316 (b)
Once Through Cooling
Deadline: 9/15/06 5pm

Department of Water and Power the City of Los Angeles

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VIA: E-Mail and US Mail

September 15, 2006

Ms. Song Her
Clerk to the Board
State Water Resources Control Board
Storm Water Unit
P.O. Box 100
Sacramento, CA 95812

Dear Ms. Her:

Subject: Los Angeles Department of Water and Power Comments on the State Water Resources Control Board (State Board) Scoping Document Proposed Statewide Policy on Clean Water Act Section 316(b) Regulations

The Los Angeles Department of Water and Power (LADWP) appreciates the opportunity to review and comment on the State Board's Scoping Document dated June 13, 2006 for a Proposed Statewide Policy on Clean Water Act Section 316(b) Regulations. LADWP has provided the enclosed comments for your review and consideration and looks forward to working with the State Board on any 316(b) policy development.

If you have any questions regarding these comments, please don't hesitate to contact me at 213-367-0279.

Sincerely,

Susan M. Damron
Manager Wastewater Quality Compliance

c/enc: Mr. Dominic Gregorio

Los Angeles Department of Water and Power Comments on the
State Water Resources Control Board Scoping Document:
Proposed Statewide Policy on Clean Water Act Section 316(b) Regulations

The Los Angeles Department of Water and Power (LADWP) appreciates the opportunity to review and comment on the State Water Resources Control Board (State Board) Scoping Document on the Proposed Statewide Policy on the Clean Water Act Section 316(b) Regulations (Scoping Document). LADWP owns and operates three coastal generating stations that generate a total of 2672 megawatts (MW) which utilize once through cooling (OTC) and are essential to the current and future power needs of the City of Los Angeles. LADWP is a major power source not only for the residents of Los Angeles but also the State of California when called upon to support the State's power demands. The proposed policy as written would have a significant adverse impact on LADWP's ability to continue to produce power essential to fulfill its city charter mandate of providing reliable and cost-effective power to the citizens of Los Angeles, and therefore, LADWP has the following concerns and comments.

Baseline

Under the Clean Water Act Section 316(b) Phase II Rule (Rule), the calculation baseline is an estimate of the impingement mortality and entrainment that would occur at an existing site assuming the cooling water system has been designed as a once-through system. Unlike citing a new facility, an existing plant's location, design, capacity and how it was constructed are already fixed. That is to say, an existing plant was built to operate and perform at a certain maximum design flow in order to produce a design and constructed energy output. At any point in time, and particularly in the peak demand summer periods, a plant that is not base-loaded can be called upon to perform at its maximum designed capacity. This was certainly the case for LADWP's three coastal plants during the recent July heat wave. On July 24th, LADWP hit its all time energy production peak of 6164 megawatts, which included operating all LADWP's plants (steam and all hydro generation except Castaic, held back for spinning reserves) and the taking of LADWP's full allocation of energy from jointly owned power plants external to California (e.g., from the Intermountain Power Plant and others). For this reason, it is critical that any state policy not limit, in any way, the ability of the power plants to operate at their maximum designed flow and energy production capability.

EPA, in its Phase II Rule, often uses the word "design" in discussing the Rule's applicability. For example, the Rule uses "design" intake flow both for defining facilities subject to the Rule (e.g., those with a design intake flow of 50 million gallons per day (MGD) (ref. Section 125.91(a)(2)) and in defining what facilities are subject to the entrainment standard on rivers (e.g., facilities with a "design" intake flow greater than 5% of mean annual flow of the river (ref. 125.94(b)(2)). As EPA explained in the preamble to the final Phase II Rule, EPA relied on "design" (vs. actual) flows for several reasons: "....Design intake flow is a fixed value based on the design of the facility's operating system and the capacity of the circulating and other water intake pumps employed at the facility. This approach provided clarity—the design intake flow does not change, except in those limited circumstances when a facility undergoes major modifications or expansion, whereas actual flows can vary significantly over sometimes

short periods of time. EPA believes that an uncertain regulatory status is undesirable because it impedes both compliance by the permittee and regulatory oversight, as well as achievement of the overall environmental objectives. Further, using actual flow may result in the NPDES permit being more intrusive to facility operation than necessary since facility flow would be a permit condition and adjustments to flow would have to be permissible under such conditions and applicable NPDES procedures. It also would require additional monitoring to confirm a facility's status, which imposes additional costs and information collection burdens, and it would require additional compliance monitoring and inspection methods and evaluation criteria, focusing on operational aspects of a facility. (69 FR 41611, col. 2) Thus, it would appear that EPA was contemplating a facility's full design capability as it crafted the 316(b) Rule.

During the State Board's two workshops and the hearings at the State Land Commission (SLC) and Ocean Protection Council (OPC) on their OTC resolutions, stakeholders pointed to New York's approach as an appropriate model for California. As the draft Scoping Document correctly identifies, New York has determined that full flow will be the baseline it will use for implementation of both the federal Rule and its own state rule and policies. Among other things, the staff at the Department of Environmental Conservation (DEC) for the State of New York concluded three things: (1) past performance would be difficult to implement now in the deregulated electric industry; (2) past performance would result in a moving target; and (3) using a baseline other than full flow would not be a balanced approach for all affected utilities. A more detailed discussion is presented below.

The Deputy Commissioner in the NPDES permit hearing for the *Danskammer Generating Station* concluded that the testimony of the New York DEC staff was persuasive in explaining the rationale for selecting the full-flow baseline, and that full-flow baseline should be used to determine the facility's compliance with entrainment and impingement performance standards. [*Danskammer Generating Station*, DEC No. 3-3346-0011/00002, SPDES No. NY-0006262 (Decision of the Deputy Commissioner), May 24, 2006 at 17.] New York DEC staff said that relying on the full-flow baseline would be consistent with EPA's Phase II Rule. The staff further reasoned that every electric generating facility has the potential to operate at full-flow conditions, given the deregulated nature of the electric generating industry. Some facilities on the Hudson River do operate continuously at full-flow when generating electricity, and some Hudson River facilities do generate electricity every day of the year. Others are fully capable of such operation, should demand warrant.

DEC staff considered two alternatives to full-flow: (1) using a standard capacity factor and (2) using past performance. Staff concluded, however, that the standard capacity factor alternative would require staff to establish a single capacity factor for all existing electric generating facilities and to decide how to distribute these reductions in cooling water flow during a particular period of time. (For example, the flow limit could be imposed either year-round, or else during biologically important times.) [Hearing Report at 65-66.] Staff thought it would be difficult to base the capacity factor on objective criteria and that using a capacity factor would likely result in favoring some facilities over others.

With respect to using actual past performance as the baseline, DEC staff considered using several time periods: (1) average flow since construction; (2) average flow over the last three to five years; and (3) the greatest flow since construction. DEC staff concluded, however, that although this alternative would be more objective than using a standard capacity factor, past performance would be difficult to implement now in the deregulated electric generating industry. In addition, operations at electric generating facilities vary from year to year based on the weather and fuel costs. Also, units may be offline for maintenance and repairs. As a result, DEC staff concluded that past performance would not be an accurate indicator of either future operations at a particular electric generating facility or future power demands for the deregulated electric generating industry. DEC staff also testified that using past performance would result in a "moving target." Finally, using a baseline other than full-flow would favor those facilities that run continuously at full-flow conditions and penalize facilities that have made recent investments to reduce flow and thereby reduce entrainment and impingement.

Should the State Board consider pursuing its baseline definition based on actual flow over the previous 5 years, the Substitute Environmental Document (SED) must include a discussion of the reasonably foreseeable consequences to continued plant operation, and correspondingly, the availability and reliability of power to the state of California. For illustration, LADWP's Harbor Generating Station repowered in 1993 and in so doing, reduced its flow approximately 75%. A rough approximation of the average actual flow for the last five years is approximately 54 MGD. The incremental cost to achieve a state impingement standard of 95% or an entrainment standard of 90% would require a serious evaluation on the expenditure of public resources.

LADWP is committed to fully evaluating the potential to use variable speed pumps (VSP) as part of its federal Rule compliance strategy. However, the use of VSPs must be evaluated on a site-specific basis because of site-specific conditions. For example, determining the proper flow volume and pressure at the LADWP's Haynes Generating Station is critical to ensuring that when high tide occurs, water does not move backwards into the cooling water system. In this example, a policy requirement of reducing flow to 10 percent of actual flow when not generating for two consecutive days may be impractical because it would jeopardize the integrity of the condenser piping system. When a facility is not generating, flow is needed to prevent fouling and blockage by macrofouling organisms. It is also needed to maintain a certain vacuum on the system so that a plant can be brought on line to meet energy demand in one to two hours as opposed to half a day. Some level of minimum flow (to be determined) is necessary to cool other plant auxiliary components, and to prevent oxygen depletion by fouling organisms and red tide conditions. This latter condition would cause corrosion, pitting and ultimately condenser tube leaks. Lastly, some LADWP facilities are configured such that one circulating water pump provides flow to one-half of the condenser water box and another pump provides flow to the other side. In order to maintain flow in the condensers, both circulating water pumps must be operating. Therefore, reducing flow by shutting off one of the two pumps is not an option.

LADWP recommends that any state 316(b) Policy be based on the full design flow for the facility.

Performance Standards

The Scoping Document, it would appear, has arbitrarily selected the top of the performance range set forth by EPA without any justification or basis for its selection. EPA spent nearly a decade gathering and evaluating technical, scientific, and economic information upon which to base the federal Rule. EPA identifies why it decided to establish the technological performance standards in the form of a range. EPA states that the performance standards that reflect best technology available (BTA) are not based on a single technology but, rather, are based on consideration of a range of technologies that EPA determined to be commercially available to the industry and have acceptable non-water quality environmental impacts. (Federal Register 41598 - 41599).

EPA further states that, because the requirements of implementing Section 316(b) are applied in a variety of settings (waterbody type, aquatic organism assemblage) and on different existing facilities (type, size, usage rate, water volume withdrawn), no single technology is most effective at all facilities. Furthermore, there is inherent uncertainty associated with the efficacy of any one individual technology under these variations. Therefore, a range of technologies have been used to derive the performance standards. For impingement, EPA identified wedge wire (fine and wide mesh) screens and aquatic filter barrier (AFB) fabric with reductions up to 99 percent, barrier nets with reduction between 80 to 90 percent, and modified screens with fish return systems having reductions between 80 to 90 percent. For entrainment, EPA identified some of the same technologies and added fine mesh screens with a fish return system having reductions between 60 to 90 percent. EPA concluded that it believes it is reasonable to vary performance standards by the potential for adverse environmental impact in a waterbody type. Thus, recognizing that different technologies will perform differently under different circumstances, and that some technologies will either not work at all or work at some diminished level under site-specific conditions, EPA set the performance standards as a range. For the state Scoping Document, the question becomes, what technologies did the state review and what was their level of performance under different site-specific conditions such that the state felt confident in proposing the top of EPA's performance range?

In informal discussions with state staff, LADWP understands that staff believes impingement is easily solved via such technologies as velocity caps and fish return systems. LADWP would like to point out that velocity caps, which can have impingement reduction levels in the range of 80 to 90 percent (maybe even slightly higher) are technologies that only apply to offshore intakes. LADWP's Scattergood Generation Station (SGS) is an offshore facility and does have a velocity cap which has historically been shown to be approximately 86% effective at impingement reduction. (Updated verification studies are ongoing as part of LADWP's federal Rule compliance efforts.) However, LADWP has two shoreline facilities, Haynes and Harbor Generating Stations (HnGS and HGS) where installation of a velocity cap is infeasible. As to the option of employing fish return systems, a return of nearly one mile (HGS) and over 1.5 miles (HnGS) would be needed to return fish to an unaffected portion of the waterbody. At these distances, the level of survivability is unknown, particularly for species that are more fragile. Thus, the ability to meet the 95 percent impingement standard for any of

LADWP's facilities is highly questionable. These examples also serve to illustrate why the ability to consider site-specific control measures and mitigation is imperative. This will be discussed later in these comments.

Impingement and Entrainment Technologies under Consideration by LADWP

In general, the impingement and entrainment control technologies fall into five basic categories: behavioral barriers; physical barriers; collection systems; diversion systems; and flow reduction measures. A listing of these technologies and a preliminary review of their feasibility in meeting the federal Rule performance standards is presented in Attachment 1. In general, the effectiveness of behavioral measures is highly species specific. Those species which seem to respond best to light, sound, bubble curtains, etc. are not found in California. Thus, with the exception of velocity caps, consideration of the various behavioral barriers as viable impingement controls technologies at all LADWP facilities has been eliminated from further review. As noted above, a study to confirm the effectiveness of the velocity cap at SGS will be conducted as part of the federal Rule compliance efforts.

Physical barriers include about nine technologies with examples such as barrier nets, Aquatic Filter Barrier fabric (AFB), wedge wire screens, bar racks, etc. Retrofitting existing plants, as opposed to installations at new plants, can make some physical barriers infeasible. Other physical barriers require certain installation criteria that do not exist at all LADWP facilities. For example, wedge wire screens must have a sweeping cross flow or all entrained organisms will be impinged on the screen face. Such a sweeping flow does not exist at either HGS or HnGS. Rotary drum screens are typically installed in channels where the water depths are less than 12 feet. The use of AFB in an aggressive open coastal environment is untested and is likely to be ineffective because it cannot be kept in place. Technologies such as the AFB, barrier nets, and wedge wire screens cannot be installed where they will be an obstacle to navigation as in the Long Beach Marina at HnGS and the Los Angeles Harbor at HGS.

As a result of the various constraints, the only physical barrier technology LADWP will evaluate further for its level of performance will be wedge wire screens at SGS. That being said, the feasibility of wedge wire screens at SGS has two major concerns. Debris deposited on the screen face is eliminated or reduced with the use of an air blast system. It will be a technological challenge, if possible at all, to design such a system that could deliver the air blast to screens approximately 2000 feet offshore. Another major concern will be in controlling marine biofouling. Currently, periodic heat treatments remove barnacles and mussels that settle out and develop on Cooling Water Intake Structure (CWIS) equipment. With a slot width of 0.5 millimeters, flushing shell debris from the intake after a heat treatment is not possible unless an alternative mechanism to flush the debris can be found in order for this technology to be considered further.

Fine mesh Ristroph screens with a fish return system is an example of a collection system that may meet the federal performance standard; however, its site-specific performance level is unknown, particularly on the west coast, and, as previously

mentioned, fish return survivability, and thus performance standard compliance, may be questionable for some LADWP facilities.

Diversion systems for all but Modular Inclined Screens (MIS) are considered infeasible for LADWP facilities. The MIS technology is only applicable to the impingement performance standard and, since there are no full-scale applications, its performance level is unknown. Rivers are generally the ideal waterbody type for this option due to the continuous unidirectional water current. However, due to slack tides and variable current patterns along the coastline, this technology option is not generally feasible for California's coastal facilities, especially at the 95% performance range. The HnGS intake channel and the SGS forebay are the only facilities where use of this technology could be evaluated; however, this technology will not address any entrainment reductions and its cost may be significantly greater than the number of fish impinged.

On the whole, there is a great lack of information on technology applications in the ocean and a lack of information on west coast species. LADWP has considered doing short term pilot studies to assist in trying to establish feasibility, performance and cost; however, the performance standards proposed in the Scoping Document, which differ significantly from the federal ranges, would mean that performing pilot studies would be a pointless exercise because they clearly could not achieve the top of EPA's performance range. LADWP would not expend public resource funds to conduct pilot testing on a technology in which it is either fairly well known or expected that it will not meet the state performance standard.

Lastly, OTC flow reductions (exclusive of via cooling towers) that would be necessary to meet a state impingement standard of 95 percent or an entrainment standard of 90 percent (60 percent with restoration) would cripple the plants' ability to operate. While LADWP intends to explore the use of variable speed pumps under the federal Rule, at present, there are insufficient data to indicate the level of reductions they will provide. It has been suggested that the optimization of variable speed pumps will be highly plant-specific and may provide only a two to five percent reduction; certainly no where near 60 to 95 percent. Flow reductions via the use of alternative cooling (e.g., wet cooling towers, dry cooling towers, or reclaimed water use) have not yet been fully explored. Reclaimed water in sufficient supply to fully offset OTC is not available in the vicinity of any of LADWP's facilities, including SGS which is adjacent to the City of Los Angeles' Hyperion sewage treatment plant. Further analysis is needed to determine if and how LADWP might be able to use reclaimed water, and what operational impacts may arise if it were used.

Cooling towers, wet or dry, have numerous other environmental impacts assuming they can be sighted at a facility. The SGS facility does not have enough space to install cooling towers. In addition to that, it is located against a hill and the site has three different elevations on which some of its ancillary equipment is located, including an electrical substation. The power block to the west, a hill to the east, and road grades to the north and south restrict airflow that is critical to wet or dry cooling tower operation. Any heat, plume or drift from wet towers or heat from dry towers would immediately and directly impact homes at the top of the hill behind SGS. It is also anticipated that the presence of numerous underground substructures (storm drain, sewage, electrical

conduits) will make retrofitting the site with new piping to a cooling tower infeasible. Lastly, drift is also a serious concern for the electrical substation on the property. Drift contains contaminants which, when settled out on energized electrical equipment and in the presence of moisture, can cause arcing and flashing problems which would de-energize the station and cause power interruptions. It is also unknown at this time whether the wet tower plume would create an air traffic problem for the Los Angeles International Airport.

It is likely that HGS also does not have sufficient space for cooling towers. Although this has not yet been explored, it will be assessed as part of the federal Rule compliance package. As with SGS, the wet cooling tower drift and plume issues would be of concern to the downwind, onsite electrical substation and the existing substructures would make retrofitting the site with piping infeasible.

Unlike SGS and HGS, some preliminary engineering investigations and assessments have occurred at HnGS. Although space and airflow may not be an issue at this site, the presence of existing substructures and existing aboveground obstacles makes retrofitting the site infeasible. Before determining that retrofitting the site was infeasible, unless LADWP wanted to remove all aboveground structures and underground substructures and start anew, very preliminary engineering cost estimates were obtained. Assuming it would have been feasible, LADWP estimates that the cost of installing wet cooling towers for the entire plant would cost no less than $225.7 million dollars and the cost to install dry cooling towers would cost no less than $502.6 million dollars.

Lastly, the cooling tower's ancillary equipment power needs consume electricity. This loss of power, known as the energy efficiency penalty, must be recovered by either increased generation or new power sources, both of which result in increased fuel consumption, increased energy costs, and indirect environmental impacts.

EPA considered and rejected basing the federal 316(b) Rule on the use of closed-cycle cooling (FR 41605). The reasons given included, "a national requirement to retrofit existing systems is not the most cost-effective approach and at many existing facilities, retrofits may be impossible or not economically practicable". EPA cited costs for large facilities at well over $100 million with annual O&M costs on the order of $4 to $20 million. EPA also noted the significant cost difference between the use of closed-cycle cooling at new facilities (i.e., the Phase I Rule) compared to the higher costs to retrofit existing facilities. To better illustrate and address the retrofit costs associated with the existing California facilities, the California utilities are funding an Electric Power Research Institute (EPRI) study to develop retrofit cost estimates for these existing facilities. The results of that study, along with the OPC effort, should be very useful and enlightening for the State Board in developing its 316(b) policy. LADWP requests that the State Board not finalize its 316(b) policy until it has the benefit of both studies for review, which should be completed in the same approximate time frame.

Discussion of Plant-Specific Technologies in the Context of the State Performance Standards

LADWP believes it is important to recap the various technologies in the context of the draft Scoping Document. For SGS, it is very likely that LADWP's velocity cap study to verify its effectiveness will confirm our historical number of 86% or better. Based on this information alone, LADWP would comply with the federal Rule impingement performance standard (80 – 95%). If LADWP needed to meet the state performance standard (95%), an additional reduction of 9 percent may be needed. Under the current draft of the Scoping Document, LADWP would be unable to bridge this performance gap with restoration. While installation of fine mesh screens with a fish return system is a possible alternative, its actual performance level is unknown and may also not meet the state impingement standard. Furthermore, the cost to achieve this incremental reduction may be, in EPA's words, "an unbearable economic burden". Therefore, LADWPs only option guaranteed to ensure compliance would be flow reduction which would essentially cripple the plant. As noted above, should the use of reclaimed water be operationally acceptable, insufficient supplies of wastewater from Hyperion exist to totally replace OTC and therefore some amount of OTC would be needed and the impingement standard would still not be met. Also as noted above, the installation of cooling towers is likely infeasible, would cause impacts to the electrical substation, and causes negative environmental impacts. Therefore, in order to comply with the impingement standard, SGS would have to cease operation. The state 316(b) policy document must address in its SED the reasonably foreseeable consequences of this outcome.

In 2004, as part of LADWP's effort to come up to speed with the potential implications of the then newly adopted Phase II Rule, Alden Research Laboratories, Inc. (Alden) was requested to conduct a preliminary review of the various feasible compliance options for each of LADWP's facilities. LADWP requested Alden to review the draft Scoping Document and to contrast those proposed requirements with its prior compliance alternative assessments for each of the LADWP facilities. Attachment 2 is their response to our request and concludes that, short of retrofitting with closed cycle cooling or implementing major flow reductions, compliance cannot be achieved. The actual feasibility of closed cycle cooling retrofits was discussed above.

LADWP's primary recommended alternative for the state policy is to adopt the performance standards set forth in the federal Rule. If the State Board believes it has the scientific evidence to support the selection of a 95 percent impingement standard and a 90 percent entrainment standard, then it must allow restoration to be an option utilized for attainment of both the impingement and entrainment standard.

Need for Site Specific Determinations

EPA considered several factors, such as efficacy, availability, ease of implementation, and the indirect effects of the control measures, as well as the benefits to be achieved and the costs that could be incurred, when it established the performance standards. EPA also understood that existing facilities have less flexibility than new facilities in selecting the location of their intakes and in retrofitting with technologies for minimizing

adverse environmental impacts. As a result, there may be instances where the national standards do not anticipate the site-specific costs or retrofit costs, making it difficult for some facilities to avoid significant costs in order to comply. The federal Rule's site-specific alternative allows consideration of the best economically practicable technology available for the purpose of minimizing environmental impact, and is not, as some may characterize it, a loophole. According to EPA, inclusion of this compliance approach reflected congressional concerns that the application of BTA should not impose an impracticable or unbearable economic burden. (FR page 41604). The State of California should have no less a concern that the various power plants can select and implement a compliance strategy that achieves the best environmental protection and/or mitigation without compromising the plants' ability to continue to operate, ensuring a reliable and cost-effective power source to the state.

As discussed at the outset of these comments, it is anticipated that application of a technology such as fine mesh screens with a fish return system could have widely varying performance results if it were installed at each of LADWP's coastal plants. Furthermore, because the plants are located in different waterbody types, have different design configurations, and have different return scenarios, the cost of installation could also vary widely. In an effort to ballpark a rough approximation of the costs associated with various technologies, Alden provided cost approximations for the installation of fine mesh screens at LADWP facilities based on national costs and a cursory understanding of LADWP's facility layout and engineering. Fine mesh screens at HGS were approximated at an annualized cost of $486,000, at HnGS - $3.4 million, and at SGS - $4.8 million [2002 dollars at an assumed discount rate of 7% and an amortization rate of 10 years for the capital costs and 30 years for the downtime costs].

In addition to these widely varying costs, it is anticipated that the level of performance for organism survivability will be severely impacted by the extremely long fish return system needed at HGS and HnGS. EPA identified a performance level ranging between 60 to 90 percent; however, it is not known whether even 60 percent could be attained at HGS and HnGS. For this reason, fine mesh screens/fish return systems at HGS and HnGS may not be BTA for minimizing adverse impacts and, as previously noted, cooling towers may be either infeasible or incredibly expensive (e.g., HnGS wet towers at $225.7 million). In this example, the cost of cooling towers would most certainly be significantly greater than EPA's assigned costs and significantly greater than the anticipated benefits, although the latter assessment will not be known until LADWP completes the ongoing impingement/entrainment characterization study. As previously noted, LADWP contemplated the need to perform pilot studies to attempt to assess site-specific and/or west coast technology performances; however, the potential impact of a state policy that requires an entrainment and impingement (90 and 95 percent) reduction from an actual baseline would make conducting pilot studies pointless and a waste of public funds since these levels of performance are unattainable.

The ability to utilize a site-specific determination of BTA to minimize adverse impacts without it imposing "an impracticable or unbearable economic burden" is not a loop hole, but rather an essential avenue necessary to be able to achieve environmental improvements in a manner that will not force California power plants to cease operating

or place enormous economic ratepayer burdens on the State's residences and businesses. LADWP recommends that the state either implement the federal Rule, or include a site-specific alternative in its 316(b) policy.

Monitoring and the Need to Address Ecological Impacts

Addressing Ecosystem Impacts

The draft Scoping Document discusses a need to address ecosystem-wide impacts of OTC systems and appears to consider the need to additionally evaluate phytoplankton and zooplankton impacts. EPA recognized in its Rule that community and ecosystem level impacts can occur but that reducing impingement mortality and entrainment would be a "relatively easy to measure and certain metric". EPA further states that, "Although adverse environmental impact associated with CWIS can extend beyond impingement and entrainment, EPA has chosen this approach because impingement and entrainment are primary, harmful environmental effects that can be reduced through the use of specific technologies. In addition, where other impacts at the population, community, and ecosystem levels exist, these will also be reduced by reducing impingement and entrainment mortality." Based on EPA's reasoning, focusing on the monitoring and assessment of all life stages of fish and shellfish (as the Rule requires) should be sufficient to also reduce any ecosystem or population impacts, should they occur.

In addition to EPA's perspective that the assessment of phytoplankton and zooplankton population levels is unnecessary in order to prevent ecological impacts, the California Energy Commission (CEC) and others have similarly concurred. The CEC June 2005 Report referenced in the Scoping Document states, "Adults and other stages of small planktonic invertebrates (e.g. copepods) and phytoplankton (e.g. diatoms) are generally not sampled due to their small individual size and the assumption that because their large population sizes, and rapid growth and reproduction, ecologically important impacts are unlikely" (Appendix A Entrainment Impacts in Impacts Analysis Section). Furthermore, the CEC Water Intake Structure Environmental Research Workshop (Appendix D of CEC June 2005 Report) identified that understanding the ecological OTC impacts would be an area in need of research. Based on this statement, therefore, it would be inappropriate to base a 316(b) policy on unsupported assumptions as if they were fact, while for some, the area is currently identified as in need of further research.

