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and the
State Water Resources Control Board
Nuclear Review Committee

Alternative Cooling Technologies or Modifications to the Existing Once-Through Cooling System for the Diablo Canyon Power Plant

Prepared by
Bechtel Power Corporation
Report No. 25762-000-30R-G01G-00010

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Independent Third-Party Final Technologies Assessment for the Alternative Cooling Technologies or Modifications to the Existing Once-Through Cooling System for Diablo Canyon Power Plant

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25762-000-30R-G01G-00010

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2. Introduction

Independent Third-Party Interim Technical Assessment for the Alternative Cooling Technologies or Modifications to the Existing Once-Through Cooling System for Diablo Canyon Power Plant, Report No. 25762-000-30R-G01G-00009 (Phase 1 report) issued on November 5, 2012, describes the findings of the first phase of an assessment of the viability of the technologies noted in the *Scope of Work Report* prepared for the Diablo Canyon Power Plant (DCPP) by the Review Committee to Oversee Special Studies for the Nuclear-Fueled Power Plants Using Once-through Cooling and dated November 7, 2011. The report is in support of the Nuclear Review Committee (Committee) initiative to identify strategies to implement the *California Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling*. This strategy would comply with the *California Once-Through-Cooling Policy*. The Phase 1 report concludes that the following technologies are technically feasible (based on assessment checklist items 1 through 9) for DCPP:

- Inshore mechanical (active) intake fine mesh screening systems
- Offshore modular wedge wire systems
- Closed- cycle cooling systems (five closed-cycle cooling variations, including hybrids)

Phase 2 of the effort includes completing the nuclear-specific assessment (assessment checklist item 10) and then, based on the results of the Criterion 10 assessment, proceeding with the detailed cost and schedule (Criterion 11) assessment for each technology that passes the Criterion 10 evaluation. The Criterion 11 effort includes developing a preliminary design for each technology to the extent necessary to prepare the cost estimate and complete the implementation schedule assessment.

This report contains the Criterion 10 assessment for the three technologies selected from Phase 1 and a description of the preliminary engineering effort performed to obtain adequate technical information to be used in preparing the cost estimate and schedule to implement each of those technologies.

3. Licensing Nuclear-Specific Assessment (Criterion 10)

The final Phase 1 report on alternate cooling technologies or modifications to the existing once-through cooling systems for DCPP evaluated eight technologies. Of the eight, the following three were approved by the Nuclear Review Committee for further consideration in Phase 2:

- Inshore mechanical (active) intake fine mesh screening systems
- Offshore modular wedge wire systems
- Closed-cycle cooling systems

The first step in the Phase 2 effort is to complete the Criterion 10 evaluation for each of the technologies to be considered. This evaluation is provided below for each technology.

Criterion 10 is among the criteria specified by the Review Committee to Oversee Special Studies for the Nuclear-fueled Power Plants Using Once-through Cooling for evaluating the feasibility of alternative technologies to reduce the impingement and entrainment of aquatic organisms in the cooling water. Criterion 10 describes eight areas of NRC interest to be assessed:

- Seismic issues
- Operability
- Transient analyses
- Nuclear fuel (accident analyses)
- Single failures
- Hydraulic design
- Probabilistic risk assessment
- Instrumentation controls and alarms

Criterion 10 is a feasibility assessment based on regulatory requirements established by 10 CFR 50.59 to determine whether NRC approval of the alternative technology is required.

3.1 Alternatives for Closed Cooling Technology

The closed cooling technology reviewed in the Phase 1 assessment replaces the existing once-through cooling with a closed loop in which the cooling water is continuously circulated. The heat picked up by the circulating water in the main condenser is dissipated to the general environment (the atmosphere) in cooling towers. Five variants of closed-cycle technologies were evaluated. The assessment concluded that replacing the DCPP once-through cooling systems with any of the five variants of closed-cycle cooling technologies evaluated is technically feasible. Makeup water to replenish losses to the environment (i.e., through cooling tower evaporation) would be provided by a combination of freshwater from a new onsite desalination plant and industrial wastewater and potable water to be supplied from local resources. Therefore, all five variants were recommended as candidates for further evaluation in the Phase 2 stage of the assessment.

The five closed-cycle technologies evaluated were:

1. Passive draft dry/air cooling
2. Mechanical (forced) draft dry/air cooling
3. Wet natural draft cooling
4. Wet mechanical (forced) draft cooling
5. Hybrid wet/dry cooling

Natural draft towers rely on convection currents to move air through the tower. These currents are created by the difference in air density between the inside of the tower, where the air is warmer as it picks up heat from the circulating water, and the outside of the tower, where the air is cooler at general ambient temperature. Forced draft towers use fans to drive the air through the tower.

Dry towers use finned tubes for heat transfer. When the circulating water passes through these finned tubes, its heat content is transferred by conduction and convection to the air passing over the fins/tubes. In a wet tower, the circulating water is sprayed though nozzles into direct contact with the air passing through the tower and is cooled by evaporation as it falls into the tower basin. A hybrid tower uses both wet and dry methods in a stacked arrangement, with the dry section on top to eliminate the visible plume generated by the wet section.

3.2 Alternatives to Existing Intake Technology

The Phase 1 assessment also evaluated several potential design alternatives to replace or enhance the existing DCPP shoreline intake structure. Two design alternatives were selected as candidates for further evaluation in the Phase 2 stage of the assessment. These alternatives are:

1. *Inshore mechanical (active) intake fine mesh screening systems* using new dual-flow screens to replace the existing flow-through screens associated with the circulating water (CW) pumps (six per unit). Existing flow-through screens associated with the safety-related auxiliary saltwater (ASW) system (one per unit) would not be replaced. The new dual-flow screens would include new fine mesh screen panels to replace the existing coarse mesh screens plus a new fish recovery (collection and return) system for each new dual-flow traveling water screen. Additional water required for the larger dual-flow screens and fish recovery system would be provided by additional pumps supplementing the existing screen wash system. New pumps would be located in the bays serviced by the new screens.

2. *Offshore modular wedge wire or similar exclusion screening systems* using offshore wedge wire screen assemblies and piping to transport the ocean water to the existing intake cove. The existing intake cove opening to the Pacific Ocean would be closed. Two stop log gates would be incorporated in the cove closure to provide an emergency means of supplying water to the plant intake structure in the event of an unforeseen issue with the offshore wedge wire screen assemblies and piping.

3.2.1 10 CFR 50.59

Title 10 of the Code of Federal Regulations, Part 50, Section 59 (10 CFR 50.59), describes the review that is necessary to determine whether a change, test, or experiment in a licensed nuclear power plant must be approved by the Nuclear Regulatory Commission (NRC) before being implemented.

