed Evaluation

The traveling screen structural design and fish return piping, either retrofitting the existing intake or adding a new screen house, will use the current licensing base seismic category that was employed for the current onshore pump intake. The screen retrofit technology is located inside the existing pump intake, so there is no

exposure to wave attack. The new screen house can be located on shore and be designed with proper grade level to avoid the wave attack.

4.7 Structural

The majority of the modifications will occur inside the existing pump intake and it is expected that system will not result in adverse impact to the structural integrity of the existing pump intake. However, increased debris loading conditions associated with addition of the fine mesh could impact the integrity of existing traveling screen system due to much increased debris loading when fine mesh panels are installed, due to insufficient surface area and very high through screen velocity. A new screen house and its connection to the existing intake suction line and the existing pump house will be fully reviewed regarding structural aspects in subsequent assessment phase, if the new screen house option is pursued.

4.8 Construction

4.8.1 General Discussion

The major construction activities for retrofit of existing intake with fine screen panels as part of this technology include the replacement of existing coarse screen panels to the fine mesh panels. If a new screen house will be built as part of the fine screen option, the construction evaluation will be addressed in a subsequent assessment phase.

4.8.2 Detailed Evaluation

With the modification to the existing intake structure, it is expected that at least one unit will be shutdown to facilitate installation of the fine screen system on the other unit. However, with the addition of a new screen house, extensive unit downtime will be need to support the pipe rerouting and tie-in with the existing intake suction line and the existing pump intake the details of this effort will be laid out in detail during the next phase of this study.

4.9 Maintenance

There are considerably greater operation and maintenance requirements associated with use of fine mesh screens, as compared to the existing coarse mesh screens. The primary operation and maintenance concern is tied to the increased wear and tear on the now continuously rotating screens. This may lead to more frequent replacement of fine mesh panels, chain, and fish buckets.

5. Conclusion

Retrofitting the existing pump intake by replacing the flow through screen panel with fine mesh panels (1 millimeter x 4 millimeters or 2 millimeters x 6 millimeters) and adding a fish collection/return system can reduce the entrainment impact and it represents an improvement over the existing condition. Eggs/larvae and fish trapped on fine mesh will be collected and returned back to the sea via a new fish return pipeline. However, the fundamental risk associated with adding the fine screen panel is screen rupture during heavy debris seasons. This situation has occurred on similar systems that have reduced their screen mesh panel opening to 2 millimeters. This risk could be characterized as a fatal flaw, if the fine screen system is installed in the existing cooling water intake structure.

To fully gain the intended benefits of this technology, a new screen house will have to be added near the existing pump intake, which will allow more screens to be put in service to reduce the approach and flow through screen velocities. The number of screens can be increased to reduce the through mesh flow velocity to 0.5 fps. The individual fish collection and return system improves the survival of egg/larvae and fish impinged on the screens.

Thus, on the basis of the criteria evaluation in Section 4, this fine mesh technology should be a candidate for further evaluation in the pending Phase 2 assessment, if paired with a new screen house. This technology should not be considered further without the screen house addition. Detailed design and inter-connecting piping between the new screen house and the existing intake suction line and the existing pump house will be pursued in a subsequent assessment phase.

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Table IFMS-1.
Environmental Permit/Approval Assessment: Inshore Fine Screen Intake System
San Onofre Nuclear Generating Station

Permit/Approval	Assessment	Permit Review Period (Preconstruction)	Critical Path	Fatal Flaw
National Environmental Policy Act – BLM or Other Responsible Lead Federal Agency (Record of Decision, ROW)	Not applicable – the addition of the inshore fine screen intake system does not constitute major federal action (federal land, funding).	Not applicable	NA	NA
Department of Navy and United States Marine Corps – Camp Pendleton Lease	Not applicable - USMC Camp Pendleton and ultimately the Department of Navy approvals are needed to amend the lease for significant additions to the SONGS leased property or adjacent Camp Pendleton lands. The intake system will not demand any additional land, nor involve any exterior changes to existing structures.	Not applicable	NA	NA
Section 404/10 Permit – U.S. Army Corps of Engineers (USACE)	Installation of the inshore fine screen intake system will generate significant impacts to waters of the U.S.	120 days from complete application (goal) ~12 months (expected)	Potential	NA
Section 401 Water Quality Certificate – U.S. Army Corps of Engineers (USACE) & Regional Quality Control Board (RWQCB)	Section 401 permit process will parallel Section 404 permit process.	~12 months (expected)	Potential	NA
Nationwide Permit – U.S. Army Corps of Engineers	Not applicable - the installation of the inshore fine screen intake system will generate significant impacts to Waters of U.S. that likely cannot be addressed by the Nationwide permitting process.	Not applicable	NA	NA
Section 7 Consultation with U.S. Fish and Wildlife Service (Endangered Species Act of 1973)	While installation of the inshore fine screen intake system poses significant impacts to local marine habitat and aquatic life, it potentially reduces impingement impacts.	Connected to CEQA process	No	No
Notice of Proposed Construction or Alteration – Federal Aviation Administration (FAA), Permanent Facilities	Not applicable - the addition of the addition of the inshore fine screen intake system will not result in any significant exterior changes to existing structures.	Not applicable	NA	NA

