

3. REGULATORY REVIEW

1.0 GENERAL REGULATORY CONSIDERATIONS FOR COOLING SYSTEM RETROFITS

The conversion of an existing power plant's cooling system from once-through to a wet cooling tower would involve considerations and reviews across a range of regulatory programs. The following discussion provides an overview of the programs and agencies that would be involved and highlights the specific aspects that would need to be addressed as part of a conversion. The review focuses on environmental and planning programs at the federal, state, and local government levels, including executive orders, statutes, regulations, and policies. In some cases, the objectives of different programs and policies may conflict with one another.

The lead agency for permitting each power plant conversion project cannot be projected for this study and is likely to vary on a site-by-site basis. The Regional Water Quality Control Boards (RWQCBs), Air Pollution Control Districts (APCDs)/Air Quality Management Districts (AQMDs), California Energy Commission (CEC), California Coastal Commission (CCC), Bay Conservation and Development Commission (BCDC), and State Lands Commission (SLC) all will likely play significant roles, and may serve in a lead role for a specific facility.

The Nuclear Regulatory Commission (NRC) will also play an important role in overseeing any retrofit projects undertaken at Diablo Canyon Power Plant and San Onofre Nuclear Generating Station to ensure any proposed redesign complies with all applicable operating and safety requirements.

2.0 AGENCY ROLES AND RESPONSIBILITIES

A number of state and local agencies would be involved in the review and permitting of a cooling system retrofit at existing power plants. In addition federal agencies may become involved where federal issues, such as endangered aquatic species, nuclear safety, navigable/harbor waters, military zones, etc., are present at the intake structure site. The roles of these agencies are summarized below and further described in sections 3.0-7.0.

2.1 STATE LANDS COMMISSION

The SLC has jurisdiction and control over public trust lands, which can generally be described as all ungranted tidelands and submerged lands and beds of navigable rivers, streams, lakes, bays, estuaries, inlets, and straits in the state. These lands include a wide section of tidal and submerged land adjacent to the state's coast and offshore islands, including bays, estuaries, and lagoons, and are managed by the SLC under a multiple-use policy for water-related commerce, navigation, fisheries, recreation, open space, and other recognized public trust uses.

In its administration of surface leases on public trust lands, the SLC considers numerous factors in determining whether a proposed use is appropriate, including the protection of natural resources and other environmental values as well as preservation or enhancement of the public's access to state lands. Where a lease is issued, the SLC can serve as the lead agency for California Environmental Quality Act (CEQA) analyses. The SLC also comments on Environmental Impact Reports (EIRs) for land use changes within its jurisdiction and on projects that affect state lands. The SLC also conducts a review of applications submitted to the CCC.

2.2 CALIFORNIA ENERGY COMMISSION

The Warren-Alquist Act grants the CEC the exclusive authority to license new power plants with capacity greater than 50 MW or repower projects that increase the facility capacity by 50 MW or more. As part of this process, the CEC is required to make findings regarding the project's conformance with applicable laws, ordinances, regulations, and standards (LORS). The CEC also serves as the lead agency for CEQA compliance. The Warren-Alquist Act includes specific provisions for compliance with the California Coastal Act, including specific CEC requirements for coordination with the CCC.

If an existing power plant was originally licensed by the CEC, a modification to the cooling system would require an amendment to the original decision, including an assessment of compliance with CEQA. If the facility was not originally licensed by the CEC, a modification to only the cooling system would not require CEC permitting or approval.

2.3 NUCLEAR REGULATORY COMMISSION

A nuclear facility's design is understandably more complex than a typical fossil-fueled facility and incorporates additional systems that require cooling in addition to the main condenser. Auxiliary and safety systems, such as component cooling, spent fuel storage, and emergency cooling, may operate in parallel with the main condenser system with dedicated pumps and supply lines. These systems may also be integrated as part of facility-wide cooling system. In either case, special consideration must be given to ensure these systems could continue to operate as intended following conversion to wet cooling towers.

The Energy Reorganization Act of 1974 established the NRC and tasked the agency with the oversight of commercial nuclear operations, material and waste management, and decommissioning activities. Accordingly, the NRC exercises broad regulatory authority over commercial nuclear power plants to protect public health and safety and maintains rigorous design criteria to meet these goals. Any major modification proposed for an existing facility would be subject to NRC review and approval to ensure compliance with all applicable regulations and standards.

2.4 OCEAN PROTECTION COUNCIL

The OPC is responsible for coordinating the activities of ocean-related state agencies and improving ocean protection. The objectives of the OPC are more narrowly defined than many other agencies. With respect to conversion to once-through cooling, the OPC may have a

coordination role but does not have specific permitting or approval authority for individual facilities.

2.5 REGIONAL WATER QUALITY CONTROL BOARDS

California has nine RWQCBs that are responsible for implementing the requirements of the Porter-Cologne Water Quality Control Act and the Clean Water Act (CWA), including CWA Section 316(b), which governs cooling water intake structures. Each RWQCB implements the requirements of the CWA and Porter-Cologne through the issuance of National Pollutant Discharge Elimination System (NPDES) permits, which include standards set forth in each RWQCB's Basin Plan as well as State Water Quality Control plans such as the Thermal Plan, Ocean Plan, and California Toxics Rule (CTR). NPDES permits issued to power plants address the operation of cooling water intake structures that withdraw water from surface waters of the state as well as the direct discharge of cooling water and other wastewaters. Since conversion of a once-through cooling system to a wet closed-cycle system would require a major modification to the facility's NPDES permit, the RWQCBs will have a primary role in permitting power plant conversions.