10 CFR 50.59 allows the licensee to make changes to a plant or its procedures, or to conduct tests or experiments, without prior NRC approval if the proposed activity does not require a change to the Technical Specifications (TSs) and does not significantly change analyses or their conclusions as documented in the Final Safety Analysis Report Updated (FSARU). This provides assurance that the change, test, or experiment would not adversely affect the ability to safely shut down the plant, to maintain the plant in a safe shutdown condition, and to ensure the ability to maintain offsite radiological consequences of an accident within the limits of 10 CFR Part 100. More specifically, the change, test, or experiment cannot:

1. Result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the FSARU

2. Result in more than a minimal increase in the likelihood of occurrence of a malfunction of a system, structure, or component (SSC) important to safety previously evaluated in the FSARU

3. Result in more than a minimal increase in the consequences of an accident previously evaluated in the FSARU

4. Result in more than a minimal increase in the consequences of a malfunction of an SSC important to safety previously evaluated in the FSARU

5. Create the possibility of an accident of a type different from any previously evaluated in the FSARU

6. Create the possibility of a malfunction of an SSC important to safety with a result different from any previously evaluated in the FSARU

7. Result in a design basis limit for a fission product barrier as described in the FSARU being exceeded or altered

8. Result in a departure from a method of evaluation described in the FSARU used in establishing the design bases or in the safety analyses

3.2.2 FSARU

The FSARU provides a summary level description of the plant SSCs, including the controls, monitoring, and protective features that ensure that the plant can be safely operated and controlled under various normal, abnormal, and accident conditions. It also provides a discussion of normal, abnormal, and accident operations, including analyses of a spectrum of transients and accidents and the results of those analyses. The focus is on the safety-related SSCs and their supporting features that provide the ability to safely control and shut down the plant, and to maintain it in a safe shutdown condition, under probable and extreme conditions.

The DCPP FSARU describes the circulating water system (CWS) in section 10.4.5. The Design Bases section, 10.4.5.1, states that the system provides cooling water to condense steam entering the main condenser and that it also serves the intake coolers, condensate cooler, and service cooling water (SCW) heat exchangers. The CWS Safety Evaluation section, 10.4.5.3, states that the CW pumps are not required for the (nuclear) safety of the units but that provisions are incorporated in the design to ensure their dependable operation for reliable operation of the plant. In section 9.2.1, the SCW system is described as a closed system used to cool non-safety-related equipment in the secondary portion of the plant. CWS acceptability is based on meeting the requirements of General Design Criteria (GDC) 4 as it relates to design provisions provided to accommodate the effects of discharging water that may result from a failure of a component or piping in the CWS. The requirements of GDC 4 are met when the CWS design includes provisions to accommodate the effects of discharging water that may result from a failure of a component or piping in the CWS. Consequently, section 10.4.5.4 provides a flooding analysis discussion and details of the CWS design and operating pressures and the connection to the main condenser, noting that significant flooding of the turbine building with seawater due to CWS failure is a highly improbable event. It also describes a flooding analysis based on the failure to properly secure a waterbox manway cover. In section 9.2.5, the ultimate heat sink is identified as the Pacific Ocean, which is the source of cooling water to the non-safety-related CWS and SCW heat exchangers and to the safety-related ASW system. The availability of the ultimate heat sink to provide cooling when required under severe conditions is discussed in section 2.4.11.6.

3.3 Assessment of Closed Cooling Technology

The following is an assessment of the five alternative closed-cycle system heat transfer technologies that were determined to be technically feasible in the Phase 1 assessment. The closed-cycle technology designs can use wet, dry, or hybrid wet/dry cooling methods. Dry cooling technologies require minimal makeup water to account for system leaks/losses after the closed system is initially charged. Wet cooling technologies, because of their operating principle, require a greater volume of makeup water to compensate for evaporation, blowdown, and drift losses. As such, makeup requirements vary depending on the cycles of concentration at which the wet cooling towers are operated. For the purposes of this assessment, both dry and wet closed cooling technologies are discussed together.

The five closed-cycle technologies evaluated are:

1. Passive draft dry/air cooling
2. Mechanical (forced) draft dry/air cooling
3. Wet natural draft cooling
4. Wet mechanical (forced) draft cooling
5. Hybrid wet/dry cooling

3.3.1 Seismic

The seismic requirements for a design change can be summarized as ensuring that seismically induced structural or functional failure of any new SSCs would not adversely affect safety-related SSCs. Direct effects, such as falling on a safety-related SSC, and indirect effects, such as functional failure affecting the ability of a safety-related SSC to perform its safety function, must be either demonstrated as acceptable or prevented from happening.

The new cooling towers would be located remote from the power block and safety-related SSCs so that their partial or total structural failure would not adversely affect any safety-related functions. The new pumphouse(s) for the new CW pumps would be located within the existing power block area and would be sufficiently separated from safety-related SSCs as to pose no direct or indirect adverse effects.

Functional failures of the closed-cycle cooling system would not be expected to adversely affect safety-related SSCs or functions since the safety-related cooling requirements of the ASW system would continue to be met since they would not be functionally modified by this change. The existing supports and piping associated with the component cooling water (CCW) heat exchangers and interfacing ASW system components are seismically designed and would not be adversely affected by the proposed modifications.

3.3.2 Operability

Replacement of once-through cooling with closed-cycle cooling would increase the operating temperature of the circulating water and increase main condenser backpressure. This would result in decreased turbine efficiency and reduced electrical output from the main generator. It may be necessary to modify the low-pressure turbine so that it can operate at higher condenser backpressures. The higher condenser backpressure decreases the margin to alarm set points; however, sufficient margins would be maintained to provide assurance that there would be no significant increase in the probability of turbine trips. It is intended that when the closed-cycle cooling system design is finalized, there would be sufficient margin between the turbine trip set point and higher condenser pressure so that the probability of more frequent turbine trips would not increase significantly.

3.3.3 Transient Analyses

As mentioned above, the closed-cycle cooling technology alternatives would increase the operating temperature of the circulating water and increase main condenser backpressure. However, sufficient margin between new operating backpressures and the turbine trip point would be maintained to minimize the potential for increased turbine trips. As part of the design of the closed-cycle cooling system, a pressure transient analysis would be performed to ensure that adequate design parameters are identified for piping and associated components. No transient analyses associated with safe shutdown of the plant are expected to be adversely affected by the closed cooling technology.

3.3.4 Nuclear Fuel (Accident Analyses)

3.3.4.1 Auxiliary Saltwater System

The safety-related ASW system is not affected by this modification. The CWS and the SCW system do not provide cooling to any component required for safe shutdown. The CW pumps are not required for the safety of the units. A complete shutdown of the SCW system would not affect safe shutdown of the reactor. The replacement of the once-through cooling with closed-cycle cooling would result in an increase in circulating water temperature. This increase is not expected to adversely affect FSARU accident analyses since these systems serve no safety-related functions.

3.3.4.2 Single Failure

The conversion of the once-through cooling system to closed-cycle cooling design technologies would not adversely affect the safety-related function of the ASW system since this system is not expected to be modified. Closed-cycle cooling is not expected to adversely affect any single failures evaluated in the FSARU because the CWS and the SCW system have no safety-related functions, nor do they support any safety-related functions. There would be four CW pumps per unit in lieu of the current two per unit. Operation of the four pumps in the closed-cycle cooling system in lieu of two once-through pumps would not result in additional adverse single failures. The forced draft cooling towers would have fans but, due to the number of fans, single fan failures should have negligible effects on CWS operation and performance. Dependable pump operation in the closed-cycle system would remain a high priority to ensure reliable plant operation.