Table IFMS-1.
Environmental Permit/Approval Assessment: Inshore Fine Screen Intake System
San Onofre Nuclear Generating Station *(cont.)*

Permit/Approval	Assessment	Permit Review Period (Preconstruction)	Critical Path	Fatal Flaw
Notice of Proposed Construction or Alteration – FAA, Temporary Construction Facilities	Not applicable - the addition of the inshore fine screen intake system will not demand the services of a crane or other construction equipment in excess of 200 feet above ground - agl.	Not applicable	NA	NA
Multiple-Use Class L Limited Land Use Designated Utility Corridor – Bureau of Land Management (BLM) or Other Responsible Federal Agency	Not applicable - superseded by Department of Navy lease arrangement with SONGS. The addition of the inshore fine screen intake system will not require any additional land, nor involve any significant exterior changes to existing onshore structures.	Not applicable	NA	NA
California Public Utility Commission (CPUC) Approval	CPUC will likely be the lead agency for the California Environmental Authority Act (CEQA) review process regarding the proposed inshore fine screen intake system. The CEQA review process trigger development of a comprehensive EIR.	~12 months	Potential	No
California Energy Commission (CEC) – Final Decision	Not applicable – the addition of the inshore fine screen intake system will not result in a net power capacity (increase) > 50 MW, the threshold for CEC review.	Not applicable	NA	NA
Coastal Development Permit - California Coastal Commission/Local Coastal Programs	Applicable because of the considerable nearshore development within the Coastal Zone. While there are no specific fatal flaws with the inshore fine screen intake system, the significant construction-related marine habitat impacts and limited ability to further reduce impingement or offer positive benefits regarding entrainment are likely to make for a contentious approval process.	Connected to CEQA (~12 months)	Potential	NA

Table IFMS-1.
Environmental Permit/Approval Assessment: Inshore Fine Screen Intake System
San Onofre Nuclear Generating Station *(cont.)*

Permit/Approval	Assessment	Permit Review Period (Preconstruction)	Critical Path	Fatal Flaw
Coastal Development Lease – California States Lands Commission	Applicable because of the considerable offshore development on subaqueous lands. While there are no specific fatal flaws with the inshore fine screen intake system, the significant construction-related marine habitat impacts and associated limited reduction in operational impingement losses are likely to make for a contentious approval process.	Connected to CEQA (~12 months)	Potential	NA
Regional Pollution Control District Authority to Construct (ATC) – San Diego Regional Air Pollution Control District	Not applicable - the inshore fine screen intake system will not generate any additional operational air emissions.	Not applicable	NA	NA
Regional Control District Permit to Operate (PTO) – San Diego Air Pollution Control District	Not applicable - the inshore fine screen intake system will not generate any additional operational air emissions.	Not applicable	NA	NA
Title V Federal Operating Permit – San Diego Air Pollution Control District and USEPA	Not applicable - the inshore fine screen intake system will not generate any operational additional air emissions.	Not applicable	NA	NA
Title IV Acid Rain Permit - USEPA	Not applicable - the inshore fine screen intake system will not generate any additional operational air emissions.	Not applicable	NA	NA
Dust Control Plan – San Diego Air Pollution Control District	Not applicable – construction of the inshore fine screen intake system expected to disturb little or ground surfaces and so there is little potential to generate significant dust emissions. The system, itself, will not generate any additional air emissions.	Not applicable	NA	NA
NPDES Industrial Discharge Permit – Regional Water Quality Control Board (RWQCB) and State Water Resources Board	The inshore fine screen intake system will not change the cooling water withdrawal or blowdown rates. This system is not expected to demand any changes in the water treatment system. Any subsequent required alteration of the current NPDES permit will be minor.	~6 months	No	No

Table IFMS-1.
Environmental Permit/Approval Assessment: Inshore Fine Screen Intake System
San Onofre Nuclear Generating Station *(cont.)*