2.6 CALIFORNIA COASTAL COMMISSION

The Coastal Act of 1976 permanently established the CCC, which, in partnership with local county and municipal planning authorities, plans and regulates development in the coastal zone. Development within the coastal zone can proceed only subsequent to issuance of a coastal development permit issued by an approved local coastal program or, in limited circumstances, by the CCC itself. Where the CCC issues a permit, the commission or the local coastal planning agency must comply with CEQA and may serve as the lead agency for a CEQA analysis.

An exception to the CCC's permitting authority is provided under the Warren-Alquist Act for new power plants or those projects involving an increase of 50 MW or more. In these cases, the CCC participates in the CEC's review process but does not have independent permitting authority. The CCC's role (under Section 30413[d] of the Coastal Act) is to provide to the CEC a report describing what measures are necessary for the proposed project to conform to Coastal Act policies. The CEC must then adopt those measures as part of any approval, unless it finds that the measures are infeasible or would cause greater adverse environmental harm.

2.7 BAY CONSERVATION AND DEVELOPMENT COMMISSION

San Francisco Bay is excluded from the California Coastal Act and instead is addressed by the McAtter-Petris Act. Under this act, the BCDC functions similarly to the Coastal Commission in the Bay Area. Only two power plants addressed by this study (Pittsburg and Contra Costa) are under BCDC jurisdiction.¹

¹ Potrero Power Plant was not included in this study.

2.8 REGIONAL AIR POLLUTION CONTROL DISTRICTS/AIR QUALITY MANAGEMENT DISTRICTS

In California, authority to enforce the requirements of the Clean Air Act (CAA) and its implementing regulations, as well as state and local air pollution laws and regulations, rests with 35 regional air pollution authorities known as the APCDs/AQMDs. These are established by county or by larger regional area. APCDs/AQMDs issue all permits and approvals required by the CAA. The State Air Resources Board develops statewide standards, while the APCDs/AQMDs establish individual airshed plans.

3.0 ENERGY AND ONCE-THROUGH COOLING POLICIES

3.1 CALIFORNIA ENERGY ACTION PLAN

Reacting to a statewide energy crisis manifested in high energy costs and rolling blackouts, the state approved an Energy Action Plan (EAP) in 2003. The EAP, created by California's three principal energy agencies (the CEC, the California Public Utilities Commission (CPUC), and the Consumer Power and Conservation Financing Authority, which is now defunct), identifies specific goals and actions to eliminate energy outages and excessive price spikes in electricity and natural gas. The EAP, which is a living document and was supplemented by the Energy Action Plan II in 2005, "will be ever mindful of the need to keep energy rates affordable, and is sensitive to the implications of energy policy on global climate change and the environment generally."

The EAP envisions a "loading order of energy resources" to guide decisions made by the three regulating agencies, jointly and singly. The loading order is a priority sequence for agency actions addressing the state's energy needs, described as follows:

- Optimize all strategies for increasing conservation and energy efficiency to minimize increases in electricity and natural gas demand.
- Encourage that new generation needs are first met by renewable energy resources and distributed generation.
- Support additional clean fossil fuel, central-station generation until the preferred resources have had sufficient investment and adequate time to "get to scale."
- Provide the bulk electricity transmission grid and distribution facility infrastructure to support growing demand centers and the interconnection of new power generation.

The CPUC's approach to the loading order prioritizes energy resources on the demand side to emphasize energy conservation, resource efficiency, and reduction of per capita demand; and on the supply side, favors renewables over fossil fuel resources. The Energy Action Plan II specifically includes climate change as an action area, acknowledging a strong connection between energy use and climate change. Regarding climate change, the plan identifies several key action steps for the state's energy agencies, including implementation of strategies to meet the greenhouse gas emission reduction goals established by Executive Order S-3-05 (discussed below). More broadly, throughout the EAP and Energy Action Plan II, there is emphasis on developing environmentally sound energy sources. In addition, under Research, Development, and Demonstration, Action Item 8 encourages the development of cost-effective dry cooling

technologies and reduction of once-through cooling practices to minimize the impact of new generation on California's water resources.

Converting power plants to wet cooling tower systems would generally be consistent with the goal of reducing environmental impacts. At the same time, the minor loss of generating efficiency associated with conversion could be construed as conflicting with some of the plan goals, although the primary focus is on retiring older plants and replacing them with cleaner, more efficient energy sources. Overall, on a plant-by-plant basis, the implementing agencies will have to consider the plan goals in evaluating conversion scenarios.

3.2 CALIFORNIA OCEAN PROTECTION COUNCIL RESOLUTION ON THE USE OF ONCE-THROUGH COOLING TECHNOLOGIES IN COASTAL WATERS

The OPC passed a resolution on April 20, 2006, that effectively discourages the use of once-through seawater cooling. The OPC has resolved to accomplish the following:

- Urge the State Water Board to implement CWA Section 316(b) and any more stringent state requirements that require reductions in entrainment and impingement at existing coastal power plants, and encourage the state to implement protective controls to achieve a 90–95 percent reduction in such impacts.
- Encourage the State Water Resources Control Board (SWRCB) to form a group to provide technical review of each coastal power plant's data collection proposals, analyses, and impact reductions; and implement statewide data collection standards to comply with CWA Section 316(b) requirements.
- Establish an interagency committee from the RWQCBs, the CEC, the CPUC, the CCC, and others to integrate agency actions and to coordinate regulatory authorities.
- Fund a six-month study to analyze each existing coastal power plant's conversion to alternative cooling technologies or installation of best technology available.
- Work with the RWQCBs, the CEC, the CPUC, the CCC, and others to investigate non-regulatory incentives to accelerate conversion from once-through cooling.