3.3.5 Hydraulic Design

The hydraulic design for closed cooling would be developed to ensure efficient and reliable hydraulic performance of the non-safety-related CWS. The safety-related ASW system remains functionally unchanged in the final design.

3.3.6 Probabilistic Risk Assessment

The replacement of non-safety-related once-through cooling with closed-cycle cooling is not expected to adversely affect the probabilistic risk assessment. The CWS has no safety-related function, nor does it support any safety-related functions. The safety-related ASW system remains unchanged in the final design.

3.3.7 Instrumentation, Controls, and Alarms

The design of the instrumentation, controls, and alarms for the closed-cycle cooling would provide monitoring and indication for flows, temperatures, pressures, motor currents, etc., to provide operators with required evidence of system operating conditions and trends, similar to the existing once-through cooling.

3.4 Assessment of Intake Technology Alternatives

The following is an assessment of the two intake technology design alternatives that were selected in Phase 1 as candidates for further evaluation. Each of the two design alternatives is discussed below.

3.4.1 Alternative 1–Inshore Mechanical (Active) Intake Fine Mesh Screening System

3.4.1.1 Seismic

The seismic requirements for the new dual-flow fine mesh screening system, including the fish recovery system, would be same as the existing intake structure seismic design requirements. The safety-related SSCs associated with the ASW system would remain unchanged. The replacement of flow-through screens with dual-flow type screens would not pose an adverse impact from a seismic perspective.

The intake and discharge structures do not perform an active safety-related function. They are seismically designed and indirectly support a safety-related function by structurally supporting the ASW pumps, associated once-though screens, and related piping located at the intake structure and the CCW system's heat exchangers located in the turbine building and related piping located at the discharge structure. The final design for the new intake and discharge structures for the closed-cycle cooling should ensure that seismically induced structural or functional failure of any new SSCs would not adversely affect safety-related SSCs.

3.4.1.2 Operability

The dual-flow screens and fine mesh screen panels would be sized to reduce the overall velocity across the screening system. The existing common traveling screen servicing the intake bays associated with each unit's safety-related ASW pumps would not be modified. Therefore, modification of the traveling screens on the non-safety-related intake bays would not adversely affect the operation of the safety-related ASW system. It is intended that the new screen modifications would not adversely affect any SSCs serving the safety-related ASW pumps. The significant reduction of mesh opening (from the current 3/8 in. to 1 to 2 mm), would result in a substantially higher debris load on the screen panels. This much higher debris loading on the screen panels must be removed to avoid overloading or collapsing the screen panels. The new design would provide the required removal capability. For the fish recovery system to be effective, fish, eggs, and larvae must be continuously removed. The new rotating dual-flow screen design would need to be continuously operated and be equipped with variable speed drive to increase the screen rotation speed as needed due to changing debris loading.

3.4.1.3 Transient Analyses

The dual-flow screens and fine mesh screen panels would be sized to ensure a low pressure drop across the overall system and provide required flow to the CW pumps. No modification would be made to the traveling screens servicing the intake bays associated with the safety-related ASW system. It is intended that the new fine mesh screen modifications would not adversely affect any SSCs serving the safety-related ASW system. No transient analyses associated with safe shutdown of the plant would be adversely affected by the new fine mesh screen modifications.

3.4.1.4 Nuclear Fuel (Accident Analyses)

The CWS and the SCW system do not provide cooling to any component required for safe shutdown. The CW pumps are not required for the safety of the units. A complete shutdown of the SCW system would not affect safe shutdown of the reactor. The conversion of the existing flow-through screens to dual-flow type would not affect the screens serving the safety-related ASW pumps. Consequently, the final design for the dual-flow screens and fine mesh screen panels is not expected to adversely affect FSARU accident analyses.

3.4.1.5 Single Failure

The traveling screens associated with the safety-related ASW system would not be modified. The conversion of the existing flow-through screens to dual-flow screens for the intake bays servicing the CW pumps would not adversely affect any single failures evaluated in the FSARU because the CWS and the SCW system have no safety-related functions, nor do they support any safety-related functions. The final designs for the shoreline intake structure, including the dual-flow screens and fine mesh screen panels, would ensure that the single failure requirements for the safety-related ASW and CCW systems remain unaffected.

3.4.1.6 Hydraulic Design

As mentioned above, the dual-flow screens and fine mesh screen panels would be sized to ensure a low pressure drop across the overall system. The final design would also consider the increased pressure drop effects due to postulated blockages of the fine mesh screen panels. It is intended that the new screen modifications, including the fish recovery system, would not adversely affect any SSCs serving the safety-related ASW pumps.

3.4.1.7 Probabilistic Risk Assessment

The modifications to the shoreline intake structure, including the dual-flow screens and fine mesh screen panels, are not expected to adversely affect the probabilistic risk assessment since the overall design philosophy remains unchanged.

3.4.1.8 Instrumentation, Controls and Alarms

The design of the instrumentation, controls, and alarms for the fine mesh dual-flow screens, including the fish recovery system, would provide for monitoring of flows, temperature, pressures, motor currents, etc., to provide operators with required evidence of system operating conditions and trends.

3.4.2 Alternative 2–Offshore Modular Wedge Wire or Similar Exclusion Screening Systems

3.4.2.1 Seismic

The offshore modular wedge wire system, in conjunction with the closure of the intake cove, would functionally replace the existing cove opening. The offshore modular wedge wire screening system would be seismic and non-safety-related. The two stop-log gates located in the cove closure would be seismic and safety-related to ensure that a second source of water is available for the ASW system. Because of the offshore, submerged location of the modular wedge wire screening system, the final design would accommodate both seismic design loads and wave forces that would be encountered in the open sea environment.

The remote offshore location of the modular wedge wire screening system, including the piping manifolds, vertical shaft, and breakwater enclosure, would ensure that seismically induced structural or functional failure of any new SSCs would not adversely affect safety-related SSCs.

3.4.2.2 Operability

The offshore modular wedge wire system would functionally replace the intake cove opening. The offshore modular wedge wire screening system would be sized to ensure a low pressure drop across the overall system and a low velocity across the wedge wire screens. The offshore screen/piping design would be based on a low pressure drop across the wedge wire screen's intake system and a large piping or tunnel diameter to minimize the added offshore component head loss compared to the existing shoreline intake system. The wedge wire screen slots would be sized to provide a balance between the reduction in impingement/entrainment and the required additional maintenance as a result of their susceptibility to clogging. Extensive in situ testing would be conducted during the project's detailed design phase to demonstrate that the screen slot size selected is not prone to blockage in the marine environment. The frequency of inspection and cleaning would be directly proportional to the seasonal marine growth and debris condition at the screens. Emergency openings (i.e., stop-log gates) would be incorporated in the breakwater extension to ensure a continual water supply to the ASW pumps to maintain their safety function. The final design for the offshore modular wedge wire screening system would not increase the risk for unit trips.

3.4.2.3 Transient Analyses

The offshore modular wedge wire screening system would be sized to ensure a low pressure drop across the overall system. This would ensure that the ultimate heat sink would remain available to provide cooling water to the non-safety-related CWS and SCW system. It is intended that the new offshore modular wedge wire screening system modifications would not adversely affect any SSCs serving the safety-related ASW pumps. No transient analyses associated with safe shutdown of the plant are expected to be adversely affected by the new offshore modular wedge wire screening system modifications.