Detailed studies were conducted as part of the 316(b) studies performed in the late 70's and early 80's by many of the power plants, including LADWP. Studies conducted at the San Onofre Nuclear Generating Station, which utilizes up to 2.2 billion gallons per day of seawater for cooling, determined "that in fact no substantial changes have occurred in the zooplankton" as a result of plant operations. The reason for this was hypothesized to be the small fraction of zooplankton actually entrained compared to the populations in the vicinity of the generating station. Zooplankton are widely distributed and have very short reproductive periods. A similar study was conducted at the Long Beach Generating Station, and there were no detectable effects from plant operation on local zooplankton populations. These and other studies of impacts to primary and

secondary producers determined no significant impacts were occurring. The reasons, as noted in a 1979 EPRI study entitled, "Ecosystem Effects of Phytoplankton and Zooplankton Entrainment", include:

- The rapid reproduction potential of plankton permits relatively rapid replacement making entrainment impacts negligible.
- Plankton are transient, and therefore, losses in a given area are replaced by mixing.
- Plankton are opportunistic colonizers and are highly resistant to perturbations.
- Individuals killed by entrainment are not lost to the ecosystem.

Lastly, EPA recognized the low vulnerability of phytoplankton and zooplankton in its 1977 draft 316(b) guidance, which stated that, because of their short life span and population regeneration capacity, these organisms should be less vulnerable to adverse impacts than macroinvertebrates and fish. *Sources: EPA 1977 draft Guidance for Evaluating the Adverse Impact of Cooling Water Intake Structures on the Aquatic Environment: Section 316(b) P.L. 92-500; Central Hudson Gas & Electric Corporation et al., 1977, The Effects of Intakes and Associated Cooling Water Systems on Phytoplankton and Aquatic Invertebrates of the Hudson River*

Monitoring

As currently written, the Scoping Document would require monitoring for zooplankton species, defined as aquatic organisms 200 microns or larger in size. The Impingement Mortality and Entrainment (Im/E) Characterization Studies required to comply with the federal Rule, which have either been completed or are currently underway, utilize a different net size (333 micron mesh). Consequently, the Scoping Document is inconsistent with past and ongoing sampling efforts that use the 333-micron net size, thus making the data useless for purposes of addressing the state policy. Another round of sampling would be required, which would both increase the utility's overall 316(b) compliance effort study costs and ultimately delay implementation of any control or mitigation efforts until the new study results have been gathered and assessed. Incidentally, the 333 micron net size, and the sampling protocol being used by most utilities, is consistent with the sampling protocol and study design being collaboratively developed by a group of academicians and agency scientists for the CEC. (Steinbeck et. al. in review)

Lastly, LADWP is not entirely clear as to the purpose of the monitoring program. Unlike the current Im/E Characterization Study being conducted for determining baseline and a compliance strategy under the federal Rule, which provides flexibility for a number of compliance approaches, the draft state policy severely limits any compliance options to essentially reduced flow (cooling towers, reclaimed water usage, or reduced OTC usage). Under this scenario, there is little or no need for the monitoring data being requested to support decision-making efforts. Clearly, if the State Board believed there was some uncertainty as to the level of impingement and entrainment impact actually created, and this uncertainty had a bearing on the scope of the 316(b) policy, then it

would be inappropriate for the state to finalize a policy with specific compliance requirements in an arena of uncertainty.

LADWP recommends that a state 316(b) policy implement the federal Rule to minimize inconsistency and/or the need to totally repeat the current monitoring efforts. Any policy prepared by the state that includes monitoring should instead focus on assisting and standardizing how the various Regional Boards should evaluate and interpret the Im/E data gathered or currently being gathered. The State Board could also offer assistance on the scope of the Verification Monitoring that will be required, irrespective of whether technological, operational, or restorative control measures are proposed under the federal Rule. In essence, unless it is the State Board's intent to stall current compliance efforts and repeat the Im/E data gathering efforts, it would be more productive for the State Board to offer guidance that looks forward.

Impacts of Once Through Cooling

A recent report prepared by the Pew Ocean Commission summarized scientific information and policy options for dealing with nine major threats to marine resources. Among the most important of these threats are over fishing, nutrient enrichment, and introduction of non-native species. These major factors, along with habitat modification, ocean warming, and pollutant sources are discussed later in these comments as more significant impacts on fishery populations than power plant OTC systems.

A review of impingement and entrainment studies conducted at California power plants that have been recently completed (e.g., South Bay, Encina, Moss Landing, etc.) indicate that there is no evidence to suggest that power plant impingement or entrainment is damaging fish populations in coastal waters. In fact, at every one of these facilities, the recent data, when contrasted with the historical data (some over three decades old) demonstrated that not only was there no evidence of any present day damage, but the source water populations were remarkably unchanged. Long-term monitoring studies at Moss Landing Power Plant have shown that species composition and overall densities of dominant fish larvae remain fairly similar from year to year.

The Diablo Canyon Generating Station studies are particularly interesting since a significant database exists for the period before the plant commenced operation, as well as ongoing studies since operation commenced. An additional point of interest is that since the area around Diablo has fewer influences from some of the factors that are known to have an effect on fishery populations (e.g., pollution, storm water runoff, habitat modification, etc.), a more clear analysis of OTC effects can be analyzed. The long-term studies at Diablo conclude that there are no significant fish population declines despite the presence of the largest user of OTC water in California. In contrast, recent fishery studies conducted around Diablo show striking trends in fish population changes related to changes in fishing pressure and fishing regulations, but no apparent response to the presence of the generating station. The lack of power plant influence can also be seen in Attachment 3 (Table 1), which illustrates the fishing losses in the vicinity of the HnGS as compared to the impingement numbers obtained from the 1978-1979 316(b) Study. A more detailed discussion of fishing impacts, including discussions regarding the findings from several other California power plants

and a discussion of the studies conducted across the United States at other power plants which concluded that there are no impacts from OTC withdrawals, is provided in Attachment 4.

Once Through Cooling Losses Compared with Other Sources

Entrainment losses are often considered to be substantial because the absolute numbers of larvae entrained are usually determined to be hundreds of millions or even billions of larvae per year. However, it is important to remember that the numbers of larvae produced by most coastal fish species is several orders of magnitude higher and constitute the overall source water population. For example, 316(b) data from LADWP's 1978 – 79 study illustrate the vast difference between what is actually entrained compared to the available standing stock for certain species (See Tables 5 through 8 in Attachment 3). Although the number of eggs and larvae entrained for white croaker appear particularly large, this amounted to a cropping from the overall source water populations of 0.8% to 3.0% (e.g., 143,000 larvae at HGS was a 0.8% cropping loss). It is also important to note that natural mortality of eggs and larvae is a huge loss component (89 to 99.5%) when evaluating fish population levels. Updated information should be available at the conclusion of the current Im/E characterization study efforts at the end of this year.

More recently, a one-year study of entrainment and impingement losses was recently completed at the AES Huntington Beach Generating Station (HBGS)[1]. Entrainment losses, assuming maximum cooling water flow, totaled nearly 345 million larvae, of which almost 40% of the larvae entrained were unidentified gobies (113 million larvae). White croaker was the fifth most abundant species in entrainment samples with an estimated 17.6 million larvae entrained. While this may seem like an enormous loss, a single mature female can produce about 900,000 eggs per year. Therefore, the larvae lost annually are essentially equivalent to the reproductive output of 20 females.

Impingement losses of adult fish from power plants, when contrasted with the source water standing stock, show a similar relationship as that for entrainment comparisons. LADWP's 1978 – 79 data illustrate that a very small fraction of the source water population is being impinged. For example, the daily impingement for queenfish at HnGS was 2.4 fish compared to a source water population of 3, 900,000. (See Tables 2 through 4 in Attachment 3). Impingement losses also need to be placed into perspective with other population cropping sources. Fish populations have been shown to dramatically fluctuate with changes in recreational and commercial fishing regulations; namely, more stringent regulations show a dramatic improvement in fish population levels. Fish losses from power plant impingement do not even begin to compare with those losses attributed to commercial and recreational fishing takes. Table 1 in Attachment 3, and the information provided below serve to illustrate the tremendous impact recreational and commercial fishing has on fishery populations. Updated information should be available at the conclusion of the current Im/E characterization study efforts at the end of this year.

Lastly, fishery populations are also impacted by habitat losses or modifications from sources such as surface water temperature fluctuations, storm water runoff, dredging,

hydromodification, pollutant sources, and invasive species. These latter impact sources will be discussed again under cumulative impact assessment, but they clearly affect fishery populations, perhaps to a significant degree, and have nothing to do with power plants.

In total, these "other" sources of impact to fishery populations have a much greater impact than that attributable to power plants. This conclusion was reached over 25 years ago with the previous 316(b) studies and has been again demonstrated with studies conducted since (including revised 316(b) studies). This conclusion is also consistent with the Pew Report previously mentioned.

► Recreational Fishing

Recreational fishing is an important activity in California, contributing large dollar amounts to the local and state economies. However, it is also a major source of fish mortality when compared to OTC. An annual average of about 1.4 million fish are landed by recreational anglers in southern California's nearshore waters each year[1]. Figure 1 presents a comparison of southern California recreational fishing landings (top four species) compared with impingement losses at all of LADWP's three coastal generating stations. Note the impingement losses would not be visible without modifying the Y-axis.

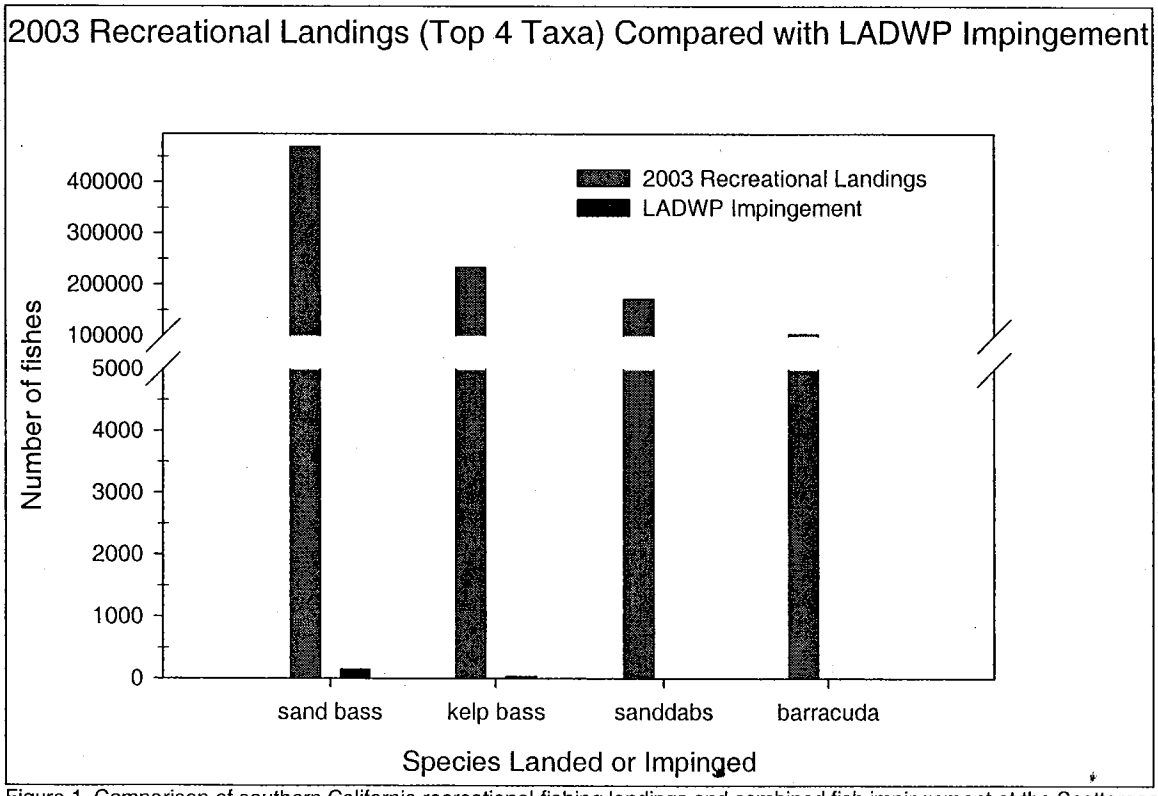


Figure 1. Comparison of southern California recreational fishing landings and combined fish impingement at the Scattergood, Haynes, and Harbor Generating Stations, 2003.

Given the previous above discussion about how many eggs are produced by females within a given species, it is interesting to consider how many eggs and larvae are removed from the standing stock populations (as compared to power plant entrainment)

with the fish losses as presented in Figure 1. For example, sand bass females produce approximately 100,750 eggs per batch and can spawn up to 41 times per year. Therefore, if one assumes that 50% of the fish in Figure 1 are female, a loss of 234,794 females (one-half of the Figure 1 number) would equate to 969,875,315,500 eggs lost due to recreational fishing alone. A similar exercise for kelp bass (116,999 females can produce 81,000 eggs per batch and spawn up to 32 times per year) generates a figure of 303,261,408,000 eggs lost due to recreational fishing. Given the previous statement regarding the total HBGS entrainment losses for all species of 345 million, the above egg losses for just two species as a result of fishing impacts is put into perspective.

► Commercial Fishing

Commercial fishing is also an important activity in California, providing consumers with a valuable food source, as well as multiple commercial products. However, it is also a major source of fish and invertebrate mortality when compared to OTC. Between 1999 and 2004, California's annual commercial fish and invertebrate landings totaled between 278,000,000 and 552,000,000 pounds[2]. A comparison of California's commercial landings and fish impingement at LADWP's Scattergood Generating Station is presented in Figure 2. Similar to Figure 1, the impingement totals would not appear if the Y-axis was not modified.

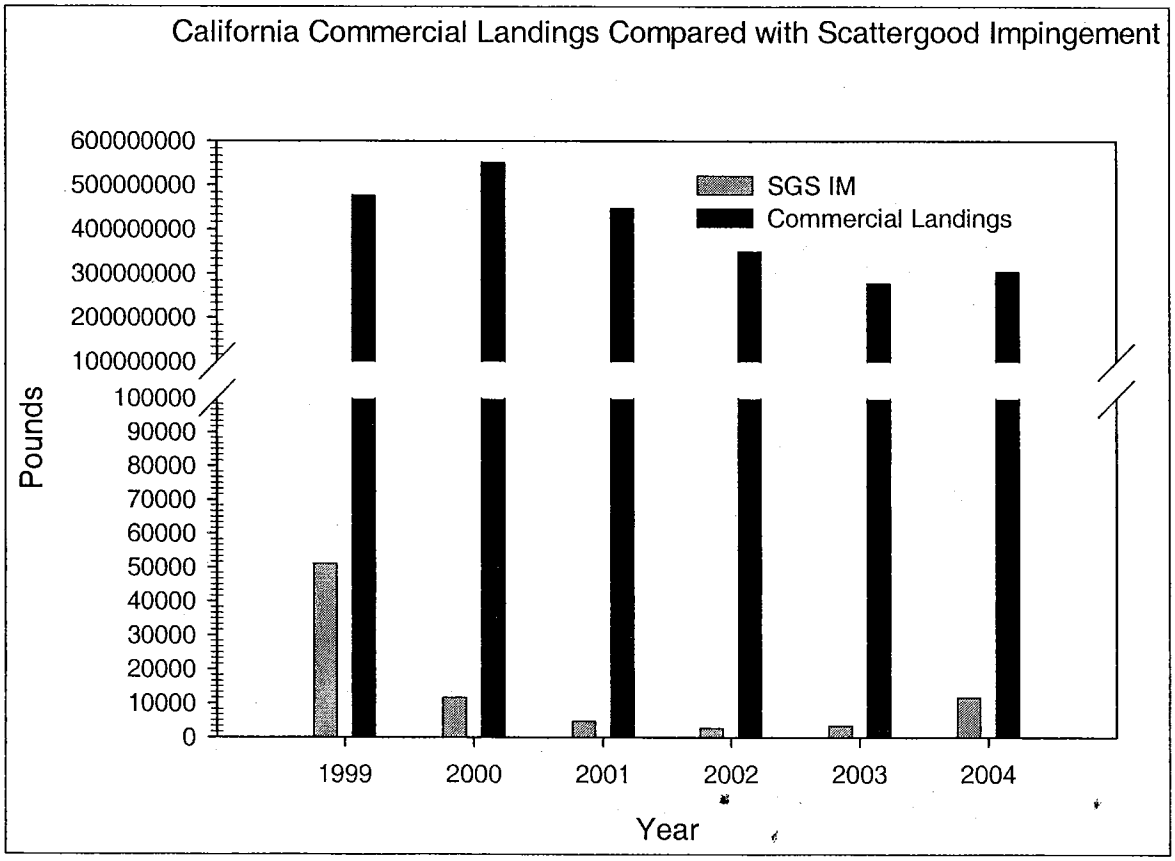


Figure 2. Comparison of California commercial landings and fish impingement estimates at the Scattergood Generating Station, 1999-2004.

A comparison of fishing losses with HBGS impingement losses for two important commercial species--market squid and California spiny lobster—is as follows.

Combined landings for these two species in the Catch Block off Huntington Beach (Block 738) totaled 95,094 pounds in 1999, 1,121,950 pounds in 2000, and 1,003,608 pounds in 2001. In contrast, the annual combined impingement estimates of market squid and spiny lobster during the 2003-4 Entrainment and Impingement Study totaled 44 pounds; no larvae of these two species was collected in entrainment samples.

In the ongoing 316(b) discussions throughout the state, comments have been made that impacts to lesser abundant species in the power plant Im/E data are no less important and that proportionally the impacts could be greater. Consider for a moment that the commercial fish landings, which have been shown above to be orders of magnitude greater than that from power plants, are not discriminating as to species in their catches; discarding unwanted fish caught in trawls and seines.

► Oceanographic Processes Affecting Coastal Fishes and Invertebrates

Climatological and oceanographic processes are more likely to have population level impacts to coastal fish and invertebrate populations since they affect much larger areas than coastal generating stations. Recent research has attempted to quantify how changes in water temperature and coastal upwelling affect coastal fish populations. For several species, trends in impingement rates have been correlated with such processes.

- From the mid 1970's through the mid 1990s, macrozooplankton biomass in the regional waters off southern California decreased by 80%, coinciding with a temperature increase in the oceanic surface layer[3]. Between 1978 and 1992, the abundance of 37 fish species in southern California declined an average of 41%, and the authors attributed this regional decline in productivity to temperature increases[4].
- Herbinson et al.[5] analyzed 21 years of impingement data from five coastal generating stations to determine trends in nearshore croaker populations in southern California. Croakers are of particular interest because two – queenfish and white croaker – are usually among the most abundant species in impingement samples collected in southern California. Overall, a decline in impingement rates was recorded for six of the seven croakers analyzed. The authors noted "*historical trends suggest a strong relationship to warming ocean conditions during the 1980s and 1990s.*" Warming of southern California's coastal waters resulted in an 80% decline in zooplankton biomass.
- Jarvis et al.[6] expanded on the work by Herbinson and others and analyzed recreational fish catches, impingement data from the same five coastal generating stations, and trawl data from the Palos Verdes shelf, and multiple independent environmental variables, including sea surface temperature/Pacific Decadal Oscillation (PDO) indexes, El Niño-Southern Oscillation (ENSO) indexes, and coastal upwelling indexes.

  The authors found nearly 50% of the recreational fishes analyzed showed mostly negative responses to temperature or positive responses to upwelling in the

Southern California Bight, the most influential environmental variable being the PDO. Sea surface temperature accounted for 33% of the variability of impingement of California corbina. The authors also summarized the findings of Norton and Mason[7], who found a weak negative correlation between commercial catches of white croaker and water temperature.

- The 2004 "State of the Bay" report for the Santa Monica Bay states that ocean temperatures are one of the key factors causing fluctuations in fish abundance, and that "*perceived impacts on fish abundance from other factors such as water pollution, impingement, and entrainment have not been conclusively demonstrated in the Bay and need to be further studied.*"[8]

► Habitat Loss or Modification

As previously noted, fishery populations can be impacted by habitat losses or modification from sources such as storm water runoff, dredging, hydromodification, pollutant sources, and invasive species. Storm water runoff can affect populations by (1) the introduction of harmful contaminants to coastal waters, (2) habitat modification, and (3) the potential redistribution of larval forms. Fish and invertebrate communities that establish themselves in rivers or flood control channels during dry periods can be flushed to sea during rainstorms. Additionally, heavy storm water flows can scour existing habitat, and storm water discharges can contribute heavy sediment and other pollutant loads to their respective watersheds, which in turn can effect fishery populations. The satellite image in Attachment 5 was taken on January 12, 2005, after a storm event, and illustrates the magnitude of storm runoff in southern California. Discharges from the Santa Clara, Los Angeles, San Gabriel, and Santa Ana Rivers are clearly visible; however, almost the entire visible coastline was affected.

Invasive, non-native fish and invertebrate species have the potential to disrupt healthy ecosystems (predation/competition), transform entire biological communities, and change population dynamics and species abundance. Of the 112 freshwater and estuarine fish species established in California, about one-half (54) are exotic species, and about two-thirds of native species are in decline. In Los Angeles and Long Beach Harbors, there are several examples of introduced and invasive species in recent years. Yellowfin goby, which is native to Asia, was first discovered in Los Angeles Harbor in 1977, and is now prevalent in entrainment and impingement collections at Harbor Generating Station. About 15% of the invertebrate taxa in Los Angeles and Long Beach Harbors is considered non-native, and throughout southern California non-native invertebrate species account for 28% of total abundance in embayments[9].

State Examples for Investigating and Assessing Power Plant Influences

In the course of the July 31st Scoping Meeting, when staff questioned what states to look at besides New York, a recommendation was made to look at the state of Maryland and its Power Plant Research Program. The majority of Maryland's generating stations are located on the Chesapeake Bay, the Nation's largest estuary. The EPA is provided with special funds to address Chesapeake Bay issues, and for that reason, the Maryland Power Plant Research Program (PPRP) has funded millions of dollars in

independent research to evaluate the effects of OTC, in addition to studies conducted by the generating facilities. The PPRP 1999 Cumulative Environmental Impact Report on generation environmental and economic issues states:

- Relative to impingement and entrainment issues, "Results of these studies show that while operation of individual power plants impact various ecosystem elements in various ways, those impacts, taken together, have had no identifiable substantive cumulative impact on Maryland's aquatic resources to date."

- "Although large entrainment losses of some types of aquatic organisms have been measured frequently, no consistent depletions in numbers of organisms have been found, or the loss is being mitigated."

In a similar manner to Maryland's PPRP, California has a mechanism to research, evaluate and resolve any environmental effects associated with OTC. With the signing of AB 1890, the CEC was directed by legislature to deal with several energy restructuring impacts. One of the programs, known as the Public Interest Energy Research (PIER) program, is required to be funded annually in the amount of at least $62 million by an investor owned utility ratepayer surcharge. These funds are for "public interest" energy research, development, and demonstration efforts not adequately provided for in competitive and regulated markets. Within the PIER program is the ability to conduct research on environmental issues (otherwise known as the PIER Environmental Area, or PIER-EA) through partnerships with individuals, businesses, utilities, and public or private research institutions. In order to improve the understanding of the ecological effects of OTC on California's coastline, CEC's PIER has established a program within PIER's Environmental Area called the Water Intake Structure Environmental Research (WISER) program. Thus, as with Maryland's PPRP, WISER can undertake research that will contribute to a better understanding of OTC effects in California.

Cumulative Impacts

The Scoping Document suggests the need for a Cumulative Ecological Study for plants considered to be in "close proximity". The Scoping Document fails to identify what cumulative effects should be studied, as well as how such a study would be used in a determination of 316(b) compliance. As previously discussed, there are stressors to fish and shellfish populations (e.g., recreational and commercial fishing pressures, habitat loss or modification from dredging, storm water runoff, or pollution, and competition from non-native or invasive species) that are likely to be more substantial than OTC effects. Thus, any study characterizing cumulative impacts on fishery populations would need to be multi-pronged; power plants, or even closely sited power plants, being only one of the many factors to be considered. For this reason, any holistic cumulative ecological study the State Board believes might be needed would not be industry-led. Again, perhaps such a study would be best suited for the WISER group within the CEC. While recently completed, or soon to be completed, impingement and entrainment characterization studies may be able to provide information on the power

plant component, until information is obtained for the other components and holistically evaluated, little can be said about cumulative impacts on fishery populations.

Characterizing the state of marine ecosystems remains one of the fundamental challenges to development of ecosystem-based management of the nearshore waters. If determination of the health of the coastal ecosystem is a desired goal, then much more information should be used than just entrainment and impingement at coastal generating stations.

Absence of Substantial Impacts to Coastal Fishes and Invertebrates in Closely Located Facilities

The basis for a cumulative impact analysis for closely located facilities is unclear. The scientific studies of coastal power plants have thus far documented no substantial impacts to source populations. Studies which have evaluated source water bodies wherein more than one power plant is located have similarly indicated these water withdrawals have not led to detectable changes in nearshore fish populations. As discussed in greater detail in Attachment 6, despite the fact that SGS and El Segundo Generating Station have utilized up to 1.1 billion gallons per day of OTC water from Santa Monica Bay since beginning operation in the 1950s, the bay-wide sport fishing catch-per-unit-effort steadily increased and nearly doubled from the mid-1950s to the 1970s.

Similarly, HGS and Long Beach Generating Stations have withdrawn seawater from the Los Angeles-Long Beach Harbor complex since the 1940s and numerous studies have shown improved marine biological communities from the 1950s through the 1970s, which remain healthy today. While early improvements to the biological communities were largely the result of pollution abatement measures, it illustrates that despite the use of OTC in a semi-enclosed harbor, diversity and abundance of fishes and invertebrates improved. (See Attachment 6)

Extensive entrainment/source water larval fish studies were conducted for HnGS in Alamitos Bay in 1978 -1979. During the study, the HnGS and Alamitos Generating Stations were permitted to withdraw over 2 billion gallons per day of OTC water from Alamitos Bay. For the species analyzed, it was determined that densities of larval fishes within Alamitos Bay were as high or higher than densities of fishes in other nearby bays/harbors, including Anaheim Bay, Los Angeles-Long Beach Harbor, and Newport Bay. Since there are no generating stations that withdraw cooling water from Anaheim Bay or Newport Bay, it suggests there have been no substantial effects on Alamitos Bay due to entrainment/impingement at HnGS and/or Alamitos Generating Stations.