The resolution highlights OPC's desire to encourage interagency cooperation to facilitate the implementation of protective controls that can address the impacts associated with once-through cooling water withdrawals. Specifically targeting the protection of marine resources, the resolution does not explicitly take operational efficiencies into account. The resolution's call for an interagency workgroup that includes the CEC and CPUC may enable the various entities to reconcile any inconsistencies between the OPC's objectives and those established under the EAP. The impact of the resolution on the retrofitting process will be determined by the subsequent work by the interagency workgroup and actions taken by the SWRCB and RWQCBs.

As adopted, the OPC resolution did not explicitly call for a technology cost evaluation as part of this study. Interagency and staff discussions following its adoption, however, identified the need to develop cost assessments as part a technology's overall feasibility evaluation at each coastal power plant. The OPC believes that collecting cost data in conjunction with the engineering assessments is an appropriate step in assisting other state agencies in the regulatory process.

While this study contains initial cost data in addition to providing long-term cost estimates, no conclusions are reached with respect to a particular retrofit option's *economic* feasibility.

3.3 CALIFORNIA COASTAL ACT

On land, the coastal zone varies in width from several hundred feet in highly urbanized areas up to five miles in rural areas; and it extends three miles offshore. The coastal zone established by the Coastal Act excludes San Francisco Bay, where development is regulated under the McAtter-Petris Act. The Coastal Act includes specific policies regarding such subjects as public access to the shore, protection of terrestrial and marine habitat, visual resources, land form alteration, and agricultural lands. These policies are the standards that are applied to the planning decisions affecting the coastal zone made by local authorities and the CCC.

The CCC is the designated coastal management agency for the purpose of administering the federal Coastal Zone Management Act, which grants to those agencies, when coastal resources are affected, regulatory control over all federal activities and federally licensed, permitted, or assisted activities. Such activities may include outer shelf oil and gas leasing, exploration, and development; military projects at coastal locations; and issuance of Corps of Engineers dredge and fill (CWA Section 404) permits.

Implementation of the California Coastal Act is carried out through a partnership between the CCC and local planning authorities that includes approximately 15 counties and 60 municipalities. These entities prepare local coastal programs (LCPs), which include land use plans (zoning maps, zoning ordinances, and other legal instruments) that are consistent with the policies established by the act and approved by the CCC. Development within the coastal zone can then proceed only subsequent to issuance of a coastal development permit by local planning authority and/or, for any submerged portion of a project, by the CCC itself under its retained jurisdiction. Projects that are larger than 50 MWe are subject to the exclusive siting authority of the CEC.

The Coastal Act includes the following statements of policy regarding development within the coastal zone. These policies could affect the conversion of a power plant from once-through cooling to a wet closed-cycle cooling system.

- Regarding electrical generating facilities the Coastal Act specifically states, “Notwithstanding the fact electrical generating facilities . . . may have significant adverse effects on coastal resources or coastal access, it may be necessary to locate such developments in the coastal zone in order to ensure that inland as well as coastal resources are preserved and that orderly economic development proceeds within the State.”
- Development in the coastal zone shall not interfere with the public’s right of access to the sea.
- Coastal areas that are well suited for water-oriented recreational activities that cannot be readily provided at inland water areas shall be protected for such uses.
- Upland areas necessary to support coastal recreational uses shall be reserved for such uses, where feasible.

- Marine resources shall be maintained, enhanced, and, where feasible, restored. Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters.
- Development in areas adjacent to environmentally sensitive habitat areas, parks, and recreation areas shall be sited and designed to prevent impacts that would significantly degrade those areas, and shall be compatible with the continuance of those habitat and recreation areas.
- California Code of Regulations (CCR) Section 30250 establishes policy that new residential, commercial, and industrial development shall be located within, contiguous with, or in close proximity to existing developed areas able to accommodate it or, where such areas are not able to accommodate it, in other areas with adequate public services and where it will not have significant adverse effects on, either individually or cumulatively, coastal resources.
- The scenic and visual qualities of coastal areas shall be considered and protected as a resource of public importance. Permitted development shall be sited and designed to protect views and, along the ocean and scenic coastal areas, to minimize the alteration of natural land forms, to be visually compatible with the character of surrounding areas, and, where feasible, to restore and enhance visual quality in visually degraded areas.
- Industrial facilities shall be encouraged to locate or expand within existing sites and shall be permitted reasonable long-term growth, consistent with the policies of the Coastal Act. Where new or expanded coastal-dependent industrial facilities cannot feasibly be accommodated in a manner consistent with the policies of the Coastal Act, such facilities may still be permitted if (1) alternative locations are infeasible or more environmentally damaging; (2) to do otherwise would adversely affect the public welfare; and (3) adverse environmental effects are mitigated to the maximum extent feasible.

The conversion of power plants to closed-cycle cooling is clearly consistent with some of the policies of the Coastal Act (e.g., conserving, enhancing, and restoring marine resources) but may be inconsistent with others (e.g., related to visibility, land use, and public access). The effects of the conversion and overall consistency with the act must be determined on a site-by-site basis, including mitigation measures to address specific act requirements.