3.4.2.4 Nuclear Fuel (Accident Analyses)

The CWS and the SCW system do not provide cooling to any component required for safe shutdown. The CW pumps are not required for the safety of the units. A complete shutdown of the SCW system would not affect safe reactor shutdown. The installation of the offshore modular wedge wire screening system would not adversely affect the screens serving the safety-related ASW pumps. Seismically designed and safety-related dual stop-log gates located in the cove closure would provide a second source of water to the ASW system. The safety-related saltwater cooling system is not affected by this modification because it remains in the original once-through configuration. Consequently, the final design for the offshore modular wedge wire screening system is not expected to adversely affect FSARU accident analyses.

3.4.2.5 Single Failure

The installation of the new offshore modular wedge wire screening system is not expected to adversely affect any single failures evaluated in the FSARU because the CWS and the SCW system have no safety-related functions, nor do they support any safety-related functions. The final design for the offshore modular wedge wire screening system would ensure that the single failure requirements for the safety-related ASW and CCW systems remain unaffected. Emergency openings (i.e., stop-log gates) would be incorporated in the breakwater extension to ensure a continual water supply to the ASW pumps to maintain their safety function.

3.4.2.6 Hydraulic Design

As mentioned above, the offshore modular wedge wire screening system would be sized to ensure a low pressure drop across the overall system. The final design would also consider the blockage of the screens due to seasonal marine growth and debris. The complete stoppage of flow may result in vacuum conditions inside the screen that could damage the screen. This would be considered as part of the hydraulic design. It is intended that the new offshore modular wedge wire screening system would not adversely affect any SSCs serving the safety-related ASW pumps.

3.4.2.7 Probabilistic Risk Assessment

The installation of the new offshore modular wedge wire screening system is not expected to adversely affect the probabilistic risk assessment.

3.4.2.8 Instrumentation, Controls and Alarms

No new instrumentation is provided as part of the offshore wedge wire screening system. Existing plant instrumentation would provide means to monitor plant intake flow, levels, temperatures, etc., to provide operators with the required evidence of system operating conditions and trends.

3.5 Conclusion—Criterion 10 Assessment

Criterion 10 is a 10 CFR 50.59 feasibility assessment to determine whether NRC approval of the alternative technology would be required. Eight nuclear design change criteria were considered in the assessment:

1. Seismic issues
2. Operability
3. Transient analyses
4. Nuclear fuel (accident analyses)
5. Single failures
6. Hydraulic design
7. Probabilistic risk assessment
8. Instrumentation controls and alarms

Based on the results of the feasibility assessment and when more detailed engineering information becomes available, the anticipated responses to the following eight 10 CFR 50.59 criteria questions for each of the proposed modifications would be NO:

1. Result in more than a minimal increase in the frequency of occurrence of an accident previously evaluated in the FSARU?
2. Result in more than a minimal increase in the likelihood of occurrence of a malfunction of an SSC important to safety previously evaluated in the FSARU?
3. Result in more than a minimal increase in the consequences of an accident previously evaluated in the FSARU?
4. Result in more than a minimal increase in the consequences of a malfunction of an SSC important to safety previously evaluated in the FSARU?
5. Create the possibility of an accident of a type different from any previously evaluated in the FSARU?
6. Create the possibility of a malfunction of an SSC important to safety with a result different from any previously evaluated in the FSARU?
7. Result in a design basis limit for a fission product barrier as described in the FSARU being exceeded or altered?
8. Result in a departure from a method of evaluation described in the FSARU used in establishing the design bases or in the safety analyses?

Consequently, subject to the limitations of the Phase 2 assessment information, implementation of the closed cooling technology, the inshore dual-flow fine mesh screens, or the offshore modular wedge wire screening system design alternatives is believed to not require a License Amendment Request (LAR) in accordance with 10 CFR 50.59.

3.6 Facility Operating License/Technical Specifications

The DCPP Facility Operating Licenses and TSs were reviewed to identify all requirements associated with the once-through cooling cycle SSCs. Specifically, the review focused on the need to revise any TS requirements associated with the CWS, SCW system, ASW system, and ultimate heat sink. This review did not identify the need to revise any TS requirements that would require a LAR. However, the TS Bases discussion for the ultimate heat sink (B 3.7.9) may need to be updated to describe the closed cooling technology. Revisions to the TS Bases do not require prior NRC approval.

3.7 Environmental Protection Plan (Non-Radiological)

The DCPP Facility Operating Licenses include a facility nonradiological environmental protection plan (EPP) as Appendix B, *Environmental Protection Plan (Nonradiological)*. 10 CFR 50.59 does not apply to changes to the plan because a method for control of plan changes is described in the plan itself. Changes are submitted to the NRC as license amendments and would include an assessment of the environmental impact and supporting justifications. However, in accordance with Section 3.3 of the plan, changes in plant design or operation and performance of tests or experiments required to achieve compliance with other federal, state, or local environmental regulations would not be subject to prior NRC approval.

4. Preliminary Design Development

Ultimately, the inshore mechanical (active) intake fine mesh screening system, the offshore modular wedge wire screening, and the closed-cycle cooling technologies were selected for the Phase 2 assessment. This section presents a description of the preliminary design development for each of these three technologies.

4.1 Onshore Mechanical (Active) Intake Fine Mesh Screening Technology

The fine mesh screening technology involves using smooth woven fine mesh screens in the nominal rectangular size of 1 mm x 6 mm to achieve substantial entrainment reduction of fish, eggs, and larvae and using a fish recovery system to achieve impingement mortality reduction of fish, eggs, and larvae. Specifically, the fine mesh screening technology consists of replacing six of the existing flow-through coarse mesh traveling screens per unit, located in the plant intake structure, with dual-flow traveling screens with fine mesh. Using dual-flow screens along with larger screen panels provides more than twice the screen surface area per screen compared to the existing flow-through screens, thus resulting in substantial reduction in through-screen velocity. The fine mesh screens selected for this study would reduce velocity from about 1.95 fps to 1 fps. In addition, a fish recovery system would be incorporated to collect fish, eggs, and larvae impinged on the new dual-flow screens. A fish bucket attached to the bottom of each screen panel would hold the fish along with sufficient water as the screen moves upward. Eggs and larvae impinged on the fine mesh screens and fish collected inside the fish bucket would be removed, collected, and returned back to the sea via a new fish return pipeline. The increased debris loading on the fine mesh would be mitigated by the increased screen surface area, higher screen rotating speed, and continuous screen operation (rotation). The existing screen wash (spray) system would be modified to fit the new dual-flow screens with a dual-pressure spray system (low pressure spray of 5 to 10 psig for fish, egg, and larvae removal and high pressure spray of at least 60 psig for debris removal) and supplemented to provide the additional flow capacity needed to support the requirements of the larger screens for trash and fish, egg, and larvae recovery.

