IMPLEMENTATION OF ONCE-THROUGH COOLING MITIGATION THROUGH ENERGY INFRASTRUCTURE PLANNING AND PROCUREMENT

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Your Link to Power

Arnold Schwarzenegger, *Governor*

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Abstract

This paper outlines a joint proposal by the California Energy Commission, the California Public Utilities Commission, and the California Independent System Operator Corporation to the State Water Resources Control Board intended to assure reliability of the electrical grid while substantially reducing the use of once-through cooling in existing coastal power plants. Rather than focusing on refitting existing power plants to reduce once-through cooling water intake/discharge, the proposed approach develops replacement infrastructure such that existing plants would no longer be needed for local reliability. This replacement infrastructure encompasses refitting existing plants to alternative cooling systems; repowering existing plants; and retiring the current site, possibly requiring transmission system upgrades to rely more upon remote generation. The State Water Resources Control Board has released its proposed once-through cooling mitigation policy, which substantially relies upon this joint agency proposal. The complexities of electrical system planning differ by region within California; thus the proposed approach can be implemented immediately for some regions but requires substantial further analysis of options in other cases. Such analyses would flow into California Public Utilities Commission procurement activities, California Independent System Operator Corporation transmission planning and project approval processes, and Energy Commission power plant licensing proceedings.

Keywords: California Independent System Operator Corporation, California Public Utilities Commission, California Energy Commission, State Water Resources Control Board, South Coast Air Quality Management District, Los Angeles Department of Water and Power, once-through cooling, local capacity requirements, electric system reliability, power plants, priority reserve

Summary

This paper outlines a proposal by the California Energy Commission (Energy Commission) and California Public Utilities Commission (CPUC), in conjunction with the California Independent System Operator Corporation (ISO), to the State Water Resources Control Board (SWRCB) intended to assure electrical grid reliability while substantially reducing once-through cooling (OTC) in existing coastal power plants.[1] The SWRCB's March 2008 preliminary OTC policy report established reliability as a condition for the design and implementation of an OTC mitigation policy but did not propose a mechanism to ensure that reliability is maintained.

In June 2008, the SWRCB formed an Inter-agency Working Group (IWG) to foster communication among seven agencies. The Energy Commission, the CPUC, and the ISO (Energy Agencies[2]) were encouraged to propose alternatives to the fixed compliance schedule proposed by the SWRCB staff in the March 2008 preliminary policy report.

The Energy Agencies propose to adapt existing planning, procurement, and project permitting processes to induce appropriate generation and transmission development to replace existing OTC facilities with some combination of repowered technologies onsite, new generation located in other areas, and/or upgrades to the transmission system. The Energy Agencies understand that the proposal has been accepted by the SWRCB staff and references to it were published as an element of the draft OTC policy on June 30, 2009.

This paper includes in its entirety the proposal made to the SWRCB on May 19 as well as an illustrative schedule for replacing existing OTC facilities. These two items appear as Appendices A and B of this paper. The SWRCB published Appendices A and B of this paper as Appendix C of its Substitute Environmental Document on July 15, 2009.

Background

In June 2006, the SWRCB issued a preliminary proposal concerning reduction of OTC impacts from existing power plants. The preliminary proposal elicited substantial comment expressly cautioning the SWRCB to consider electricity system reliability. In March 2008, the SWRCB issued a second preliminary OTC policy report for electric power plants that established reliability as a condition for the design and implementation of an OTC mitigation policy. The second proposed policy contemplated a phased compliance schedule with time included for the Energy Agencies and the transmission and generation industries to build new infrastructure or identify new resources quickly, thus assuring adequate electrical system reliability. The proposal used historic capacity factors as the basis for establishing fossil power plant compliance dates. Those plants with annual capacity factors below 20 percent were to comply with OTC mitigation by 2015, all other fossil plants by 2018, and the four nuclear units by 2021.

Staff from the Energy Agencies were concerned that the large number of power plants with low capacity factors now largely serving a reliability role could not be replaced realistically

[1] This paper has been reviewed and sanctioned through the management structures of the Energy Commission, the California Public Utilities Commission, and the California Independent System Operator Corporation, but it has not been formally approved or adopted by any of these organizations.

[2] For purposes of expressing collective recommendations, this paper will refer to these three organizations as the Energy Agencies.

by 2015 and that excessive "bunching" of compliance dates would risk creating reliability problems. This stimulated a discussion about the timeline to achieve a systematic schedule for replacement infrastructure.

In December 2008, the Energy Agencies made an initial proposal to the SWRCB that sketched a sequence of analysis, planning decisions, procurement and permitting, and construction of new infrastructure that would establish an operating time horizon for existing OTC power plants to be terminated as new infrastructure became operational. In subsequent meetings and discussions, the SWRCB staff and other members of the IWG communicated broad support for the proposal but also requested refinements that defined milestones and accelerated compliance timelines wherever possible. In particular, the SWRCB staff requested consideration for applying the general approach on a regional rather than statewide basis.[3]

This paper describes the final proposal submitted to the SWRCB on May 19, 2009, focusing on regional analysis and implementation, and leading to a specific schedule when each existing OTC power plant would no longer be required for reliability (updated chart provided on June 22, 2009, and shown in Appendix B).

