Report of the Statewide Advisory Committee on Cooling Water Intake Structures

September 29, 2011

I. Introduction and Executive Summary

The Statewide Advisory Committee on Cooling Water Intake Structures (SACCWIS)[1] has prepared this report to the State Water Resources Control Board (Water Board) in connection with implementation plans submitted by non-nuclear power plant owners on April 1, 2011, as contemplated by the Water Board's statewide policy on the use of coastal and estuarine water for power plant cooling.[2] The statewide policy requires SACCWIS to advise the Water Board on whether the statewide policy's compliance schedule takes into account electric grid reliability. Section 3(b)(2) of the Water Board's statewide policy provides in part: "The SACCWIS shall review the owner or operator's proposed implementation schedule and report to the State Water Board with recommendations no later than October 1, 2011." SACCWIS will also report to the Water Board with recommendations on modifications to the implementation schedule every year starting in 2012.[3]

This report describes SACCWIS' initial review and observations of implementation plans submitted by power plant owners for generating facilities subject to the statewide policy in the ISO's balancing authority area. SACCWIS recommends that the Water Board modify its statewide policy as follows:

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[1] SACCWIS includes representatives from the California Energy Commission (CEC), California Public Utilities Commission (CPUC), California Coastal Commission (CCC), California State Lands Commission (SLC), California Air Resources Board (ARB), the California Independent System Operator Corporation (ISO), and the Water Board.

[2] A copy of the Water Board's statewide policy, effective on October 1, 2010, is available at the following Web site: http://www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/docs/policy100110.pdf

[3] Statewide policy at section 3.B(4).

- Develop a compliance schedule on a unit-by-unit basis at existing power plants rather than on a facility-wide basis; and
- Require generators to supplement their implementation plans annually as new information becomes available.

This report also describes analysis that the CPUC, CEC and ISO are undertaking that will serve as a basis to advise the Water Board on or before March 31, 2012 of the need for changes to the statewide policy's compliance schedule. This report does not address implementation plans for the Diablo Canyon Power Plant or San Onofre Nuclear Generating Station. These nuclear-fueled power plants are subject to a separate study process under the Water Board's statewide policy.

II. SACCWIS' review of generator implementation plans has resulted in several observations that the Water Board should consider.

This section addresses the following issues, discussed in more detail below:

- SACCWIS' initial review of generator implementation plans.
- The implementation plans reflect the presumption that California should preserve all generating capacity subject to the statewide policy.
- The need for the CPUC to authorize procurement by investor owned utilities.
- The Water Board should examine compliance on a unit-specific basis.
- The implementation plans reflect the presumption that Track 2 compliance measures under the statewide policy can succeed.
- The Water Board will need additional information from power plant owners.
- The ISO, CPUC and CEC need to complete further analyses of generator implementation plans.

A. SACCWIS has conducted an initial review of generator implementation plans.

In advance of April 1, 2011, the Water Board issued letters to each power plant owner subject to the statewide policy specifying items to include in implementation plans. The Water Board then hosted a workshop for generators on February 7, 2011. Representatives of SACCWIS members, including the ISO, CPUC and CEC participated in this workshop. While the Water Board received implementation plans from power plant owners on or about April 1, 2011, SACCWIS' members and their technical staff did not have immediate access to these implementation plans because of the logistics of posting a large volume of information on the Water Board's Web site and because one generator owner requested confidential treatment of some information. In order to access confidential information, state agency members of SACCWIS signed a memorandum of agreement (MOA), which required SACCWIS to meet so that authorized representatives of each agency could sign the MOA. The ISO also signed the MOA but separately entered into confidential agreements with generator owners where needed so that the ISO could obtain confidential information for purposes of its participation on the SACCWIS. At the request of the Water Board, SACCWIS focused on providing a review of the Los Angeles Department of Water and Power's implementation plan and devoted considerable resources to LADWP issues in preparation for a Water Board meeting in July 2011.