Even though this technology does not comply with the maximum 0.5 fps through-screen velocity for impingement mortality reduction described in the *California Once-Through Cooling Policy* rules, the inclusion of a fish recovery system provides the alternative mitigation measures that support compliance with the *California Once-Through Cooling Policy* requirements. Similarly, implementation of fine mesh screening technology substantially reduces entrainment loss and marks significant improvement over the current DCPP situation since it currently has a 100% administrative loss of fish, eggs, and larvae due to the very large mesh opening of 9.5 mm on the existing flow-through traveling water screens.

In order for the plant to operate reliably, an automatic trash raking system is needed to remove large debris trapped on the trash racks located upstream of the plant traveling screens. Although the plant has a design for an automatic raking system, it cannot be installed on the existing structure due to the installation of the required plant security system. Currently, plant personnel manually remove large debris. This inefficient method of trash removal at times causes the plant to reduce output until the cleaning can be completed. The cost of designing and constructing an automatic trash removal system has not been estimated as part of this effort but would have to be added if fine mesh screening technology is selected for implementation.

No safety-related systems are affected by this modification.

4.1.1 Hydraulic Evaluation of the Dual-Flow Screen Retrofit

As shown in the general arrangement drawing, 25762-110-P1K-WL-00070, the rotating axis of the new dual-flow screens would be rotated 90 degrees from the current flow-through screen design. Three screens serve each CW pump. The general flow characteristics of a dual-flow screen and its comparison to a flow-through screen design were described in the Phase 1 report, section 3.5.

Based on the available space in the existing pump intake, the replacement screen panel width can be up to 14 ft, which is significantly larger than the existing 10-ft screen width. As with the dual-flow screen design, circulating water would pass through both the ascending and descending faces of the screen. This flow, combined with the larger screen panel width, would reduce the average through-screen velocity to about 1 fps from the existing 1.95 fps at low water level. The significant reduction in average through-screen velocity to 1 fps, combined with continuous screen operation at up to a high speed of 40 fpm, provides an available screen carrying capacity that enables finer mesh screen panels, up to 1 mm size, to be used to mitigate an expected increase of debris loading on the fine mesh screen panels. An increase of debris loading is obvious since the debris in the size range of 1 mm to 9.5 mm would otherwise pass the existing screen panels but would be blocked by the new screens with 1 mm size. In addition, to further mitigate the debris issue, a prerequisite to the fine-mesh, dual-flow screen retrofit is to convert the existing manual cleaning of the upstream trash racks to an installed automatic raking system that would effectively clean larger size debris, such as kelp.

Due to the orientation of the dual-flow screen, the flow exiting the screen is through the middle section of the screen well. This results in a more concentrated flow pattern leaving each screen. Even though the exit velocity would be higher than that for the existing flow-through screen, hydraulic evaluation indicates that the current CW pump suction arrangement should tolerate this velocity increase, primarily due to the elaborate use of the formed suction inlet design, a smooth and accelerating turn toward the pump impeller, as shown in Section A of the general arrangement drawing, 25762-110-P1K-WL-00070. However, to confirm this hydraulic assessment, a physical CW pump intake model test should be conducted by a reputable hydraulic laboratory during the final design process if this technology is selected for implementation. Depending on the testing results, it may be necessary to add a surface beam/baffle downstream of the dual-flow screen exits.

4.1.2 Justification of Selecting 1 mm Fine Mesh Opening

Fine mesh screens fitted to the traveling water screens belong to the active "collect and transfer" design with a mesh size sufficiently small to minimize entrainment loss of fish, eggs, and larvae. As background information, the existing DCPP traveling water screens have a mesh size of 9.5 mm, which essentially allows all fish, eggs, and larvae to pass through and suffer a 100-percent administrative entrainment loss during plant operation. Any reduction in the number of fish, eggs, and larvae entrained presents an improvement over the current situation of total entrainment loss.

Section 4.2.4 of the Phase 1 report provides supporting information on the selection of the rectangular mesh with an effective mesh opening of 1 or 2 mm to achieve improvement in entrainment loss reduction. Additional information was made available to Bechtel during the Phase 2 assessment that indicates a need for an effective mesh opening of 1 mm.

A Tenera report, *Length Specific Probabilities of Screen Entrainment of Larval Fishes Based on Head Capsule Measurements*, dated April 9, 2013, provides screen entrainment probabilities calculated for six slot/screen widths (0.75 mm, 1 mm, 2 mm, 3 mm, 4 mm, and 6 mm) based on the mathematical relationships between overall notochord length of the larvae and the parameters of head capsule width and depth. The report conservatively assumes that all available samples approach the screen head on. The samples were collected near the intakes of eight power plants in central and southern California, including samples collected at DCPP from 1996 to 1999. In this report, a length-specific probability of entrainment for each slot/screen size was calculated for both head width and depth. The probability of entrainment for each notochord length was determined as the larger value of either the head width entrainment probability or the head depth probability. The probabilities were calculated over a size range that approximately corresponds to the range of the lengths of larvae that would be potentially entrainable.

Out of 15 species evaluated, Tenera reported that average percentage reductions in mortality by slot/screen width are 76.89%, 67.45%, 34.51%, 15.75%, 7.73%, and 1.77% for slot/screen sizes of 0.75 mm, 1 mm, 2 mm, 3 mm, 4 mm, and 5 mm, respectively.

It would not be possible to use a 0.75 m slot/screen size because that size would provide insufficient screen surface area based on the available space of the existing pump intake; furthermore, the net result would be only a small percentage reduction in mortality compared to using the 1 mm slot/screen opening. However, the Tenera results listed above show that using a 1 mm slot/screen size results in a major improvement in entrainment loss over the 2 mm and larger sizes.

Considering the information in the Tenera report, the available space in the existing pump intake for screen retrofit, and the better hydraulic characteristics of rectangular screen mesh as opposed to square mesh, fine mesh screens with 1 mm x 6 mm woven mesh were selected for the Phase 2 assessment effort.

4.1.3 Mechanical Design

Six existing flow-through traveling screens per unit would be replaced with larger dual-flow traveling screens for a total of 12 screens for two units. The concrete deck at elevation 17'-5" would require new cutouts to accommodate the installation of new traveling fine mesh screens that support the CW pumps. The auxiliary system traveling screens would not be replaced and would not require modification. The enlargement of the existing traveling screen opening in the concrete would remove portions of the original debris trough imbedded in the concrete deck. The remaining debris trough would be abandoned in place and covered as required. The new debris trough would be routed to the existing debris grinder located at the west end of the screen house deck. The trough would sit on deck elevation 17'-5". Each screen debris trough would connect to a header trough that would be routed in the most economical manner to the debris grinder.

A second trough above the debris trough is provided for fish, egg, and larvae collection. A fish deflector sill would be installed to bridge the gap between the screen panel and fish trough to keep fish, eggs, and larvae from falling through the gap. Each fish trough would be collected into a common trough and routed to the ocean north of the existing intake structure.