Energy Agencies' Presumptions About Once-Through Cooling Mitigation

The SWRCB has been engaged in an effort to develop an OTC mitigation policy, and on June 30, 2009 published a draft policy that establishes closed cycle wet cooling towers as the benchmark for compliance. The Energy Agencies agree that a fixed-year outer bound on OTC mitigation compliance can be established, provided it allows for the orderly development of necessary replacement infrastructure and can be amended if conditions, such as permitting and construction delays, indicate that amendment is needed to ensure reliability. The Energy Commission is currently discouraging power plant applications that use once-through ocean water or fresh water-cooling technologies, so the general concept being applied by the SWRCB is already accepted practice for new power plants. This proposal also elaborates upon a general practice adopted by the CPUC in its 2006 Long-Term Procurement Plan (LTPP) rulemaking final decision, directing the investor-owned utilities (IOUs) to acquire new generation that will allow some retirement of existing aging power plants while integrating increasing amounts of renewable energy:

> To support the types of needs we anticipate in a [greenhouse gas]-constrained portfolio and to replace the aging units on which some of this authorization is based, we require [the IOUs] to procure dispatchable ramping resources that can be used to adjust for the morning and evening ramps created by the intermittent types of renewable resources. Preference should be given to procurement that will encourage the retirement of aging plants, particularly inefficient facilities with once-through cooling, by providing, <u>at minimum</u>, qualitative preference to bids involving repowering of these units or bids for

[3] While there are several alternative regional definitions in use among agencies for various specific purposes, for this purpose the local capacity areas used as the basis for resource adequacy requirements are the starting point. The relevant regions that are local capacity areas are San Diego, Los Angeles Basin, Ventura/Big Creek, Greater Bay Area, and Humboldt. To these the Central Coast has been added to encompass all once-through cooling facilities.

new facilities at locations in or near the load pockets in which these units are located.[4]

Preferred Approach

It is possible that the majority of power plant operators will retire their existing facilities rather than invest money to refit the old technologies to meet the proposed SWRCB requirements.[5] To preserve reliability in this case, repowers or new green field facilities enabled by upgraded transmission system capabilities will likely be the mechanism that allows OTC facilities to retire and to reduce or eliminate OTC impacts on the environment.[6] Until then, however, the existing OTC plants must continue to operate in most cases.

As identified in the ISO's P*reliminary Analysis of Reliability Impacts from Restrictions on Once-Through Cooling in California*, retiring plants currently viewed as necessary for local reliability will require replacement in the same area or transmission upgrades to meet local reliability needs must be made in addition to development of replacement generation somewhere else.[7] The preliminary analysis also lays out considerations for power plant development and retirement timing. The study evaluated generation shutdown scenarios of facilities that currently rely on OTC and provided conceptual transmission options, including their order-of-magnitude costs for mitigating the shutdown of these power plant groups. Although clearly preliminary and subject to change, the preliminary analysis reveals the extensive required system upgrades and high cost of relying upon transmission and remote resources that would allow large amounts of capacity to retire without replacement nearby.

The SWRCB's mission is to create policy that guides OTC mitigation for existing power plants. It cannot know whether operators of these existing power plants will choose to comply with the proposed requirements or retire. The more costly the requirements compared to the net revenues available from these facilities under expected market conditions, the more likely retirement becomes.

Meshing the environmental regulator perspective with that of the Energy Agencies is critical to ensure reliability. From the Energy Agency perspective, most capacity cannot be allowed to retire until replacement capacity needed to assure reliability is operational. Analyses of options to satisfy future requirements, planning decisions, procurement processes, permitting, and construction all take time and carry uncertainties that are not easily reduced to a specific date when replacement infrastructure can be certain to be operational. The Energy Agencies would prefer that an OTC mitigation regulation be specified in a conditional manner, that is, an existing OTC plant continues to operate until its replacement

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[4] California Public Utilities Commission, D.07-12-052, http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/76979.htm, p. 106, [111-112, and 115].

[5] With limited exceptions, representatives of the existing OTC plants confirmed this presumption at a May 11, 2009, workshop on OTC mitigation conducted by the Energy Commission as part of the *2009 Integrated Energy Policy Report* proceeding, transcript available at http://www.energy.ca.gov/2009_energypolicy/documents/2009-05-11_workshop/2009-05-11_Transcript.pdf.

[6] Some plant owners may choose to bring the cooling systems into compliance with the proposed SWRCB rules. This alternative is not presented in depth as it is presumed this process will take less time and, therefore, have fewer reliability impacts than building a new or repowered plant.

[7] California Independent System Operator, November 25, 2008, http://www.caiso.com/208b/208b8ac831b00.pdf

is operational. At that point, it can retire, and OTC harm ceases. On the other hand, the SWRCB must establish a policy that creates a deadline to force action by the operator of the plant. Creating a policy with a fixed compliance deadline allows its regional boards to issue necessary permits to the existing plants with knowledge that OTC mitigation will occur on a fixed schedule.

Therefore, the Energy Agencies strongly believe that implementation of an OTC mitigation policy for existing generators has to be integrated with planning and development of the replacement infrastructure necessary to support system reliability. Although estimated dates for new infrastructure being operational have been provided as part of the proposal to the SWRCB, these must be periodically reviewed and updated. Such updates must be reviewed by the SWRCB and, where significant changes have been made, must be used as the basis for changing the permits for existing OTC plants. The Energy Agencies are committed to working together and with the SWRCB to achieve this objective.

Energy Agency Policy Objectives and Constraints

State law and agency policies set forth objectives for the electricity industry that OTC replacement can help achieve. At the same time, reliability and other objectives constrain how quickly OTC replacement can occur. In examining infrastructure development, the approach preferred by the Energy Commission and the CPUC is to pursue system modernization compatible with three key policy objectives, while assuring reliable operation of the system:

- Retire and/or repower all aging power plants unless cost-effectiveness analysis justifies continued use of a specific unit at an aging plant.
- Facilitate sufficient power plant development to meet operational requirements to integrate intermittent renewable resource development, while complying with statewide and air basin air quality attainment plans for criteria pollutants.
- Implement Assembly Bill 32 (Núñez, Chapter 488, Statutes of 2006) goals for energy efficiency, demand response, and customer-side of the meter generation technologies to achieve the economy-wide greenhouse gas (GHG) reductions needed for AB 32 and the Governor's Executive Order S-20-06.[8]

Within the broad umbrella of linking OTC mitigation to the development of replacement infrastructure, many alternative plans could be developed. State agency policies emphasize preferred resource types. Taking these considerations into account would probably lead to a different set of proposed fossil power plants than would reliance upon a conventional fossil power plant replacement strategy, most likely a smaller set enabled by more renewable generation and its associated transmission, energy efficiency, distributed generation, and demand response. The following discussion identifies the broad consequences of pursuing these policy initiatives through the analyses of replacement infrastructure options and ultimately making procurement and construction decisions based on the options.