Thus, the scientific studies to date have not produced any evidence that power plants have a significant impact on fishery populations, much less that cumulative impacts to fishery populations from closely located plants have been created. The information currently being gathered in the current 316(b) compliance efforts, along with a state-funded program such as that described for the state of Maryland, may be able to address whether closely located power plants cause cumulative impacts, and if so, to what degree.

CEC HBGS Cumulative Impact Analysis

The Scoping Document references and attempts to summarize the Cumulative Impact Analysis that was required as part of the Conditions of Certification by the CEC for the AES Huntington Beach Retool Project. As stated in the Final Report for the AES Huntington Beach Entrainment and Impingement Study, this was a first-order analysis using available information and conducted under the constraints of time and resources (CEC budget) in order to complete the analysis. As such, the applicability of that information to answer the question of whether cumulative impacts exist from closely located facilities is questionable.

The estimations made in the MBC/Tenera report should not be used as a reliable estimate of actual entrainment impacts in southern California, since they were not based on empirical data. The estimations made in the cumulative entrainment analysis used an assumed source water and maximum permitted intake flow at all generating stations, and the analysis focused on sensitivity of the model input parameters (larval duration and proportional entrainment). An estimate of entrainment mortality should consider actual flow and a measured source water, but the time/budget constraints associated with the project precluded this. The analysis used an assumed source water (from shore to the 75-m isobath) based on previous 316(b) studies in the Southern California Bight, and a second source water limited to the 35-m isobath to illustrate the effect of altering the source water volume on probability of mortality estimates. However, these source waters did not include harbors or semi-enclosed bays, which are known to be important source waters for gobies, one of the most prevalent fish families in entrainment studies.

The impingement estimate made in the MBC/Tenera report was based on available impingement data. The majority of the "available" impingement data (97%) was attributable to SONGS, and that data was comprised mostly (87%) of northern anchovy. Thus, the "available" data is highly skewed at the outset. It should also be noted, however, that the 14.7 tons of northern anchovy estimated to be impinged pales in comparison to the 1848 tons landed by commercial fishing in California during that same year, and, only represents 0.003% of the Central Subpopulation's estimated standing stock in 1994.

Lastly, although the HBGS cumulative study should not be used as reference for discussing cumulative impacts from closely located power plants for the reasons already stated, it should be noted that the estimated average cumulative entrainment mortality reported in the Scoping Document (1.4%) was based on a larval duration (period of susceptibility to entrainment) of 40 days. However, this was the maximum larval duration based on northern anchovy (38 days); the average larval duration was actually 20 days. At 20 days, the average cumulative mortality was estimated as 0.7%.

An accurate estimation of cumulative IM&E impacts should include:

- Accurate oceanographic data to determine potential for entrainment to egg and larval stages, as well as an accurate estimation of the extent of the source water;

- Determine which generating stations to include in cumulative impact analyses based on oceanographic data (i.e., those in relatively close proximity that have overlapping source waters);
- The durations of exposure of each taxa, which will differ by species and life stage; and
- Actual cooling water flow data from each applicable facility.

Restoration

The Scoping Document does not currently provide any ability to utilize restoration as a means of achieving compliance with the proposed state impingement standard. While LADWP believes that the federal Rule performance standards for impingement should prevail, any state-imposed impingement standard must provide the ability to scale restoration projects to meet any shortcoming after the implementation of technological and/or operational measures.

The use of the Habitat Production Foregone model as a means of portraying entrainment loses for all species is inappropriate. "Area" does not produce fish; habitat, which varies by species and location, produces fish. For example, pelagic zone, reef, mud flat, and rocky intertidal habitats all support different species with different production rates. No amount of on-shore wetland acreage would result in any significant production of offshore species such as northern anchovy or sardines. Proper scaling of in-kind restoration requires species-specific data involving the identification of habitat requirements for the species selected for replacement and the quantification of habitat productivity for those species.

A state 316b policy should fully embrace opportunities to conduct restoration. Investments that restore and preserve marine and coastal watersheds and habitats will yield ecologically superior benefits to California, both in quality and in longevity, than could be attained with installing technology or performing operational measures that will last only for the life of the power plant.

CEQA

The State Board's SED should, first and foremost, identify the tangible and quantifiable benefits that a state 316(b) policy will provide over and above that achievable through compliance with the federal Rule. The Scoping Document deviates significantly in selected areas from the federal Rule and the state should fully discuss, with supporting documentation, why those deviations are necessary to meet state law or why those deviations will provide a level of environmental protection greater than the federal Rule in a feasible, cost-effective way.

The SED must also fully identify and discuss the economic impacts associated with compliance with a state 316(b) policy and the reasonably foreseeable impacts that the compliance alternatives will have on the state's energy supply, energy markets, and the various ratepayers (e.g., residential, commercial, industrial) relative to the environmental benefits that are anticipated to occur. The State Board cannot abdicate

its responsibility to analyze the reasonable range of economic factors that need to be addressed if a state 316(b) policy is created (Public Resources Code 21159 (c)) by referencing EPA's economic data.

Economics

The SED should not rely only on EPA economic data for California. The Scoping Document provides a discussion of EPA's estimates of costs and benefits of the Phase II Rule in California. EPA's estimated cost for facility compliance in California was $31.7 million while the commercial and recreational fishery use benefits were estimated to be approximately $3 million per year. The Scoping Document states, "EPA was not able to monetize benefits for about 98% of all species being protected by the Phase II Rule. Therefore, the use benefits calculated by USEPA only represent consideration of 2% of species and USEPA specifically recommended using caution in interpreting this information. While monetary estimates are not available for the non-consumptive marine life resources being protected by reductions in Im/E, it is obvious that the use benefits dramatically underestimate the overall ecological benefits of the Phase II Rule."

In terms of EPA's estimated cost of compliance for California of $31.7 million, under the state's proposed policy, this cost is expected to be exceeded for HnGS alone. Therefore, it can be clearly seen that EPA's dollar figures are woefully low when all 22 California facilities are considered. For this reason, the State Board should not rely on EPA's economic data, but must instead generate its own economic assessments.

In terms of the economic benefit estimate, the vast majority of the economic value EPA estimated for the impingement and entrainment losses in California was attributable to entrainment. LADWP recognizes that there are some limitations in the EPA economic benefit estimates. However, there are a number of factors that make concern over a potential underestimate not as significant as suggested in the Scoping Document. The reasons that economic benefits may not be dramatically underestimated are as follows:

- The Scoping Document expresses concern for not including economic estimates for the majority of species entrained (i.e. only 2% of species included in the estimate). However, this should not be interpreted to suggest that the estimate should be 98% higher. Reasons for this include:

  - For most of the species, the number of organisms entrained was extremely small. In many cases, the species collected amounted to one, two or a few larvae. Due to high natural larval mortality rates (i.e. 98% to 99.5%) such losses are insignificant both from an economic and ecological standpoint.
  - EPA did, with the exception of croakers, include estimates for the species which make up the vast majority of entrainment both in terms of numbers and biomass. It is important to note that the CEC is currently funding MBC Environmental Sciences, Inc. to collect the data and generate a report that will provide information to estimate equivalent adult losses for several fish species common in southern California entrainment samples, including croakers.

- EPA's method for estimating benefits used a combination of conservative estimates. For example, after consideration of natural mortality rates, EPA's estimate assumes that all of the forage species, such as gobies and blennies that were entrained would have been eaten by commercial or recreational species. This is almost certainly not the case.

- Gobies are the single most commonly entrained species in southern California. Adult gobies are closely associated with inshore coastal wetlands and embayments. Larval gobies caught in coastal currents and carried offshore and entrained at facilities such as SGS are not likely to be transported back into coastal wetlands in any significant numbers to mature and reproduce. However, EPA's estimate, after consideration of natural mortality losses, assumes all these larvae would have made it back to wetland habitat and become adults.

- One of the Scoping Document concerns is that the EPA method does not quantify the benefit of phytoplankton and zooplankton losses. As noted in the CEC white paper issued in June 2005, these species are normally not included in entrainment studies. Phytoplankton and zooplankton have very short life spans and extremely high reproductive rates. Phytoplankton, such as diatoms, generally have life spans and reproduce over a period of days or a week. Zooplankton generally have life spans and reproduce over a period of weeks. These short life spans and reproductive rates make it difficult to separate entrainment losses from natural waterbody variability. The impact of phytoplankton and zooplankton losses are insignificant; therefore, they should have no economic impacts

The bottom line of these points is that it is not clear to what extent EPA has underestimated the economic benefit of meeting the performance standards. Data is being collected now, for example, on white croakers and gobies, which will provide a basis to make a current estimate. It is certainly clear that EPA's estimate of the cost to comply would be a dramatic underestimate if used under the proposed policy.

Indirect Effects of Closed Cycle Cooling

As discussed throughout these comments, the installation of closed cycle cooling may be one of the only compliance alternatives under the proposed state policy. Therefore, the State Board's SED must consider the reasonably foreseeable indirect impacts created by the installation of closed cycle cooling (e.g., noise, aesthetics, impacts to air quality, impacts to fresh water resources including in the absence of sufficient reclaimed water supplies, etc.). A brief discussion of some of these impacts, as well as a discussion on the lack of impacts from OTC, can be found in the California Council for Environmental and Economic Balance (CCEEB) letter dated February 7, 2006 (Attachment 7). A discussion of some of these impacts, as well as the economic implications of installing closed cycle cooling, can be found in CCEEB's letter dated March 24, 2006 (Attachment 8).

Absence of State Law

Consistent with the Clean Water Act (CWA) Section 510, the Phase II Rule preserves state authority to "establish more stringent standards as best technology available for minimizing adverse environmental impact if the Director determines that...compliance with the applicable requirements of this section would not meet the requirements of applicable State and Tribal law, or other federal law." The Scoping Document cites Chapter 5.5 of the Porter Cologne Act as the statute implemented to ensure consistency with the CWA, and further references Section 13142.5(b) as the "existing Porter Cologne Policy" that requires "new or expanded power plant or other industrial installation using seawater for cooling, heating, or industrial processing [to use] the best available site, design, technology, and mitigation measures feasible...to minimize the intake and mortality of all forms of marine life."

It would appear that state law to address existing power plants with OTC systems or state law authorizing the State Board to establish 316(b) regulations more stringent than the federal law does not exist. As noted in the Scoping Document, Water Code Chapter 5.5, and in particular Section 13372, establishes that state law shall be consistent with the federal law (not more stringent than). In order for the State Board to establish 316(b) policy that is more stringent than the federal Rule, it must request the legislature to enact such a law authorizing the State Board to establish more stringent requirements for the existing facilities covered under the Phase II Rule. While Water Code Section 13777 requires the imposition of more stringent limitations "necessary to implement water quality control plans, or for the protection of beneficial uses, or to prevent nuisance", the State Board must, in a rulemaking setting, develop a record adequate to support its justification on why more stringent standards are necessary to comply with state law.

Lastly, while Water Code Section 13142.5(b) requires the use of the " best available site, design, technology and mitigation measures feasible [to]minimize the intake and mortality of all forms of marine life", much like the Phase II Rule, the bulk of the existing power plant OTC systems are neither new nor expanded.

LADWP recommends that the State Board implement the federal Phase II Rule and provide guidance to the Regional Boards to ensure consistency in implementation and guidance where the federal regulations need clarification.

Expert Panel

The Scoping Document and State Board staff has indicated that it believes an expert review panel could be "an extremely valuable asset" as the state moves forward in the overall 316(b) compliance program. LADWP's believes that the track record for technical review groups and expert panels have been mixed as to their effectiveness and timeliness. The state is already "playing catch-up" in the 316(b) regulatory arena and utilizing an expert panel could end up adding additional delays. As was noted in the comments at the scoping meeting on July 31st, any Regional Board can ask for a peer review by technical experts in assisting with the review of the Comprehensive Demonstration Study (CDS) to be submitted as required by the federal Rule. As also

commented, obtaining local peer reviews at the regional level on site-specific issues needing site-specific science or familiarity may be more helpful and productive than centralizing that resource in one area at the State Board level.

New York

During the two State Board workshops and the two OTC resolution hearings of the SLC and OPC, the New York 316(b) program was consistently touted as the approach California should take. Despite any comments already stated above as to the inappropriateness of equating any environmental impacts which may occur at California's open coastal power plants with those which may occur within the enclosed system on New York's Hudson River, it is important to note that New York is essentially implementing the Phase II 316(b) Rule.

Unlike the Scoping Document, the New York approach has not "cherry-picked" the top of EPA's performance standard range. Rather, New York's approach can be more likened to implementing the Rule's Compliance Alternative 5 which addresses achieving BTA in the most economically feasible way. The New York DEC, in its recent NPDES permitting of the Roseton, Bowline, and Danskammer facilities, specifically considered the cost of all feasible technologies in determining which is the best technology available. New York states on page 4 of its letter to Ben Grumbles that, "for all feasible alternatives...the Department will require that the cost of implementing each alternative be included as part of the technology review." The New York DEC considers whether the costs of practicable-technologies (NY letter pp. 5-6) are wholly disproportionate to the environmental benefits. The NY DEC letter does not suggest that DEC will arbitrarily require permittees to meet the top of the performance standard range. Instead, it specifically says that it will "seek (emphasis added) to impose the higher end" of the ranges, consistent with a variety of site-specific considerations.

In specific cases, including the Roseton, Danskammer, and Bowline permits, the New York DEC has identified BTA technologies that will meet performance standards below the top of EPA's performance range. After evaluating all feasible control technologies, the New York DEC required the Roseton facility to implement a combination of six operational and control technologies. They include: maintain the fish-escape passageway; maintain continuous washing of the traveling screens; maintain flow minimization and outages; change the thermal differential between May 15 and October 16; institute diurnal cycling of the cooling water flow with generation load; and install variable speed drives on two or more circulating water pumps. The New York DEC specifically reviewed and rejected closed cycle cooling, AFB, Ristroph screens, and sound deterrents. With regard to closed cycle cooling, the New York DEC stated that the cost of retrofitting would be many times higher than the selected suite of controls and would not result in any greater impact reductions. As to the use of AFB, associated design and construction issues make the system unavailable at this time. Lastly, an analysis of the Ristroph screens demonstrated that minimal reductions in impingement mortality would occur compared to the measures being recommended in the permit.

In the Bowline NPDES permit, the New York DEC required the seasonal installation and maintenance of a coarse mesh barrier net in the river, reductions in design flow during

the winter months, and the installation of variable speed pumps to achieve an impingement reduction of 95% and an entrainment reduction of 80%. It should be noted that while coarse mesh barrier nets might work for the cooling water entrance of this facility on the Hudson River, the use of barrier nets at LADWP's SGS (harsh open ocean environment), and HGS and HnGS (navigation obstructions in the harbor and marina, respectively) are likely not possible.

Lastly, it is interesting to note that the approach the state of California implemented in the late 70's and early 80's was based on best professional judgment, which is essentially the Phase II Rule's site-specific alternative approach which seeks to find the best BTA that is economically feasible.

CEC Document Assessing Historical Utility Impact Studies

The Scoping Document references, and may in some way utilize, the information presented in the CEC's June 28, 2005 document entitled, "Issues and Environmental Impacts Associated with Once-through Cooling at California's Coastal Power Plants. Appendix A: An Assessment of the Studies Used to Detect Impacts to Marine Environments by California's Coastal Power Plants Using Once-Through Cooling" (Report). This Report is often cited and referenced by many entities involved in the ongoing 316(b) discussions, but rarely are the Report's flaws and errors also cited. For this reason, and to ensure a balanced consideration of this Report by State Board staff, LADWP is attaching the comments it provided to the CEC on the draft Report's assessment of the LADWP historical documents. (See Attachment 9)

Conclusion and Recommendations

EPA spent nearly 10 years developing the Phase II Rule during which time EPA reviewed countless studies, investigated numerous technologies and their performance, and interfaced with numerous scientists and technical experts. The Rule reflects a comprehensive, integrated approach for establishing BTA requirements for CWIS at all existing facilities. The Rule is intended to provide a uniform, technology-based approach to implementing Section 316(b) which places all existing nationwide and statewide power plants subject to the Rule on a level playing field. The State Board should not discount the level of effort and scientific rigor that went into developing the Rule. Most especially, the State Board should not believe that it can begin to arbitrarily select individual components of the federal Rule, such as the top of the performance standard range, and refuse to implement others without developing a technical record to justify its selections and omissions. Such a record should identify the tangible and quantifiable benefits that a state 316(b) policy will provide over and above that achievable through compliance with the federal Rule, and the SED should fully identify the depth and breadth of the reasonably foreseeable impacts (environmental, economic, and to the energy markets within California) of the policy.

LADWP recommends that a state 316(b) policy adhere to and implement the federal Rule as written, and offer assistance/guidance to the Regions where the Rule is vague or to ensure a consistent application/interpretation of the Rule. Any policy prepared by the state should instead focus on assisting and standardizing how the various Regional

Boards should evaluate and interpret the Im/E data gathered or currently being gathered, how to evaluate the CDS documents, and how to implement these findings into the NPDES permits. The State Board could also offer assistance on the scope of the Verification Monitoring that will be required, irrespective of whether technological, operational, or restorative control measures are proposed under the federal Rule. In essence, unless it is the State Board's intent to stall current compliance efforts and repeat the Im/E data gathering efforts, it would be more productive for the State Board to offer guidance that looks forward.

The Scoping Document deviates significantly in selected areas from the federal Rule and the state should fully discuss, with supporting documentation, why those deviations are necessary to meet state law or why those deviations will provide a level of environmental protection greater than the federal Rule in a feasible, cost-effective way. LADWP believes it would be more prudent to allow the federal Rule compliance efforts currently underway to continue, unhindered to their completion. Once the data has been gathered and thoroughly reviewed by the Regional Boards and State Board, the state would be in a better position to determine if there is information lacking or whether controls additional to those implemented under the federal Rule are necessary to satisfy state standards.

Lastly, LADWP refers the State Board back to the various sections within these comments where detailed observations and recommendations were made (e.g., restoration needs to be allowed for both impingement and entrainment impacts, baseline must consider full design flow, the need for site-specific determinations, use of the CEC WISER group for cumulative impact assessments, etc.). The State Board also needs to keep the comment record open for the receipt of additional factual information, such as the OPC and EPRI cooling tower retrofit analysis and cost assessment studies, as it attempts to develop a state 316b policy.

LADWP suggests that additional, and perhaps more highly focused issue/technical scoping meetings, be considered before finalizing any state 316b policy.

List Of References

1. MBC *Applied Environmental Sciences* and Tenera Environmental. 2005. Final Report: AES Huntington Beach L.L.C. Generating Station Entrainment and Impingement Study. Prepared for AES Huntington Beach L.L.C. and California Energy Commission. April 2005.

2. NMFS Southwest Regional Office website (http://swr.ucsd.edu/fmd/bill).

3. Roemmich, D. and J. McGowan. 1995. Climatic warming and the decline of zooplankton in the California Current. Science 267:1324-1326.

4. Brooks, A.J., R.J. Schmitt, and S.J. Holbrook. 2002. Declines in regional fish populations: have species responded similarly to environmental change? Mar. Freshwater Res. 53:189-198.

5. Herbinson, K.T., M.J. Allen, and S.L. Moore. 2001. Historical trends in nearshore croaker (family Sciaenidae) populations in southern California from 1977 through 1998. Pp. 253-264 *in*: So. Calif. Coast. Water Res. Proj. Annual Report 1999-2000.

6. Jarvis, E.T., M.J. Allen, and R.W. Smith. 2004. Comparison of recreational fish trends to environment-species relationships and fishery-independent data in the Southern California Bight, 1980-2000. CalCOFI Rep. 45:167-179.

7. Norton, J.G. and J.E. Mason. 2003. Environmental influences on species composition of the commercial harvest of finfish and invertebrates off California. CalCOFI Rep. 44:182-190.

8. Santa Monica Bay Restoration Commission. 2004. State of the Bay: 2004 Progress and Challenges. 45 p.

9. Mikel, T.K., R.G. Velarde, J.A. Ranasinghe, S.B. Weisberg, D.E. Montagne, D.B. Cadien, R.W. Smith, and A. Dalkey. 2003. The prevalence of non-indigenous species in southern California embayments and their effects on benthic macroinvertebrate communities. Pp. 246-252 *in*: So. Calif. Coast. Water Res. Proj. Annual Report 2001-2002.

Evaluation of Technologies to Reduce Impingement Mortality and Entrainment

Technology	IM reduction 95%	E reduction 60%	Feasible for Ocean Environments	Feasible for LADWP facilities
Behavioral				
Sound	Studies have shown IM reduction at least 80% for certain species.	No evidence or literature cited will meet 60%	Possible dependent on species	No
Infrasound Strobe Lights Mercury Lights Chemicals Electric Screens Air Bubble Screens Water Jet Curtains Hanging Curtains Hybrid Barriers (e.g. stobe light/air bubble curtain)	No evidence or literature cited will meet 95% Studies have been inconclusive	No evidence or literature cited will meet 60% Studies have been inclusive	Possible dependent on species	Not effective for species in and around LADWP facilities.
Velocity Cap	Studies have shown 50 to 90 percent reduction. Depends on fish species and water body, ie, site specifics.	May not provide entrainment reduction. Although, larvae and eggs may exhibit diel water column distribution, they do not distinguish flow characteristics.	Works well in ocean environment for certain fish species.	Applicable at SGS only.
Physical				
Fixed Screens Bar rack barrier	Lack of literature information.	Lack of literature information.	Lack of literature information.	No
Traveling water screens Fine mesh (< 5mm)	Impingement is species specific, no published performance reduction. Benefit only if survival of impinged "entrainable" organisms is greater than their entrainment survival.	Literature states that these screens have the potential to reduce entrainment 80% or more. Reduction contingent on optimization operation and intensive maintenance to avoid biofouling and clogging, especially in marine environments.	Survival is highly species and life stage dependent. Information on these screens is from East Coast, Minnesota, and Texas, mostly rivers and bays.	This technology would require that screen houses at the generating stations be expanded in order to meet 0.5 ft/sec velocity in order for this technology to work
Drum Screens	Drum screens have been used primarily at irrigation and hydro facilities to physically block fish passage. Many have been found ineffective for reduction in IM and E. Many now are the angled variety to actively guide the fish to bypasses.			No
Rotary Disc Screens	The rotary disc screen has not been used for screening at a CWIS and is not considered an appropriate technology for this use.			No
Barrier net (fish net barrier)	May provide a reduction in IM. Studies have shown at least 80% reduction in areas with limited debris flow. This tech. is often used seasonally.	May provide entrainment reduction depending on egg and larval size, however, would require extensive maintenance.	Barrier nets have not been used in ocean environments, they have been used in the Hudson River, Patuxent River, Lake Erie, Lake Michigan, and Pine River.	May be evaluated only at at SGS installed around the CWIS.

Evaluation of Technologies to Reduce Impingement Mortality and Entrainment

Technology	IM reduction 95%	E reduction 60%	Feasible for Ocean Environments	Feasible for LADWP facilities
Physical cont.				
Artificial filter bed	Not shown to be highly reliable due to clogging problems. No recent info for use as a fish protection technology.			No
Porous dike	Lack of full-scale performance data makes it difficult to predict performance and wide spread applicability Porous dikes and leaky dams do show potential to limit passage of adult and juveniles fish.	Lack of full-scale performance data makes it difficult to predict performance and wide spread applicability Porous dikes and leaky dams do show potential to limit passage of adult and juveniles fish.	No evidence or literature to show works in ocean environment.	No
Aquatic filter barrier (Gunderboom)	Literature does not mention if this technology is for impingement reduction.	Shows promise for minimizing entrainment, but no successful deployment pilot test.	Not been piloted on ocean waters on West coast but have been depolyed in marine conditions to prevent migration of particulates and bacteria Gunderboom is being tested in Northern California along the San Joaquin River and East East Coast along the Hudson River.	No
Cylindrical wedge wire screen	Studies show that impingement and entrainment reduced significantly if certain conditions are met, ie low through screen velocity, higher channel velocities, and larger slot size. IM performance data not available.	Studies show that impingement and entrainment reduced significantly if certain conditions are met, ie low through screen velocity, higher channel velocities, and larger slot size. 60% entrainment can be met if site conditions are met.	May work in ocean environments. Limitations due to navigation. Lack of full scale plant data for marine environments where biofouling and clogging are significant concerns. May clog quickly, need frequent maintenance.	Only possible SGS where will need (23) T-84 wedgewire screens.
Collection Systems				
Modified traveling (Ristroph) screens	Studies have shown survival rates improve markedly but does not give percentage of performance. Site specifics such as fish species, temperature of water, speed of rotational screens, etc. all influence the survival rates of these types of screens.	Studies have shown survival rates improve markedly but does not give percentage of performance. Site specifics such as fish species, temperature of water, speed of rotational screens, etc. all influence the survival rates of these types of screens.	Survival is highly species and life stage dependent. Information on these screens is from East Coast, Minnesota, and Texas, mostly rivers and bays.	May be applicable to all three plants, however, long fish return systems, at HnGS and HGS may create questionable survivability.
Fish pumps	Studies show reduction in IM 70% and latent mortality low.	Preliminary results indicate that pump facilities are effective. Other studies associated with predation, adult migration, and survival of fish under a wider range of environmental conditions are on-going. Also, operational issues associated with the centrifugal pump are being addressed.	Studies and installations have been at facilities on Rivers on both coasts. No ocean studies.	No
Louvers/angled bar racks	Impingement performance of 96% has been observed at San Onofre and Redondo Beach Stations. EPRI quotes 80-95% percent reduction for a large variety of species under a range of site conditions. Latent mortality is a concern.	No associated reduction in entrainment.	Appears to be effective at San Onofre and Redondo Beach, both ocean enviroments.	No

Evaluation of Technologies to Reduce Impingement Mortality and Entrainment

Technology	IM reduction 95%	E reduction 60%	Feasible for Ocean Environments	Feasible for LADWP facilities
Diversion Systems cont.				
Angled screens (fixed or traveling)	Potential to minimize impingement by greater than 80 to 90 %. More widespread full scale use is necessary to determine optimal design specifications and verifications that this technology can be used on a widespread basis.	No associated reduction in entrainment.	Has not proven to be successful in ocean environments. Has been tested at San Onofre showing poor to good guidance (0 to 70 percent) for northern anchovy and moderate to good guidance for other species (60 to 90 %).	No
Angled rotary drum screens	Such screens have not been applied to steam electric generating stations but have been used at irrigation and hydro facilities.		Not been tested in ocean waters. Cannot be totally submerged due to risk of fish passing over screens.	No
Inclined plane screens	This technology has not been used as an application to date for steam electric generating stations and has not been considered for potential application at CWIS.			No
Eicher Screens	These screens are used at hydro facilities and according to the literature not applicable to CWIS.			No
Modular inclined screens	Certain species show high reduction in IM. EPRI tested MIS in a laboratory and results showed diversion efficiencies of 47 to 88 %. At the Niagra test site, diversion and survival rates approached 100%.	No entrainment reduction.	Technology has undergone extensive hydraulic evaluation in the laboratory and at a prototype field site on the Hudson River. To date, there has not been full scale applications at any type of water intake.	May be applicable to SGS and HnGS.
Modifications to Reduce Intake Flow				
Modified pump operation	No literature information	No literature information		May be applicable to SGS and HnGS.
Install variable speed drivers	No stated IM reduction performance.	Reduced entrainment approximately 10% and is site specific.		No
install closed loop cooling system (mechanical & natural draft and dry cooling towers)	Meets 95% IM reduction	Meets 60% E reduction	Have been used on ocean waters	No

August 4, 2006

Ms. Susan Damron
Environmental Engineer
Los Angeles Department of Water & Power
111 North Hope Street
Los Angeles, CA 90012

California State 316(b) Policy

Dear Ms. Damron:

As requested, Alden Research Laboratory, Inc. (Alden) has reviewed the proposed California State 316(b) Policy and considered the implications of the Policy in terms of our previous analysis of compliance alternatives under the Federal 316(b) Rule. The proposed California Policy standards and options for impingement and entrainment reductions are as follows:

1. The California State Water Resources Control Board Scoping Document (July 13, 2006) proposes three alternatives to address impingement that include:

   i. Reduce intake flow to that commensurate with a closed-cycle recirculating system, or

   ii. Reduce the maximum through-screen design intake velocity to 0.5 feet per second (ft/s) or less, or

   iii. Reduce impingement mortality for all life stages of fish and shellfish by 95 percent from the calculated baseline by any combination of operational or structural controls.