Water Board staff and CEC staff both prepared assessments (in spreadsheet format) of the generator implementation plans. This effort was intended to facilitate an understanding of any differences between the implementation plans and the adopted statewide policy, summarize how generators proposed to comply with the requirements of the statewide policy, and whether these implementation plans were consistent with other available information. CEC staff prepared an additional document describing, in narrative form for each power plant subject to the statewide owners, the power plant owner's proposal for the units at that plant, further clarifications needed from the power plant owner, and analyses that might be necessary to determine if the statewide policy's compliance schedule or the generator's implementation plans might result in electric

grid reliability consequences.[4] ISO staff reviewed and edited this document, which was discussed with the staff of SACCWIS' members. The CEC provided a copy of the document to the Water Board staff as a guide to enable the Water Board to engage in discussion with, or request further information from, each power plant owner.

B. The implementation plans reflect the presumption that California should preserve all generating capacity subject to the statewide policy.

Most generator implementation plans reflect that the aggregate capacity from all power plants subject to the statewide policy should be preserved. In most instances, generators propose to repower the units at an existing power plant facility using air as opposed to wet cooling. Some generator owners propose to preserve the existing power plant for some extended period by implementing Track 2 measures, which the statewide policy states may be accomplished by either operational or structural controls, or both. Generators can accomplish Track 1 compliance by implementing an acceptable cooling technology, such as closed cycle wet cooling system or closed cycle dry cooling. Only one generator proposes to refit the cooling system of an existing power plant by substituting the existing cooling system with air or evaporative cooling towers. Some generator owners submitted schedules showing multiple phases of repowering for the various units at a power plant that will result in at least as much capacity as exists today. These plans seek to minimize any periods of time in which construction of new units combined with demolition of existing units would result in a loss of aggregate power plant capacity. Many of these repowering proposals are for generators in the Los Angeles Basin. The implementation plans reflect that existing units will retire when the new units are completed and placed in-service.

SACCWIS has reviewed available local capacity studies in the ISO's balancing authority area in conjunction with its review of generator implementation plans. Local capacity studies identify the need for generation within a transmission constrained area to serve end-user load and relieve contingencies. The ISO completes these studies

[4] CEC and ISO Staff, *Overview of Further Information Needed from Generators about OTC Implementation Plans*.

annually and makes three to five year projections to identify trends in local capacity requirements. The ISO's most recent multi-year local capacity area study does not appear to require replacing all existing capacity subject to the statewide policy with new units on the same facility site.[5] This study finding, however, does not extend beyond 2015. A comparable study that will extend to 2021 is underway and will provide a better foundation for assessing compliance dates in the statewide policy with local capacity needs.

As new power plants come online, or as the transmission system evolves, local capacity area requirements may diminish. In particular, transmission system upgrades can reduce local capacity requirements if they survive environmental review.[6] By way of example, San Diego local capacity requirements will shift when the Sunrise Power Link transmission line commences operation, reducing the need for near and mid-term capacity in the core San Diego area by extending the local capacity boundary eastward to include capacity in the Imperial Valley. SCE local capacity requirements (in both the Los Angeles Basin and Ventura/Big Creek local capacity areas) are projected to diminish once SCE completes the Tehachapi Renewable Transmission Project, which will bring additional transmission import capability to both of these local capacity areas. The eastern edge of the Los Angeles Basin local capacity area, with completion of the Vincent – Mira Loma 500kV lines and 230kV upgrades south of Vincent substation, will shift substantially to the west. As a result, some power plants located in the eastern edge of the Los Angeles Basin that are currently able to satisfy local capacity requirements will not serve as qualify to satisfy the western Los Angeles Basin capacity requirements. However, load serving entities must still procure adequate resources to import into these areas. Assessing these zonal requirements is another important element of verifying that compliance proposals do not threaten reliability.

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[5] ISO, *2013-2015 Local Capacity Technical Analysis: Report and Study Results*, December 2010.

[6] ISO studies only address the ISO portion of the Los Angeles area, and not local resources that may be required for the LADWP service area or LADWP balancing authority area.