Repowering/Retiring Existing Plants

Since the *2005 IEPR*, the Energy Commission has pursued a policy of repowering or retiring aging power plants. In many instances, the OTC power plants targeted by SWRCB OTC policy were also identified in past *IEPR*s as aging. Closing or repowering such facilities to a

[8] Office of the Governor, October 17, 2006, http://gov.ca.gov/index.php?/executive-order/4484/.

new power plant using a cooling technology other than OTC resolves two concerns simultaneously. Some units may be cost-effectively refitted with alternative cooling systems.

The CPUC has authority to approve cost-based contracts for repowering facilities under Assembly Bill (AB) 1576 (Núñez, Chapter 374, Statutes of 2005), but would need to modify the procurement process to approve designated power plants for long-term contracts with IOUs. In May 2007, the CPUC held public workshops in the 2006 LTPP proceeding (R.06-02-013) to discuss AB 1576 implementation, but to date the CPUC has not used this authority.

Local Air Quality Constraints on New Power Plant Development

The July and November 2008 Superior Court decisions voiding the South Coast Air Quality Management District's (SCAQMD) Priority Reserve Rule and other related rules favorable to repowering of existing generation make unclear how some recently permitted projects, and any current and future power plant proposals in the Energy Commission licensing process, would be constructed in the SCAQMD air shed. SCAQMD's air quality permitting processes affect 7,500 megawatts (MW) of existing fossil capacity in the Los Angeles load capacity area of the ISO and the Los Angeles Department of Water and Power (LADWP) control area. Serious limitations will be placed upon power plant development in the South Coast Basin and nearby areas for some time. New facilities totaling 1,750 MW in capacity have power purchase agreements with Southern California Edison but cannot be licensed because they do not have access to the Priority Reserve. If this issue remains unresolved, these facilities will not be available to reduce the reliability threat from the proposed limitation on the use of OTC. This would significantly increase the challenge of siting new power plants needed to implement the OTC policy and steer solutions to rely more upon transmission system upgrades to tap remotely located generation.

Greenhouse Gas Mitigation

The energy industry's compliance with the detailed regulations that will implement the California Air Resources Board AB 32 *Climate Change Scoping Plan*[9] presumably leads to a lower electricity demand forecast, because additional energy efficiency measures will reduce demand and rooftop photovoltaic and other distributed generation will displace sales of electricity from the bulk power system to end users. A lower demand forecast would require fewer central station generating facilities within load pockets to satisfy reliability criteria. An AB 32 compliance plan presumably also strengthens the role of renewable power generation, which encourages more transmission development, lessening the need for energy from traditional fossil generation but simultaneously increasing the need for dispatchable facilities to provide reliability services. Recognizing these likely consequences from AB 32 implementation could lead to changes in both the mix and capabilities of fossil generation needed in load pockets, whether from repowered OTC plants or from new facilities that are electrically equivalent. Post-AB 32 goals announced by Governor Schwarzenegger in Executive Orders establishing a 33 percent Renewables Portfolio Standard and giving preference to renewable power generation would move even further in this direction than the legislative mandates of AB 32. CPUC staff recently issued a

[9] California Air Resources Board, *Climate Change Scoping Plan*, December 2008, http://www.arb.ca.gov/cc/scopingplan/document/scopingplandocument.htm.

report analyzing the costs, risks, and timing of meeting a 33 percent Renewables Portfolio Standard.[10]

Need for Further Analyses

The Energy Agencies are developing enhanced Local Capacity Requirement (LCR) analyses for the ISO Balancing Authority Area. Some areas lack excess capacity, and every megawatt of peak load increase or power plant retirement means replacement capacity must be developed. Some local capacity areas have surpluses, and some retirement could be tolerated. An Energy Commission staff paper illustrates how constraints on air credits in the Los Angeles Basin would lead to delays in OTC retirement.[11] Based on load and resource assumptions, these analyses will extend current LCR requirements out to 10 years and identify the amount of and various operating characteristics needed to plan for retirement of OTC capacity in some load pockets. The results of these analyses would be the key inputs into an Energy Agency OTC Power Plant Infrastructure Replacement Plan producing specific reliability designations, or dates that specific power plants could retire, as determined by the need for and expected timing of replacement infrastructure development. The plan would identify, for each region, the course of action required to eliminate reliance upon a power plant or unit using OTC. Most importantly, this plan would identify the complete set of infrastructure additions that, once operational, would allow OTC to be eliminated. Recognizing these problems, multiple bills addressing OTC mitigation and restoration of a functioning air quality credit mechanism for new power plants in the South Coast air basin have been proposed in the current session of the legislature.

Applying Existing Planning and Procurement Processes Regionally

To accomplish the retrofitting, repowering, or retirement of more than 30 percent of the power generating capacity in California, significant planning decisions, procurement authorization, and, ultimately, permitting of specific energy infrastructure projects will be necessary.[12] Of the five balancing authorities in California, all of the 19 generation plants with OTC units are encompassed within only two (the ISO and the Los Angeles Department of Water and Power [LADWP]). Of the 16 OTC plants in the ISO control area, 13 are located in transmission-constrained regions. Transmission constraints on the LADWP system also influence both the need for and options among refitting, repowering, and replacing the three OTC plants within the LADWP balancing authority. In sum, the need for OTC plants and options for retrofitting/refitting, repowering, or replacing them are more readily understood at this regional level. Thus, the Energy Agencies propose a process that does not have uniform schedules for all OTC facilities; rather, the regions whose problems are better

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[10] California Public Utilities Commission, *33% Renewables Portfolio Standard Implementation Analysis Preliminary Report*, June 2009.
http://www.cpuc.ca.gov/PUC/energy/Renewables/hot/33implementation.htm

[11] Energy Commission Draft Staff Paper, *Potential Impacts of the South Coast Air Quality Management District Air Credit Limitations and Once-Through Cooling Mitigation on Southern California's Electricity System*, February 2009, CEC-200-2009-002-SD.