Two additional screen wash water pumps, one for each unit, would be provided to supplement the existing three pumps. The new Unit 1 screen wash pump and strainer would be located in front of CW pump 1-2 at elevation –2'-1". The new Unit 2 screen wash pump and strainer would be located in front of CW pump 2-1 at elevation –2'-1". This location provides the most space to accommodate these components. The new pump's suction nozzle would extend into the CW forebay at a depth equal to 1'-0" below the extreme low tide water level (–2'-4"). The new pump nozzle would be approximately 10 ft above the CW pump suction nozzle and 4 ft forward of the CW pump suction nozzle. The two pump discharge nozzles would be routed to a new extension of an existing 24-inch header. This flanged header pipe can be extended at each end to accommodate the new equipment. The Unit 1 and Unit 2 automatic strainers would receive their suction from the 24-inch header. The strainers would be connected to a common 16-inch-diameter header that would distribute its flow to each Unit 1 and Unit 2 fine mesh screen. This existing piping is about 12 ft overhead. This allows the strainer basket to be removed and the new screen pumps to be installed. The new traveling fine mesh screens would be connected to existing 6-inch piping. This configuration was chosen to reduce cost by using existing piping and supports. It eliminates unnecessary core drilling of additional penetrations of the upper deck. The location of the new screen wash pumps and strainers is near a perimeter wall and allows the surrounding space to be used as a laydown area for other equipment repair or placement.

Six-inch y-strainers would be added at each new traveling screen spray header. Individual isolation and pressure control valves would be provided at each traveling screen. Mechanical equipment associated with this technology is summarized in the equipment list, 25762-110-M0X-YA-00006. New valves being added are summarized in the valve list, 25762-110-M6X-YA-00006.

Two major screen suppliers were contacted to obtain the technical information needed to perform the preliminary design. These suppliers assisted in maximizing the screen surface area that could be installed in the existing structure—which resulted in minimizing the through-screen velocity to about 1 fps—in conjunction with using a slot/screen size (nominal 1 mm x 6 mm) that would effectively collect fish, eggs, and larvae. The suppliers also helped to identify the design requirements for a recovery system for fish, eggs, and larvae impinged on the screen panels. The suppliers provided screen performance information; preliminary physical drawings; equipment weights; electrical requirements; spray wash flow requirements for debris and fish, egg, and larvae removal; and guidance on transporting fish, eggs, and larvae. The screens would be equipped with variable speed drives (with a range of about 10 to 40 fpm). The materials of construction would be primarily stainless steel with fiberglass splash housing, troughs, spray piping, and fish return trough. Cathodic protection would be provided by replaceable sacrificial anodes with an estimated life of 5 years.

A piping and instrumentation (P&I) schematic (25762-110-M6K-WT-00001) was developed for the screen wash spray system to show its piping sizes and components as well as how it would interface with the existing screen wash system. Lists of new valves and inline piping components were generated to identify the required scope to complete the system. Existing piping is a lined piping; new piping would be fiberglass. Valves would be ductile iron or duplex stainless steel, depending on size and service.

General arrangement drawings (25762-110-P1K-WL-00070, 25762-110-P1K-WL-00071) were developed to identify the new location for the dual-flow traveling screens, screen wash pumps, and screen wash strainers and the routing of the fish return trough.

The following assumptions are associated with the mechanical portion of the design:

- There has been no significant degradation to the existing screen wash pump performance.
- The existing spray piping is reusable (has not deteriorated).
- A bar rack debris removal system would be added to the system if this technology is selected for implementation.

4.1.4 Control System Design

Control systems and equipment have been designed in accordance with the instrumentation and controls shown on P&I schematic 25762-110-M6K-WT-00001 and the equipment described in the mechanical section of this report. A new vendor-supplied local control panel with operator interface would be provided for each new traveling screen and associated screen wash system. The existing traveling screen panel would be decommissioned and removed. The new panels would be installed at the locations of the old traveling screens panel in the intake structure of the Unit 1 and Unit 2 electrical equipment rooms. New panels would be provided for the two existing traveling screens that are not being replaced.

A new control panel would be furnished for the two new screen wash pumps. This panel would be located in the general vicinity of the existing screen wash control panel. The two new automatic backwash strainers would each have vendor-supplied control panels located in the general vicinity of the strainers.

Alarms would be generated by the local controlling device or PLC to indicate potential loss of operating equipment. Pump, motor, strainer, and screen/spray system trouble would be provided to operators via common alarms as per existing design.

A pressure control valve would be provided at each new traveling screen to control the screen wash spray water pressure. Local pressure indicators would also be furnished downstream of each pressure control valve. A pressure transmitter and local pressure gauge would be provided downstream of each automatic backwash strainer. The pressure transmitters would interface with the dual-flow traveling screen and screen wash spray controls. A differential pressure gauge would be provided across each automatic backwash strainer and would interface with the strainer controls.

Existing intake level instrumentation would be retained and interfaced with the new traveling screen controls.

4.1.5 Civil Design

The Civil discipline has performed preliminary engineering to support the development of the price and schedule for adding replacement screens and making related modifications to the existing intake structure.

Replacing the through-flow screens with larger dual-flow screens necessitates making structural modifications to the intake structure. The modifications would be to the concrete deck, where the dual-flow screens would be situated at a 90-degree angle relative to the existing screens. Each new screen requires a larger east–west footprint. The new screens would be anchored to the walls of the existing intake structure.

4.1.5.1 Description of Civil Structure

The existing single-flow screens are supported on the intake structure, and fish and debris are collected, sent to the grinder, and then discharged to the ocean north of the plant, beyond the breakwater.

To accommodate the new dual-flow screens, the intake structure deck would be modified by cutting it to provide larger openings.

The fish recovery system would be a fiber-reinforced-polymer (FRP) pipe that would run along the new screens above the existing concrete deck. It would direct fish, eggs, and larvae to the ocean through a vertical shaft, a tunnel, and a concrete conduit, thereby securing their release to the ocean. Refer to general arrangement drawing 25762-110-P1K-WL-0071, for details of the modifications and the addition of the fish recovery system.

4.1.5.2 Seismic Classification

The intake structure is a Seismic Design Class II reinforced concrete building housing and supporting Design Class I equipment. Thus, the structure is designed to avoid collapse that would impair equipment operation.

The fish recovery system is designed as Seismic Category II, and its failure would not affect plant operations during a seismic event.

4.1.5.3 Summary of Civil Deliverables

Civil modifications are planned to accommodate the replacement of the existing single-flow screens with new dual-flow screens as follows:

1. Modify the existing intake structure:

    a. Modify the deck by increasing existing opening sizes to accommodate each new dual-flow screen (opening sizes increase in the east–west direction).

    b. Design anchors for the screens.

    c. Rebuild the voids (between the existing opening and the new screens).

    d. Cut two openings in the existing slab for the installation of the new pumps.

2. Install the new fish recovery system:

    a. Provide FRP pipe to recover fish, eggs, and larvae and direct them to the ocean.

    b. Provide a support system for the FRP pipe.

    c. Drill a vertical shaft in the ground.

    d. Drill a horizontal tunnel.

    e. Provide a concrete conduit and a header at the end of the concrete conduit.

The following assumptions are associated with the Civil portion of the design:

- The concrete deck and the intake structure are adequate for new slab openings.
- The existing trash trough is abandoned in place.
- No other modifications are required in the intake structure.
- The Mechanical discipline will raise the fish recovery bucket to elevation 23'-0" to allow a 4-ft minimum clearance from the concrete deck level at elevation 17.5'.
- The new raking system for trash racks would be designed separately at a future date if this technology is selected for implementation.
- The safety classification of the new structure in front of the existing intake structure is Seismic Category I and Design Class II (similar to the existing intake structure classification).
- No underground utilities are required for the fish recovery tunnel and Construction can tunnel through the rock area.
- No new fence is required (minor existing fence modification may be required, but were not considered in this estimate).