SACCWIS believes that since comprehensive studies are still underway, the Water Board does not need to consider all generator requests for compliance date extensions at this time. Further studies are necessary to determine whether the capacity of a plant, or an individual unit at a plant, is needed to serve as local capacity. Additionally, power plants subject to the statewide policy could play a useful role in other dimensions in the overall electricity supply/demand balance, such as providing low cost energy, ancillary services, or helping to integrate renewable resources by ramping up and down each day to complement the production profile of wind and solar resources, even if they are not required for local capacity purposes.

C. The CPUC needs to authorize procurement by investor owned utilities.

Several implementation plans state that the CPUC must issue procurement authority to the investor owned utilities in the CPUC's current 2010 long-term procurement plan proceeding to support the numerous steps necessary to for a new or repowered generating facility to achieve commercial operation. These implementation plans assert that failure to do so will mean that adopted compliance dates in the statewide policy cannot be achieved. Any decision by the CPUC to authorize additional procurements involves at least two considerations: 1) the utilities will not engage in power purchase agreements absent CPUC authorization and guidance, and 2) the timeline of the process to get a new power plant operational is extremely lengthy. It starts with a utility obtaining procurement authorization, includes a competitive solicitation and CPUC approval of a power purchase agreement, permitting by applicable agencies, and construction of a new/repowered power plant. Even for power plants with 2020 compliance dates, the generator owners assert that such dates may be infeasible unless the CPUC acts within the next few months. In contrast, the joint energy agency proposal to Water Board linking proposed compliance dates with the infrastructure planning and procurement process for the utilities envisioned that the 2012 long-term procurement process may serve to support 2020 compliance dates for

some generators.[7] Permitting delays or time lags in authorizing procurements, however, could require extensions of these compliance dates.

SACCWIS agrees with one key aspect of the generator's implementation plans: the CPUC must grant some procurement authority to facilitate the repowering existing capacity or developing new green field projects to replace capacity subject to the statewide policy. It is not realistic to expect that generators will repower existing capacity or develop new greenfield projects without a long-term power purchase agreement from a utility. But it is unlikely that the CPUC will grant broad authority to utilities to engage in procurement activities that would allow generators to execute power purchase agreements to support repowering capacity in the current long-term procurement plan cycle. Rather, SACCWIS believes the CPUC will address this issue in another proceeding or in the 2012 long-term procurement planning cycle.

D. The Water Board should examine unit-specific compliance patterns.

Despite the statewide policy's use of a common compliance date for all units within a facility, generator implementation plans propose compliance solutions that are unit-specific. Some generator-owners provided detailed schedules for repowering facilities that necessitate some new construction on available land within a facility footprint, and then demolition of existing units to allow any further development. SACCWIS views unit-specific compliance dates as reasonable and appropriate, although we are not prepared to endorse or oppose the specifics of each generator's implementation plan at this time. The Water Board should examine unit specific compliance as described in Section III of this report.

E. The implementation plans reflect the presumption that Track 2 compliance measures under the statewide policy can succeed.

Under the statewide policy, power plant owners may pursue compliance under Track 2, which involves reducing entrainment and impingement to specific levels using either operational or structural controls, or both. Some generator-owners submitted

[7] Statewide policy, *Substitute Environmental Document*, Appendix C.

implementation plans that propose to investigate Track 2 measures for several years. If these measures succeed, the implementation plans state that the generators will attempt to obtain a multi-year power purchase agreement with a load serving entity for the output of the plant that would allow owner to support implementation of Track 2 measures. Generally, the timeline proposed in these generator implementation plans for compliance is close to the adopted compliance date in the statewide policy. As a result, these proposals may not allow sufficient time for obtaining a power purchase agreement to finance the upgrades if the feasibility of Track 2 measures remains uncertain. If either the feasibility of a Track 2 measure remains in question or a power purchase agreement is not obtained, then there may be little remaining time until the compliance date. The generator's only option will be to shut down the facility (either permanently or temporarily). While the adopted policy contains provisions – Section 2.B(2) – to suspend a compliance date that would create electric grid reliability concerns, SACCWIS recommends the Water Board work to avoid triggering such provisions through advance planning and close monitoring of generator implementation plans.