4.0 WATER QUALITY

4.1 PORTER-COLOGNE WATER QUALITY ACT

The Porter-Cologne Water Quality Act (California Water Code [CWC] Section 13000 et seq.) provides for the preservation, enhancement, and restoration of the state’s water quality. Specifically, CWC Section 13142.5 establishes state policy that wastewater discharges be treated to protect present and future beneficial uses and, where feasible, to restore past beneficial uses. Highest priority is given to improving or eliminating discharges that adversely affect the following:

- Wetlands, estuaries, and other biologically sensitive sites
- Areas important for water contact sports
- Areas that produce shellfish for human consumption
- Ocean areas subject to massive waste discharges

In determining the effects of such discharges, the policy requires consideration of ocean chemistry and mixing processes, marine life conditions, other present or proposed outfalls in the vicinity, and relevant aspects of area wide waste treatment management plans and programs, *but not* convenience to the discharger. The policy suggests that wastewater containing “toxic and hard-to-treat substances” should be discharged to a sanitary sewer system or pretreated before being discharged to a sanitary sewer system.

CWC Section 13142.5 also expresses policy regarding (1) facility siting, design, and treatment technology, and mitigation measures, when seawater is used for cooling; (2) new thermal discharges to coastal wetlands and areas of special biological significance (ASBSs); (3) baseline marine studies, when new or expanded facilities use seawater for cooling; and (4) preference for use of recycled water, when it is feasible. When new or expanded coastal power plants use seawater for cooling, “the best available site, design, technology, and mitigation measures feasible shall be used to minimize the intake and mortality of all forms of marine life.”

CWC Section 13142.5 applies to power plants that use once-through cooling or wet cooling towers, since in each case, plants would require intake and discharge facilities. A plant using seawater as makeup water in wet cooling towers would need to meet the same provisions, including the use of the best available site, design, technology, and mitigation measures on the intake, although the volume of water passing through the system would be reduced significantly from a once-through system.

Other sections of the CWC are also relevant to cooling system conversions. Section 13240 requires RWQCBs to develop and implement Regional Water Quality Control Plans (Basin Plans), which establish water quality criteria for all state waters in their region. Section 170.2 requires the development of the Ocean Plan by the SWRCB, which establishes procedures for the use and protection of ocean waters.

4.2 CLEAN WATER ACT

4.2.1 SECTION 316(B)

This section is discussed in the Chapter 3 of this report.

4.2.2 SECTION 402

Discharges to surface water from power plants must be permitted under CWA Section 402 through NPDES permits. These permits include both technology- and water quality-based discharge limitations to protect the designated uses of the receiving water. Because of the substantive changes in discharge characteristics, the conversion from once-through cooling to wet cooling towers would require a major modification to the facility's NPDES permit. The power plant would apply for the modification and the permit would be reissued by the appropriate RWQCB. As part of this process, the RWQCB would reevaluate the discharge characteristics and discharge limitations and prohibitions.

For a once-through cooled power plant, the discharge is overwhelmingly dominated by the heated water from the cooling system (greater than 99 percent by volume), with smaller contributions from low-volume wastes such as boiler blowdown, laboratory drains, and facility sumps. Discharges of thermal waste are regulated under the State Water Resources Control Board's *Water Quality Control Plan for Control of Temperature in the Coastal and Interstate Water and Enclosed Bay and Estuaries of California (Thermal Plan)*, which includes water quality objectives for temperature. Depending on the final configuration selected for a particular facility, the conversion of once-through cooling system to a wet cooling tower system will likely reduce the temperature of the final discharge and, because the volume is substantially less, will also reduce the size of any associated thermal plume in the receiving water.

A power plant that converts its cooling system to wet cooling towers will no longer discharge once-through cooling water. Instead, the facility will generate cooling tower blowdown, which, if discharged to a surface water, is subject to technology-based effluent limitation guidelines (ELGs) promulgated by EPA at 40 CFR 423.13. These ELGs contain numeric effluent limitations for chromium and zinc (0.2 mg/L and 1.0 mg/L, respectively) and narrative criteria for the remaining priority pollutants (no detectable amount). The ELGs for chromium and zinc were based on the common practice of using chromium compounds, such as chromate-zinc, to inhibit corrosion and fouling in cooling towers. While the use of chromium-based compounds in cooling towers has been prohibited since 1994, the ELGs are still applicable to cooling tower blowdown, including the narrative limitation for priority pollutants.

Many facilities utilize condenser tubes consisting of zinc and copper alloys (brass, bronze, copper-nickel) and may contribute small amounts of these and other metals to the circulating water flow through the effects of corrosion. In addition, trace amounts of these metals may be present in the water used to provide makeup water to the cooling tower. If present, their concentrations in the final discharge would increase according to the cycles of concentration used in the design of wet cooling towers and may trigger an exceedance of the ELGs. Because ELGs are applicable at the point of discharge from the cooling tower and not at the point of final discharge, there is no benefit from dilution that might result from commingling with other waste streams the facility may generate. A facility that exceeds these limitations would be required to

adopt treatment measures or possibly secure an alternative source of makeup water for the cooling tower.

Water quality–based effluent limits (WQBELs) are generally derived from two sources, depending on the nature of the receiving water. For ocean dischargers, WQBELs are derived statewide from the Ocean Plan. For inland waters, including estuaries and enclosed bays, WQBELs are derived from the CTR (implemented through the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California*) and the Basin Plans for each RWQCB. Changes in the volume and composition of the final effluent resulting from a conversion may impact a facility’s ability to meet effluent limitations established under these plans due to the concentrating effects of the cooling tower.