Permit/Approval	Assessment	Permit Review Period (Preconstruction)	Critical Path	Fatal Flaw
Notice of Intent (NOI) – National Pollutant Discharge Elimination System General Permit for Storm Water Discharges Associated with Construction Activity, San Diego Regional Water Quality Control Board (RWQCB)	Not applicable – construction of the inshore fine screen intake system is not expected to disturb ground surfaces or alter storm water management features onsite.	Not applicable	NA	NA
Storm Water Pollution Prevention Plan (SWPPP) – National Pollutant Discharge Elimination System General Permit for Storm Water Discharges Associated with Construction Activity – San Diego Regional Quality Control Board (RWQCB)	Not applicable – construction of the inshore fine screen intake system is not expected to disturb ground surfaces or alter storm water management features onsite.	Not applicable	NA	NA
Notice of Intent (NOI) – National Pollutant Discharge Elimination System General Permit for Storm Water Discharges Associated with Industrial Activity, San Diego Regional Water Quality Control Board (RWQCB)	Not applicable - SONGS NPDES permit addresses operational storm water. No changes to existing storm water management system are expected from addition of the inshore fine screen intake system.	Not applicable	NA	NA
Storm Water Pollution Prevention Plan (SWPPP) – National Pollutant Discharge Elimination System General Permit for Storm Water Discharges Associated with Industrial Activity, Regional Quality Control Board (RWQCB)	Not applicable - SONGS NPDES permit addresses operational storm water. There is no separate operational phase SWPPP.	Not applicable	NA	NA
2081 Permit for California Endangered Species Act of 1984 (Fish and Game Code, §2050 through 2098) – California Department of Fish & Game (CDFG)	The installation of the inshore fine screen intake system is expected to impact marine habitat areas, but there are no threatened or endangered species in the immediate marine area.	Not applicable	NA	NA
Lake and Streambed Alteration Agreement - California Department of Fish & Game (CDFG)	Not applicable – the addition of the inshore fine screen intake system will not results in impacts to jurisdictional streambed areas (waters of the state).	Not applicable	NA	NA

Table IFMS-1.
Environmental Permit/Approval Assessment: Inshore Fine Screen Intake System
San Onofre Nuclear Generating Station *(cont.)*

Permit/Approval	Assessment	Permit Review Period (Preconstruction)	Critical Path	Fatal Flaw
Waste Discharge Requirements (WDR) – San Diego Regional Water Quality Control Board	Not applicable – the addition of the inshore fine screen intake system will not results in impacts to jurisdictional streambed areas (waters of the state).	Not applicable	NA	NA
Section 106 Review – Office of Historic Preservation (OHP)	Not applicable - the inshore fine screen intake system will not demand any additional land nor generate any new surface disturbances.	Not applicable	NA	NA
Notification of Waste Activity - RCRA Hazardous Waste Identification Number (Small Quantity Generator) – Construction Phase - Department of Toxic Substance Control, USEPA, San Diego County Department of Environmental Health - California Unified Program Agency	Installation of the inshore fine screen intake system could potentially require an ID number to support management or construction wastes, unless current SONGS ID will be used.	1-2 weeks	No	No
Notification of Waste Activity - RCRA Hazardous Waste Identification Number (Small Quantity Generator) – Operation - Department of Toxic Substance Control, USEPA, San Diego County Department of Environmental Health - California Unified Program Agency	Not applicable – the addition of the inshore fine screen intake system will allow for the continuing use of the existing hazardous waste ID number. There will be not impacts to the onsite hazardous treatment facility (oil separation unit).	Not applicable	NA	NA
SPCC Plan - 40 CFR 112 and Aboveground Petroleum Storage Act – San Diego County Department of Environmental Health - California Unified Program Agency and USEPA	Not applicable – the addition of the inshore fine screen intake system is not expected to require additional water treatment chemicals.	Not applicable	NA	NA
Underground Storage Tank Permit - San Diego County Department of Environmental Health - California Unified Program Agency and State Water Resources Board	Not applicable - the addition of the inshore fine screen intake system is not expected to require force the relocation of underground tanks.	Not applicable	NA	NA

Table IFMS-1.
Environmental Permit/Approval Assessment: Inshore Fine Screen Intake System
San Onofre Nuclear Generating Station *(cont.)*