2. The Scoping Documents proposed compliance alternatives for entrainment are:

   i. Reduce intake flow to that commensurate with a closed-cycle recirculating system, or

   ii. If the power plant has a capacity utilization rate of 15 percent or greater, reduce entrainment of all life stages of fish and shellfish by 90 percent of the calculated baseline by any combination of operational or structural controls.

   iii. Existing power plant owners or operators who satisfactorily demonstrate to the Regional Water Board that no combination of operational and structural controls can feasibly achieve the 90 percent reduction in entrainment must comply with the following:

a. The owner or operator must reduce entrainment of all life stages of fish and shellfish by a minimum of 60 percent from the calculated baseline by any combination of operational or structural controls, and

b. Restoration measures must be employed to achieve the remaining percent reduction in entrainment over the minimum achieved in *a* (above), up to 90 percent, of all life stages of fish and shellfish from the calculated baseline.

3. Additionally, the proposed policy would not allow use of Site-Specific Standards that include the Cost-Cost and Cost-Benefit Test. The result is the proposed requirements are significantly more stringent than those required by the Federal Rule. Based on the proposed requirements and currently available information, here are the implications for each of your three facilities:

- Haynes – The only option identified for entrainment reduction, other than closed-cycle cooling or major flow reductions, was use of fine-mesh traveling screens. The data needed to support a 90 percent entrainment reduction at coastal California plants is limited. Survival of fish and invertebrates following collection from fine-mesh screens is highly variable and species-/life stage-specific. The limited available data indicate that the performance standard would not be met for one of the numerically dominant species entrained (northern anchovy) (Edwards et al 1981). Goby and white croaker, on the other hand, proved to be quite hardy, showing survival levels approaching 100 percent. Therefore, it is clear that some species will not be protected by fine-mesh screens even at a 60 percent level; and, there is some level of risk associated with the application of this technology.

  Two technologies have been suggested for impingement mortality reduction: the MIS and coarse-mesh Ristroph screens. Since the MIS is an unproven technology and coarse-mesh Ristroph screens have not been tested in California, site-specific pilot-scale studies would be warranted. As with any other technology, 95% survival of all species cannot be expected.

- Scattergood – For entrainment, two technologies were identified: fine-mesh traveling screens and narrow-slot wedgewire screens. The same issues apply to use of fine-mesh screens at Scattergood that were discussed for Haynes. While narrow-slot wedgewire would be likely to comply with the performance standards, there are questions as to whether such screens could be maintained in an operational condition given biofouling issues in the California coastal environment. Specifically, the issues are biofouling control inside the intake tunnel and on the screen modules themselves. The screen manufacturer has questioned the ability to use the air backwash process at such a great distance. This would require manual cleaning by divers. The frequency of cleaning cannot be estimated at this time. The issue of clearing backwashed biofouling organisms during the current heat treatment would require a new valving

approach. This concept has never been tested. Currently there has been no deployment of these screens at large, once-through cooling generating facilities such as Scattergood. Additional research and testing would be necessary to address these issues prior to full-scale deployment in order to ensure that cooling water supply to Scattergood would be ensured.

Because the Scoping Document would not allow any credit for current capacity utilization which is well below 50%, use of closed-cycle cooling or major flow reductions that would limit the facility's generation of electric power are the only feasible proven options that would meet the proposed maximum entrainment standards.

The same consideration of credits would affect impingement mortality reduction performance standards.

- Harbor - Two entrainment reduction technologies were considered for this facility: fine-mesh traveling screens and narrow-slot (0.5 mm) wedgewire screens. All the issues discussed above for fine-mesh traveling screens are appropriate for Harbor. Installation of narrow-slot wedgewire screens would meet the maximum entrainment reduction standard. However, these screens would be subject to the same biofouling concerns addressed above. Based on subsequent site assessments, consideration of the wedgewire screens has been dropped due to lack of a sweeping current and the configuration of the boat slip in which the CWIS is located.

  Depending on the amount of credit that can be taken for existing operational characteristics, closed-cycle cooling or major flow reductions are the only other feasible proven options that would meet the proposed maximum entrainment standard of 90%.

4. Based on the above discussions, short of retrofitting with closed-cycle cooling or cooling water flow reductions, the 90% maximum, entrainment performance standard could not be achieved at any of the facilities. However, because of the potential credits you could receive for existing CWIS location, use of an offshore intake with a velocity cap at Scattergood, you could very well meet the 60% minimum.

   Although 95% survival of all impinged species cannot be expected with most fish collection and return technologies, depending on the dominant species impinged, overall survival may be relatively high. However, pilot studies would be required to quantify rates. Again, because of the CWIS location credits discussed above for Scattergood, although the 95% maximum, impingement mortality reduction cannot be expected, the 80% minimum could possibly be met.

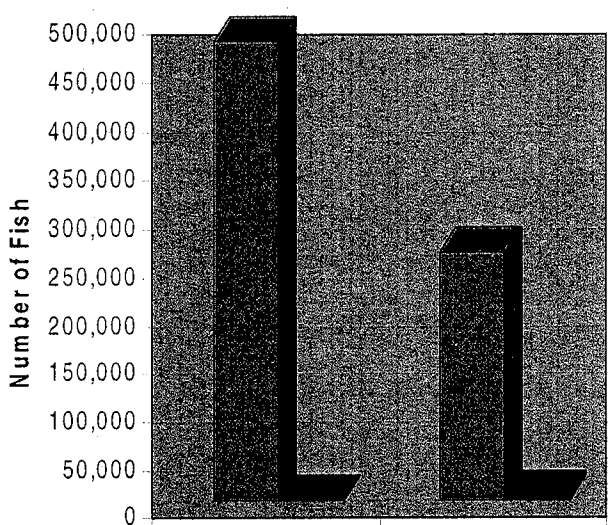
Should you have additional questions, please give Ray Tuttle a call at x492 or me at x410.

Sincerely,

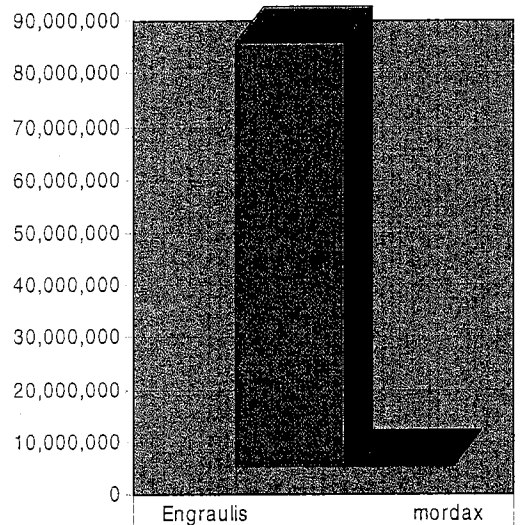
Edward P. Taft III
President

EPT/sjb

Table 1. Fishing Losses Vs. Haynes Impingment



	Genyonemus lineatus	Peprilus simillimus
Commerical\ Recreational fishing[1]	474,692.0	257,247.0
Impingment [2]	653.0	4,513.0



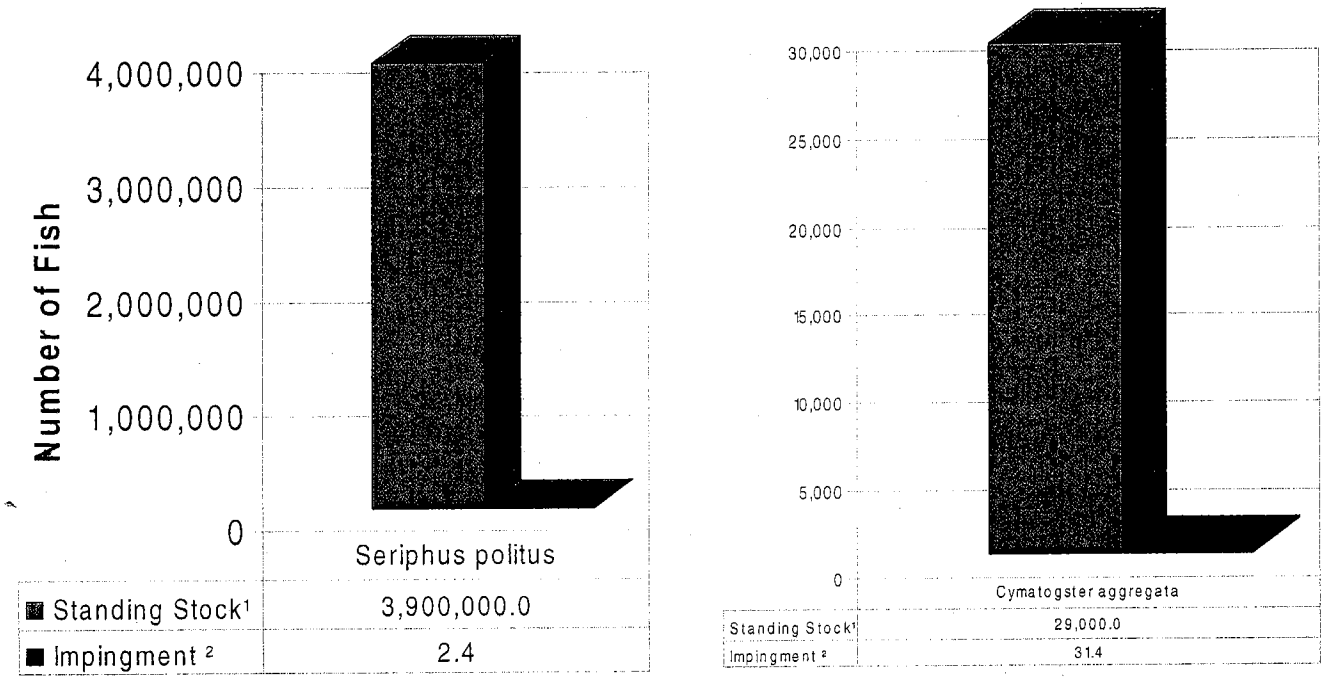
	Engraulis mordax
Commerical\ Recreational fishing[1]	80,499,851.0
Impingment [2]	170.0

Species Impinged

[1] Estimated number of fish in commercial landings
[2] Estimated number of fish impinged per year

Ref: Haynes Generating Station Cooling Water Intake Study 316(b) Demonstration Program, Intersea Research Corp. Nov. 1981.

Table 2. Standing Stock Vs. Haynes Impingment



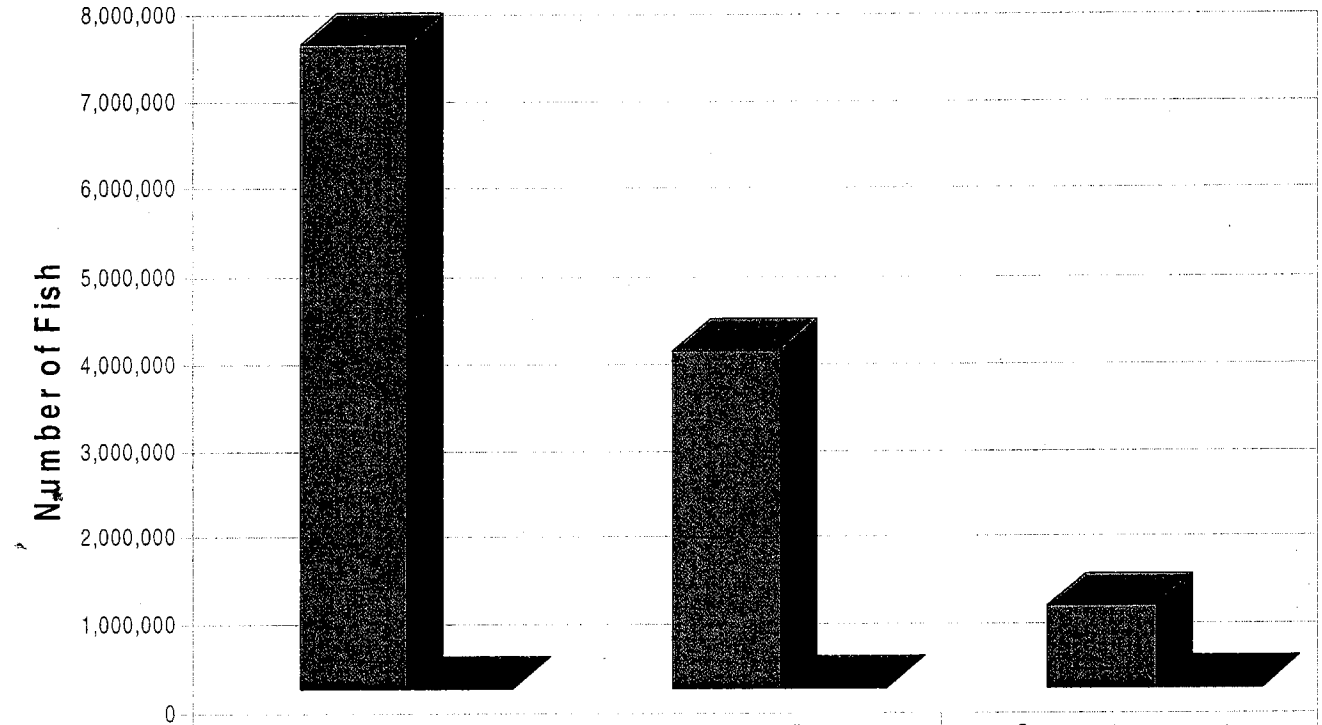
Species Impinged

[1] Source water standing stock estimate

[2] Mean number of fish impinged per day

Ref: Haynes Generating Station Cooling Water Intake Study 316(b) Demonstration Program 1978-1979, Intersea Research Corp. Nov. 1981.

Table 3. Standing Stock Vs. Harbor Impingement



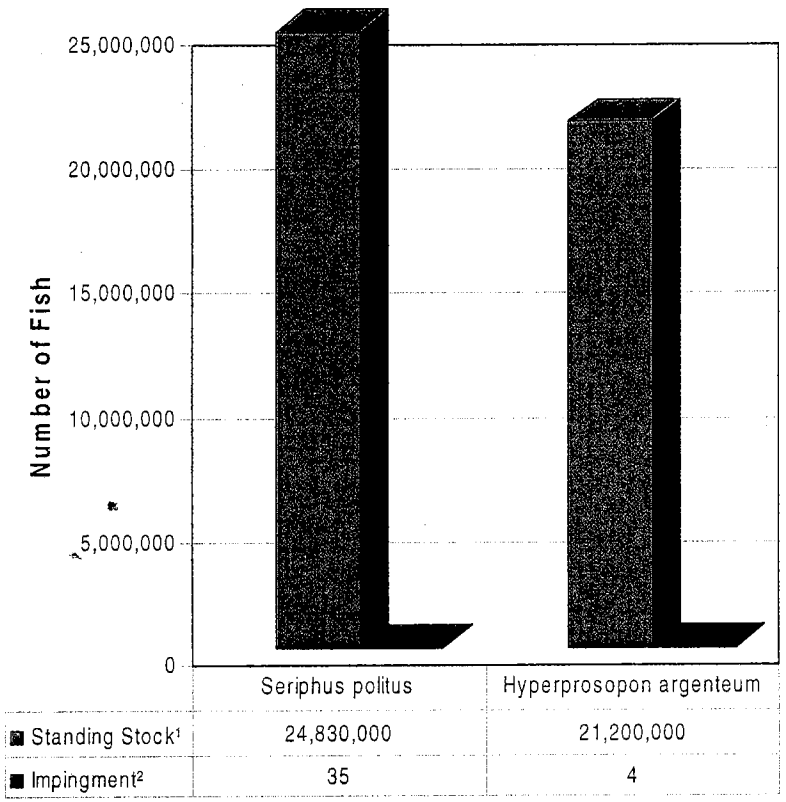
	Genyonemus lineatus	Seriphus politus	Cymatogster aggregata
Standing Stock[1]	7,400,000.0	3,900,000.0	950,000.0
Impingment[2]	130.0	75.0	48.0

[1] Source water standing stock estimate
[2] Mean number of fish impinged per day

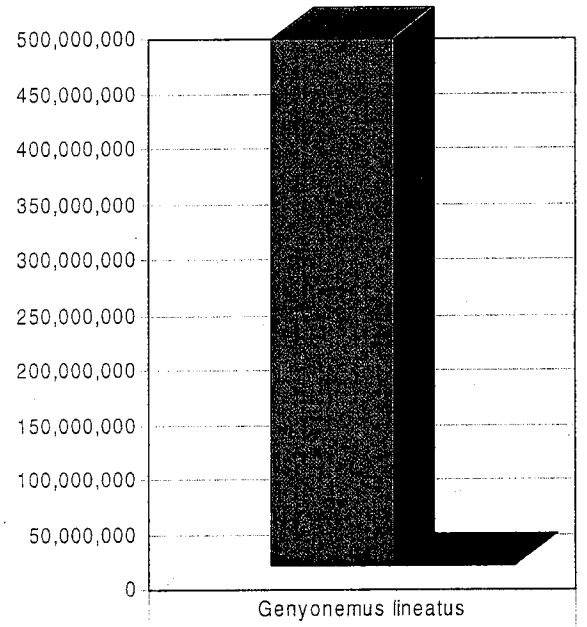
Species Impinged

Ref: Harbor Generating Station Cooling Water Intake Study 316(b) Demonstration Program, Intersea Research Corp. Nov. 1981.

Table 4. Standing Stock Vs. Scattergood Impingement



	Seriphus politus	Hyperprosopon argenteum
Standing Stock[1]	24,830,000	21,200,000
Impingment[2]	35	4



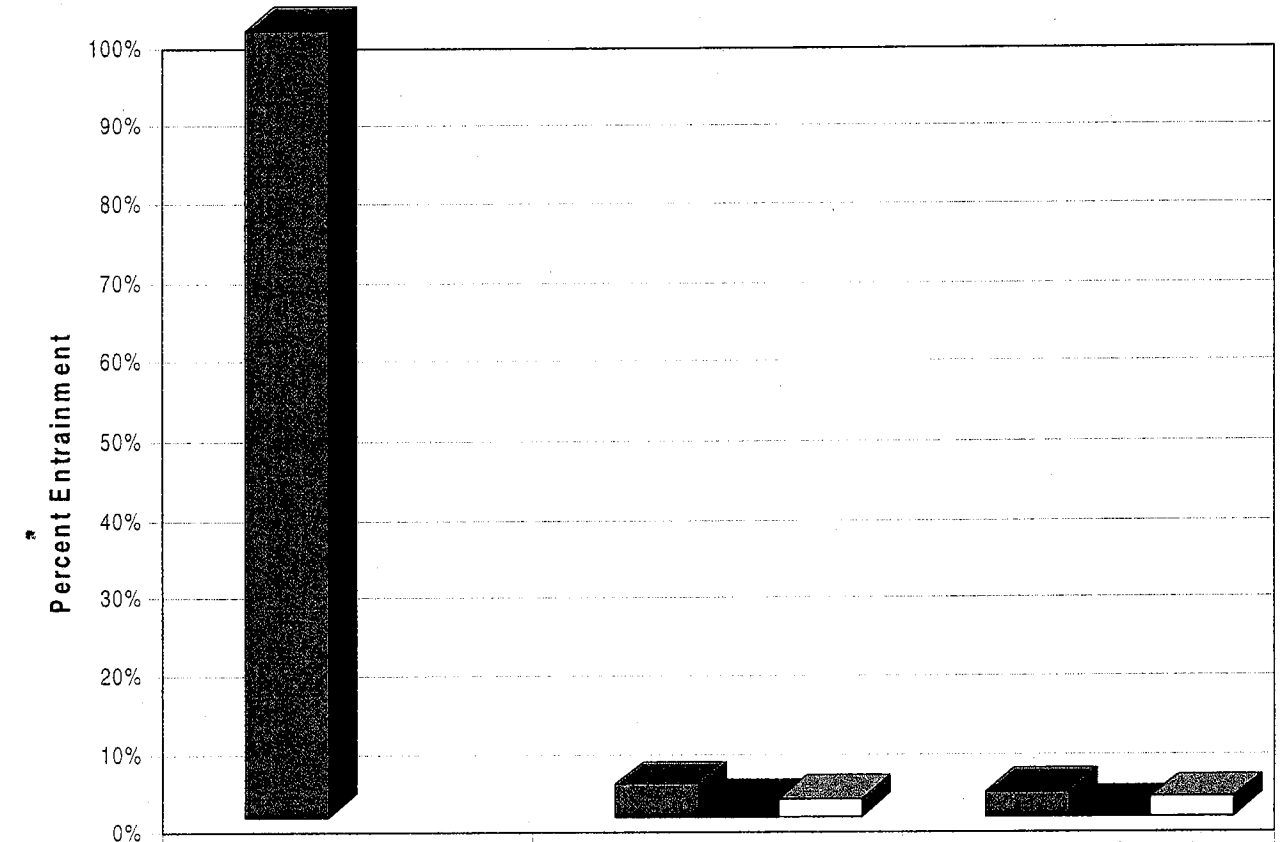
	Genyonemus lineatus
Standing Stock[1]	479,000,000
Impingment[2]	8

[1] Source water standing stock estimate
[2] Mean number of fish impinged per day

Species Impinged

Ref: Scattergood Generating Station Cooling Water Intake Study 316(b) Demonstration Program, Intersea Research Corp. Nov. 1981.

Table 5. Standing Stock Vs. Power Plant Entrainment



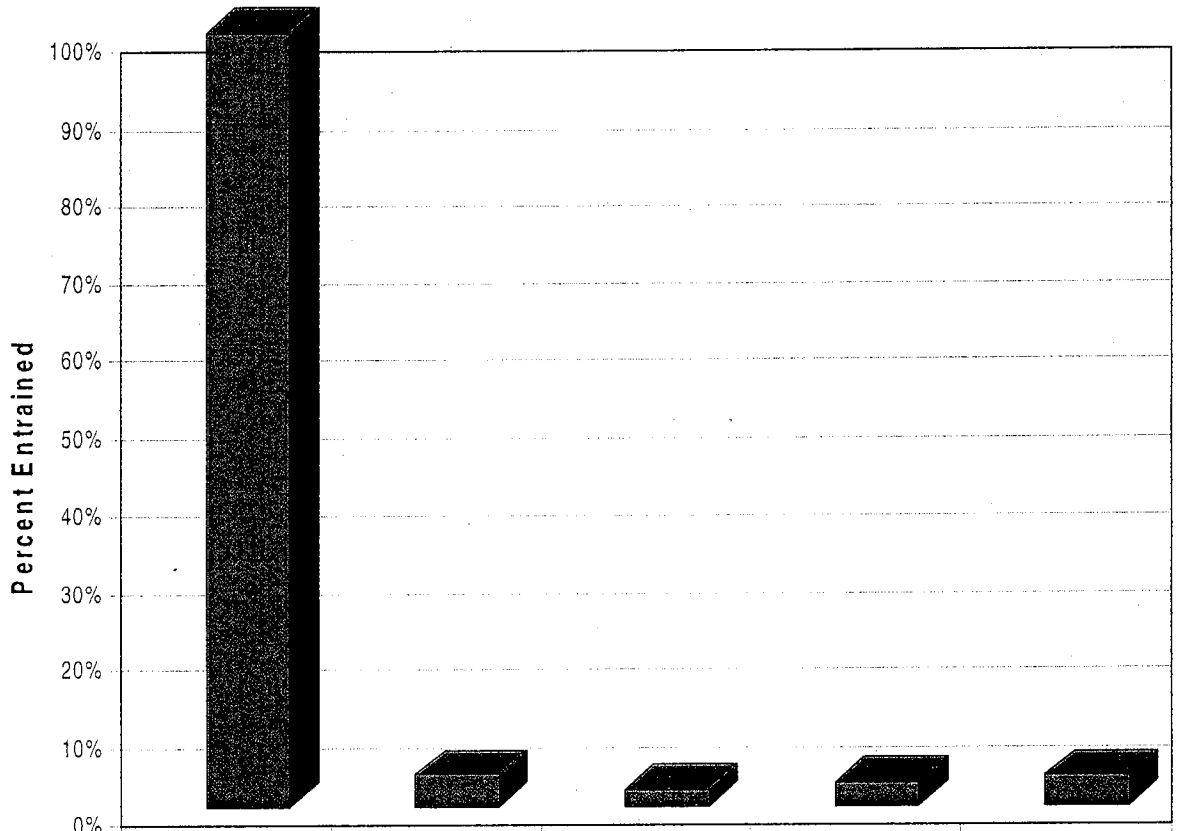
	Standing Stock	Engraulid Species Complex*	Genyonemus lineatus*
Haynes	100%	4.0%	3.0%
Harbor	100%	1.8%	0.8%
Scattergood	100%	2.2%	2.4%

Species Entrained

*Percent number of fish in standing stock entrained per day

Ref: Haynes, Harbor, and Scattergood Generating Station Cooling Water Intake Study 316(b) Demonstration Program, Intersea Research Corp. Nov. 1981.