Larger mixing zones or additional dilution may be necessary to meet the applicable criteria. In some cases, such dilution may not be available either because of the flow characteristics of the receiving water and/or the existing background pollutant concentrations (e.g., where the receiving water is already listed as impaired under CWA Section 303(d) for the pollutant). Without such dilution, additional treatment may be required to meet the effluent limits. Likewise, intake credits would not be available because the cooling towers alter the physical and chemical makeup of the water by concentrating various pollutants prior to discharge.

4.2.3 SECTION 404

CWA Section 404 is administered by the U.S. Army Corps of Engineers (with oversight by EPA) and protects waters of the United States, including wetlands. The program requires avoidance, minimization, and mitigation for impacts to “jurisdictional” wetlands. Jurisdictional wetlands are delineated based on vegetation, soils, and hydrologic criteria.

Construction of cooling towers in coastal areas would have the potential to impact jurisdictional wetlands if they were present on the site. In this case, a permit from the Corps of Engineers would be required. The permitting process could involve minimizing disturbances to wetlands, the development of compensatory mitigation, and/or participation in a wetland banking program, depending on the extent of impacts and the location of the project.

5.0 AIR QUALITY

Conversion to wet cooling towers would require revisions to facility air quality permits issued by the APCDs/AQMDs. The scope of such revisions is somewhat dependent on the expected increases in emissions associated with the cooling towers, as discussed below.

Significant programs of the CAA pertain to National Ambient Air Quality Standards (NAAQS), New Source Performance Standards (NSPS), New Source Review (NSR), nonattainment area requirements, hazardous air pollutants, and acid deposition control, as described below.

5.1 NATIONAL AMBIENT AIR QUALITY STANDARDS

The NAAQS program addresses pervasive pollution that endangers public health and welfare and has resulted in the establishment of air quality standards for six pollutants: sulfur dioxide (SO₂), nitrogen dioxide (NO₂), particulate matter (PM₁₀), carbon monoxide (CO), ozone (O₃), and lead. States have primary responsibility for ensuring that emissions are maintained at levels consistent with the NAAQS by establishing source-specific requirements in State Implementation Plans (SIPs). CAA Section 110(a)(2) describes the components of a SIP, which include (1) enforceable emission limitations, (2) provisions for developing ambient air quality data, (3) requirements for preconstruction review and approval of major new stationary sources in attainment areas, and (4) preconstruction permitting requirements relating to construction of new sources and the operation of existing sources in nonattainment areas. Incorporation of a wet cooling tower system will result in an increase in PM₁₀ from the towers themselves (in the form of drift particles that evaporate and leave particulate matter behind). Total stack emissions of PM₁₀ and other pollutants may increase if changes to a facility's efficiency result in the combustion of additional fuel.

5.2 NEW SOURCE PERFORMANCE STANDARDS

EPA has identified certain stationary source categories and promulgated NSPS for those industrial categories—technology-based emission limitations that are imposed on new or modified sources. EPA has promulgated NSPS for (1) fossil fuel-fired steam generators built or modified after August 17, 1971, and (2) fossil fuel-fired steam generators built or modified after September 18, 1978. Both apply to new or modified units with thermal input rates greater than 250 MMBTU/hr, and both strictly control PM₁₀. Emission sources built prior to 1971 are exempt from the NSPS unless they are modified or reconstructed. NSPS regulations are more general (than New Source Review) and are based on what is technologically and economically feasible within an industrial category.

5.3 NEW SOURCE REVIEW

NSR requirements are more site and project specific than NSPS and allow state regulating authorities to set stricter limitations based on what they determine to be the best technology currently available. The CAA designates “major emitting facilities” that are subject to the NSR program, including fossil fuel-fired steam electric plants of more than 250 MMBTU/hr heat input that emit, or have the potential to emit, 100 tons per year or more of any air pollutant. The NSR program then distinguishes between areas where NAAQS are met and nonattainment areas.

Major emitting sources in attainment areas that are being constructed or modified must undergo PSD (prevention of significant deterioration) permitting and must implement the best available control technology (BACT). In nonattainment areas, the lowest achievable emissions rate (LAER) applies to such sources. BACT and LAER are technology-based standards and must be as stringent as, or more stringent than, the applicable NSPS emission limitation.

For existing plants to trigger NSPS or NSR, two criteria must be satisfied: (1) there must be a physical or operational change and (2) there must be a significant net emissions increase. EPA defines “significant net emissions increase,” differently for the two programs, using a total annual emissions test (tons or kg/yr) in the NSR program and using an emissions rate test (tons or kg/hr) for NSPS purposes. If a modification results in an increase in emission rate to the atmosphere of any pollutant to which a standard applies, the source must comply with the NSPS requirements for its industrial category.

For power plants, an important threshold is the emissions of PM₁₀. A cooling tower would increase the total PM₁₀ emissions from a facility, although the increase would be based on the capacity utilization for the facility. The threshold for determining a significant net emissions increase is 15 tons per year. This analysis has assumed the use of high-efficiency air pollution controls (drift eliminators) to minimize PM₁₀ emissions from cooling towers. These controls represent the accepted BACT for cooling towers. Even with these controls, however, some of the towers may trigger NSR for the entire facility. This would involve BACT or LAER evaluations of all emission sources at the plant as part of the permit modification process. Many of the plants may already have scrubbers or pollution control equipment that meets BACT or LAER requirements, but a final determination of what additional controls could be required and the associated costs is beyond the scope of this analysis.