Permit/Approval	Assessment	Permit Review Period (Preconstruction)	Critical Path	Fatal Flaw
Risk Management Plan (Clean Air Act 112r) – San Diego County Department of Environmental Health - California Unified Program Agency and USEPA	Not applicable – the addition of the inshore fine screen intake system will not require the addition of any new volatile chemicals.	Not applicable	NA	NA
Emergency Planning and Community Right-to-Know Act (EPCRA) – 40 CFR 311 & 312 - San Diego County Department of Environmental Health - California Unified Program Agency and USEPA	Not applicable – the addition of the inshore fine screen intake system is not expected to require any new chemicals are stored in quantities that exceed applicable thresholds (e.g., 10,000 lbs for hazardous chemicals, 500 lbs for extremely hazardous chemicals).	Not applicable	NA	NA
Land Use Zones/Districts Approval - San Diego County Department of Planning and Land Use	Not applicable - the SONGS property is entirely situated on federal property (USMC Camp Pendleton property) and the offshore subaqueous lands are the responsibility of the California State Lands Commission.	Not applicable	NA	NA
Conditional Use Plan Amendment - San Diego County Department of Planning and Land Use	Not applicable - the SONGS property is entirely situated on federal property (USMC Camp Pendleton property) and the offshore subaqueous lands are the responsibility of the California State Lands Commission.	Not applicable	NA	NA
Grading Plan Approval or Permit - San Diego County Department of Public Works & Planning and Land Use	Not applicable - the SONGS property is entirely situated on federal property (USMC Camp Pendleton property) and the offshore subaqueous lands are the responsibility of the California State Lands Commission.	Not applicable	NA	NA
Erosion and Sediment Control Plan (Rain Event Action Plan) - San Diego County Department of Public Works	Not applicable - similar to the construction-phase SWPPP. No separate submittal is expected to be directed to the county, since the SONGS property is entirely situated on federal property (USMC Camp Pendleton property) and the offshore subaqueous lands are the responsibility of the California State Lands Commission.	Not applicable	NA	NA

Table IFMS-1.
Environmental Permit/Approval Assessment: Inshore Fine Screen Intake System
San Onofre Nuclear Generating Station *(cont.)*

Permit/Approval	Assessment	Permit Review Period (Preconstruction)	Critical Path	Fatal Flaw
Building Permit (including plumbing and electrical) – San Diego County Building Division	Not applicable because the SONGS property is entirely situated on federal property (USMC Camp Pendleton property) and the offshore subaqueous lands are the responsibility of the California State Lands Commission.	Not applicable	NA	NA
Domestic Water Supply Permit (public potable water) -San Diego County Department of Environmental Health	Not applicable – no new potable water systems are planned.	Not applicable	NA	NA
San Diego County Well Water Permit - San Diego County Department of Environmental Health	Not applicable – no new wells to be developed.	Not applicable	NA	NA
California Department of Transportation (Caltrans) – Oversize/Overweight Vehicles	Not applicable – the inshore fine screen intake elements and associated piping are not expected to be oversized.	Not applicable	NA	NA
Caltrans Heavy Haul Report (transport and delivery of heavy and oversized loads)	Not applicable - the inshore fine screen intake elements and associated piping are not expected to be oversized.	Not applicable	NA	NA
Resource Conservation (RC) Land Use Management Approval	Not applicable - while local municipality rules may supersede this regional land use//watershed protection-related project approval process, this is not the case for SONGS.	Not applicable	NA	NA
Temporary Power Pole – Local municipality or San Diego County Public Works Department	Not applicable - the installation of the inshore fine screen intake system is not expected to require local power poles.	Not applicable	NA	NA
Fire Safety Plan Approval, Certificate of Occupancy, Flammable Storage – San Diego County Fire Department	The addition of inshore fine screen intake system may require minor revisions to the existing Fire Safety Plan.	1 month for approval of Fire Safety Plan.	No	No
Sewer and Sewer Connections – San Diego County Environmental Health Department	Not applicable - No new sanitary connections are envisioned.	Not applicable	NA	NA

Table IFMS-1.
Environmental Permit/Approval Assessment: Inshore Fine Screen Intake System
San Onofre Nuclear Generating Station *(cont.)*

Permit/Approval	Assessment	Permit Review Period (Preconstruction)	Critical Path	Fatal Flaw
Road Crossing or Encroachment Permit (Caltrans)	Not applicable – the addition of inshore fine screen intake system will not pose any road crossing or encroachment issues.	Not applicable	NA	NA

Table IFMS-2
Offsetting Impacts for the Inshore Fine Screen System
San Onofre Nuclear Generating Station