Table 6. Standing Stock Vs. Haynes Entrainment



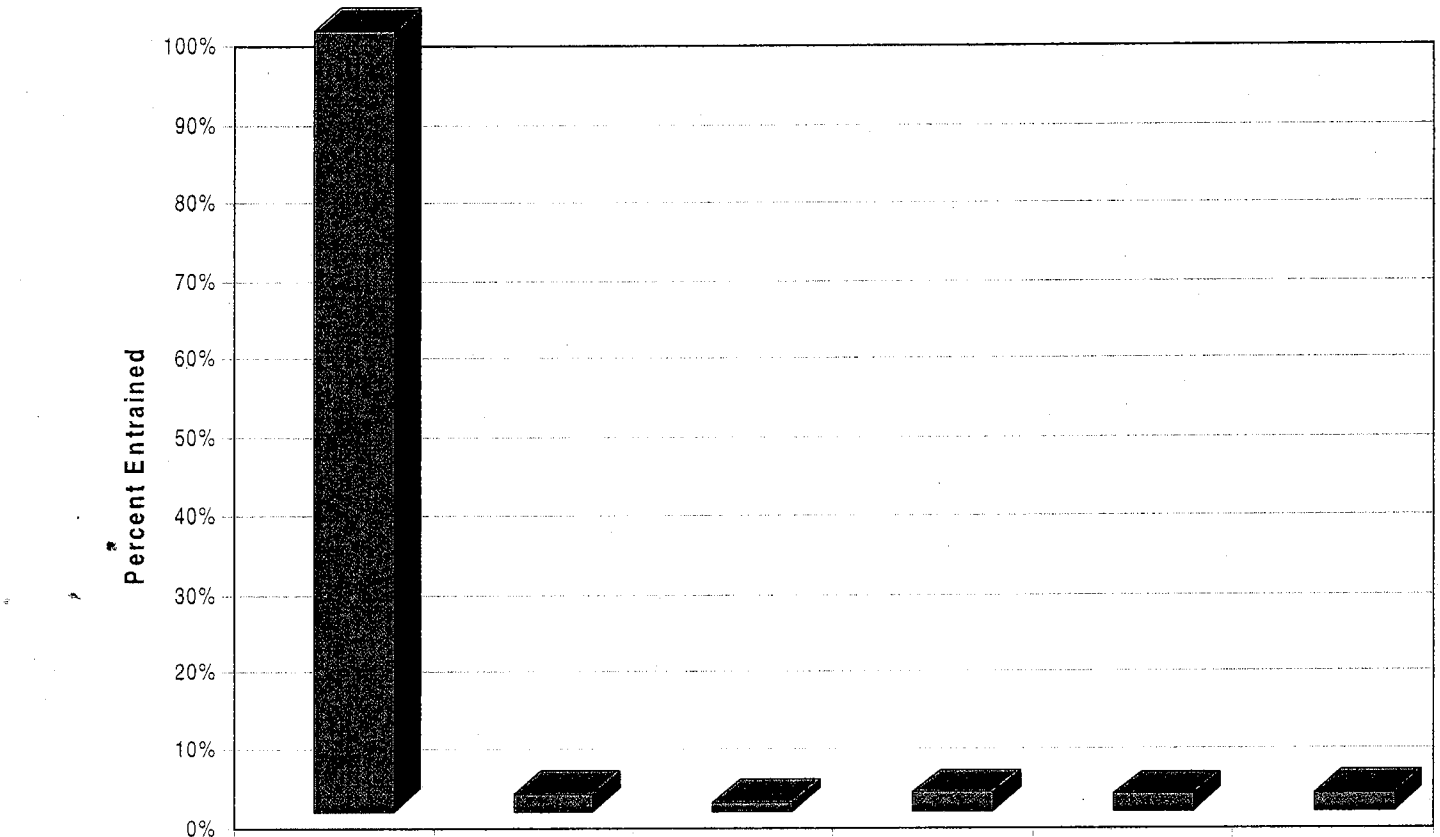
	Standing Stock	Engraulid Species Complex*	Atherinid Species Comples*	Genyonemus lineatus*	Seriphus politus*
Percent Entrained	100%	4.0%	2.0%	3.0%	3.7%

Species Entrained

* Percent number of fish in standing stock entrained per day

Ref: Haynes Generating Station Cooling Water Intake Study 316(b) Demonstration Program, Intersea Research Corp. Nov. 1981.

Table 7. Standing Stock Vs. Scattergood Entrainement



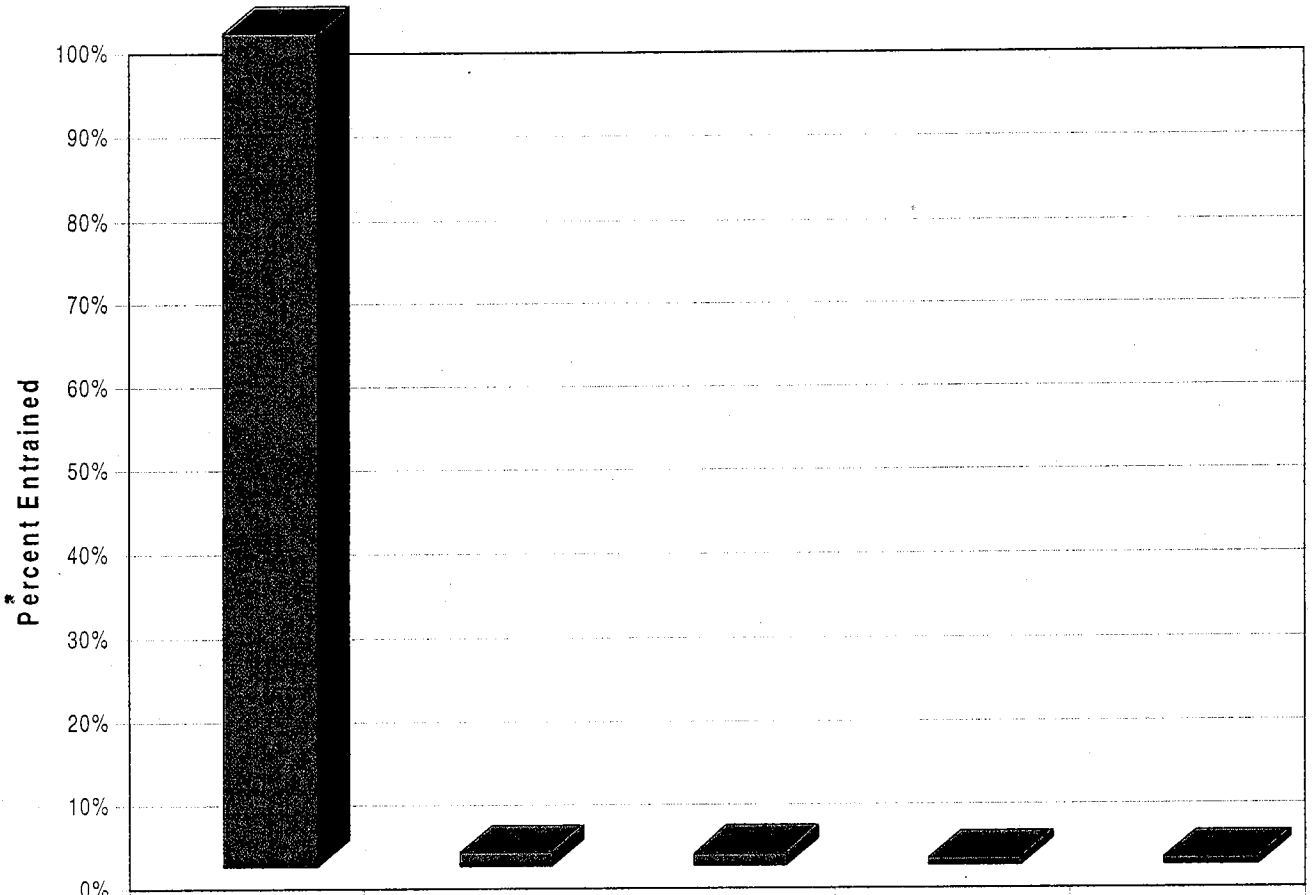
	Standing Stock	Engraulid Species Complex*	Atherinid Species Comples*	Genyonemus lineatus*	Seriphus politus*	Pleuronichthys spp.*
Percent Entrained	100%	2.2%	1.1%	2.4%	2.0%	2.2%

Species Entrained

*Percent number of fish in standing stock entrained per day

Ref: Scattergood Generating Station Cooling Water Intake Study 316(b) Demonstration Program, Intersea Research Corp. Nov. 1981.

Table 8. Standing Stock Vs. Harbor Entrainment



	Standing Stock	Engraulid Species Complex*	Gobiid Species Comples*	Genyonemus lineatus*	Hypsoblennius spp,*
Percent Entrained	100%	1.8%	1.6%	0.8%	0.9%

*Percent number of fish in standing stock entrained per day

Species Entrained

Ref: Harbor Generating Station Cooling Water Intake Study 316(b) Demonstration Program, Intersea Research Corp. Nov. 1981.

Attachment 4

Excerpted from the EPRI Solution/Tenera Environmental Comments

(Submitted under separate cover directly to the State Water Resources Control Board)

Impact Sources to Fishery Populations

Moreover, the benefits of compliance with the Proposal can be shown to be quite small compared to the benefits of reducing other types of impacts on marine and coastal ecosystems. A recent report prepared by the Pew Oceans Commission, a blue-ribbon panel chaired by former Congressman and White House Chief of Staff Leon Panetta, summarized scientific information and policy options for dealing with nine major threats to marine resources (Pew Oceans Commission, 2003). Among the most important of these threats are overfishing, nutrient enrichment, and introductions of non-native species.

Overfishing has had severe, and in some cases irreversible impacts on marine ecosystems throughout the world (Dayton et al., 2003). For example, the world-wide abundance of large, predatory marine fish has been reduced by approximately 90% since 1970 (Myers and Worm, 2003). These reductions in predator abundance have led to indirect effects on the structure and function of marine food webs throughout the world. Additional impacts on marine resources caused by fishing include bycatch (discarding of unwanted fish caught in trawls and seines) and habitat destruction due the physical impacts of the fishing gear on reefs and other bottom substrates (Dayton, 1998).

Nutrient enrichment has caused or contributed to major changes to fish communities in many waterbodies. Nutrient enrichment causes oxygen depletion and fish kills. Nutrient enrichment also contributes to blooms of toxic algae that kill large numbers of fish and, in some cases, contaminate fish and shellfish so that they are toxic to humans (Anderson et al., 2002). The Pew Commission documented 44 U.S. estuarine and coastal areas that suffer from excessive nutrient enrichment (Boesch et al., 2003). Although the majority of these areas are along the Atlantic and Gulf of Mexico coasts, the commission included four California estuaries on its list: Tomales Bay, San Francisco Bay, Elkhorn Slough, and Newport Bay.

Introductions of non-native species have had catastrophic impacts on many waterbodies. Introduced species have been shown to alter interspecies interactions, to induce changes in nutrient cycling and energy flow, and produce unpredictable effects on food webs (Ruiz and Carlton, 2003). San Francisco Bay alone supports more than 175 introduced species of marine invertebrates, fish, algae, and higher plants (Carlton , 2003).

Although there have been significant changes in fish populations along the California coast mostly due to overfishing, other factors including changes in water quality and warmer ocean temperature regimes have been associated with changes in these populations starting in 1976 (Holbrook et al. 1997). Shifts in fish populations have been

well-documented from southern California where large increases in human population have undoubtedly contributed to the changes (Horn and Stephens, 2006). Although there is no evidence that power plant OTC has caused or even contributed to these changes, especially since most of the power plants in southern California have been operating since the 1950s (a large number of units were added at many facilities in the '60's), the confluence of factors that could potentially affect fish populations make it difficult to separate the potential effects of OTC from other factors (Englert and Boreman, 1988).

The many factors that can affect fish populations in California are exemplified by the population declines in striped bass and other species in the Sacramento and San Joaquin estuary. Impacts to the estuary's fish populations are occurring from many potential sources, including water exports, pesticides and herbicides, invasive species, and over-harvest and poaching of recreational and sport harvested species (CalFed, 2000). To mitigate for OTC effects from the Pittsburg and Contra Costa power plants, the estimated number of striped bass entrained and impinged by the plants were reared in culture and returned to the estuary. This did not result in any effects on striped bass populations, which continued to decline. If the cooling water withdrawal of these two power plants had in fact played a role in the decline of the estuary's striped bass populations, (or analogously any entrained species population), the replacement of the striped bass that were entrained and impinged should have resulted in an increase in sport harvest. Intensive monitoring of striped bass populations and other populations have shown continued declines to the present time, reaching critical levels in several populations. These declines have occurred despite a nearly eighty percent reduction in the amount cooling water used by the power plants in recent years.

Once Through Cooling Influence on Fishery Populations

There are few examples in California of long-term data that can be used to look at effects of OTC on fish populations independent of other anthropogenic impacts. The Diablo Canyon Power Plant (DCPP) is located in central California where coastal fish populations are more isolated from wastewater and watershed development impacts present in other areas of the state. The DCPP is also unique in having long-term data on adult fish populations that start in 1976, nine years before the plant began operating (PG&E, 1988). The DCPP also has a cooling water volume of 2.5 billion gallons per day, the largest in the state, and has a capacity factor greater than 90% since it began operating in 1985. If OTC was causing changes in fish populations they should be detectable from the areas around DCPP. This has not been the case. Long-term monitoring of adult fishes in control areas not affected by the power plant thermal discharge show no changes over time that are coincident with the start of plant operation and could be caused by entrainment of fish larvae (Ehrler et al., 2003). In addition, long-term data from sport fish party boats show no changes in catch per unit effort over the period of plant operation that could be attributable to power plant entrainment.

The DCPP long-term monitoring data and independent fisheries-specific data show no changes that could be attributable to plant operation; however, what does become apparent from a review of the data are the changes bought about due to fishing pressure and fishing regulations. When a trap fishery in shallow nearshore areas started in the area

around 1990 there was a decline in targeted species such as cabezon and rockfishes apparent in the monitoring data. There have been increases in the abundances of cabezon at the monitoring stations since controls were placed on the fishery in the late 1990s (Tenera Environmental, 2006). This type of population response and recovery would be unlikely if entrainment of the larvae of these species by the DCPP intake was having a large effect.

Impingement in the Context of OTC Usage

Unlike power plants on the east coast, the number of fish impinged at nearly all of California's power plants is relatively low. This is documented from the results of recent studies and also in statements from Regional Water Quality Control Board staff:

- Morro Bay Power Plant – "The evidence supports the conclusion that impingement impacts of the Project are not significant either in the absolute sense or relative to the existing plants."[1]

- Diablo Canyon Power Plant – "Regarding impingement of adult fish in the intake structure, the number of fish lost per year is so minor (a few hundred fish per year) that intake structure modifications or operational changes are not necessary. These losses are already minimized pursuant to Clean Water Act Section 316(b)."[2]

Nearly all of the plants in northern California have shoreline intakes with conventional bar racks and 3/8" mesh traveling screens. The plants either do not heat treat their intake tunnels or heat treat very infrequently due to their current operating characteristics. A plant on the open ocean like Diablo Canyon has very low impingement due to the low intake velocities and strong swimming ability of the fishes out on the open exposed coast. Total annual impingement of fishes is the approximate equivalent of the fishes caught during four party boat trips. Plants in more protected harbors and bays such as Morro Bay and Moss Landing generally have higher impingement. In southern California, plants with offshore intakes are fitted with velocity caps. Studies done at Huntington Beach and Ormond Beach Generating Stations in late 70s and early 80s show that the velocity caps can reduce impingement by upwards of 90%

Not allowing any consideration of environmental benefits is especially burdensome in the absence of any consideration of the environmental benefits of meeting the 95% impingement reduction performance standard in the Proposal. As previously noted, all of the offshore facilities have installed velocity caps for the purpose of fish protectionand

[1] Central Coast Regional Water Quality Control Board. Draft Waste Discharge Requirements. Order No. R3-2004-0028 NPDES No. CA0050610 For Duke Energy, Morro Bay, Morro Bay Power Plant, Units 1 and 2. December 2, 2004.

[2] Central Coast Regional Water Quality Control Board. Staff testimony for regular meeting of July 10, 2003 Pacific Gas and Electric Company's Diablo Canyon Power Plant renewal of NPDES Permit Prepared on June 6, 2003

previous studies have shown that this technology can achieve a reduction of approximately 80-90%. This is sufficient to comply with the Rule and many of these facilities are in the process of conducting studies to confirm the level of performance at their facilities. However, this technology is not expected to achieve the 95% reduction required by the Proposal. An additional reduction of 75 fish per year would be required for El Segundo and 525 fish per year at Huntington Beach to achieve a 95% reduction. Yet the potential cost to achieve this level of reduction due to the current intake design is likely to be in the range of millions of dollars and tens or hundreds of thousands of dollars per year in O&M costs depending on the option selected to achieve the additional 15% reduction. The effect of the current draft Proposal that does not allow for any consideration of benefit will result in very high costs with very small, or no, benefits for most of these facilities.

Entrainment in the Context of OTC Usage

The South Bay Power Plant (SBPP) and Encina Power Station (EPS) entrainment studies, in addition to relatively recent studies at DCPP, Huntington Beach, Morro Bay and Moss Landing, provide sources of information to evaluate entrainment associated with power plant operation. The results of these studies indicate there is simply no evidence suggesting that impingement or entrainment is damaging fish populations in California's coastal waters. At every one of the facilities with data from previous intake studies, some over three decades ago, not only was there no evidence of any present day damage, the source water communities of entrained fish and invertebrate larvae were remarkably unchanged. Independent scientists consulting to the Central Coast RWQCB made specific finding of this nature in their final review of the Moss Landing 2000-2001 316(b) studies of the Elkhorn Slough, Moss Landing Harbor and Monterey Bay source water in comparing them to their own study findings from 1977, a period of nearly three decades.

Specific examples regarding the lack of entrainment impacts from OTC usage include:

- South Bay Power Plant

  Studies at the South Bay Power Plant showed very little change in annual estimates of goby larvae entrainment between studies in 1979–1980 and studies in 2001 and 2003, even though they are entrained in greater numbers than any other fish. The absence of any long-term changes in larval productivity is supported by abundance data on adult gobies from an independent study that showed increases in the population through the time period from 1994-1999.

- Encina Power Station

  Recent studies at the Encina Power Station (EPS), which draws water from Agua Hedionda Lagoon (AHL), showed that goby larvae were entrained in higher

numbers than other fishes and comprised 62% of the total fish larvae entrained[3]. Monthly densities were typically several thousand per 1,000 m3 in the inner and middle portions of the lagoon, over 1,000 per 1,000 m3 in the outer lagoon, and less than 100 per 1,000 m3 in the nearshore zone. Slightly lower concentrations were measured in the earlier 316(b) study done in 1979 (SDGE 1980), with goby concentrations averaging almost 500 per 1,000 m3 in lagoon samples and 30 per 1,000 m3 in nearshore samples. The higher densities in the recent study indicate that the goby population in AHL has not changed considerably over time and not been adversely affected by the operation of EPS. The higher densities are noteworthy since infilling of the middle and inner lagoons and development of sandbars at the western edge of the inner lagoon (MEC 1995) have contributed to a reduction in total habitat area in recent years.

In contrast, densities of blenny larvae of 1,000 per 1,000 m^3 in the outer lagoon during the recent study were much greater than the densities of 67 per 1,000 m^3 from the earlier 316(b) study. The increase in larval blennies in AHL over this time period probably reflects the establishment and expansion of aquaculture operations that provide additional habitat for these fishes. The study results for blennies contrasts with the results for gobies that showed only slightly increased densities in the recent study. Whereas the habitat for gobies has declined slightly since the previous study, the habitat for blennies has increased significantly with the placement of artificial habitat in the outer lagoon.

The dependency on habitat more than larval supply is shown by results from supplemental studies on adult gobies in AHL done during the recent 316b study. Results showed large numbers of new recruits in mudflat areas in spring. By late summer the numbers had decreased indicating density dependent mortality at the settlement stage for gobies. The density dependent mortality is related to the availability of mudflat habitat, which is not affected by power plant entrainment. Overall, densities of adults in AHL were greater than densities of adults measured in nearby Batiquitos Lagoon (Merkel and Associates, 2002) which does not have a power plant intake.

- Diablo Canyon Power Plant

Long-term monitoring in central California near the Diablo Canyon Power Plant (DCPP), with an OTC volume of 2.5 billion gallons per day, showed declines in some species and increases in others in 10 years of plant operation (PG&E, 1999). Long-term declines may be attributed to a climatic shift and localized fishing, but there is no evidence that larval entrainment has substantially affected local populations that produce planktonic larvae. The health of the nearshore fish populations around DCPP is supported by recent fishery studies showing that the

[3] Tenera Environmental. 2006. EPS Cooling Water System: Entrainment and Impingement of Marine Organisms Effects on the Biological Resources of Agua Hedionda Lagoon and the Nearshore Ocean Environment. (unpublished data).

stocks in central California have not experienced the same declines seen elsewhere in the state (Stephens et al., 2006). Both sets of data show striking trends in response to changes in fishing pressure and fishing regulations, but no apparent response to the presence of the DCPP cooling water intake system – the largest single OTC system in California. If OTC is a large environmental problem why are no effects seen in fish populations due to OTC in the pristine area around DCPP with many fewer human impacts than other areas of the state.

- Moss Landing Power Plant

A Central Coast Regional Water Quality Control Board Staff Report on the Moss Landing Power Plant NPDES Permit from May 15, 2003, long-term studies on the fish fauna of Moss Landing Harbor and Elkhorn Slough by researchers at the Moss Landing Marine Laboratories showed "...in general, the species composition and overall densities of the dominant fish larvae appear to have remained fairly similar, with some species of fish larvae being considerably more abundant in 1999-2000 than in previous decades. The main categories of fish larvae exhibiting higher densities were gobies, the Pacific herring, Pacific sand lance, staghorn sculpin, white croaker, true smelts, and blennies." Although the Moss Landing Power Plant OTC was proposed as a cause of some of the changes that were observed, "...the intakes for that plant are in Moss Landing Harbor, and there is no evidence *that water from Elkhorn Slough specifically was entrained in sufficient volume to cause these changes in the ichthyofauna."* Changes in the Elkhorn Sough and Moss Landing Harbor ichthyoplankton, as shown from the results of changes in gobies from the Encina Power Station, primarily result from physical changes in habitat over time. *"As the slough's habitats have been modified (e.g. through tidal scour and erosion, especially of the tidal creeks, but also the main channel), the fish assemblages and their use of these habitats also have changed. Thus, the main reason for these changes in the Elkhorn Slough fish assemblages is erosion and the subsequent shifting of sediment..."*

Value of Historical Studies

In addition to the entrainment studies currently in progress, there are historical studies that provide for valuable comparisons with current study results and identify potential changes in fish populations due to power plant entrainment. The report on effects of OTC published by California Energy Commission in June 2005, states that IM&E studies done in the 1970s and early 1980s "...usually concluded that the cooling system had no or minimal adverse impact on the environment, and Water Boards generally accepted these conclusions. Foster (2005) concluded, however, that while the impingement studies generally provided accurate impact estimates, nearly all of the entrainment impacts in these early studies were poorly assessed, most often due to problems with study designs and sampling methods. Conclusions of "no adverse impacts" were generally unjustified." The IM&E study done at SONGS under the direction of the Marine Review Committee in the early 1980s was cited as an exception. Contrary to the statements in this CEC review of power plant studies, there were well-designed IM&E studies done in the 1970s. Two examples are the South Bay Power Plant and Encina Power Station, which

combined entrainment and source water sampling similar to the approaches later used at SONGS and DCPP. In fact, the study at the SBPP was used in a scientific journal article that was the foundational basis for the ETM approach promoted by the CEC Report as "state-of-the-art".

OTC Assessments in Other US States

The State of Maryland has spent millions of dollars through their Department of Natural Resources on the largest power plant research program in the U.S. After many years of studies they have concluded that power plant water withdrawal has had no identifiable impact on Chesapeake Bay fisheries even though the volume of OTC withdrawal from the bay is greater than any other estuarine area in the United States. Other examples from the east coast of definitive studies on OTC with long-term data collected by numerous research groups include:

- Hudson River studies showing that the striped bass spawning population increased by 10X in spite of 6 power plants employing OTC technology to withdrawal more than 5 billion gallons per day (Barnthouse 2000).

- Studies showing that the annual production of juvenile striped bass in the Delaware River grew from nearly zero in the early 1980s to more than 1,000,000 fish per year by 1990 (Kahn et al. 1998). This exponential population growth has been attributed to improvements in water quality, and occurred despite the operation of the Salem Generating Station (more than 1 billion gallons per day) and other OTC power plants withdrawing water from the Delaware.

- The Connecticut Yankee Nuclear Station located on the Connecticut River, a tidal river, was retired from service several years ago. Studies conducted prior to, during and after retirement showed no changes in fish populations that could be attributed to plant operation.

It is important to remember that the numbers of larvae produced by most fishes during their reproductive years as adults can be enormous, but only two of those larvae need to survive to adult to maintain a stable population level. For example, California halibut may release as many as 50 million eggs per year over a period of greater than 20 years, and rockfishes may release up to one million larvae per year for several years to decades depending on the species. Other species such as gobies produce only a few thousand larvae per year over a much shorter lifespan, but even in these fishes, the total lifetime survival required to maintain the population is less than 0.1%. The incremental losses of larvae due to OTC do not have any measurable effect on fish populations because they are adapted to living and reproducing in highly variable environments where the natural rates of mortality are very high and vary from year-to-year. The variation is much larger than the levels of entrainment mortality that operate on small subsets of the total coastal populations of these fishes.