4.1.6 Electrical Design

The overall additional electrical load for this modification is relatively minimal. The existing power distribution system has the required capacity for the incremental load. The existing 480 V intake load center switchgear would feed the loads to the extent possible. Existing feeders would be used to swap the existing screen loads with the new screen loads.

The instrumentation list and quantities were the primary inputs for the electrical design. Input data used to develop the quantities were:

- Mechanical equipment lists depicting the pump house power requirements
- P&I schematics depicting the system components for the various options
- General arrangement drawings

The resulting major load change would be to replace the existing traveling screens with new ones having lower power requirements. The existing 350 hp screen wash pumps would remain in service. This option also requires additional new 200 hp screen wash pumps (one per unit) that would be fed from the existing load centers by using a spare breaker. The load addition on the existing power distribution system as a result of adding one new 200 hp screen wash pump per unit was analyzed and found acceptable.

The duct banks and trays that feed the existing traveling screens would be used for the replacement screens. The plan is to use existing raceway system from the MCCs to the new screens. No new tray or duct bank would be required. A small amount of conduit would be required for the new screen wash pump.

The input was provided to estimating in the form of electrical single-line drawings and a document that quantifies cables and conduit.

4.1.7 Permitting

The initial Phase 1 permitting assessment focused on identifying the applicable (required) permits and approvals for construction and operation of the inshore mechanical (active) intake fine mesh screen system. A comprehensive list of potentially applicable permits and approvals at the federal, California, county, and municipal level (as applicable) was developed. The applicability of each permit/approval to the fine mesh screening system 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. Ultimately, the fine mesh screening system option was selected for the Phase 2 assessment.

The subsequent permitting assessment focused on identifying the critical path (longest duration) initial preconstruction permitting processes and the associated project costs. The preconstruction permits are those approvals that directly support site mobilization, physical site access, and initial earthwork/foundations for the subject cooling system technology option. The costs include the direct permit filing, impact mitigation, and permitting application development (services) costs.

4.1.7.1 Cost and Schedule Evaluation

The cost and schedule to secure the following major applicable permits were developed based on discussions with key relevant regulatory authorities and from associated website resources:

- California Environmental Quality Act (CEQA) – Final Notice of Determination
- Section 404/10 Permit, U.S. Army Corps of Engineers (USACE)
- California Public Utilities Commission
- Coastal Development Permit, California Coastal Commission (CCC)
- Coastal Development Lease, California State Lands Commission
- National Pollutant Discharge Elimination System (NPDES) Industrial Discharge Permit, Central Coast Regional Water Quality Control Board, and State Water Resources Control Board
- Dust Control Plan, San Luis Obispo Air Pollution Control District
- Local Approvals, San Luis Obispo County

Table IFMS-1 summarizes the key cost and schedule details and assumptions for the inshore mechanical (active) intake fine mesh screening system. Legal costs associated with managing appeal processes and related litigation have not been included. The bulk of the potential mitigation costs would be developed through negotiation and are consequently not included in the cost estimate.

Table IFMS-1
Environmental Permit/Approval Cost Assessment: Inshore Mechanical (Active) Intake Fine Mesh Screening System
Diablo Canyon Power Plant

Permit/ Approval	Cost Discussion	Responsibility	Permit Review Period	Filing Costs	Remediation or Mitigation Costs	Permitting Service Costs
Section 404/10 Permit – U.S. Army Corps of Engineers (USACE)	No filing fees are associated with the Section 404 permit application, although there is a nominal fee ($10–$100) associated with preparing an Environmental Assessment (EA). Labor costs for preparing an individual permit application = 1,000 hours @ $150.	Owner	120 days from complete application (goal); 12 months (expected but aligned with CEQA)	$100	$0	$150,000
Section 401 Water Quality Certificate – Central Coast Regional Water Quality Control Board (CCRWQCB)	Fill & Excavation Discharges are evaluated as: • $944 + $4,059 x disturbed area (acres) • Dredging Discharges are $944 + $0.15 x cy • Channel and Shoreline Discharges are $944 + $9.44 x discharge length (ft) (CCR Title 23§2200) Assumption: 2,000 ft of shoreline impacts. Labor costs: contained in Section 404/10.	Owner	Aligned with Section 404/10 Permits	$19,284	$0	$0
Section 7 Consultation with U.S. Fish and Wildlife Service (USFWS), Endangered Species Act of 1973	It is unlikely the project would have sufficient “federal nexus” (federal funding, federal lands) to trigger USFWS consultation. However, California Department of Fish and Wildlife would likely provide the consultation.	Owner	May be part of CEQA review	$0	$0	$0

Permit/ Approval	Cost Discussion	Responsibility	Permit Review Period	Filing Costs	Remediation or Mitigation Costs	Permitting Service Costs
California Public Utilities Commission (CPUC) Approval	While formal CPUC review and approval may prove necessary, the primary costs of this process are associated with the CEQA review process. The CPUC could be the lead CEQA agency or share this role with another regulatory organization (California Coastal Commission, San Luis Obispo County). These CEQA costs are addressed in the County Conditional Use Plan Approval Process.	Owner	About 12 months if required	$0	$0	$0
Coastal Development Permit – California Coastal Commission/Local Coastal Programs	The CCC indicates that the filing fee for non-residential development is $265,000 (CCC, 2008). There may be additional fees for reimbursement of reasonable expenses, including public notice costs. CEQA costs are covered in the County Condition Use Plan Approval Process. Labor costs for preparing/submitting related forms and documentation = 2,000 hours @ $150/hr	Owner	A 3–9 month process is advertised but would be aligned with the CEQA review process	$265,000	$0	$300,000
Coastal Development Lease – California State Lands Commission and potential California Environmental Quality Act (CEQA) Lead Agency	The Commission lease-related fees include (CSLC, 2011): • Industrial Lease: $25,000 • Dredge Lease Fee: $1,500 • Filing Fee: $25 Labor costs for preparing/submitting related forms and documentation = 3,000 hours @ $150/hr	Owner	Depends on duration of CEQA review process; about 2 years	$26,525	$0	$450,000

Permit/ Approval	Cost Discussion	Responsibility	Permit Review Period	Filing Costs	Remediation or Mitigation Costs	Permitting Service Costs
Dust Control Plan or Construction Activity Management Plan (CAMP) – San Luis Obispo Air Pollution Control District (SLO-APCD)	While SLO-APCD does not list any specific fee for the Dust Control Plan, other California Air Resources Board (CARB) entities are known to charge $300 to reimburse review costs. If the construction ozone precursor emissions (ROG + NOx) exceed the SLO-APCD quarterly significance threshold of 6.3 tons, the SLO County CEQA Handbook (SLO-APCD, 2012) defined mitigation rate is $16,000 per ton of ozone precursor plus 15% administrative fee. The current assumption is that precursor emissions are below this threshold. Labor costs for preparing/submitting the plan = 80 hours @ $150/hr	Contractor	1-month plan development process	$0	$0	$12,000
NPDES Industrial Discharge Permit – Central Coast Regional Water Quality Control Board (CCRWQCB) and State Water Resources Control Board (SWRCB)	The operating project is incurring annual fees based on its current discharge rate, which is not expected to change appreciably with the addition of this new intake system. Consequently, any associated fee structure is not expected to change. Labor costs for revising NPDES permit to reflect new intake structure = 500 hours @ $150/hr	Owner	About 6 months, but likely to be aligned with CEQA review process	$0	$0	$75,000