[12] Retrofitting or refitting refers to the installation of a cooling system that complies with the proposed SWRCB policy. Repowering entails replacement of the existing boiler with advanced generation technology – improving thermal efficiency – and installing a compliant cooling technology. Retirement may, and often does, require replacement of the foregone capacity with generation at another location.

understood and where solutions are at hand should be required to reduce OTC harm more quickly than those regions where constraints on implementing solutions are more extensive.

Multi-Step Implementation Proposal

The implementation proposal submitted to the SWRCB encompasses three broad efforts. First, the agencies would conduct a series of studies examining the consequences of retiring individual or clusters of existing OTC power plants under a range of alternative futures and transmission system configurations to identify generation and transmission options for replacing each OTC facility. The Energy Commission would facilitate a review of the LADWP power plants, which are outside of the jurisdiction of the CPUC or the ISO. Second, key analytic results would be reviewed by the agencies to determine a broad strategy that is compatible with broad energy policy preferences. When results are available, they would be entered into the 2010 or 2012 CPUC LTPP proceeding for further analysis by the IOUs and consideration by the CPUC, with the objective of issuing procurement guidance to IOUs to acquire resources, and to the ISO transmission planning process to identify specific transmission projects. Third, necessary power plant additions would be approved by the CPUC and licensed by the Energy Commission, and necessary transmission projects would be licensed by the CPUC. Finally, staff of the Energy Agencies would monitor progress; the Energy Agencies would periodically inform the SWRCB regarding progress and, as appropriate, recommend changes.

Appendix A spells out this effort in greater detail. In particular, the analysis step is likely to have to be repeated periodically as new information is developed or in response to electricity system issues that could not be anticipated in earlier cycles. The SWRCB has acknowledged this possibility and built periodic review into its OTC mitigation policy.

Appendix A also identifies five key uncertainties that had not yet been resolved by the time this proposal had to be submitted to the SWRCB. These are:

- Availability of air pollution credits in SCAQMD for new power plants displacing OTC power plants, or repowers of existing OTC plants/units to eliminate OTC cooling technologies.
- Sequencing of bidding into utility request for offers (RFOs) versus permitting of a facility.
- The degree of reliance upon conventional generating facilities versus preferred technologies.
- Analyses of nuclear generating units at San Onofre and Diablo Canyon.
- Development of a comprehensive plan and preferential treatment of elements of the plan in licensing proceedings compared to proposed facilities not included within the plan.

Expected OTC Replacement Schedule

Appendix B provides a nominal schedule for creating replacement infrastructure for all OTC power plants. The table and its footnotes identify that construction of replacement infrastructure for some OTC plants is already underway or even operational. The replacement infrastructure for other power plants requires substantial analysis of the

options, decisions among the Energy Agencies, and then procurement, permitting, and construction lead times. The complexities of these analyses differ from one region to another, with the Los Angeles Basin expected to be the most problematic given severe limitations on the air credits needed for new generation development. For this reason, the schedule of dates for replacement infrastructure typically is further into the future for the existing OTC plants located in the Los Angeles Basin.

Next Steps

This paper presents the background necessary to understand the two components of the proposal by the Energy Agencies submitted to the SWRCB on May 19, 2009, (with minor updates to the OTC chart made on June 22, 2009). The two components are reproduced as Appendices A and B. The Energy Agencies are now compiling information about the evaluations that are relevant to the OTC power plants in the various regions, and preparing a workplan for those further analyses that are needed. The analytic work will be initiated in the third quarter of 2009 and continued through 2010 with results for various regions released as completed.

The Energy Commission and the CPUC will conduct a joint workshop as part of the Energy Commission's *2009 Integrated Energy Policy Report* proceeding and the CPUC's 2008 LTPP rulemaking on July 28, 2009, to solicit input from the generator community, environmental groups, agencies with environmental responsibilities, and the public. Technical staff of the three Energy Agencies will be available to answer questions about this proposal.

APPENDIX A: Specific Proposal for Planning and Procurement of Electricity Infrastructure

This narrative description of the Energy Agency proposal was submitted to the SWRCB on May 19, 2009.

Background

In March 2008, the State Water Resources Control Board (SWRCB) issued a preliminary once-through cooling (OTC) policy report for electric power plants establishing reliability as a condition for the design and implementation of an OTC mitigation policy. The proposed policy contemplates a phased compliance schedule that would allow sufficient time for the energy agencies and the transmission and generation industries to build new infrastructure or identify new resources in a timely manner, thus assuring adequate electrical system reliability. The following outline identifies the steps that the California Public Utilities Commission (CPUC), California Energy Commission, and California Independent System Operator Corporation (The California ISO) intend to undertake to support the SWRCB efforts. This proposal seeks to address the replacement or repowering of OTC power plants through an approach that (1) maintains reliability of the electric system; (2) meets California's environmental policy goals; and (3) achieves these goals through effective long-term planning for transmission, generation and demand resources. The proposal relies upon use of competitive procurement and forward contracting mechanisms to identify low cost solutions.

The SWRCB recognized that its implementation process could create transitional problems, so it created an Inter-agency Working Group (IWG) to review these implementation challenges and other aspects of the proposed policy.

In a December 15, 2008 paper, the Energy Commission and the CPUC in conjunction with the California ISO proposed an alternative approach to the fixed time schedule to reduce OTC in existing coastal power plants, while assuring reliability of the electrical grid.[13] That paper broadly sketched out changes to planning, procurement and project permitting processes to encourage repowering or new infrastructure so that retirement of OTC facilities can occur without threatening reliability. In subsequent meetings and discussions, the SWRCB staff and other members of the IWG communicated broad support and requested refinements that defined milestones and accelerated compliance timelines wherever possible. In particular, the SWRCB staff requested consideration of applying the general approach on a regional, rather than statewide basis.[14] This paper modifies the original proposal, focusing on regional analysis and implementation.