Despite the large numbers of larval fish that are entrained, there is no scientific basis in population dynamics or fisheries management policy and practice to expect adverse

effects on the populations. More importantly, there is no evidence from previous 316(b) studies or information presented in the Proposal that OTC has caused or is, at present, causing significant adverse effects on California coastal fish populations. Though the absolute numbers of larvae entrained seem enormous, these losses comprise very small fractions of the populations at risk to entrainment. From a population sustainability perspective, the mortality imposed on larval populations by entrainment at OTC power plants is negligibly small compared to mortality levels of concern in fishery management. The California Department of Fish & Game has stated (CDFG 2002) in their Nearshore Fisheries Management Plan that an overfished stock is one that has been reduced to 30% of its unfished biomass and that controls would need to be enacted whenever a stock is reduced to 60% of its unfished biomass. The designs of recent entrainment studies are based on similar principles of fishery management and provide estimates of the numbers entrained (harvested) as percent of the total larvae at risk to entrainment (catchable). In these studies, the entrained fractions typically average between 2 and 10 percent of the estimated larval source populations. For many species, the average mortality level is much lower. These source populations represent, for most species, only small fractions of the total annual larval production by the adult spawning population. Because most of the spawned larvae are never susceptible to entrainment, the population-level mortality rates are likely to be much smaller than the mortality rates estimated in typical entrainment studies. Even the 2-10% mortality measured in typical entrainment studies is very small compared to the fishing mortality required to reduce a fish population to 60% or less of its unfished abundance. For many this scientific fact is difficult to comprehend or is philosophically at odds with their ideas of preservation.

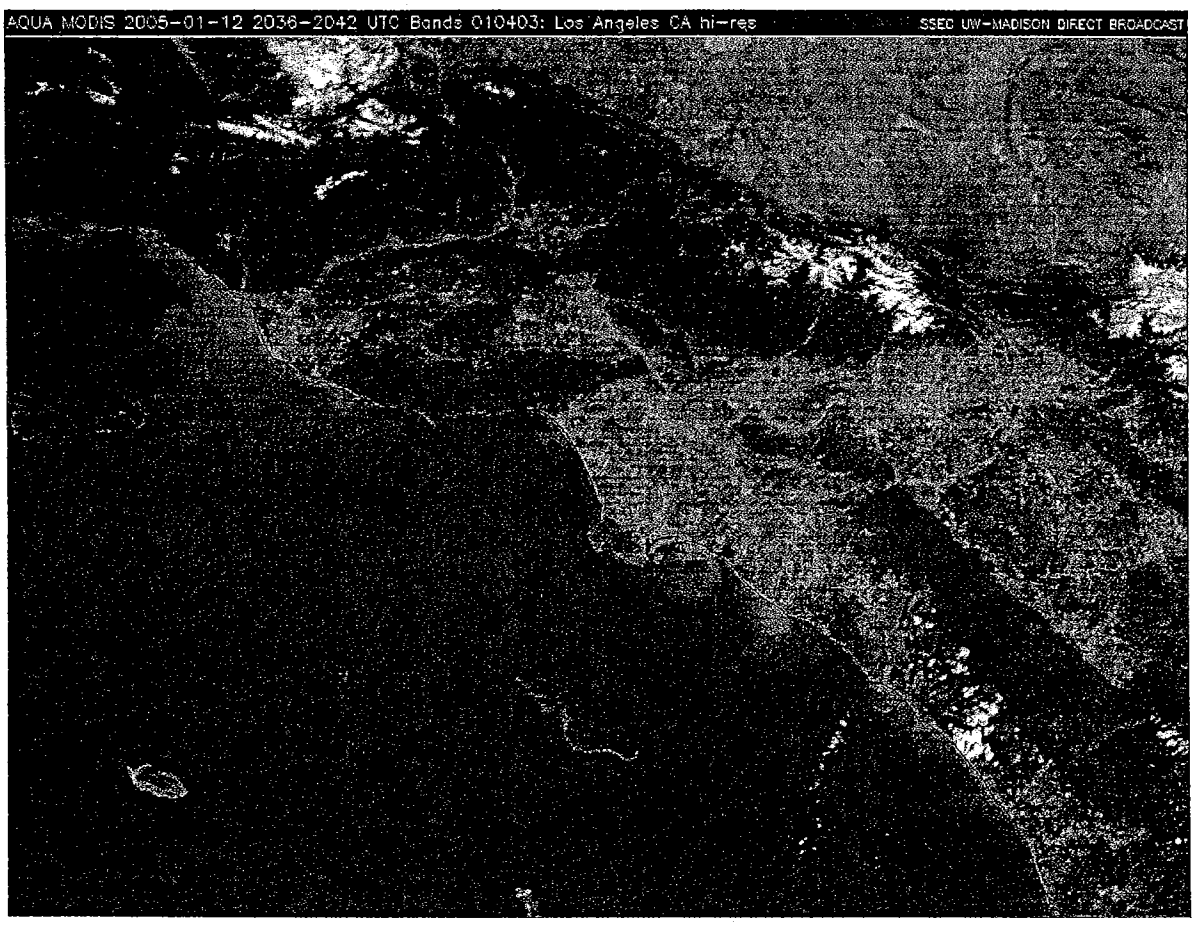
In addition, the arguments presented by State Board, California Energy Commission, and California Coastal Commission staff and members of the environmental stakeholder groups ignore the role of compensation (density dependent predation and recruitment) in maintaining these populations. An important example is the observation on gobies from Agua Hedionda Lagoon. In the case of gobies there appears to be strong density dependent mortality at the stage when the fishes recruit onto the mudflat habitat they will occupy as adults (Brothers, 1975). There is only so much space for goby burrows on the mudflat and all of the juvenile gobies that are unable to find suitable available habitat are probably prey for larger fishes. The adult population of gobies has very little dependence on larval supply, but is very dependent on habitat availability. Similar density dependencies have been shown in other temperate and tropical reef fishes. Estimates of the strength of density-dependence are now frequently used to inform fisheries management decisions. For example, recent stock assessments for cabezon and kelp greenling, prepared for the Pacific Fisheries Management Council, include an explicit model of density-dependent population dynamics (Cope and Punt, 2005; Cope and Punt, 2005). Although the relative effects of density-dependence have been debated (Rose et. al., 2001), there is a strong theoretical basis for its importance.

An equally important statistic from both the past and most recent entrainment studies is that the majority of the larval fish entrained are from species that are not commercially or recreationally important and therefore are not harvested. Since they are not harvested, the low levels of mortality imposed by entrainment are being imposed on populations that are at a level close to the natural carrying capacity of the coastal environment. The mortality due to entrainment would not affect such populations. In fact the loss (or cropping) of

early life stages in populations limited by food or space generally leads to faster growth and higher survival of subsequent life stages; another reason why reductions in entrainment losses of larval fish will not be followed by observable increases in source water populations.

The lack of evidence of environmental impacts from OTC explains why industrial cooling water remains a significant and compatible beneficial uses in coastal and bay basin plans. The State's power plant siting policy with preference to power plants that use ocean water rather than freshwater for cooling is as environmentally sound today as it was when it was first created. All of the State's approved water quality basin plans for bays and estuaries explicitly recognize the compatible, beneficial use of the water for industrial cooling The current studies being conducted under the new 316b Rule will undoubtedly provide many other examples that OTC is not resulting in significant impacts to nearshore populations. Unfortunately, the State Board is moving toward implementing a policy without any definitive studies on the effects of OTC. However, California's coastal generating facilities are currently conducting impingement and entrainment studies. Studies conducted at most of these facilities include source waterbody sampling that will allow use of the ETM model. These studies will provide quantitative information on the current level of entrainment for each facility that should provide information to quantify the affects of entrainment on marine fish populations and the level of environmental benefits that would be achieved as a result of a California Policy more stringent than the federal Rule.

The satellite image below was taken on January 12, 2005, after a storm event, and illustrates the magnitude of storm runoff in southern California. Discharges from the Santa Clara, Los Angeles, San Gabriel, and Santa Ana Rivers are clearly visible; however, almost the entire visible coastline is affected.



Absence of Substantial Impacts to Coastal Fishes and Invertebrates

There have been no studies of coastal power plants that have documented substantial impacts to source populations. On the contrary, there are several lines of evidence which indicate that despite once-through cooling system affects on individual fishes and invertebrates, these water withdrawals have not led to detectable changes in nearshore fish populations.

- Despite the fact that two generating stations that utilize up to 1.1 billion gallons per day of once-through cooling water from Santa Monica Bay began operation in the 1950s, the bay-wide sportfishing catch-per-unit-effort steadily increased and nearly doubled from the mid-1950s to the 1970s[1].

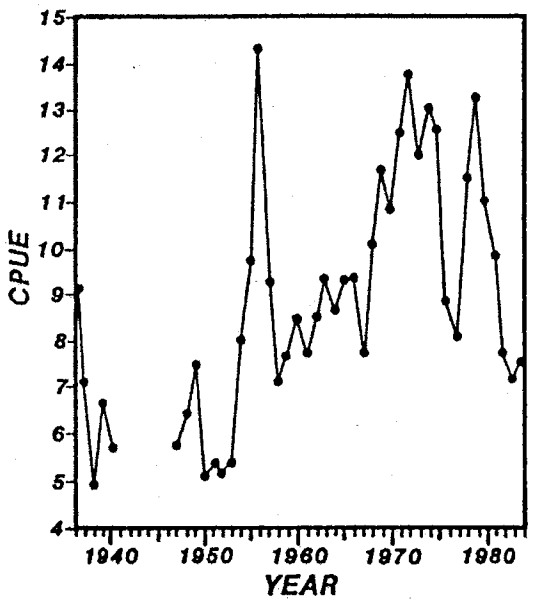


Figure 4-6. Total catch per unit effort (CPUE) for all fishing blocks in Santa Monica Bay, 1936-1984.

- Even though two generating stations (Harbor and Long Beach) have withdrawn seawater from the Los Angeles-Long Beach Harbor complex since the 1940s, the marine biological communities of the harbor complex improved from the 1950s through the 1970s, and remain healthy[2]. While early improvements to the

1 MBC *Applied Environmental Sciences*. 1985. Santa Monica Bay: Sport Fishing Revitalization Study. Prepared for Calif. Dept. Fish and Game. Dec. 1985.

2 MEC Analytical Systems. 2002. Ports of Long Beach and Los Angeles: Year 2000 Biological Baseline Survey. Prepare for the Port of Long Beach and the Port of Los Angeles. June 2002.

biological communities were largely the result of pollution abatement measures, it illustrates that despite the use of once-through cooling in a semi-enclosed harbor, diversity and abundance of fishes and invertebrates improved.

Mean larval fish densities in 2000 reported by MEC from Long Beach Harbor were similar to those reported in 1990-1 from Queensway Bay[3] and in 1983-4 in Outer Long Beach Harbor and Queensway Bay[4] (Table 1). MEC summarized: "*During the last 30 years, the dominant larval fish and egg species in Long Beach and Los Angeles Harbors have remained relatively consistent although there have been some shifts in dominance. Dominant larval fish species in the current study are similar to those caught in the past.*" These results suggest that, even in the presence of ongoing use of harbor waters for once-through cooling, the harbor complex remains a productive habitat.

Table 1. Summary of fish densities in Outer Long Beach Harbor/Queensway Bay, 1983-2000.

Year	Locations	Average Densities (Fish larvae / 100 m^2)
1983-4	L.B. Outer Harbor, Queensway Bay	1,269 – 8,365
1990-1	Queensway Bay	1,393 – 8,423
2000	L.B. Outer Harbor	3,485 – 8,358

The most abundant juvenile/adult fish species in the harbor complex in 2000 were northern anchovy, white croaker, queenfish, Pacific sardine (*Sardinops sagax*), and topsmelt (*Atherinops affinis*).

- At the AES Huntington Beach Generating Station, which withdraws up to 507 million gallons per day of once-through cooling water from the nearshore waters of San Pedro Bay, the seven most abundant fish species in weekly impingement samples in 2003-4 were the same seven dominant species recorded during the 316(b) demonstration in 1978-80. The species included queenfish (*Seriphus politus*), white croaker (*Genyonemus lineatus*), shiner perch (*Cymatogaster aggregata*), northern anchovy (*Engraulis mordax*), white seaperch (*Phanerodon furcatus*), Pacific pompano (*Peprilus simillimus*), and walleye surfperch (*Hyperprosopon argenteum*).

- At the Long Beach Generating Station, a four-year study of the potential effects of entrainment and thermal discharge was conducted from 1974 through 1978 as

[3] MBC *Applied Environmental Sciences*. 1994. Marine Biological Baseline Study: Queensway Bay, Long Beach Harbor. Prepared for the City of Long Beach. Oct. 1994.

[4] MBC *Applied Environmental Sciences*. 1984. Outer Long Beach Harbor – Queensway Bay Biological Baseline Survey. Prepared for the Port of Long Beach. Oct. 1984.

required by the California Coastal Zone Conservation Commission. The generating station was only operated intermittently between 1958 to 1974, and the plant underwent repowering to combined-cycle technology from 1974 to 1976. The scope of work was approved by the LARWQCB, CDFG, USFWS, NMFS, City of Long Beach, Port of Long Beach, and California Coastal Zone Conservation Commission (now the California Coastal Commission), and included pre-operational surveys from 1974-1976, followed by operational surveys from 1977 through 1978[5].

Among the studies conclusions were the following:

- The generating station had no detectable effect on phytoplankton in the harbor complex;
- The generating station had no measurable effect on the zooplankton community in the study area;
- The generating station did not have a detectable effect on the pelagic and demersal fishes in the harbor complex.

[5] Environmental Quality Analysts and Marine Biological Consultants, Inc. 1978. Marine Monitoring Studies, Long Beach Generating Station. Final Report 1974-1978. Prepared for Southern California Edison Company. Dec. 1978.

California Council for Environmental and Economic Balance

February 7, 2006

Paul D. Thayer
Executive Officer
State Lands Commission
100 Howe Avenue, Suite 100-south
Sacramento, CA 95825

RE: Comments on staff proposed Resolution Regarding Once Through Cooling in California Power Plants

Dear Mr. Thayer,

The California Council for Environmental and Economic Balance (CCEEB) is a non-partisan, non-profit organization of business, labor and community leaders that seeks to achieve the State's environmental goals in a manner consistent with a sound economy.

CCEEB's membership includes companies that represent over 75% of the owners of the power generating facilities that utilize once through cooling ("OTC") systems. Such companies will be impacted by the Proposed Resolution Regarding Once Through Cooling in California Power Plants scheduled for consideration at the February 9th Commission meeting. These CCEEB members wish to express their viewpoints associated with the use of OTC systems in California. CCEEB urges your reconsideration of the proposed resolution and requests the Commission to defer action until such time that it is fully informed of the potential consequences of implementation of this resolution as drafted.

Power plants utilizing OTC systems play an extremely important role in powering California and its economy by generating efficient and reliable electricity. In fact, 21 power plants producing approximately 24,000 megawatts utilize this efficient cooling technology in California, which represents approximately 40% of the total electrical generating resources in California. Many of these coastal power plants are also located in the heart of the electrical load centers of California, thereby providing critical local and regional electrical grid reliability services.

California is Currently Addressing Once Through Cooling Through Implementation of US EPA's Phase II 316(b) Regulation

US EPA spent nearly a decade developing the Phase II 316(b) regulation that now applies to power plants utilizing OTC systems. The rule targets very substantial reductions in impingement and entrainment levels at power plants, while also retaining the needed flexibility to meet the reductions in a feasible and cost effective manner. Statements that OTCs are a significant source of adverse impacts to California's coastal marine biology and ecology are inconsistent with the data that has been collected during almost three decades of operations of these facilities. The section of this letter entitled "Impacts of Once Through Cooling Systems are Not Biologically Significant" describes the evidence from recent and historical impingement and entrainment studies, from which the weight of the findings show that OTCs are not causing significant impacts to fish populations. It is therefore premature to decide that implementation of 316(b) is not the right balance of environmental protection and cost effective power production, as its full implementation is not yet realized. California should only consider a different approach if the Phase II 316(b) is proven to be insufficient for California's needs or goals.

Compliance with the Phase II 316(b) regulation is in full swing in California, with many of the mandatory steps already being completed by the regulated facilities. Those steps include recent and comprehensive impingement and entrainment studies at each of the facilities and an evaluation of the Phase II 316(b) compliance options, including the feasibility of technological solutions to meeting the impingement and entrainment standards. CCEEB is concerned that a new or different state policy as proposed by this Proposed Resolution at this stage will only serve to provide uncertainty and delay implementation of the federal regulation and most likely delay the desired end result, which is to see significant reductions in impingement and entrainment.

The State Water Board is providing valuable oversight and authority in the state's implementation of the federal 316(b) regulation. CCEEB believes the most appropriate state action is for the Board to provide specific guidance on key provisions of the regulation. In that way, the State Water Board can ensure implementation of the regulation is carried out in a consistent and efficient manner throughout the state. However, such guidance should be developed to stay within the bounds of the federal 316(b) regulation and to

not limit compliance flexibility for the facilities. This proposed Resolution undercuts the State Board's responsibility to implement 316(b) regulations in a balanced and thoughtful manner by stating the Lands Commission's intent to not extend existing leases or issue new leases after 2020.

Impacts of Once Through Cooling Systems Are Not Biologically Significant

Several staff members of the California Energy Commission and California Coastal Commission have joined with a number of environmental groups advocating the closure of coastal power plants claiming evidence of enormous damage to coastal fisheries and ecology.[1] However, both the facts and findings of recent assessments of California coastal OTC intakes provide strong evidence to the contrary, finding that OTC systems have not damaged coastal fisheries or other resources, and also have demonstrated an absence of risk to California's present and future populations of entrained organisms and to the beneficial uses of California's coastal water.

Every five years the Regional Water Quality Control Boards ("RWQCB") review the NPDES permits for use of the intake water in OTC systems. Initial, and often recurring, impingement and entrainment evaluations were required at facilities utilizing OTCs back in the early 1980's, which demonstrated these systems were not causing significant adverse impacts to marine ecosystems. In recent years, the interest and activities surrounding proposals for the installation of new generating technology for improved efficiency has provided a large amount of contemporary information on the effects of impingement and entrainment at the state's existing OTC intakes. A great deal more of this kind of information is also available as a result of information gathering requirements in EPA's new Phase II 316(b) compliance and performance standards (see Table 1 below).

At every one of the facilities with data from previous intake studies that demonstrated no adverse impacts, the recent studies also demonstrated an absence of present day damage and found the source water communities of entrained fish and invertebrate larvae were remarkably unchanged[2,3]. Independent scientists consulting to the RWQCB made specific findings of this nature in their final review of the Moss Landing 2000 & 2001 316(b) studies of the Elkhorn Slough, Moss Landing Harbor, and Monterey Bay.

[1] See for example public comments from Mr. Tom Luster (CA Coastal Commission) at the SWRCB workshop in Laguna Beach, September 26, 2005.
[2] Moss Landing Power Plant 316(b) Study
[3] South Bay Power Plant 316(b) Study

source water in comparing them to their own study findings from 1977, a period of nearly three decades.

The California Department of Fish & Game has stated in its Nearshore Fisheries Management Plan that an over-fished stock is one that has been reduced to 30% of its unfished biomass and that controls would need to be enacted whenever a stock is reduced to 60% of its unfished biomass. The designs of recent entrainment studies are based on similar principles of fishery management and provide estimates of the numbers entrained organisms as a percentage of the total larvae at risk of entrainment (source water populations). In 316(b) studies of OTC systems, the entrained fraction of the source water population of larvae usually averages between 2 and 10 percent of the estimated source populations and is much lower for most species. The 2 to 10 percent average entrained fraction represents very small impacts to adult fish due to the high natural mortality of larval fishes exceeding 99.9 percent.

The statements of significant impacts from OTC systems are often centered on the large numbers of larvae that are entrained as the only evidence needed to assume that there has to be ecological damage. However, as demonstrated by 316(b) studies, these losses of larvae are very small fractions of the source water populations of the larvae, which are present in enormous numbers in the ocean and bays (see Table 1 below). Further, the fractional losses caused by entrainment are insignificant to sustaining the adult populations of the fish relative to the levels used for fishery management, especially when more than 99.9 percent of the larvae will die naturally before becoming adults with absolutely no affect on the size of the adult fish populations. For many, this scientific fact of population dynamics, which is used to regulate and assure sustainable harvests of natural populations, is difficult to comprehend or is philosophically at odds with their ideas of preservation.

Table 1 – Summary of Entrainment Impacts from Select OTC Studies

Facility Name	Adult Equivalent Losses as a Percentage of Adult Source Water Populations	Average Proportional Entrainment Mortality as a Percentage of Source Water Larval Populations	Study Year
El Segundo	0.10 – 0.76 %	NA	1980
Huntington Beach	NA	0.6 %	2004
Diablo Canyon	NA	8.6 %	1996-1999
SONGS	0.01 – 6.9 %	NA	1979-1986
Moss Landing	NA	13.1 %	1999
Morro Bay	NA	21.0 %	2000
Scattergood	0.001 – 0.2 %	NA	1981
Harbor	0.8 – 1.8%	NA	1981
Haynes	NA	NA	1981
South Bay	NA	13.4 %	2001

The numbers of larvae produced by most fishes during their reproductive years as adults can be enormous, but only two of those larvae need to survive to adult to maintain a stable population level. For example, a single California halibut may release as many as 50 million eggs per year over a period of greater than 20 years, and a single rockfish may release up to one million larvae per year for several years to decades depending on the species. Other species such as gobies produce only a few thousand larvae per year per adult female over a much shorter lifespan, but even in these fishes, the total lifetime survival rate required to maintain the population is less than 0.1%. The incremental losses of larvae due to OTC systems do not have any measurable effect on fish populations because they are adapted to living and reproducing in highly variable environments where the natural rates of mortality are very high and vary from year-to-year. The arguments presented by some staff at the California Energy Commission and California Coastal Commission and members of the environmental protest groups ignore the role of compensation (density dependent predation and recruitment) in maintaining these populations.

On the Pacific coast, evidence showing that high numbers of entrained larvae do not result in large impacts includes the following:

- Even though gobies are entrained in greater numbers than any other fish larvae, studies at the South Bay Power Plant showed very little change in annual estimates of goby larvae entrainment between studies in 1979–1980 and studies in 2001 and 2003. The absence of any long-term changes in larval productivity is supported by abundance data on adult gobies that showed increases in the population through time from 1994-1999.
- Although recent studies at the Encina Power Station show that goby larvae are entrained in higher numbers than other fishes, studies on adult gobies in Agua Hedionda Lagoon (where the Encina intake is located) showed much higher adult densities of gobies than similar studies from Batiquitos Lagoon where no power plant is located.
- Long-term monitoring in central California at the Diablo Canyon Power Plant, with an OTC volume of 2.5 billion gallons per day, showed no significant declines in nearshore fish populations over the 20 years of plant operation.

Implementation of Phase II 316(b) Requirements Will Significantly Reduce Impingement and Entrainment at OTCs

Compliance with US EPA's Phase 316(b) performance standards requires reduction in impingement and entrainment at OTC systems even though these systems are not causing significant impacts to fish populations. The target reductions of 80 to 95 percent of impingement mortality and 60 to 90 percent of entrainment at all California's coastal facilities will, with very little uncertainty, assure the future protection of the beneficial uses of the source waters. If we have no evidence of damage to these uses over nearly three decades of operation, and recent assessments have determined that entrainment losses are below the levels allowed for sustainable harvest (as described above), then the significant reductions in these losses required by US EPA's new rule will ensure that OTC systems will have no significant effects on populations of fish, shellfish and other wildlife.

Existing State Policy Encourages the Use of Seawater for Power Plant Cooling For Many Compelling Reasons

Established policy of the State of California {California Water Code Section 13550 *et seq.*, and State Water Resource Control Board Resolution 75-58} encourages the siting of power plants on the ocean in order to take

advantage of the state's abundant seawater as a supply for power plant cooling in order to conserve the state's finite and limited supplies of freshwater for other purposes. Alternative cooling systems to OTC require the use of substantial quantities of freshwater and/or having impacts to other environmental media, thereby providing many reasons why this remains a good policy for California, including:

- Once-through cooling systems are the most energy efficient form of cooling for power plants as compared to alternatives, including wet or dry cooling towers. Wet and dry cooling systems have been demonstrated to have moderate to large reductions in power plant thermal efficiency (energy penalty) when compared to OTC. EPA estimates efficiency losses would be approximately 2.4 to 5.3 percent from wet cooling and 8.6 to 10 percent from dry cooling as compared to OTC systems (July 9, 2005 Federal Register, page 41605; and EPA Technical Development Document, Chapter 5). This loss of power plant thermal efficiency translates into reduced power production when using the same fuel rates;

- The wet/dry cooling energy penalty noted above requires more fuel use to achieve the same number of megawatts of power as OTC systems. This increased fuel use causes increases in emissions of air contaminants that are avoided with use of the more efficient OTC systems. It also increases the cost to produce the power;

- Use of wet cooling towers has been demonstrated to cause emissions of particulates that are not created with use of OTC systems;

- OTC systems avoid the use of large volumes of potable or reclaimed water typically used for wet cooling towers. Use of seawater in OTCs maintains larger available resources of potable and reclaimed water for other important uses and reduces the need to tap into additional potable water sources;

- Not using large volumes of potable water at power plants avoids the many environmental impacts associated with use of such water sources, including the storage of water, water transportation, groundwater pumping, impacts to lake, river, and stream fish and habitats, etc;

- OTC systems are low profile cooling systems and avoid the visual impacts associated with the comparably large-sized wet or dry cooling towers, both from the physical structures themselves and from vapor plumes from wet towers. Because power plants that use OTC systems are often in constrained coastal areas, use of wet or dry cooling towers may be prohibited due to local visual resource issues or unavailability of the necessary real estate;

- OTC systems avoid the significant noise impacts normally associated with wet or dry cooling towers;

- OTC systems make possible the synergies of a co-located desalination plant to utilize a single seawater intake structure to efficiently use seawater for power plant cooling and desalination for production of critically needed additional potable water supplies for California;

These benefits associated with the use of OTC systems are often over-looked when discussing OTC systems. Further, the state's list of approved water quality basin plans for bays and estuaries explicitly recognize the compatible, beneficial use of the water for industrial cooling water. For these reasons, the existing state policies of encouraging the use of seawater for industrial cooling purposes remains a good and environmentally sound policy for California.