5.4 STATE NONATTAINMENT AREAS

All the power plants addressed by this study are located in areas designated as nonattainment for PM₁₀ as required by Health and Safety Code Section 39608. As a result, the State Air Resources Board and the APCDs/AQMDs have established plans that will lead to future attainment. These plans have specific provisions to allow for new sources. In addition to requiring control technologies, retrofit facilities may have to acquire PM₁₀ credits within the airshed to offset any increased emissions. A principal hurdle to securing credits is determining their availability and total cost. In some airsheds, such as the Los Angeles Basin, credits may be unavailable in sufficient quantities. Such an analysis is beyond the scope of this study but could impact the permissibility and cost of conversions. Table 3-1 describes state and federal ambient standards. Figure 3-1 shows the county-level attainment status for state PM₁₀ ambient air quality standards.

Table 3-1. State and Federal PM₁₀ Ambient Air Quality Standards

	California ARB	U.S. EPA
Annual Average	20 µg/m ³	N/A
24-Hour Average	50 µg/m ³	150 µg/m ³



Figure 3-1. State PM₁₀ Attainment Status

5.5 HAZARDOUS AIR POLLUTANTS

CAA Section 112 includes several provisions that address the emission of hazardous air pollutants, including a requirement that EPA establish technology-based emission standards for sources of 188 specifically identified pollutants that reflect the maximum achievable control technology (MACT). Of interest to the electric power industry, at 40 CFR 63.400, EPA has established National Emission Standards for Hazardous Air Pollutants for Industrial Cooling Towers; these standards, however, simply prohibit the use of chromium-based water treatment chemicals in cooling tower systems and have been in effect since 1994.

5.6 ACID DEPOSITION CONTROL

The CAA acid deposition program caps SO₂ emissions at existing sources through a tonnage limitation and at future plants through an allowance system; new sources must obtain allowances or offsets from existing sources that hold allowances or authorization to emit specified amounts of SO₂. EPA has also established NO_x emission standards for several types of boilers and has established NSPS for NO_x emitted from fossil fuel-fired steam generating units.

Local and state requirements and Clean Air Act programs, including those pertaining to NAAQS, NSPS, NSR, air toxics, and acid rain, are controlled by operating permits, which include emission limitations, schedules of compliance, and monitoring requirements as well as requirements regarding self-reporting and certification of compliance.

Operating permits are typically valid for five years; however, permittees must seek a permit revision if changes (such as retrofitting to install cooling towers) trigger a requirement that had not previously been applicable, e.g., NSR. Minor permit revisions are subject to limited review requirements and streamlined procedures, whereas significant permit revisions are subject to all procedural requirements applicable at the time of permit issuance.

6.0 GREENHOUSE GASES

6.1 EXECUTIVE ORDER S-3-05

On June 6, 2005, the governor of California signed Executive Order S-3-05, establishing the following targets for reduction of greenhouse gas emissions:

- By 2010, reduce greenhouse gas emissions to 2000 levels.
- By 2020, reduce greenhouse gas emission levels to 1990 levels.
- By 2050, reduce greenhouse gas emission levels to 80 percent below 1990 levels.

The state's Climate Action Team is tasked with implementing global warming emission reduction programs and reporting on the progress made toward meeting the emission targets established in the executive order.

6.2 ASSEMBLY BILL 32

Assembly Bill 32 is also known as the California Global Warming Solutions Act of 2006. Regulations have yet to be promulgated to support this act. The legislature acknowledges, however, that the Climate Action Team established by the governor to coordinate the efforts set forth under Executive Order S-3-05 will continue its role in coordinating overall climate policy. The act charges the State Air Resources Board with responsibility for monitoring and regulating emissions of greenhouse gases, including (1) developing regulations to require reporting and verification of statewide greenhouse gas emissions, beginning with categories of sources that represent the largest contributors of greenhouse gas emissions; (2) determining what the statewide greenhouse gas emissions level was in 1990 and establishing a greenhouse gas emissions limit at that level to be achieved by 2020; and (3) by 2011, adopting regulations, to become effective on January 1, 2012, establishing greenhouse gas emission limits and emission reduction measures to achieve maximum technologically feasible and cost-effective reductions in greenhouse gas emissions.

6.3 SENATE BILL 1368

Senate Bill 1368 builds on Executive Order S-3-05 and establishes policy requiring the consideration of greenhouse gas emissions when long-term electricity procurement decisions are made, and the development of performance-based emissions standards to be linked to long-term electricity procurement. The enactment of Senate Bill 1368 established the following requirements:

- A performance standard for greenhouse gases for all “baseload generation of load serving entities” based on greenhouse gas emissions for combined cycle natural gas baseload generation.
- A performance standard for greenhouse gases for all “baseload generation of local publicly owned electric utilities” as those facilities are defined in Section 9604 of the Public Utilities Code. The standard is again based on the rate of greenhouse gas emissions for combined cycle natural gas baseload generation and, in effect, will be applicable to local publicly owned electric utilities.
- No “load serving entity” or “local publicly owned electric utility” may enter into a long-term financial commitment, nor may the CEC approve a long-term financial commitment by an electrical corporation, unless the baseload generation supplied complies with the greenhouse gas emissions performance standards that are established.