Proposal for Planning and Procurement of Electricity Infrastructure

To accomplish the retrofitting, repowering or retirement of more than 30 percent of the power generating capacity in California, significant planning decisions, procurement authorization, and ultimately permitting of specific energy infrastructure projects will be necessary.[15] Of the five balancing authorities in California, only two (the California ISO and the Los Angeles Department of Water and Power (LADWP)) are needed to encompass all of the 19 generation plants with OTC units. Of the 16 OTC plants in the California ISO, 13 are located in transmission constrained regions. Transmission constraints on the LADWP system also influence both the need for and options among refitting, repowering and replacing the three OTC plants within the LADWP balancing authority. In sum, the need for OTC plants and options for repowering or replacing them are more readily understood at this regional level. Thus, the Energy Agencies propose a process that does not have uniform schedules for all OTC facilities; rather, the regions whose problems are better understood and where solutions are at hand should be required to reduce OTC harm more quickly than those regions where constraints on implementing solutions are more extensive.

Listed below are the key steps of this approach that will result in an OTC Power Plant Replacement Infrastructure Plan (Plan) and the permitting and procurement steps that will implement it.

1. Establish regional basis for analyses and identify existing transmission and system operations studies relevant to establishing constraints on the retirement of specific OTC plants/units:

[13] For purposes of expressing collective recommendations, this paper will refer to these three organizations as the Energy Agencies.

[14] While there are several alternative regional definitions in use among agencies for various specific purposes, for this purpose the local capacity areas used as the basis for resource adequacy requirements are the starting point. The relevant regions that are local capacity areas are San Diego, Los Angeles Basin, Ventura/Big Creek, Greater Bay Area, and Humboldt. To these the Central Coast has been added to encompass all once-through cooling facilities.

[15] Retrofitting refers to the installation of a cooling system that complies with the proposed SWRCB policy. Repowering entails replacement of the existing boiler with advanced generation technology – improving thermal efficiency – and installing a compliant cooling technology. Retirement may, and often does, require replacement of the foregone capacity with generation at another location.

a. Review definition of the regions to understand local reliability issues and assign OTC facilities to each region.

b. Review existing Local Capacity Requirement (LCR) studies of those regions containing OTC plants. Review specific new generation and transmission project proposals and licensing decisions by regulatory agencies for impacts on future LCR values.

c. Review other regional and system studies to determine the operating characteristics of the current generating fleet, how the amount of needed characteristics could change going forward under preferred resource (energy efficiency, renewable, and demand response) and transmission to support those resources, and the implications of OTC plant/unit retirements for the necessary characteristics of replacement facilities.[16]

d. Compile results of Steps 1.a through 1.c and identify, to the extent possible, a realistic development schedule for needed replacement infrastructure to establish the dates by which existing OTC power plants/units will no longer draw in and discharge ocean water above levels allowed by the SWRCB policy. For those plants/units requiring further analyses, Step 2 is needed.

2. Complete an enhanced Local Capacity Requirement evaluation, or other relevant assessment, for each region that contains OTC power plants, and update amounts of necessary operating characteristics as needed.[17]

   a. The Energy Commission and the CPUC will develop scenarios of annual load projections for each region, any projected generation or resource additions or non-OTC retirements for each region, and any transmission project upgrades or additions+ in each year from 2012 up to and including 2019 reflecting alternative ways in which preferred resource development policies could be implemented. The Energy Commission and the CPUC, in consultation with the California ISO, will review these scenario results and select the assumptions to be used for the following enhanced LCR evaluation.

   b. The California ISO will prepare an enhanced LCR evaluation for each year 2012 to 2019 based on those projections and available The California ISO –performed transmission studies.[18] These enhanced LCR evaluations will identify expected

[16] As an illustration, the California Independent System Operator study of the implications of 20 percent penetration of renewable generation, November 2007.

[17] Enhanced implies conducting an local capacity requirement-style analysis of capacity needs, but doing so 10 years forward and identifying the impacts of specific once-through cooling retirements or transmission developments on the area's local capacity requirement projections.

[18] Three of the facilities that use once-through cooling are operated by the Los Angeles Department of Water and Power. As a publicly-owned utility, Los Angeles Department of Water and Power makes investment decisions in the interests of its customers and does not come under the jurisdiction of the California Public Utilities Commission. As a separate control area, it is responsible for its own reliability studies and is not part of the California Independent System Operator's balancing authority area. The Energy Agencies believe the elimination of once-through cooling at these facilities will require the development of new infrastructure. Therefore, it is possible that the Los Angeles Department of Water and Power will need to compete with generator owners to secure Emission Reduction Credits (ERCs) in the air shed under SCAQMD jurisdiction. The Energy Commission hopes to facilitate the Los Angeles Department of Water and Power's cooperation in the Plan; however, absent such cooperation the Energy Agencies will proceed to develop the Plan as it pertains

generation capacity needed within the LCR Areas and OTC regions for each year for given transmission system configurations.

c. The Energy Agencies will then compare projected LCR needs with total expected generation less the capacity represented by OTC power plants/units in each LCR Area to identify the necessary capacity to replace OTC power plants/units in each region. The sequence for removing OTC plants/units through time will be based on effectiveness in mitigating various system contingencies, plant/unit-specific characteristics, and other operational needs in maintaining reliability.

d. The California ISO, in consultation with the CPUC and Energy Commission, will identify the specific characteristics of that capacity (e.g. ramping ability, minimum load constraints, regulation requirements, etc.) needed to meet systems needs once the OTC plants are retired.

e. The Energy Agencies will jointly identify what additional system capacity is needed in connection with replacing each OTC power plant/unit. While replacement capacity needed in an LCR area may be less than that provided by OTC plants/units, system-wide capacity needs may require additional power plant development elsewhere in the California ISO balancing authority area.

f. The California ISO envisions performing enhanced LCR studies each year that can support efforts to refine capacity requirements set forth in the Plan. Any updates to the Plan would occur in consultation and agreement by the Energy Agencies and would be made available to the IWG (or the Statewide Task Force) which would be formalized upon approval of the OTC Policy and the SWRCB. Any Plan updates may also reflect transmission and/or generation infrastructure constructed and completed).

g. For those OTC power plants that are not located in LCR Areas, the Plan would consider the need for capacity located within the California ISO balancing authority area (or LADWP balancing authority area) to serve system need.