Detailed EPA Review Concluded that Wet and Dry Cooling Retrofits are not Economically Practicable for Existing OTC Systems

During the September 26, 2005, State Water Board OTC Workshop, several public comments urged the Board to require retrofit of OTC systems to wet or dry cooling technology. While these technologies are certainly good methods of cooling for newly constructed power plants, they have serious and significant technical hurdles associated with being retrofitting onto existing power stations. Some of those issues can be summarized as:

- Since each of the 21 California power plants using OTC systems are located on, or in close proximity, to the coast (either ocean, bay, or canal), the very large required space for installing wet or dry towers is often not available at these locations;

- As pointed out earlier, retrofitting to wet or dry cooling towers can cause new and different environmental impacts. For example, wet cooling towers directly emit particulate matter emissions to the air, which can impact ambient air quality. Secondly, wet or dry cooling reduces the thermal efficiency (energy penalty) of a power plant, thereby requiring it to combust more fuel and emit more air emissions in order to generate the same amount of power as an OTC. The same holds true for dry cooling, which even has an even greater reduction in thermal efficiency associated with its use than wet towers;

- Wet and dry cooling towers tend to not meet coastal development requirements by causing potentially significant adverse impacts to visual resources and increase the noise footprint compared to facilities that utilize OTC systems;

- Wet cooling towers require the use of significant volumes of freshwater, which puts additional strain on the already severely limited freshwater sources for California. Even using reclaimed water for wet towers has an impact on freshwater sources since that reclaimed water cannot be used to offset some other more appropriate freshwater user;

- Wet and dry cooling retrofits at existing OTC facilities are very expensive. For example, the San Onofre Nuclear Generating Station ("SONGS") evaluated retrofit costs to these two cooling methods and found retrofit costs of dry cooling to be approximately $500 million and wet cooling to be $370-450 million, depending on the type of wet cooling utilized. These represent just the capital and construction costs associated with these technologies. EPA estimated the average cost of retrofitting to wet cooling to range from $130 to 200 million for higher flow facilities, but noted the estimates did not fully incorporate costs associated with acquiring land needed for these large cooling structures (July 9, 2004 Federal Register, page 41605). As noted before, there are additional and substantial costs associated with de-rating the generating units, reduction in thermal efficiency, higher operations and maintenance costs, etc. that are not included in these estimates.

Assuming implementation of this proposed Resolution and that wet or dry cooling retrofits were required at all 21 California facilities currently operating with OTC systems (approximately 24,000 megawatts), and using the above

noted retrofit cost estimates and average estimated thermal efficiency losses, the following impacts to the state's power generation capacity would result:

- Total capital costs for wet or dry cooling retrofits would be $1.1 to 4.2 billion;

- Retrofit to wet cooling would create thermal efficiency penalties roughly equivalent to 925 megawatts of lost power generating capacity (approximately two large scale combined cycle power plants);

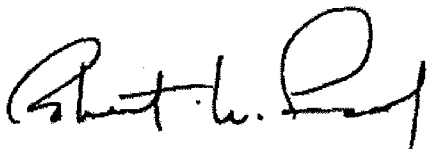
- Retrofit to dry cooling would create thermal efficiency penalties roughly equivalent the 2200 megawatts of lost power generating capacity (approximately one of California's nuclear power plants or four to five large scale combined cycle power plants).

US EPA recognized these significant and serious costs and issues and concluded that it would not require Phase II 316(b) facilities to have to consider retrofitting to wet or dry cooling as part of the Phase II 316(b) regulation (July 9, 2004 Federal Register, pages 41605 and 41608). CCEEB believes California should apply the robust set of EPA's information and findings to come to the same conclusion and not require a wet or dry cooling alternative for these OTC facilities.

In sum, this letter attempts to address some of the many complex environmental and economic issues that must be considered in any public policy statement on the topic of once through cooling. It does not attempt to describe the impact to California's energy supply or to the stability of the grid should some or all of the existing or planned, but not yet built, plants are closed because of an inability to operate after 2020. Nor does it attempt to estimate how this policy will affect investment decisions that will most certainly need to be made between now and then.

The Council thanks the State Lands Commission for its thoughtful consideration of CCEEB's viewpoints and recommendations. If you have any questions do not hesitate to call me at (916) 444-7337 for further discussion.

Sincerely,



Robert W. Lucas

cc: Members of the State Lands Commission

California Council for Environmental and Economic Balance
100 Spear Street, Suite 805 San Francisco, CA 94105

March 24, 2006

Mr. Paul D. Thayer
Executive Officer
State Lands Commission
100 Howe Avenue, Suite 100-South
Sacramento, CA 95825

RE: Comments on Staff Proposed Resolution Regarding Once Through Cooling in California Power Plants

Dear Paul,

On February 7, 2006, I wrote to you on behalf of the California Council for Environmental and Economic Balance (CCEEB) to express its concerns regarding the State Lands Commission's proposed resolution (Resolution) that states that the Commission will not approve new leases and extensions of existing leases of facilities that use Once Through Cooling (OTC) after 2020. That letter provided information regarding why the impacts of OTC systems are not biologically significant, described the stringent requirements of the US EPA Phase II 316(b) regulation which will significantly reduce impingement and entrainment at existing OTC systems, and also provided general information about the significant energy, economic, and environmental impacts associated with use of alternative cooling systems in place of OTC systems. CCEEB believes that information represents compelling evidence to not move forward with the proposed Resolution. Further to those points, CCEEB would like to provide detailed analyses and conclusions about the energy, environmental, and economic consequences that would occur should the proposed Resolution be approved.

CCEEB has compiled physical and operational data from publicly available sources on each of the affected power plants. This information was then assessed to better understand each site's capability (if any) to be retrofit with either closed cycle wet cooling towers (wet cooling) or air cooled condensers (dry cooling), the energy efficiency penalty associated with each alternative cooling source, the increased emissions of NOx, PM 10 and CO2 that would result by making up for the lost power associated with the efficiency penalties by burning more fossil fuels, and the new potable or reclaimed water that would be required

for water tower cooling. The attached tabulation displays this information along with notes that guide the reader through the methodology and assumptions as well as a statewide summary tabulation that also breaks out likely impacts in the South Coast Air Quality Management District area.

The negative impacts on energy, environmental quality, climate change, and natural resource which would occur upon implementation of this ban of OTC systems are significant and compelling to say the least. These troubling adverse impacts would be accompanied with higher costs for California consumers and businesses. We agree with statements made by representatives of the Energy Commission that these impacts should be considered on a case-by-case basis. We believe this would otherwise occur in the absence of this Resolution through normal procedures of the State Lands Commission as it applies CEQA to each application for a new or renewed lease. We recognize the limits of the information upon which the attached calculations were based, but in the absence of a complete CEQA analysis of the impacts of this Resolution, we thought it was essential for someone to compile this information and provide it to the State Lands Commission so it can be informed of the consequences of its pending action on this item.

In summary, this proposed resolution would impact 21 coastal power plants that represent 45% of in-state power generation capacity. Though four of these plants will retire or have near term shutdown commitments, approximately 67% of the active plants do not appear to have the capability to changeover to alternative cooling because of on-site space constraints or surrounding incompatible land use. As pointed out at the February State Lands Commission meeting, some of these plants operate at a low operating capacity factor as peaking units, however all of the 20,759 MWs of existing operating capacity from these plants is needed during critical peak demand periods. As such, the state can ill afford any of these plants to be shut down because the plant cannot physically accommodate alternative cooling. Yet, that remains a very possible outcome of this resolution if it is passed as proposed.

Even if one were to assume that all plants are able to be feasibly retrofit with wet or dry cooling alternatives, the capital cost to retrofit all of these facilities ranges from $2.0 Billion for wet cooling to $2.5 Billion for dry cooling. Additionally, retrofit to each of these alternative cooling technologies would create an energy efficiency penalty of a value dependent upon whether wet or dry cooling was used. Replacing the lost generation capacity to make up for the efficiency penalty would also require significant capital expenditure ranging from $290 Million for wet cooling penalties to $1.7 Billion for dry cooling penalties. Therefore the total capital cost impacts associated with retrofit and associated energy penalties ranges from $2.3 Billion to $4.2 Billion.

When these efficiency penalty factors are applied to each plant, the resulting calculation provides our estimated range of impacts associated replacing that lost generation capacity to make up the energy lost from either wet or dry cooling alternatives. In summary, the energy losses that would have to be made up

because of alternative cooling retrofit ranges from 287 MW (if all plants converted to wet cooling) to 1724 MW (if all plants converted to dry cooling). Making up this energy loss would result in a statewide increase in NOx emissions of between 167 and 1028 tons/yr, 27 to 167 tons/yr of PM10 and 311,000 to 1,914,000 metric tons of CO2. Again, the range is a function of whether each facility retrofits to either wet or dry cooling. To help put the CO2 emissions into perspective, this CO2 impact is the equivalent of adding 77,000 to 478,000 mid-size passenger cars to California roadways. Similarly, the impacts in the South Coast Air Quality Management District from making up lost power range from 78 to 483 tons/yr NOX and 13 to 78 tons/yr in PM10.

Finally, if all of the units switched to wet cooling more than 20 Billion gallons/year of fresh or reclaimed water would be required to meet the cooling needs. This appears to be contrary to the best prudent use of these valuable water resources.

We believe the State Lands Commission should also consider that State Water Resources Control Board implementation of Phase II 316(b) compliance requires 80-95% reduction in fish impingement and 60–90% reduction in entrainment. The resultant impacts on adult fish populations from these entrainments would be negligible and accomplishing these reductions are estimated to cost 5-10% of the cost of retrofitting these facilities to wet or dry cooling and would avoid the energy, economic, and environmental impacts of those alternative cooling systems.

The Commission's proposed adoption of the Resolution also fails to comply with the state Administrative Procedures Act (APA) and the California Environmental Quality Act (CEQA). It is clear that the Commission intends that the Resolution establish policy that will be binding on the Commission as well as other governmental agencies and private parties. If adopted, the Resolution will necessarily affect the decisions of facility owners, operators, lenders and others, who will be reluctant to risk substantial investment decisions on either a future change in the Resolution or approval of a lease renewal despite the Resolution. Consequently, the Resolution is in reality a regulation, the adoption of which is subject to the APA. The Commission has not even attempted to satisfy the procedural and substantive requirements of the APA.

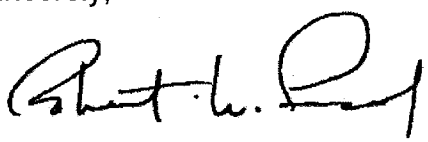
Adoption of the Resolution also independently qualifies as a "project" under CEQA. The information provided above and in our February 7 letter is more than sufficient to establish a fair argument that the Commission's adoption of the Resolution may cause a significant environmental impact. Thus, the Commission cannot adopt the Resolution until after it has prepared and certified an Environmental Impact Report that fully evaluates the environmental impacts of the Commission's proposed policy on once through cooling.

Considering the magnitude and extent of the negative impacts to energy production and cost, criteria pollutant and greenhouse gas emissions, increased fossil fuel and water resource use to preserve existing power plant operation at

today's levels- in addition to the added costs to consumers and businesses- which would occur as a result of this proposed ban on once through cooling, CCEEB again urges the State Lands Commission to reconsider this ban, revise the language in the proposed resolution accordingly and subject it to review pursuant to CEQA and in accordance with the requirements of the APA.

Thank you for your consideration of our concerns. If you would like to discuss these comments further, please contact me at 916-444-7337.

Sincerely,



Robert W. Lucas

Attachment

cc: Members of the State Lands Commission
Tam Doduc, Chair, SWRCB
Joe Desmond, Chair, California Energy Commission
Mike Chrisman, Secretary, Resources Agency
Victor Weisser, President, CCEEB
Jack Gualco, The Gualco Group

Summary of Impacts Associated with State Lands Commission Draft Resolution on Once Through Cooling:

General OTC Information:	
Number of Power Generation Facilities with OTC Systems:	21
Total Operating Capacity in MWs Using OTC Systems:	20,759
Percentage of CA In-State Power Generation Capacity that use OTC Systems:	45%
Range of Facility Generation Capacity Factors:	3.5% to 98%
Average Generation Capacity Factor:	25.5%
Number of Facilities Retired or with Near-Term Shutdown Commitments:	4
Percentage of OTC Facilities Where Alternative Cooling is Technically Infeasible:	67%

Impacts Associated with Retrofit to Alternative Cooling Systems:	Wet Towers	Dry Towers
Alternative Cooling Energy Penalty (Reduced Generation Capacity in MWs) Caused by Retrofit:	287	1,724
Statewide Increase in NOx Emissions (tons/year) from Replacing Lost MWhrs:	167	1,028
South Coast AQMD Increase in NOx Emissions (tons/year) from Replacing Lost MWhrs:	78	483
Statewide Increase in PM10 Emissions (tons/year) from Replacing Lost MWhrs:	27	167
South Coast AQMD Increase in PM10 Emissions (tons/year) from Replacing Lost MWhrs:	13	78
Statewide Increase in CO2 Emissions (metric tons/year) from Replacing Lost MWhrs:	311,491	1,914,837
Percentage Increase in CO2 Inventory from In-State Power Generation Sector to Replace Lost MWhrs:	0.7%	4.4%
CO2 increase to replace lost MWhrs is equivalent to CO2 from this many 4 tpy mid-size passenger cars:	77,873	478,709
Estimated Increase in Fresh or Reclaimed Water Use if Retrofit to Wet Cooling Towers (gallons/year):	20,427,747,169	-

Alternative Cooling Capital Cost Estimates (assumes technical feasibility):	Wet Towers	Dry Towers
Estimated Capital Cost to Retrofit All Operating Units to Alternative Cooling Systems:	$2,019,373,750	$2,502,034,376
Estimated Cost to Construct New Facility to Replace Lost MWs Due to Energy Penalties:	$286,612,000	$1,723,840,000
Total Estimated Costs to Retrofit with Alternative Cooling Systems & Replace Lost MW Capacity:	$2,305,985,750	$4,225,874,376

Phase II 316(b) Compliance Information:	
Required Impingement Reduction Standard	80-95%
Required Entrainment Reduction Standard	60-90%
US EPA's Calculated Capital Costs to Comply with Phase II 316(b) for CA Facilities:	$225,000,000
US EPA Cost Estimate as Percentage of Total Wet Cooling Retrofit Costs:	9.8%
US EPA Cost Estimate as Percentage of Total Dry Cooling Retrofit Costs:	5.3%
Did US EPA Find it Cost Effective to Require Retrofit to Closed Cycle Cooling in Phase II 316(b)?	NO

California Power Generation Facilities Using Once Through Cooling Systems

Facility Name	Owner	MW Capacity[14]	CW Capacity (MGD)	CW Capacity (GPM)	Approximate Capacity Factor	Dispatch Profile (peak (<10%), intermediate (10-50%), baseload (>50%)	Initial Commercial Operations	Retirement Date Commitment	Status of 316(b) Compliance	Status of State Lands Lease Renewal	EPA Phase II 316(b) Facility Cost Estimate (corrected)[16]
Alamitos	AES	1950	1275	885,417	10.0%	Peaking	1956	None	Submitted PIC; IM&E Study underway	Uncertain	
Contra Costa	Mirant	690	440	305,556	20.0%	Intermediate	1964	None	PIC due late Feb 06. Studies TBD.	Expires 2024	$2,018,600
Diablo Canyon	PG&E	2200	2540	1,763,889	98.0%	Baseload	1985	None	316(b) Study submitted in 2000.	Tidelands lease expires 2018 and discharge right of way expires 2019	$48,835,329
El Segundo 3 & 4[3]	NRG	670	398	276,389	15.0%	Intermediate	1964-1965	None	Submitted PIC; IM&E Study underway	Lease expired, renewal application complete	$15,600,838
Encina	NRG	965	857	595,139	25.0%	Intermediate	1954-1978	None	IM&E Study 95% Complete	Lease expired, renewal applications complete	$6,679,938
Haynes	LADWP	1619	1014	704,167	34.0%	Intermediate	1962-1970,2004	None	Submitted PIC; IM&E studies underway	No lease with State Lands	$5,283,933
Humbolt Bay	PG&E	105	78	54,167	0.0%	Peaking	NA	Near Term	NA - Near term shutdown	NA - Near term shutdown	$1,040,022
Hunters Point	PG&E	0	0	0	0.0%	Peaking	NA	2006	NA - Near term shutdown	NA - Near term shutdown	$183,653
Huntington Beach	AES	880	507	352,083	18.0%	Intermediate	1958	None	Submitted PIC; IM&E Study underway	Expires in August 2006	$6,614,078
Long Beach[4]	NRG	0	0	0	0.0%	Retired	1976-1977	Retired	Not Applicable	No lease with State Lands	$2,707,585
Los Angeles Harbor	LADWP	235	108	75,000	29.0%	Intermediate	1942-1972,1994,2001	None	Submitted PIC; IM/E studies underway	No lease with State Lands	$264,532
Mandalay	Reliant	430	255	177,083	15.0%	Intermediate	1959	None	PIC submitted; IM&E studies underway	Not applicable	$2,336,881
Morro Bay	Duke	1002	668	463,889	4.0%	Peaking	1955-1963	None	Permit renewal has schedule	Lease in trust to City of Morro Bay. Recently renegotiated.	$4,341,494
Moss Landing 6&7	Duke	1500	864	600,000	3.5%	Peaking	1969	None	Permit renewal has schedule	Lease in trust to Moss Landing Harbor District currently in negotiation	$9,044,216
Moss Landing 1&2	Duke	1038	360	250,000	55.0%	Baseload	2000	None	Permit renewal has schedule	Lease in trust to Moss Landing Harbor District currently in negotiation	
Ormond Beach	Reliant	1500	688	477,778	15.0%	Intermediate	1971-1973	None	PIC submitted; IM&E studies underway	Renewed 4/03; expires 4/17	
Pittsburg	Mirant	660	432	300,000	25.0%	Intermediate	1960-1961	None	PIC proposed later in 06. Studies TBD.	Expires 2015	$2,960,066
Potrero	Mirant	210	226	156,944	45.0%	Baseload	1965	None	PIC submitted Feb 06. E complete. I starting in Apr.	N/A. Under SF Port Authority.	
Redondo Beach	AES	1310	881	611,806	5.0%	Peaking	1954	None	Submitted PIC; IM&E Study underway	Uncertain	
San Onofre	SCE	2254	2580	1,791,667	95.0%	Baseload	1983/1984	None	Submitted PIC; IM&E to begin late Feb early Mar	Lease Expires in 2023	N/A
Scattergood	LADWP	818	495	343,750	25.0%	Intermediate	1957-1974	None	Submitted PIC; IM/E studies underway	49 year lease with State Lands started in 1980	
South Bay	Duke	723	601	417,361	25.0%	Intermediate	1960s	2008?	Submitted PIC; No Studies needed	Required plant shutdown by 2008	$143,049
Totals/Averages:		**20,759**	**15,267**	**10,602,083**	**25.5%**						**$108,054,214**

Notes:

1 These are GENERAL estimates: based on average wet cooling retrofit cost estimates from Jim Maulbetsch, Maulbetsch Consulting of $125/gpm for easy retrofits & $250/gpm for difficult retrofits. These estimates may not be accurate on a plant specific basis, due to specific site design situations

2 Based on San Onofre cost estimates for dry cooling retrofit equal to approximately $288/gpm of cooling water capacity; the SONGS estimate may or may not be an accurate estimate on a plant specific basis for the other OTC facilities in CA due to site specific design situations.

3 El Segundo 1 & 2 (350 MW) retired in 2003

4 Long Beach (598 MW) retired in 2004

5 Wet cooling energy penalty based on US EPA estimates provided in the Phase II 316(b) Technical Development Document for west coast facilities (Seattle), Table 5-4, page 5-4

6 Dry cooling energy penalty based on US EPA estimates provided in the Phase II 316(b) Technical Development Document for west coast facilities (Seattle), Table 5-4, page 5-5

7 Based on statewide average NOx rate of approximately 0.37 lbs/MWhr (Figure 3-5, Page 55, 2005 CEC Environmental Performance Report)

8 Based on statewide average CO2 equivalent rate of approximately 0.38 tons/MWhr (Figure 3-6, Page 56, 2005 CEC Environmental Performance Report)

9 Based on August 7, 2002 Utility Water Act Group comments to US EPA Phase II 316(b) rule development, as estimated by Shaw Stone & Webster. These estimates may not be accurate on a plant specific basis due to site design considerations

10 Percentage increase in state-wide CO2 metric tons from in-state power generation caused by OTC retrofit and alternative cooling energy penalties, based on 2002 inventory of 43.5 million metric tons (from CEC GHG Inventory Update, June 2005)

11 Assumed capital cost for adding a new natural gas fired combined cycle gas turbine plant to replace lost MWs caused by wet/dry cooling retrofit is $1000/KW

12 Based on CEC estimate for a typical 500 MW steam cycle plant with wet cooling towers operating at 90% capacity factor to use 1735 million gallons/year, reduced porportionally to average capacity factor of the OTC facilities (Table 5-1, Page 110, CEC 2005 Environmental Performance Report)

13 Based on statewide average PM10 rate of approximately 0.06 lbs/MWhr; does not include added PM10 from wet cooling tower drift (Figure 3-8, Page 58, 2005 CEC Environmental Performance Report)

14 Estimated MW capacity is based on actual remaining capacity still operating that uses OTC, imminent unit retirements are not included in total

15 Dry tower retrofit capital cost estimates based on formula found in US EPA's Phase II 316(b) Technical Development Document, Page D-4. These estimates may not be accurate on a plant specific basis due to site design considerations

16 In the Phase II 316(b) regulation, EPA provided plant specific cost estimates to comply with the performance standards based on national averages for control technology. For some facilities, EPA did not provide a cost estimate either due to confidential requests by the owner or because EPA found that the facility already met the performance standards due to existing control technology (e.g. Scattergood and El Segundo). EPA also provided a formula for estimating compliance cost based on a similar facility for those facilities without facility-specific cost estimates (e.g. El Segundo)

New water nee

Facility Name	Wet or Dry Cooling Feasible?	Wet Cooling Capital Cost (Easy Retrofit Estimate)[1]	Wet Cooling Capital Cost (Shaw-UWAG Estimate)[9]	Wet Cooling Capital Cost (Difficult Retrofit)[1]	Dry Cooling Capital Cost (SONGS Estimate)[2]	Dry Cooling Capital Cost (EPA Estimate)[13]	Wet Cooling Retrofit Energy Penalty (EP)[5]	Wet Cooling Lost MW Capacity - Energy Penalty[5]	Dry Cooling Retrofit Energy Penalty (EP)[6]	Dry Cooling Lost MW Capacity -Enegy Penalty[8]	Increased annual NOx tons from Wet EP[7]	Increased annual NOx tons from Dry EP[7]	Increased annual PM_{10} tons from Wet EP[13]	Increased annual PM_{10} tons from Dry EP[13]	Increased annual CO2 in metric tons from Wet EP[8]	Increased annual CO2 in metric tons from Dry EP[8]
Alamitos	Possible	$110,677,083	$171,660,000	$221,354,167	$255,000,000	$191,691,589	1.5%	29.25	8.9%	173.55	4.7	28.1	0.8	4.6	8,833.2	52,410.1
Contra Costa	TBD	$38,194,444	$64,340,000	$76,388,889	$88,000,000	$65,839,952	1.5%	10.35	8.9%	61.41	3.4	19.9	0.5	3.2	6,251.2	37,090.3
Diablo Canyon	Not technically feasible	$220,486,111	$250,520,000	$440,972,222	$508,000,000	$207,624,519	1.6%	35.20	10.0%	220.00	55.9	349.4	9.1	56.7	104,174.0	651,087.7
El Segundo 3 & 4[3]	Insufficient Space	$34,548,611	$88,560,000	$69,097,222	$79,600,000	$59,200,805	1.5%	10.05	8.9%	59.63	2.4	14.5	0.4	2.4	4,552.5	27,011.4
Encina	Incompatible Land Use	$74,392,361	$109,370,000	$148,784,722	$171,400,000	$132,295,633	1.5%	14.48	8.9%	85.89	5.9	34.8	1.0	5.6	10,928.2	64,840.8
Haynes	Insufficient Space	$88,020,833	$132,280,000	$176,041,667	$202,800,000	$156,082,345	0.4%	6.48	2.4%	38.86	3.6	21.4	0.6	3.5	6,649.3	39,895.9
Humbolt Bay	NA	$6,770,833		$13,541,667	$15,600,000	$11,360,387	1.5%	1.58	8.9%	9.35	0.0	0.0	0.0	0.0	0.0	0.0
Hunters Point	NA	$0		$0	$0	$800,490	1.5%	0.00	8.9%	0.00	0.0	0.0	0.0	0.0	0.0	0.0
Huntington Beach	Possible	$44,010,417	$71,410,000	$88,020,833	$101,400,000	$76,519,996	1.5%	13.20	8.9%	78.32	3.9	22.8	0.6	3.7	7,175.3	42,573.2
Long Beach[4]	NA	$0		$0	$0	$800,490	1.5%	0.00	8.9%	0.00	0.0	0.0	0.0	0.0	0.0	0.0
Los Angeles Harbor	Insufficient Space	$9,375,000		$18,750,000	$21,600,000	$15,561,990	1.5%	3.53	8.9%	20.92	1.7	9.8	0.3	1.6	3,087.1	18,316.7
Mandalay	Insufficient Space	$22,135,417	$32,180,000	$44,270,833	$51,000,000	$37,097,199	1.5%	6.45	8.9%	38.27	1.6	9.3	0.3	1.5	2,921.7	17,335.7
Morro Bay	Incompatible Land Use	$57,986,111	$106,180,000	$115,972,222	$133,600,000	$102,365,927	1.5%	15.03	8.9%	89.18	1.0	5.8	0.2	0.9	1,815.6	10,772.3
Moss Landing 6&7	Incompatible Land Use	$75,000,000	$124,500,000	$150,000,000	$172,800,000	$133,382,490	1.5%	22.50	8.9%	133.50	1.3	7.6	0.2	1.2	2,378.2	14,110.4
Moss Landing 1&2	Incompatible Land Use	$31,250,000	$124,500,000	$62,500,000	$72,000,000	$53,242,990	0.4%	4.15	2.4%	24.91	3.7	22.2	0.6	3.6	6,896.2	41,377.3
Ormond Beach	Incompatible Land Use	$59,722,222	$89,760,000	$119,444,444	$137,600,000	$105,570,491	1.5%	22.50	8.9%	133.50	5.5	32.5	0.9	5.3	10,192.1	60,473.2
Pittsburg	TBD	$37,500,000	$152,860,000	$75,000,000	$86,400,000	$64,571,490	1.5%	9.90	8.9%	58.74	4.0	23.8	0.7	3.9	7,474.2	44,347.0
Potrero	Space Constraints	$19,618,056	$28,390,000	$39,236,111	$45,200,000	$32,737,730	1.5%	3.15	8.9%	18.69	2.3	13.6	0.4	2.2	4,280.7	25,398.8
Redondo Beach	Insufficient Space	$76,475,694	$118,500,000	$152,951,389	$176,200,000	$136,013,233	1.5%	19.65	8.9%	116.59	1.6	9.4	0.3	1.5	2,967.0	17,604.4
San Onofre	Insufficient Space	$223,958,333	$289,800,000	$447,916,667	$516,000,000	$201,702,064	1.6%	36.06	10.0%	225.40	55.5	347.0	9.0	56.3	103,463.8	646,648.5
Scattergood	Insufficient Space	$42,968,750	$72,650,000	$85,937,500	$99,000,000	$74,600,822	1.5%	12.27	8.9%	72.80	5.0	29.5	0.8	4.8	9,263.5	54,963.5
South Bay	Incompatible Land Use	$52,170,139	$54,880,000	$104,340,278	$120,200,000	$91,606,117	1.5%	10.85	8.9%	64.35	4.4	26.1	0.7	4.2	8,187.7	48,580.2
Totals/Averages:		**$1,325,260,417**	**$2,082,340,000**	**$2,650,520,833**	**$3,053,400,000**	**$1,950,668,751**	**1.4%**	**287**	**8.4%**	**1,724**	**167.2**	**1,027.6**	**27.1**	**166.6**	**311,491.4**	**1,914,937.2**

% of state GHG inventory from power generation[10] = 0.7% 4.4%

Notes:

Cost to replace lost MWs[11] = $286,612,000 $1,723,840,000

ded for wet cooling retrofits (gals/year)[12]: 20,427,747,169

NOx Increase in SCAQMD Area = 78.3 482.7

PM10 Increase in SCAQMD Area = 12.7 78.3

Department of Water and Power the City of Los Angeles

JAMES K. HAHN
Mayor

Commission
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BARBARA E. MOSCHOS, *Secretary*

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April 11, 2005

Via EMAIL ryork@energy.state.ca.us

Mr. Terrence O'Brien, Deputy Director
System Assessment and Facilities Siting
1516 Ninth Street, MS 40
Sacramento, Ca 95814-5512

Attention: Mr. Rick York, Staff Biologist

Dear Mr. O'Brien:

Subject: Los Angeles Department of Water and Power Comments on the California Energy Commission's (CEC) Draft Document – "An Assessment of the Studies to Detect Impacts to Marine Environments by California's Coastal Power Plants Using Once-Through Cooling – A Plant-By-Plant Review" (Draft Assessment Document)

The Los Angeles Department of Water and Power (LADWP) appreciates the opportunity to review the Draft Assessment Document. LADWP further appreciates the extension of the comment period to April 11th since it did not receive copies of this document from yourself or Mr. Rick York until March 21st and March 18th, respectively.