On January 25, 2007, the CPUC adopted the Interim Greenhouse Gas Emissions Performance Standards for all baseload generation of investor-owned utilities, requiring new long-term commitments for baseload generation to come from power plants with greenhouse gas emission rates comparable to combined cycle facilities—a rate equivalent to 1.1 lb/kWh, or a heat rate of approximately 9,600 BTU/kWh for a natural gas facility. Most of the generating units covered in this study are utilized to provide capacity to the grid during peak demand periods, particularly during summer months, and have maximum heat rates ranging from 9,300 to 10,500 BTU/kWh (excluding nuclear and combined cycle units).

The conversion to a wet cooling system will impact the efficiency of a generating unit and increase the overall heat rate, which, although small, may be enough to cause an exceedance of the CPUC standard for baseload plants. This could affect the economic viability of a facility, i.e., its ability to negotiate long-term contracts, which could, in turn, affect its ability to secure financing for long-term capital improvement projects such as a wet cooling system retrofit (exclusive of repowering).

7.0 NATURAL RESOURCES

7.1 CALIFORNIA ENVIRONMENTAL QUALITY ACT

The California Environmental Quality Act (CEQA) requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts, if feasible. CEQA is applicable to all activities undertaken by public or private entities, including development projects and government decisions that may not immediately result in physical development, when those activities must receive some discretionary approval from a government agency and when those activities may affect the quality of the environment.

CEQA is intended to be used in conjunction with discretionary powers granted to public agencies by other laws. As such, state and local agencies have integrated the requirements of CEQA with planning and environmental review procedures otherwise required by law or by local practice, so that all of those procedures, to the maximum extent feasible, run concurrently, rather than consecutively.

When a project is proposed by a nongovernmental entity, the lead agency for CEQA purposes is typically the public agency with the greatest responsibility for supervising or approving the project as a whole. Lead agencies are responsible for considering the environmental effects, both individual and collective, of all activities involved in a project and must determine whether an EIR, a negative declaration, or a mitigated negative declaration is required for any project subject to CEQA. Lead agencies have authority to require feasible changes in any or all activities involved in a project in order to substantially lessen or avoid significant effects on the environment.

Prior to determining whether a negative declaration or EIR is required for a project, the lead agency must consult with all responsible and trustee agencies. A responsible agency considers only the effects of those activities involved in a project that it is required by law to carry out or approve. Responsible agencies may require changes in a project to lessen or avoid only the effects, either direct or indirect, of that part of a project for which it is responsible. Trustee agencies are state agencies with jurisdiction over natural resources affected by a project.

A lead agency must determine if a proposed project, not otherwise exempt from CEQA, will or will not have a significant effect on the environment. “Significant effect on the environment” means a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project, including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic and aesthetic significance.

If there is substantial evidence, in light of the whole record before the lead agency, that a project may have a significant effect on the environment, an EIR must be prepared. Following such a determination, the lead agency must notify all responsible and trustee agencies; those agencies must then identify the scope and content of the environmental information that is germane to their responsibilities and shall be addressed in the EIR. Following a determination of no significant effect, the lead agency must adopt a negative declaration to that effect.

As described in Article 9 of the CEQA regulations, an EIR must include the following components:

- Summary of proposed actions and their consequences
- Project description
- Description of the environmental setting, consideration of environmental impacts
- Consideration and discussion of significant environmental impacts
- Consideration and discussion of mitigation measures proposed to minimize significant effects
- Consideration and discussion of alternatives to the proposed project
- Effects not found to be significant
- Organizations and persons consulted
- Discussion of cumulative impacts

Under the CCR sections 15250 and 251, certain agency actions, e.g., those of the CCC and local coastal planning agencies, can be certified as exempt from the CEQA requirement for preparing EIRs, negative declarations, and initial studies. They are not exempt from the other requirements of CEQA, including avoiding significant adverse effects on the environment, wherever possible. Environmental analyses performed for such agencies may be used by other agencies in lieu of an EIR as long as specific requirements in CCR sections 15252 and 15253 are met. In such cases, the exempt agency is designated as the lead agency and the agency adopting the substitute document/analysis is designated as the responsible agency.

Projects may be approved even though a significant effect on the environment may result if the agency makes a fully informed and publicly disclosed decision that (1) there is no feasible way to lessen or avoid the significant effect and (2) specifically identified expected benefits from the project outweigh the policy of reducing or avoiding significant environmental impacts of the project.

CEQA would likely be triggered by the conversion of a facility from once-through cooling to cooling towers. The lead agency for such an action could be the CEC, the APCD/AQMD, local planning authority, or others, depending on the nature of the modification and the regulatory requirements. Alternatively, an agency exempt from CEQA, e.g., the CCC, could be the lead agency. Given site-specific effects and regulatory applicability, the lead agency may be different at each facility.

The level of review required is also likely to vary. In some areas with the potential for significant visual, noise, land use, or other physical, biological, cultural, or social effects, an EIR may need to be prepared. For other facilities where the effects are less significant, a mitigated negative declaration may be appropriate. In addition, under CCR Section 15887, the regulatory agency that adopts the conversion requirement will need to comply with CEQA and likely prepare an EIR for adoption of the regulation or policy. Under Section 15888 of the California Code of Regulations, a focused EIR could then be prepared for each facility during the permitting process that only describes effects not originally addressed by the statewide EIR.

Consistent with CEQA requirements, a range of mitigation measures could be required in a cooling system conversion to mitigate effects on physical, biological, cultural, and social resources.