3. The Energy Agencies will review the results of Steps 1 and 2 and, for each region, describe the course of action required to eliminate reliance upon a power plant/unit using OTC as a cooling technology. A specific schedule for each existing OTC plant/unit would be developed that identifies the latest date it would operate using OTC technology. After such date, the plant/unit will lose its reliability designation. New generating capacity would satisfy the characteristics identified in Step 2d. Collectively this set of decisions about OTC elimination and replacement infrastructure would be referred to as the "Plan." This initial version of the Plan would be updated periodically as a result of actual experience with generation and transmission project development timelines, or other material changes in assumptions affecting infrastructure needs.

4. The SWRCB and its regional boards would use the Plan as the basis for establishing an OTC mitigation policy and for issuing NPDES permits for each plant/unit based on its reliability designation. The projected date of operation of the specific replacement

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to once-through cooling power plants within the California Independent System Operator's balancing authority area.

infrastructure needed to assure reliable operation of the grid without the facility using OTC technology should be the basis for the expiration date for that plant/unit's permit.

5. The Energy Commission would review the Plan to determine how its power plant licensing process may be affected, and to facilitate air quality management district (AQMD) review by:

    a. Providing an estimate to each local AQMD of the magnitude of air quality credits likely to be required for licensing the new or repowered generating facilities included within the Plan.

    b. Obtaining AQMD concurrence that the volumes of credits used in the studies were credible, or working with an AQMD to devise valid sources of credits and estimates of their costs.

    c. Communicating any significant change in assumptions about air credit availability and costs back to other entities involved in studies and procurement activities.

6. The CPUC would authorize IOU procurement mechanisms to require the IOUs to conduct a large set of targeted RFOs following the 2010 and subsequent long-term procurement proceedings. These targeted RFOs would focus on acquiring needed replacement capacity in appropriate locations with operational characteristics that would allow existing OTC plants/units to retrofit, repower or retire consistent with the Plan.

7. The California ISO will consider SWRCB directives and schedules limiting or canceling water permits required to operate OTC plant/units in the 2011 and subsequent annual Transmission Planning Process. The California ISO will conduct an analysis as part of its Transmission Planning Process reflecting projected OTC plant/unit retirements as a result of SWRCB permitting directives and schedules, which shall be incorporated into the California ISO's annual Transmission Plan that serves as a basis for further economic or reliability based transmission upgrades or additions.

8. Once each targeted RFO was complete, generator retrofits, repowers or new generating facility development assumptions would be updated in the Plan, to the extent the results from the RFOs differ from the previous edition of the Plan. Any updates to the Plan would result in the SWRCB, or its regional boards, modifying permits for various power plants/units depending upon their role in carrying out the Plan.[19]

9. If there are changes (e.g. delays in project development or major modifications to forecast assumptions) in the infrastructure development assumptions (e.g. transmission upgrades or additions are not on schedule, or new generating capacity is not operational) upon which the Plan is based, the Energy Agencies will perform appropriate analysis and inform the SWRCB, or its regional boards, of the new time period that a specific OTC plant/unit is required for system reliability.

[19] For some once-through cooling power plants, this would mean issuing a time-limited permit allowing the plant to operate without change until a specific date at which time it would be shut down and no permit extensions allowed. For other power plants with longer timelines for continued operations, some modification of water intake structures and water usage patterns would be required, but still the plant would not be required to undergo major change because it is scheduled to be retired by a specific date. For still other plants, shifts to closed cycle cooling would be required consistent with long-term continued usage of the power plant.

10. The Energy Agencies will periodically update the Plan to reflect changing system conditions and transmission and generation developments to ensure that OTC mitigation is timely while preserving system reliability. It is possible that transmission upgrades and additions associated with California's Renewable Energy Transmission Initiative may address some system reliability concerns raised by OTC power plant retirements. The Energy Agencies intend to review these developments and incorporate them into the Plan for OTC power plant retirements.
11. The SWRCB would periodically review the Plan and, for each unit with an official reliability designation, modify the OTC permit expiration date to match the reliability designation of the unit. For units without such a designation, the SWRCB would establish compliance requirements and a schedule that transforms these into a water use permit.

Unresolved Issues for this Proposal

Some elements of this proposed approach remain unresolved. These include the following elements that are discussed below:

- Air pollution credits in South Coast Air Quality Management District (SCAQMD) for new power plants displacing OTC power plants, or repowers of existing OTC plants/units to eliminate OTC cooling technologies,
- Sequencing of bidding into utility RFOs versus permitting of a facility,
- Reliance upon conventional generating facilities or preferred technologies,
- Analyses of nuclear generating units at San Onofre and Diablo Canyon, and
- Development of a comprehensive Plan and preferential treatment of elements of the Plan in licensing proceedings compared to proposed facilities not included within the Plan.

Air Pollutant Credits in SCAQMD

Acquiring sufficient air credits through a revitalized Priority Reserve or some other mechanism is necessary for new or repowered generators in the SCAQMD. Only limited OTC retirement can happen without serious reliability consequences unless new or repowered plants can be constructed in the SCAQMD's jurisdiction.[20] The July and November 2008 court decisions in the challenge of the SCAQMD's "priority reserve" requirements has complicated the situation, making it extremely difficult for new power plants to be sited in the Los Angeles Basin. This challenge will make it difficult for most aging power plants to be closed in the Los Angeles coastal region, until new generation or transmission can be constructed. Tradeoffs exist between the need to protect water quality, satisfy air quality requirements and ensure electrical system reliability, while moving toward greater levels of renewable generation as called for by Assembly Bill 32 (AB 32) and the Governor's recent Executive Order calling for increased levels of renewable generation.

[20] Energy Commission Draft Staff Paper, *Potential Impacts of the South Coast Air Quality Management District Air Credit Limitations and Once-Through Cooling Mitigation on Southern California's Electricity System*, February 2009, CEC-200-2009-002-SD.

Sequence of Bidding and Permitting of Proposed Facilities. The sequence of Energy Commission permitting versus generator bidding into an IOU RFO raises several questions:

- Whether power plants would be required to have an Energy Commission permit as a condition of bidding into an IOU RFO.
- Whether power plants would be required to have entered the Energy Commission permitting process and have satisfied specific milestones as a condition of bidding into an IOU RFO.
- Whether winners of an IOU RFO would receive expedited treatment from the Energy Commission in the permitting process compared to other applicants.
- Whether advance guidance can steer proposed power plants into locations likely to be permitted by the Energy Commission.