SACCWIS believes that the Water Board must consider whether generator owners are investigating Track 2 compliance mechanisms that really have a chance of success. Some Track 2 compliance proposals, such as flow reduction, are considered feasible; others, however, such as large-scale screening devices, have not yet been proven in the marine environment. Although the Water Board should not discourage research into, or demonstration of, emerging technologies to reduce impingement and entrainment as specified in the adopted statewide policy, the alternatives of a "precipitous" loss of capacity or degradation of electric reliability are extremely problematic. For this reason, it is important to require generators to update their implementation plans in order to specify which measures they seek to implement, applicable milestones for successful implementation, and any necessary permits required. The Water Board will need to track these updates to avoid situations where the loss of capacity could create reliability concerns.

F. The Water Board will need additional information from power plant owners

SACCWIS believes the April 1, 2011 implementation plans submitted by most generators are preliminary at this time. Many generators propose to repower units, if they are successful in obtaining a CPUC approved power purchase agreement from a load serving entity to support the repowering.[8] As referenced above, the CPUC is at an early stage of determining how much procurement authority is prudent to issue to the investor owned utilities. Most of the implementation plans do not clearly discuss timeframes for an off-ramp decision to a plan to repower. The plans also do not discuss how generators may transition to a plan to retire if they determine that is their only compliance option. For example, generators located in the South Coast Air Basin face South Coast Air Quality Management District (SCAQMD) permitting issues. The implementation plans for power plants in the South Coast Air Basin reflect that these generators will not need to provide criteria pollutant offsets for their repowering projects by using SCAQMD's Rule 1304 (a)(2), which allows an exemption for a replacement project. In the time since the generators submitted their implementation plans, however, SCAQMD has adopted Rule 1325 for PM2.5 that does not perm it the Rule 1304(a)(2) exemption.

SACCWIS recognizes that generators hoping to be successful in a repowering cannot know all the steps of that process until the CPUC provides a procurement signal and the utilities conduct solicitations. Generators also face uncertainty regarding what air quality regulations will apply when they get to the point of seeking a permit. As this and other information becomes available, the Water Board will need more information about compliance options and power plant owners will need to update their implementation plans. Indeed, since power plant owners filed their implementation

[8] As a general rule, electricity service providers (ESP) serving direct access customers are reluctant to make commitments with suppliers over a sufficiently long time frame to justify investment in new capacity because the typical ESP-customer relationship is of short duration. The Track 1 portion of the CPUC's 2010 long-term procurement plan proceeding is intended to determine if there is capacity that investor owned utilities should facilitate developing on behalf of loads served by both the utilities and electric service providers. The CPUC has explored various mechanisms to reduce the role of the utilities in fostering power plant development, but no alternative has been adopted at this time.

plans on April 1, 2011, new information is already available in some cases (*e.g*. the sale by AES of Huntington Beach units 3 and 4 to Edison Mission Energy and their likely retirement in 2013 -- far in advance of the current 2020 compliance date).

G. The ISO, CPUC and CEC need to complete further analyses of generator implementation plans.

The technical staff of SACCWIS members is currently evaluating the compliance dates submitted by generators in their implementation plans. Unfortunately, the April 1, 2011 generator implementation plans are contingent on the feasibility of Track 2 compliance measures and CPUC approval of long-term power purchase agreements with load serving entities. Furthermore, the interactions among the facilities owned by separate companies could mean that incomplete or questionable information from one owner may make it difficult for SACCWIS to recommend changes to the compliance schedule for each individual generator unit. Nonetheless, the CPUC, CEC and ISO staff is proceeding with analysis based upon the information received at this time, which will be useful in refining the existing methodology for examining local capacity area requirements. The results are expected later this year and will serve in part to support any annual recommendations SACCWIS may make to modify the statewide policy's compliance schedule, starting in 2012. Moving forward, the ISO, CPUC and CEC will need to conduct further studies whenever the generator owners submit updated implementation plans.