7.2 ENDANGERED SPECIES ACT

The Endangered Species Act (ESA) is administered by the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS), which share responsibility for protecting “listed” plant and animal species and their critical habitat (when critical habitat is identified). Generally, USFWS manages land and freshwater species, while NMFS manages marine and anadromous species. Section 10 of the ESA applies to projects undertaken in the private sector. If a nonfederal entity, including a private landowner, proposes to undertake an activity that might incidentally (not intentionally) “take” a listed species, they must obtain an incidental take permit from the USFWS or NMFS. A request for an incidental take permit includes the preparation of a Habitat Conservation Plan, which is designed to minimize and mitigate any potential effects the activity may have on the species. The presence of threatened or endangered species (or designated critical habitat) would need to be assessed prior to any construction of new facilities (e.g., cooling towers).

7.3 CALIFORNIA ENDANGERED SPECIES ACT

The California Endangered Species Act (CESA) is administered by the California Department of Fish and Game (CDFG) to protect state-listed threatened, endangered, and candidate species. Similar to the incidental take permit available under the federal Endangered Species Act, the CDFG can issue an incidental take permit for activities meeting specific criteria. Criteria for an incidental take include impacts being minimized and mitigated, with mitigation measures being roughly proportional to the extent of the impact on the species. Adequate funding of mitigation activities is also a requirement for issuance of the incidental take permit.

7.4 FISH AND GAME CODE

The Fish and Game Code is administered by CDFG for the protection and conservation of the fish and wildlife resources of the state. The code includes the following:

Section 1602. (a) An entity may not substantially divert or obstruct the natural flow of, or substantially change or use any material from the bed, channel, or bank of, any river, stream, or lake, or deposit, or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake, unless... specific conditions defined within the code are met.

Section 1603. (a) After the notification is complete, the department (CDFG) shall determine whether the activity may substantially adversely affect an existing fish and wildlife resource.... The draft agreement shall describe the fish and wildlife resources that the department has determined the activity may substantially adversely affect and include measures to protect those resources.

7.5 CALIFORNIA NATIVE PLANT PROTECTION ACT

The California Native Plant Protection Act is also administered by the CDFG to preserve, protect, and enhance rare and endangered plants in the state. Enacted prior to the CESA, the Native Plant Protection Act extends protections to plants that are considered “rare,” in addition to those designated threatened or endangered. Requirements under the act are not as stringent as under the CESA; mitigation measures for impacts to rare plants are identified in a formal agreement between the project proponent and the CDFG.

8.0 SUMMARY

As noted above, a range of regulatory and permitting/approval requirements affect the conversion from once-through cooling to a wet cooling tower system. The specific requirements that will apply to individual facilities vary on a site-by-site basis. In addition, the roles and responsibilities of each agency will also vary for each site. For facilities that were originally permitted by the CEC, or where the project involves the addition of ≥ 50 MWe of generating capacity, the CEC will generally be lead agency for the permitting and review process. Where CEC does not have a role, the lead agency could be the CCC or local coastal planning agency, the RWQCB, the SLC, or another agency that regulates local development, such as BCDC.

In summary, conversion of once-through cooling systems to wet cooling towers

- Is consistent with the Ocean Protection Council resolution discouraging the use of once-through cooling, but does not call for conversion to closed-cycle cooling immediately.
- Will achieve compliance with RWQCB requirements for compliance with CWA Section 316(b). Though each plant must be evaluated individually, significant intake reductions may obviate the need for an NPDES permit for the intake structure, though a permit will be required for discharge structures under Section 402 of the CWA.
- Is consistent with the EAP’s goal of enhanced environmental protection. At the same time, the minor loss of efficiency may be inconsistent with other goals. The agencies involved in permitting will have to coordinate their actions to ensure compliance with the EAP. Overall, the EAP is not expected to preclude conversion, since the first priorities are energy conservation, development and use of renewable resources, and ensuring generation and distribution system reliability.
- Must be addressed with respect to long-term statewide and regional planning for climate change. A more immediate issue may be the CPUC’s recent determination to limit long-term contracts with baseload facilities to those with heat rates not exceeding 9,600 BTU/kWh. Retrofitting to wet cooling towers could cause a facility’s heat rate to exceed this threshold and impact long-term economic viability.
- Is consistent with the California Coastal Commission’s goal of conserving marine resources but may necessitate site-specific mitigation to address requirements to protect visibility, recreation, habitat, and land use resources.
- Will alter effluent characteristics and require modification of the facility NPDES permit (if effluent discharge is maintained). Increased concentrations of some pollutants, combined

with requirements to meet ELGs for cooling tower blowdown, may compel some facilities to adopt additional treatment systems or secure alternative discharge measures.

- Is not likely to be precluded by CAA permitting requirements. Conversion will likely trigger NSR at some facilities due to increased particulate emissions. This would necessitate facilitywide evaluation of control technologies and may require new or additional controls. In PM₁₀ nonattainment areas, facilities may have to obtain PM₁₀ emission reduction credits.
- Must address the unique design and safety criteria present at nuclear facilities and ensure that any proposed retrofit complies with applicable NRC design and safety regulations.
- Will require a determination of CEQA compliance, although the level of analysis will vary by site. At sites with limited impacts, a mitigation negative declaration may suffice. At other sites, particularly those with potentially significant land use, visibility, air quality and other impacts, an EIR may be required. A range of mitigation measures may also be required to address any effects on physical, biological, cultural, and social resources.