Conventional versus Preferred Technologies to Replace OTC Facilities

A straightforward solution to the OTC problem is to repower existing OTC facilities by installing a new prime mover that does not use ocean water for cooling.[21] This approach makes use of the existing electrical switchyard, perhaps eliminates consideration of new transmission lines that would allow retirement of some facilities without replacement on site, and essentially preserves the existing electrical system as much as possible. However, this approach would likely have considerable problems in SCAQMD in finding needed air credits and it would fail to address the policy preferences established by the Energy Agencies through the Energy Action Plan process or the need to reduce reliance upon fossil power plants to achieve AB 32 GHG emission reduction goals. Assessing the feasibility of major changes to the system through increased reliance upon renewable, resources, upon rooftop solar PV and other distributed generation technologies, enhanced energy efficiency program impacts reducing load, etc. is necessarily more complex and time consuming than simply endorsing a repowering strategy with little thought to the very long term consequences.

Analyses of Nuclear Generating Units

The four nuclear generating units located at San Onofre and Diablo Canyon represent unique elements of California's electrical generating system and both its positive and negative dimensions. From the perspective of the SWRCB, these four units are the largest source of biologic harm. From traditional air quality criteria pollutant or GHG perspectives, nuclear plants are viewed as highly beneficial, and OTC mitigation requirements that might cause them to shut down would exacerbate overall problems to be overcome. The nuclear units supply a significant percentage of the energy used by California end-users, operating as baseload units with very high capacity factors. Refitting these plants with alternative cooling systems or replacing their capacity and energy require special studies. Unfortunately, studies of the generation versus transmission tradeoffs of the aging fossil fleet may have different results depending on whether the nuclear units are assumed to operate as they do today for an indefinite future, or whether they are retired when their current Nuclear Regulatory Commission permits expire in 2021-2023.

[21] A prime mover is the basic source of heat energy for running the generating turbine, e.g. a steam boiler, a combustion turbine, a nuclear reactor.

Creation of a Comprehensive Plan to Enable Preferential Treatment for Some Projects

Creating a formal Plan and adopting that Plan through a CEQA-compliance process could have value by subsequently providing preferential treatment (reduced consideration of alternatives, accelerated time schedule, etc.) in the applicable licensing processes for individual projects or facilities included within the Plan. Multiple agencies now have licensing authority over various infrastructure projects, although the Energy Commission licenses the majority of the likely power plant additions and the CPUC licenses the majority of the expected transmission line upgrades. The individual CEQA reviews now implemented for new power plants and transmission lines might be conducted en masse for infrastructure additions part of the Plan. Since the Plan represents a comprehensive, multi-facility replacement of multiple existing facilities, it may be appropriate to revise Energy Agencies' review processes to consider multiple facilities as a package, and to accelerate this consideration. This will be among the alternatives that Energy Agencies will consider when fully developing this alternative approach to OTC mitigation.

Next Steps

This present document represents an attempt to incorporate the feedback to date and internal discussions among the Energy Agencies. The Energy Agencies are now compiling information about the evaluations that are relevant to the OTC power plants in the various regions, and preparing a workplan for those further analyses that are needed. The analytic work will be conducted over the second quarter of 2009.

The Energy Commission will conduct a joint workshop as part of the Energy Commission's 2009 Integrated Energy Policy Report proceeding on May 11, 2009 to solicit input from the generator community, environmental groups, agencies with environmental responsibilities, and the public. The Energy Agencies will participate in this workshop.

Following the workshop, technical staff of the Energy Agencies will determine whether and how to modify this proposal, and inform the SWRCB staff of any such suggested changes.

APPENDIX B: Draft Infrastructure Replacement Milestones and Compliance Dates for Existing Power Plants in California Using Once-Through Cooling

The following tabular chart shows the milestones for each OTC power plant using the key steps of the joint Energy Agency implementation proposal was submitted to the SWRCB on May 19, 2009, and updated on June 22, 2009.

Draft Infrastructure Replacement Milestones and Compliance Dates for Existing Power Plants in California Using Once-Through Cooling

Region (Balancing Authority)	Existing Facility Name	Infrastructure Replacement Milestones[i]							
		CAISO Enhanced LCR Study[ii]	CAISO-CPUC-CEC Infrastructure Replacement Plan[iii]	CPUC Procurement[iv]		CAISO Annual Transmission Plan[8]	CPUC Transmission Permitting[7]	Known Replacement Infrastructure Operational[9]	Unspecified Replacement Infrastructure Operational[9]
				LTPP Approval[v]	Gen Project Approval[vi]				
Humboldt	Humboldt Bay Power Plant[10]	Not required[19]	Pre-Plan[20]	Complete	Complete	Gen solution	N/A	Q3 2010	N/A
San Diego	South Bay Power Plant (partial capacity)[11]	Not required[19]	Pre-Plan[20]	Complete	Complete	Gen solution	N/A	Q4 2009	N/A
	South Bay Power Plant (remaining units)[12]	Not required[19]	Pre-Plan[20]	Trans solution	Trans solution	Complete	Complete	Q3 2012	N/A
	Encina Power Plant	Q4 2009	Q1 2010	2011	2013	2011	2015	N/A	2017
Bay Area	Potrero Power Plant (Unit 3)[13]	Not required[19]	Pre-Plan[20]	Trans solution	Trans solution	Complete	Complete	Q1 2010	N/A
	Contra Costa Power Plant (1 of 2 units)[14]	Not required[19]	Pre-Plan[20]	Complete	Complete	Gen solution	N/A	Q2 2009[21]	N/A
	Contra Costa Power Plant (second unit)	Q4 2009	Q1 2010	2011	2013	2011	2015	N/A	2017
	Pittsburg Power Plant								
Central Coast	Moss Landing Power Plant[15,16]	Q4 2009	Q1 2010	2011	2013	N/A	N/A	N/A	2017
	Morro Bay Power Plant[16]	Not required	Pre-Plan	complete	complete	N/A	N/A	Q1 2009[22]	N/A
Ventura/Big Creek[17]	Mandalay Generating Station	Q4 2010	Q2 2011	2013	2015	2012	2016	N/A	2020
	Ormond Beach Generating Station								
Los Angeles Basin[17] (CAISO)	El Segundo Generating Station	Q4 2010	Q2 2011	2013	2015	2012	2016	N/A	2020
	Huntington Beach Generating Station								
	Redondo Generating Station								
	Alamitos Generating Station								
Los Angeles Basin[17] (LADWP)	Haynes Generating Station[18]	Not under The California ISO balancing authority or the CPUC jurisdiction. The Energy Commission is conferring with LADWP to understand in-basin capacity requirements and processes for accomplishing OTC mitigation.							
	Harbor Generating Station[15,18]								
	Scattergood Generating Station[18]								
Nuclear Plants	Diablo Canyon Power Plant								
	San Onofre Nuclear Generating Station								