III. The Water Board should modify the policy's implementation schedule to reflect compliance on a unit-by-unit basis.

SACCWIS recommends modifying the statewide policy's implementation schedule for all generators to reflect compliance on a unit-by-unit basis, rather than at the facility level. As discussed in Section II.D of this report, many generators provided plans on a unit-by-unit basis, rather than for a generation facility as a whole. Unit-by-unit compliance, while making the plans more detailed, provides several benefits. Changing the implementation schedule to reflect this approach for generators in the

ISO's balancing authority area will align the treatment of these generators with the treatment of LADWP's generation units.[9] Additionally, the CPUC is still considering the need to authorize resource procurement as part of its long-term procurement plan proceeding as well as the actual resource characteristics needed in the individual local capacity areas. Adopting a unit-by-unit compliance schedule will allow greater flexibility in addressing the changes to the power plant fleet within a local capacity area. Under this approach, an individual unit may retire, repower, or utilize another alternative, while the remainder of the facility remains online.

IV. The Water Board should consider modifying the policy to require generators to supplement their implementation plans as new information becomes available.

SACCWIS recommends modifying the policy to require generators to supplement their implementation plans annually as new information becomes available. These updates might occur as a one generator learns that Track 2 measures it was investigating are unlikely to lead to compliance with impingement or entrainment reductions required by the statewide policy, or as many generators modify their expectations as a result of a decision issued by the CPUC in a procurement proceeding. As discussed in Section II of this report, the generator implementation plans submitted on April 1, 2011 are preliminary.

Many implementation plans for repowering include a caveat that the owner needs to secure a CPUC-approved long-term power purchase agreement. Several generator owners/operators propose to comply with the statewide policy using Track 2 measures (reducing impingement mortality and entrainment of marine life for the facility, on a unit-by-unit basis, to a comparable level to that which would be achieved under closed cycle wet cooling). It is unclear what technology they will use and if that technology will be acceptable to the Water Board to mitigate environmental issues arising from the use of once through cooling. Based on our experience with the statewide policy to date, the

[9] In July 2011, the Water Board adopted modifications to the statewide policy in part to base compliance on a unit-by-unit basis for generation facilities in LADWP's balancing authority area.

Water Board should require generator owners/operators to supplement their original implementation plans at specified intervals as new information becomes available.

SACCWIS believes it will also need additional information from generators to justify future recommendations it may make to the Water Board as a consequence of reliability assessments. This information may include but is not limited to technology proposals for Track 2 compliance as well as firm commitments from generators with respect to whether they will proceed with re-powering or retrofitting with an acceptable cooling technology (i.e., dry or wet cooling). SACCWIS recommends that generators provide any necessary updates to their implementation plans on April 15 of each year.

V. The ISO, CPUC and CEC are undertaking studies to assess capacity needs in the ISO's balancing authority area, which may support a recommendation to modify the compliance schedule in the statewide policy.

The ISO, in collaboration with the CPUC and the CEC, is undertaking comprehensive studies to assess potential reliability impacts to the ISO balancing authority area that may result from implementation of the Water Board's statewide policy. The analyses will include both the use of power flow study cases and the Load and Resource Scenario Analysis Screening Tool developed by the ISO, CPUC and CEC. The ISO will perform power flow (as well as stability) studies for a long-term horizon (i.e., 2021). The Load and Resource Scenario Analysis Screening Tool will include screening local capacity areas, zonal and system resource needs for every year of the ten-year planning horizon (i.e., 2012 – 2021). These analyses will aim to identify the amount of generation needed to maintain reliability in local capacity areas, zonal areas (i.e., NP26 or SP26) and the entire ISO system in light of the statewide policy, and the timeframe for these needs, which is critical to any recommended modifications to compliance dates in the statewide policy. These studies will help assess whether generating facilities outside of a local capacity area such as those at the Moss Landing

power plant are still critical for electric grid reliability.[10] The ISO is undertaking these analyses as part of the ISO 2011/2012 transmission planning process.[11]