Category	Impacts – Construction	Impacts – Operations	Magnitude	Construction Impact Significance	Operation Impact Significance
Air	Minor increase in greenhouse gases, NOx, volatile organic compound, CO, and PM from construction equipment, material deliveries, commuting workforce. Increased greenhouse gas emissions from replacement fossil-fuel generation to offset the short term loss of SONGS generation during the plant outage to install this system.	While the inshore system could result in some minor improvements in plant efficiency, but there should be no significant changes in overall air quality impacts or greenhouse gas emissions during operation.	Insignificant temporary increase in CO_2 greenhouse gas emissions from temporary increase in commuting traffic during associated plant outage.	Small Negative	None
Surface Water	Construction activities are primarily marine-based and they have the potential to generate turbidity impacts from disruption of nearshore habitats.	Operational cooling water withdrawal and discharge rates will be remain largely unchanged.	Marine Area Impacted (pending a subsequent assessment phase)	Moderate Negative	None
Groundwater	No additional groundwater resources will be needed to support construction.	No additional groundwater resources will be needed to support operations.	Not applicable	None	None
Waste	Marine sediment wastes will be generated to facilitate installation of the inshore system.	Moderate increase in waste generation from maintenance activities on the partially submerged screen systems.	Marine Spoil Wastes (pending subsequent assessment phase)	Moderate Negative	Moderate Negative
Noise	Buffer areas around offshore construction zones will serve to reduce noise impacts to offshore noise receptors (watercraft) and shoreline recreational areas, but	Operational noise levels are expected to be largely unchanged as a result of the inshore fine screen system.	Noise impacts above the 70 dBa threshold value may occur along shoreline during construction.	Small negative	None

	there is the potential for impacts to the shoreline areas.				

Table IFMS-2
Offsetting Impacts for the Inshore Fine Screen System
San Onofre Nuclear Generating Station *(cont.)*

Category	Impacts – Construction	Impacts – Operations	Magnitude	Construction Impact Significance	Operation Impact Significance
Land Use	Construction activities are primarily nearshore and they may temporarily preclude normal recreational activities in nearby waters.	The reconfiguration of the inshore fine screen system represent a change in land use of some nearshore areas, but will not preclude waterborne activities.	Work Schedule (pending subsequent assessment phase)	Small negative	None
Marine Ecological Resources	Construction will potentially generate significant, temporary water quality and marine habitat impacts (localized turbidity impacts and loss of marine habitat).	Some reduction further of impingement and entrainment. Overall water withdrawal or discharge rates are unchanged. Thermal discharge impacts to aquatic life will remain largely unchanged	Marine Bed Area (pending subsequent assessment phase)	Moderate Negative	Moderate Positive
Terrestrial Ecological Resources	Since construction will be confined to previously disturbed land, there is no potential to disturb natural habitats or other areas with significant ecological value or sensitivity.	No permanent loss of natural habitat areas or other areas with significant ecological value or sensitivity.	Not applicable	None	None
Cultural & Paleontological Resources	Since construction will be confined to previously disturbed land there is little or no potential to discover new cultural or paleontological resources in these developed areas.	No permanent loss of cultural or paleontological resources.	Not applicable	None	None
Visual Resources	All construction equipment will be low profile, i.e., not extend above	The inshore fine screen system will be mostly submerged and present no	Not applicable	None	None

Table IFMS-2
Offsetting Impacts for the Inshore Fine Screen System
San Onofre Nuclear Generating Station *(cont.)*

Category	Impacts – Construction	Impacts – Operations	Magnitude	Construction Impact Significance	Operation Impact Significance
	the height of local facility structures.	permanent change in external profile of the facility.			
Transportation	Increased traffic from the construction workforce and construction deliveries could temporarily worsen the existing level of service on local roads during the plant outage.	The inshore fine screen system will not significantly alter the current number of plant deliveries or operating personnel.	Workforce and Level of Service (pending subsequent assessment phase)	Small Negative	None
Socioeconomic Issues	While there will be some additional construction-related employment opportunities, these opportunities are not expected to significantly strain local community resources (e.g., housing, school, fire/police services, water/sewer).	Maintenance staff levels may increase slightly in response to the increase cleaning and marine waste management duties associated with the inshore fine screen intake system	Workforce (pending subsequent assessment phase)	Small Positive	None

Notes: Levels of Impact of Significance

Small: Environmental effects are not detectable or are minor, such that they will not noticeably alter any important attribute of the resource
Moderate: Environmental effects are sufficient to noticeably alter, but not significantly change the attributes of the resource.
Large: Environmental effects are clearly noticeable and are sufficient to change the attributes of the resource.