[i] These infrastructure milestones assume no litigation about facility permits following appropriate agency approvals.

[ii] California Independent System Operator Corporation (The California ISO) would conduct an enhanced Local Capacity Requirement (LCR) study identifying the impacts of specific OTC retirements or transmission developments on the local area's LCR projections 10 years out. The California ISO will use assumptions about load and generation developed jointly with the California Energy Commission (Energy Commission) and the California Public Utilities Commission (CPUC).

[iii] The Infrastructure Replacement Plan developed jointly and updated by the California ISO, Energy Commission, and the CPUC would identify the complete set of infrastructure needed to make OTC plants/units redundant for grid reliability. It would advise the SWRCB about the reliability designations of specific power plants.

[iv] CPUC would modify its Long-Term Procurement Plan (LTPP) proceeding and procurement processes to require the investor-owned utilities (IOUs) to assess replacement infrastructure needs and conduct targeted request for offers (RFOs) to acquire replacement or repowered generation capacity. CPUC also has authority to approve cost-based contacts under AB 1576.

[v] CPUC has authority to order the IOUs to procure new (or repowered) fossil generation for system reliability in the LTPP proceeding. LTPP proceedings are conducted on a biennial cycle and plans are normally approved in odd-numbered years.

[6] Once authorized to procure by a CPUC LTPP decision, it takes 18 months for the IOUs to issue an RFO for generation (new or repowered), sign contracts and submit applications to the CPUC for approval. Approval by the CPUC takes 9 months. If the contract involves a facility already licensed by the Energy Commission, then financing and construction can begin. Generation permitting for thermal technologies >50 MW in capacity is under Energy Commission authority, and may take place before, after or during the CPUC contract approval process. The Warren-Alquist Act authorizes the Energy Commission to license certain categories of power plants and related structures. The Energy Commission's siting process has been determined to be a certified regulatory program under the California Environmental Quality Act (CEQA) and the functional equivalent of preparing environmental impact reports (EIRs). The Energy Commission is the lead agency and consults with other relevant agencies. The standard licensing process is normally conducted in 12 months, but streamlining of the permitting process may be an option so multiple facilities can be considered as a package (planning level EIR). Reviews should be somewhat faster because impacts to water resources are by definition minimized; impacts to the grid reliability are already considered and mitigated; and conformity to state laws and regulation has been considered under the Plan.

[7] Transmission permitting is under CPUC authority. Proposed transmission facilities to meet needs identified in the California ISO Annual Transmission Plan to replace OTC plants/units would be brought to the CPUC for approval.

[8] Transmission solutions (upgrade and/or new addition) that would make specified OTC system redundant would be analyzed in the California ISO Annual Transmission Plan. The California ISO will consider SWRCB directives and schedules limiting or canceling water permits required to operate OTC plants/units in the 2011 and subsequent annual Transmission Planning Process (TPP). The California ISO will conduct analysis as part of its TPP reflecting projected OTC plant/unit retirements as a result of SWRCB directives and schedules, which shall be incorporated in to the California ISO's annual Transmission Plan that serves as the basis for further transmission upgrades or additions.

[9] These compliance dates may change subject to the California ISO-Energy Commission-CPUC Infrastructure Replacement Plan produced in Q1 2010 and updated periodically. All dates assume a generation solution that requires an Energy Commission permit. If a permit has been acquired prior to CPUC contract approval, then an earlier on line date is possible. If transmission solutions are selected, then longer time lines would be expected.

[10] Humboldt Repower generation project is approved by the CPUC and expected operational by Q3 2010. This new infrastructure will eliminate OTC at the Humboldt Power Plant.

[11] Otay Mesa Power Plant is in construction and expected operational by Q4 2009. This new infrastructure is expected to displace a portion of the need for the capacity of the South Bay Power Plant.

[12] Sunrise Powerlink transmission project is approved by the CPUC and expected operational in 2012. This new infrastructure is expected to displace the need for remaining South Bay Power Plant capacity.

[13] TransBay Cable transmission project is expected operational by Q1 2010. This new infrastructure is expected to replace the need for Potrero Unit 3.

[14] The new Gateway Generating Station became operational in January 2009. This new infrastructure is expected to replace the need for one unit at the Contra Costa Power Plant.

[15] Units that have recently been repowered will be addressed separately.

[16] Not needed for local network reliability, according to a November 26, 2008 preliminary The California ISO Study, although may be needed for system resource adequacy requirements.

[17] Due to siting/land use and air quality constraints, it is likely that a combination of new generation and transmission infrastructure will be necessary to replace the need for OTC plants/units in the Ventura/Big Creek and L.A. Basin regions.

[18] Owned and operated by the Los Angeles Department of Water and Power, its own balancing authority (not controlled by The California ISO).

[19] No further study is required. Existing studies are sufficient to determine reliability designation of specified OTC facilities.

[20] Replacement infrastructure sufficient to determine reliability designation of specified OTC facility was identified prior to development of the Infrastructure Replacement Plan.

[21] Contra Costa Power Plant is under contract to PG&E until 2011.

[22] Morro Bay units 3-4 have contracts with SCE through Q4 2011.