The analyses include four renewables portfolio standard scenarios. Additionally, two load levels will be evaluated: (1) a high-net load scenario in which the CEC adopted load forecast from the 2009 Integrated Energy Policy Report will be used; and (2) a mid-net load scenario used in the CPUC's long term procurement planning process, which is also based on the CEC adopted load forecast from the 2009 Integrated Energy Policy Report. For the mid-net load scenario, the CPUC incremental energy efficiency, combined heat and power and demand response inputs are used.[12] The ISO, CEC and CPUC agreed to study these assumptions as sensitivities to the high-net load scenario. As part of the reliability assessment, the ISO will evaluate two generation scenarios: (1) minimum generation requirements to meet local, zonal and system reliability needs; and (2) modeling of the generators' implementation plans submitted under the statewide policy.[13]

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[10] Moss Landing capacity is not within the Greater Bay Area local capacity area, but the ISO does have operating procedures that rely upon Moss Landing capacity under some load conditions. The absence of Moss Landing capacity can trigger commitment and dispatch of separate capacity located in the Contra Costa and/or Pittsburg local capacity sub-areas within the Greater Bay Area. The retirement of Moss Landing may therefore require additional capacity within the Greater Bay Area. The 2600 MW of capacity at Moss Landing also represents about 10 percent of the entire NP26 capacity, requiring consideration of supply/demand balances for the entire NP26 zone.

[11] See, pp. 38-40 of the ISO's 2011/2012 Transmission Planning Process study Plan available on the ISO's Web site: http://www.caiso.com/Documents/2011-2012ISOTransmissionPlanningProcessFinalStudyPlan.pdf

Additional materials describing this effort are available on the ISO web site: http://www.caiso.com/Documents/Once%20through%20cooling%20and%20Assembly%20Bill%201318%20studies

[12] The CPUC included 5687 MW for incremental Energy Efficiency, 1638 MW for combined heat and power, and 5100 MW for demand response for the mid net load scenario.

[13] In parallel to the Review Committee established by the Water Board's statewide policy to undertake a cost assessment of implementing impingement and entrainment reductions at the two nuclear facilities, the ISO plans to assess the implications of the loss of capacity at the two nuclear facilities as a result of the Nuclear Regulatory Commission relicensing process.

Another important consideration arising from the statewide policy is the connection between generating units using once-through cooling and renewable integration. Replacement infrastructure will need to retain or improve the capabilities of these units to support renewable integration (whether by the repowered plants or replacement capacity). Analyses of these needs may also result in recommended changes to the compliance dates in the statewide policy.

VI. SACCWIS will provide a report to the Water Board on the results of the studies to assess capacity needs in the ISO's balancing authority area by March 31, 2012, including any recommendations to revise the compliance schedule in the statewide policy if the studies support a revision.

The statewide policy contemplates that SACCWIS will provide a report to the Water Board each year starting in 2012, with recommendations on modifications to the implementation schedule.[14] The statewide policy calls for the first such report on or before March 31, 2012. As described in Section V of this report, the ISO, CPUC and CEC are undertaking an analysis of local area and grid reliability needs in the ISO's balancing authority area in light of the generator implementation plans. The ISO intends to present the results of those studies later this year in the context of its transmission planning process. These study results will serve in part to support any recommendations that SACCWIS will make to revise the implementation schedule under the statewide policy.

In addition, the Water Board's recently adopted amendments to the statewide policy to address the compliance schedule for LADWP provides in part that the Water Board will consider further modifications to the compliance dates for certain LADWP units when LADWP submits information in response to any requests SACCWIS makes by January 1, 2012. SACCWIS may also recommend revisions to the implementation schedule under the statewide policy based on any information it receives from LADWP.

[14] Statewide policy at section 3.B(4).

SACCWIS believes the Water Board can address the recommendations set forth in this report and any recommended modifications to the implementation schedule it may make on or before March 31, 2012, as part of a consolidated process during the second and third quarters of 2012. This approach will provide certainty to affected interests and avoid the need to administer multiple, overlapping processes that may result in changes to the statewide policy.