Permit/ Approval	Cost Discussion	Responsibility	Permit Review Period	Filing Costs	Remediation or Mitigation Costs	Permitting Service Costs
Conditional Use Plan Amendment – San Luis Obispo County Department of Planning and Building and Potential California Environmental Quality Act (CEQA) Lead Agency	As the CEQA lead agency or co-lead, the county would assess fees for development of the Initial Study, environmental coordination fees, and EIR processing fees (SLO-DPB, 2012). Other fees include: • Initial Study Cost: $14,603 • CalFire Review: $603 • Health Department Review: $600 • Geological Review: $2,671 (min) • Resource Conservation District Review: $375 (min) Labor costs for EIR consultant + 50% premium = 4,000 hours @ $150/hr x 1.5.	Contractor	Depends on duration of CEQA review process; about 2 years	$20,000	$0	$900,000
Notification of Waste Activity – Resource Conservation and Recovery Act Hazardous Waste Identification Number (Small Quantity Generator) – Construction Phase – Department of Toxic Substance Control, USEPA, San Luis Obispo County Environment Health Services – California Unified Program Agency	Securing the Construction Phase Hazardous Waste ID (if necessary) does not demand a filing fee. Labor costs for preparing/submitting related forms = 4 hours @ $150/hr	Contractor	1–2 weeks if required	$0	$0	$600
Building Permits – San Luis Obispo County Department of Planning and Building and Public Works: • Grading • Site Plan Reviews/Checks • Mechanical, Plumbing and Electrical • Tanks • Fire Inspections	County of San Luis Obispo Department of Planning and Building has a complex fee schedule (SLO-DPB, 2012). Recent SLO County experience on a significant solar PV project indicates that overall building permit and inspection fees could total $750,000. Labor costs for preparing/submitting related engineering packages = 2,000 hours @ $150/hr	Contractor	4–6 weeks for initial permits following completion of CEQA review and conditional use permit	$750,000	$0	$300,000

Permit/ Approval	Cost Discussion	Responsibility	Permit Review Period	Filing Costs	Remediation or Mitigation Costs	Permitting Service Costs
Fire Safety Plan Approval, Certificate of Occupancy, Flammable Storage – San Luis Obispo County Fire Department	Revisions to the existing Fire Safety Plan are not expected to result in additional filing or direct regulatory fees. The initial filing fee of $408 would probably not apply. Labor costs for revising Fire Safety Plan = 20 hours @ $150/hr	Contractor	1 month for plan approval	$0	$0	$3,000
TOTAL				$1,080,909.00	$0.00	$2,190,600.00

4.1.7.2 Permitting Summary

The list of potentially applicable federal, state, and local permits for the inshore mechanical (active) intake fine mesh screening system reflects the potentially significant impacts to the onshore and near-shore marine environment, primarily related to returning fish, eggs, and larvae system back to the sea. The efforts to conduct a successful CEQA review would be the primary critical path permitting process. The CEQA lead agency may be a shared responsibility among a number of key regulatory departments (e.g., San Luis Obispo County, California State Lands Commission [CSLC]). The requisite USACE Section 404 permit, CCC Coastal Development Permit, California State Lands Commission Lease, and NPDES permit modification would have potentially lengthy review processes but would all be essentially bounded by the critical path CEQA/Environmental Impact Report (EIR) review process.

The CEQA review process duration varies. The shortest path appears to be a nominal 210-day (7-month) period that would include the minimum 30-day review period to determine that the initial CEQA application is complete. This process culminates in a Negative Declaration and does not involve developing a comprehensive EIR. However, the fine mesh screening system review process would likely demand preparation of an EIR, which would serve to significantly extend this review process. The process—inclusive of the initial 30-day completeness review, a 1-year EIR review, and a so-called 90-day “reasonable extension” triggered by compelling circumstances recognized by both the applicant and lead agency—would then extend out to 16 months. (CEQA Flowchart)

The CEQA review process would be extended even further by conservatively adding an additional 8 months to cover “unreasonable delays” ostensibly associated with the applicant’s difficulty in supplying requested information. Collectively, this longer and probably more applicable 2-year CEQA review process would likely follow a 1-year period of permit application development. The other permitting processes are assumed to proceed in parallel to the critical path CEQA review process.

The total permit filing and permitting service costs associated with this 3-year permitting process would be approximately $3.2 million. As noted earlier, this 3-year period does not reflect the impact of permit appeals, litigation, or potentially negotiated CEQA-related mitigation fees.

4.1.7.3 Sources

1. California Coastal Commission Permit Application Instructions, Appendix E Filing Fee Schedule (3/17/2008).

2. California Code of Regulations (CCR) Title 23§2200 Annual Fee Schedules - Subpart a(3) Dredge and Fill Materials.

3. California State Lands Commission , Land Management Division Application Guidelines (10/12/2011).

4. California State Water Resources Control Board (SWRCB) Fee Schedule 2012-2013, 2012 http://www.swrcb.ca.gov/resources/fees/docs/fy12_13_fee_schedule_npdes_permit.pdf.

5. CEQA Flowchart for Local Agencies: California Code - Section 21151.5, http://www.ceres.ca.gov/planning/ceqa/flowchart.html.

6. San Luis Obispo County Air Pollution Control District (SLO-APCD) CEQA Air Quality Handbook – A Guide for Assessing the Air Quality Impacts for Projects Subject to CEQA Review, April 2012.

7. San Luis Obispo County Department of Planning and Building (SLO-DPB) – Fee Schedule 2012-2013, 2012.

4.2 Offshore Modular Wedge Wire Screening Technology

[Later]

4.3 Closed-Cycle Cooling Technology

4.3.1 Passive Draft Dry Air Cooling

[Later]

4.3.2 Mechanical Draft Dry Air Cooling

[Later]

4.3.3 Wet Natural Draft Cooling

[Later]

4.3.4 Wet Mechanical Draft Cooling

[Later]

4.3.5 Hybrid Wet/Dry Cooling

[Later]

5. Construction Approach

[Later]

6. Schedule Development

[Later]

7. Estimate Development

[Later]

8. References

1. 25761-110-M6K-WT-00001 P&ID Traveling Screen Wash and Fish Return System
2. 25761-110-P1K-WL-00070 Circulating Water System – Fine Mesh Screen House – General Arrangement
3. 25761-110-P1K-WL-00071 Circulating Water System – Fine Mesh Screen House & Fish Return – General Arrangement
4. 25762-110-M0X-YA-00006 Preliminary Mechanical Equipment List – Fine Mesh Screening
5. 25762-110-M6X-YA-00006 Diablo Canyon Power Plant Valve List – Fine Mesh Screening