After a careful and thorough review of the Draft Assessment Document, as well as the LADWP studies referenced in the document, LADWP has several comments and concerns. A detailed response to the Draft Assessment Document is enclosed.

If you have any questions or would like to discuss the nature of LADWP's comments, I may be reached at (213) 367-0279
Sincerely,

Susan M. Damron
Manager of Wastewater Quality Compliance

Enclosure
SMD/bdc
c: Mr. Rick York, Staff Biologist
1516 Ninth Street, MS 40
Sacramento, Ca 95814-5512

Mr. Michael Lyons, Staff Biologist
Los Angeles Regional Water Quality Control Board
320 West Fourth Street, Suite 200
Los Angeles, CA 90012

Los Angeles Department of Water and Power Comments on the California Energy Commission's (CEC) Draft Document – "An Assessment of the Studies to Detect Impacts to Marine Environments by California's Coastal Power Plants Using Once-Through Cooling – A Plant-By-Plant Review" (Draft Assessment Document)

The Draft Assessment Document, despite its title and stated purpose, namely to determine the scientific adequacy of studies used to detect impacts, chose to review only three documents; the 1971-72 Thermal Effects Studies (published in 1973), the 1978-79 316(b) Demonstration Studies (published in 1981), and only the 1996 annual Receiving Water Monitoring Study. In addition to the Thermal Effects Study and the 316(b) Demonstration Study, LADWP has conducted Receiving Water Monitoring studies since 1978 (1978, 1980, 1986, 1988, and 1990 – 2004). LADWP believes Dr. Michael Foster, the document's author, conducted a very cursory review of a limited subset of scientific documents, some of which were very lengthy, and to say the least, complicated. In some cases (e.g., the Scattergood Generating Station), the document's author never reviewed the Thermal Effects Study and yet concluded that it was inadequate. Other supporting documents, such as interim reports and sampling plans, were not reviewed or disregarded. As a result of these cursory reviews, Dr. Foster reported that the study designs were inadequate and lacked current information, thereby concluding that impacts from once-through power plant cooling systems are largely unknown. LADWP believes that Dr. Foster's reviews are both insufficient and incomplete, and as a consequence, lead to inaccurate conclusions.

General Comments

Dr. Foster often concludes that a study or portions of a study are inadequate, however, the document never offers a definition, nor describes in detail, what is consider adequate. Therefore, the standard to which the comparison is being made is left unknown. Dr. Foster is also inconsistent in applying his standard of "adequacy" among the generating stations.

The Draft Assessment Document fails to describe the regulatory protocols used for the Thermal Effects Studies and the 316(b) Demonstration Studies that serve as the basis for study design. The implementation directive of the 1971 Thermal Plan was to require that existing dischargers of thermal waste "conduct a study to define the effect of the discharge on beneficial uses and, for existing discharges, determine design and operating changes which would be necessary to achieve compliance with the provisions of this plan." The Los Angeles Regional Water Quality Control Board (LA Board), with the concurrence of the State Department of Fish and Game (DFG), subsequently issued Study Plan and Technical Report Specifications to LADWP for each of its three coastal generating stations that accomplished the Thermal Plan directives. LADWP's Thermal Studies referenced in the Draft Assessment Document adhered to these study protocols. The LA Board deemed that the results of this yearlong study were not only compliant with the study specifications, but also concluded that the results demonstrated that the beneficial uses of the receiving water were being protected. In the estimation of the LA

Board, these studies were deemed adequate to detect impacts and that there were no impacts to the designated beneficial uses of the water body.

The implementation directives of the 1971 Thermal Plan further require the various Regional Boards to monitor the discharges of elevated temperature wastes to determine compliance with effluent and receiving water requirements. The implementation directives specifically state, "Furthermore, for significant thermal discharges as determined by the Regional Board or State, Regional Boards shall require expanded monitoring programs, to be carried out either on a continuous basis or periodic basis, designed to assess whether the source continues to provide adequate protection to beneficial uses (including the protection and propagation of a balanced indigenous community of fish, shellfish, and wildlife, in and on the body of water into which the discharge is made)." These periodic, and more recently continuous, monitoring programs have been the annual Receiving Water Monitoring (RWM) studies. The study scope of the RWM studies has remained essentially the same (with minor changes over the years) as the initial thermal study specifications (e.g., sampling locations, water column monitoring, benthic monitoring, etc.). Thus, substantial and current information does exist to track and assess the thermal effects of the generating stations. This information is submitted annually to the LA Board for their review.

The scope of study for LADWP's 316(b) Demonstration Studies was developed in conformance with USEPA's Development Document for Best Technology Available for the Location, Design, Construction and Capacity of Cooling Water Intake Structures for Minimizing Adverse Environmental Impacts, published April, 1976. Prior to commencing, this scope of work was reviewed by the LA Board and various state and federal resource agencies (e.g., DFG, NMFS). In addition to receiving agency approval for the study design, LADWP's consultant conducted biological and physical oceanographic field work prior to commencing the 316(b) Demonstration Study to further frame the scope of work. This Interim Report, published in July of 1978, contains findings and explanations for any modifications to the final study approach. This document was also reviewed and approved by the LA Board prior to embarking on the yearlong 316(b) demonstration. The LA Board, and the state and federal agencies consulted, deemed the final study approach adequate. LADWP is confident that the study design, scope of work, sampling methods, and the metrics used during this study reflected the best study approach of its time. While more recent entrainment and impingement approaches have been implemented, these neither invalidate nor diminish the validity, accuracy, and usefulness of the data that was historically gathered. The new studies, which will be implemented next year to comply with the 316(b) Rule, will take advantage of any study design improvements while maximizing the usefulness and value of the historic information.

Abstract and Summary

Page 4, Paragraph 1 – "Assessments of the effects of the cooling systems of four plants...have been completed recently using currently accepted methods to provide a reasonable understanding of impacts."

LADWP contends that just because the methods are "currently accepted" does not invalidate the historical methods or findings. Furthermore, the fact that the studies were recently completed does not necessarily provide a greater understanding of the impacts than what was known historically.

Page 4, Paragraph 2 – "The original [thermal] assessments...were completed in the 1970s and early 1980s, with occasional new studies since then."

As previously pointed out above, the annual RWM Studies conducted in 1978, 1980, 1986, 1988, and 1990 through 2004 have provided an ongoing assessment of thermal impacts.

Page 4, Paragraph 2 – "Generally speaking the description of the thermal plume and the sampling technique used to determine impacts were inadequate."

The author has not established a definition of "adequate". As previously pointed out, the study "specifications" set forth and approved by the LA Board, with consultation from the DFG, believed the study design to be "adequate". Subsequent annual RWM studies conducted to fulfill the Thermal Plan implementation directives have also been deemed "adequate". Furthermore, the NPDES permit findings have consistently stated that the beneficial uses of the water body are being protected.

Page 4, Paragraph 4 – The document questions the appropriateness of using "surrogate" studies.

While LADWP did not rely on surrogate studies for its 316(b) demonstrations, it is interesting to note that in the Phase II 316(b) Rule, EPA acknowledged the possibility for using surrogate studies or the results from nearby similar facilities to aide in the characterization of baseline.

Page 4, Paragraph 4 – "...sampling methods (e.g., sampling at the intake or the discharge with a pump)...likely provide biased estimates of entrainment."

The wording selected by the document's author implies uncertainty ("likely") as to whether sampling by pump produces bias.

The currently used method of sampling, namely by nets, could also introduce bias if not properly integrated and accounted for. The pre-survey 316(b) demonstration testing (IRC Interim Report, 1978) was conducted in part to account for this bias. Therefore, the sampling results in the demonstration study accounted for this sampling technique in its estimates of entrainment.

Page 4, Paragraph 5 – Impingement sampling is characterized as "not very useful to evaluate current impacts" because "many plants were only studied in the late 1970's and early 1980's".

First, as LADWP consistently points out in its comments, old historic data is not bad or useless data. Historic data provides a valuable context to the overall study of impingement effects at each of the power plants.

Secondly, Scattergood Generating Station has been characterizing impingement since 1968, and regularly each year from 1977 to the present. Haynes Generating Station has been characterizing impingement each year since 2000, and Harbor Generating Station has been characterizing impingement each year since 2003. These impingement results are provided in the corresponding year's RWM report. LADWP believes there is ample, and in some cases, substantial data to characterize impingement over several years, including recent years.

Page 5, Paragraph 1 – The document comments that the current RWM sampling stations are only a subset of the original Thermal Study. The document goes on to state that because the original Thermal Studies were inadequate, the RWM studies are also inadequate in detecting thermal impacts.

As LADWP has previously commented, the author lacks a definition of adequate and the 1971-72 thermal study specifications were in fact adequate as they were developed, approved, and issued by the LA Board for the express purpose of fulfilling the requirements of the Thermal Plan, namely, to define whether the thermal plume had an impact on beneficial uses. In addition, as previously commented, the ongoing RWM studies were required to satisfy the Thermal Plan directive to continuously and/or periodically assess whether major thermal discharges were impacting beneficial uses. Thus, since the original thermal studies were deemed adequate, the RWM studies, which mirror these studies in large part, are also adequate and they are continually reviewed for adequacy each permit term. Since the original thermal studies were designed for the express purpose of detecting impacts to beneficial uses, so also have been the subsequent RWM studies.

Page 5, Paragraph 2 – The document comments on the purpose and necessity of the annual RWM studies. The author postures that, absent a regulatory purpose due to the discharge of wastes other than once-through cooling, conducting RWM studies appears to be of little value in detecting thermal impacts.

Without commenting on what is in the power plant effluent, with or without the "other" plant wastes and whether that is an appropriate trigger for requiring RWM studies, as previously pointed out, the Thermal Plan expressly requires the Regional Boards to mandate periodic evaluations for the express purpose of evaluating the thermal plume's impact on beneficial uses. LADWP contends that these ongoing RWM studies can and do have a value in detecting thermal impacts.

LADWP believes it is also important to note that the purpose of the thermal studies, and thus the ongoing RWM studies, is to assess whether beneficial uses are being protected. Thus, the ongoing RWM studies, while looking at the thermal component of the discharge, are also assessing the total impact of the discharge, if any, on the beneficial

uses. While the original thermal study assessed thermal impacts, subsequent monitoring is continuing to assess whether there is a balanced indigenous population and whether beneficial uses are being protected (i.e., not impacted).

Page 5, Paragraph 3 – The document states, "There is no question that the once-through cooling systems of coastal power plants cause adverse environmental impacts..."

What is adverse? Even USEPA, in the final Phase II 316(b) Rule, did not attempt to define adverse. Is adverse to be defined at the population level or at the single organism level? USEPA decided to avoid determining the answer to that question and instead established performance standards. Under the California Environmental Quality Act (CEQA), adverse is defined; however, the original 316(b) demonstrations were not conducted to satisfy CEQA and neither will the impending 316(b) Rule mandated compliance studies. LADWP recommends that the author omit any discussion of, or attempt to define, what are adverse impacts.

Page 5, Paragraph 3 – The document states that historic studies and recent NPDES monitoring indicating no adverse impact "have been shown to be wrong at all plants recently assessed".

The author does not elaborate or provide a supporting discussion of why he believes this. Recent 316(b) demonstrations (Diablo, Morro, Moss) have looked at the technology used at the facility and found it to be protective of the population. While various regulatory agencies have required mitigation for CEQA compliance and CEC licensing, that does not mean that the previous studies and the more recent study's assessment of no adverse impact is wrong.

Page 5, Paragraph 3 – The document states that four permit cycles have occurred since 1980 providing ample opportunity to require "properly designed studies as new knowledge has become available".

LADWP contends that the studies conducted were properly designed.

Page 6, Paragraph 1 – The document recognizes that power plants are not the only contributor to a decline in some fish populations.

LADWP believes that these other contributors (e.g., El Nino events, recreational and commercial fishing, watershed pollution, habitat modifications, storm water runoff, etc.) should be listed in the document.

Standards for Evaluation

In general, LADWP finds this entire section somewhat confusing. LADWP understood that the purpose of this document was to determine the scientific adequacy of studies used (past tense) to detect impacts to the marine environment from power plant once-through cooling systems. The confusion lies in that the author appears to be commenting

throughout this entire section on the appropriate study approach for assessing impacts in future thermal and entrainment/impingement studies.

Page 7, Paragraph 1 – While Sections 316(a) and (b) require studies to determine impacts they generally do not specify what metrics...."

If this comment pertains to the historic 316(a) and (b) studies, it is not true. LADWP's 316(a) and (b) studies were conducted following specific and/or established guidelines issued by either the LA Board, for the thermal studies, or the USEPA's published 1977 Draft Guidelines. In addition, both studies were performed with input and approval from the LA Board.

Page 7, Paragraph 1 – The document states that 316(a) and (b) studies have "relatively recently" been approved by the California Energy Commission (CEC) under CEQA if CEC jurisdiction is triggered.

LADWP believes it is important to further clarify the circumstances under which CEC jurisdiction is triggered, namely, any new power plant licensing or any re-licensing of an existing power plant wherein the total megawatt production increases by 50 megawatts or more. LADWP also believes that it is important to acknowledge that the recent reviews and approvals conducted under CEQA are separate and clearly distinct from the impending reviews and approval needed to comply with the Phase II 316(b) Rule. Those reviews and approvals will fall to the jurisdiction of the various California Regional Boards. Furthermore, the study scope and regulatory review will seek to achieve compliance with the Clean Water Act Section 316(b), and not CEQA.

Page 7, Paragraph 1, last sentence – The document references the use of a Technical Working Group (TWG) to "oversee study design, implementation, and data and impact analysis".

The document must recognize a distinction between the recent 316(b) assessments conducted under the CEC and CEQA and those studies which will be undertaken expressly to achieve compliance with the 316(b) Rule. Even those power plants who successfully completed their CEC/CEQA studies must comply with the Rule, even if this means that additional work must be redone. Unlike the studies conducted for CEC/CEQA approvals, the Phase II 316(b) Rule has a hard compliance deadline which cannot be missed. This deadline will likely preclude the feasibility of utilizing a TWG to oversee study design, implementation, and data and impact analysis. There is simply no time for project management by committee consensus.

Page 7, Paragraph 2 – "The study designs for these recent assessments...were used as a standard to evaluate all studies reviewed."

It should be noted that in 20 years, these highly regarded standards – no matter how good and competent they are, will likely be discredited in the same way that the good and credible science of the late 1970's and early 1980's have been.

Page 7, Paragraph 3, Thermal Impacts -- General Comments

In general, it is difficult to see the relationship of this entire section to the purpose of this document, namely, to determine the scientific adequacy of the historic studies to detect impacts. This entire section seems to be a commentary on how to conduct future studies.

The document lists the multiple components to an "adequate" thermal analysis, including 3-D plume modeling, benthic sampling, statistical analyses, etc. However, the provisions of Section 316(a) (e.g., to ensure protection of a balanced indigenous population) are not mentioned anywhere in this section nor are the provisions of the Thermal Plan or the Bays and Estuaries Plan.

Page 7, Paragraph 3, Thermal Impacts – "Temperature samples are taken..." and "This map shows..."

Samples taken where?, by whom?, for what? Where is the map referenced in the paragraph?

Page 8, Paragraph1 – "Laboratories studies may be necessary..."

Is this discussion intended to be a look forward to future studies or a look back at the historical studies?

Page 8, Paragraph 2 –

What is the relevance or purpose of this entire paragraph as it pertains to the stated purpose of this document?

Pages 8 and 9, Entrainment and Impingement Impacts – General Comments

The document's description of 316(b) studies relates to how the results would be interpreted by the CEC rather than in terms of compliance with the current Phase II 316(b) Rule. How the CEC might evaluate entrainment is not equivalent to the Rule. As of last year, with passage of the Phase II Rule, existing facilities are required to document the Calculation Baseline for impingement and entrainment (I/E) assuming a shoreline intake, 3/8" screens, and baseline practices. Thus, the future 316(b) studies will bear no resemblance to the study practices from 1977-2004 where I/E were documented, Adverse Environmental Impacts were assessed, and that impact assessment used in a technology assessment. While there is still some subjectivity in the new rule, it is much less than was previously exercised.

Under the current Rule, source water sampling and subsequent *ETM* analysis would be potentially "required" only if restoration was considered as a compliance option. Then it could be used to calculate habitat replacement, area of production foregone, etc. However, if technologies or operational measures are the likely compliance pathway, then it is likely not worth the effort. While source water sampling and ETM analysis is

certainly a valuable tool for interpretation, the Rule provides little latitude for interpretation.

Page 10, Paragraph 3 - "In all cases, it is important to note that these new approaches, particularly for entrainment impacts, are still subject to considerable uncertainty related to the ability to accurately sample...."

With that being said, the loss estimates derived from Proportional Entrainment (including those quoted from the South Bay 316(b) study on p.72) are still quoted and used without consideration of uncertainty. PE estimates are also used for development of mitigation measures (such as at Morro Bay).

Page 14, Summary Table – General Comments

If the author has never reviewed the Scattergood Generating Station's Thermal Study, as reported in the document, a judgment as to its adequacy cannot be made.

Consistent with the above comments, the footnote should be reflect that the TWG was utilized under the CEC/CEQA review process. Revise the footnote as follows: "A Technical Working Group....to guide CEQA impingement and ..."

Alamitos (and by reference, Haynes) Generating Station

General

Throughout the document's discussion regarding the three LADWP power plants, and Alamitos by way of reference, the author refers to the 1996 Receiving Water Monitoring Report. As has been previously noted, LADWP conducted RWM studies in 1978, 1980, 1986, 1988, and 1990 through 2004. It is unclear why the author only reviewed the 1996 report. LADWP believes that had the author more thoroughly reviewed not only the Thermal Studies, the 316(b) Demonstration Studies, the Interim Report (which preceded the 316(b) study), and all the RWM studies, it is likely that he would not have concluded that power plant impacts are largely unknown due to inadequate studies, inadequate study designs and a lack of current information.

It is also not known why the author chose to review the 1996 RWM study and rely on it as a sole indicator of RWM study protocols and findings. The 1996 RWM study is not an appropriate representative study. Under an agreement with the LA Board, portions of the typical RWM programs for both LADWP and Southern California Edison power plants were waived in exchange for funding the LA Board's attempt to automate their discharge monitoring and reporting system.

Page 15, Paragraph 3 – The document reports that the Thermal Study findings conclude that water temperatures were elevated in the San Gabriel River.

LADWP believes it is important to note that prior to the first Alamitos Unit discharging into the river, the river was essentially dry. With the exception of major storm events, the existing wastewater discharges to the river percolated into the ground and a berm formed at the mouth of the river (Lower San Gabriel River Assessment, MBC 2003). With the onset of the Alamitos Unit 1 discharge in 1956, thermally enhanced water began to flow in the previously dry riverbed and permanently maintained a constant flow of water to the San Pedro Bay. For this reason, the aquatic life within the river that has come into existence due to the constant supply of water are those species adaptable to the thermal environment. Thus, when assessing whether water temperatures in the river are elevated and whether thermal impacts to aquatic life within the river exist, the historic baseline must be considered.

Page 16, Paragraph 1 – "Benthic sampling of the infauna in the portion of the river affected by the discharges revealed 'a fauna impaired by generally poor environmental conditions...'".

The Lower San Gabriel River Assessment Study (MBC 2003) referenced above noted the following regarding the sediment and the infauna community in the Lower San Gabriel River prior to the discharges from the Haynes and Alamitos power plants.

> "The first studies of the San Gabriel River were conducted by the California Department of Fish and Game prior to it being dredged in 1952 (Reish and Winter 1954). The lower San Gabriel River was found to be polluted with black bottom sediments which had a sulfide or petroleum odor. Benthic samples collected at 14 stations between the 7th Street Overcrossing and the mouth of the river were completely devoid of macroinvertebrate species (Reish 1956)." "In the two years following dredging the sediments had not improved but the study found 12 infaunal species in the lower river, downstream of PCH."

Later in this report, MBC reports that the 2002 RWM study found 140 different infaunal species in seven sampling periods. LADWP believes the available data clearly demonstrates that the infaunal community has drastically improved since the power plants began discharging to the river.

Elsewhere in MBC's Lower San Gabriel Assessment document, infaunal community variations from year to year are explained as follows: "The benthic infauna of the Lower San Gabriel River are subjected to variations in water quality, including daily tidal fluctuations and elevated temperatures, as well as periodic storm runoff characterized by low salinity, high turbidity, and bottom scouring by river flow." Thus, LADWP believes that Dr. Foster should not be making broad sweeping statements that suggest infauna impairment, if it exists, is due strictly to elevated temperatures.

Page 16, Paragraph 1 - "Benthic infauna in San Pedro Bay near the river mouth was 'highly variable', but EQA/MBC (1973) concluded the infauna was not adversely affected by the discharge from the river."

In fact, the EQA/MBC study concluded the following: "The stability of San Pedro Bay infaunal populations, in marked contrast to the river populations, was a prominent result of the bay surveys. Environmental features which may contribute to the stability of the bay's infauna include protection of many of the stations from wave exposure, uniform supply of river borne nutrients and organic materials, and amelioration of seasonal changes in water temperatures by thermal enrichment. No adverse effect of the warm water discharge was observed in the San Pedro Bay infauna. Infaunal species composition was normal for the area and did not include any taxon characteristic of warmer latitudes (p. 84)."

Page 16, Paragraph 2, Conclusions – "The impacts to the river seem to be extreme...."

For the reasons stated above, LADWP believes Dr Foster has insufficient facts and knowledge about the San Gabriel River to make such a sweeping conclusion. The annual RWM studies have consistently shown a balanced indigenous population and that all beneficial uses are being protected.

Haynes Generating Station

Page 28, Paragraph 1, Background - The document states that Haynes is approximately 1 mile from where the river flows into the San Pedro Bay.

The southernmost discharge for the Haynes Generating Station is located approximately 1.8 miles from the river mouth.

Page 28, Paragraph 3, Conclusions – "Additional studies are needed to better define the impact of the thermal discharge on the benthos of San Pedro Bay. Moreover, the effects of the heated water on sandy beaches were not determined, and studies of the rock jetties were minimal. The impacts to the river may be very significant."

In addition to the comments previously made as it pertained to Alamitos Generating Station (pg. 16), the results of the Thermal Study uniformly demonstrated that the thermal plume which exited the river rose up and over the cooler ocean water (i.e., the thermal plume did not penetrate the water column any deeper than 5-10 feet. It did not touch the bottom of the San Pedro Bay and therefore impacts to the benthic community attributable to the thermal discharge should not exist.

Intertidal studies, including both the location and number of stations, were conducted in accordance with the specifications approved and issued by the LA Board, which were intended to address the assessment of impacts from the thermal plume on the receiving water beneficial uses.

As also commented above, a marine aquatic environment was created in the San Gabriel River when the first Alamitos discharge entered the river. Therefore, the species which inhabit the Lower San Gabriel River are those that have colonized and flourished in an environment characterized by elevated heat, varying salinity, and turbulent waters (due to

periodic storms). LADWP does not believe the impacts to the San Gabriel River from once-through cooling can be characterized as very significant.

Page 29, Paragraphs 1 and 2 – See numerous comments below.

Dr. Foster comments: "While sampling was done day and night, the time and duration of sampling over a 24-hour sampling period could not be determined from IRC (1981). Moreover, it is not clear how well pump sampling actually samples larvae being entrained.....In addition to these potential problems, it is not clear how comparable pump and net sampling are."

The Haynes 316(b) report summarizes field methods and refers the reader to Appendix G-2 for a detailed description of field plankton collection procedures and equipment utilized (p. 6-18). Examination of Appendix G revealed samples were collected for a period of 30 minutes, day and night, at a weir height of 17.0 to 18.5 cm. The Methods and Procedures section of the 316(b) Demonstration states (p. 6-15) "The selection of the methods and equipment used for this study was based upon a critical examination of the results of a preliminary survey conducted during May 1978 (IRC, op. cit.)." Perhaps a review of the preliminary survey would shed light on the sufficiency of pump sampling. In reference to entrainment sampling, the 316(b) Guidelines (EPA 1977) specify (p. 42) "A pump system is acceptable as the primary sampling method, provided it does not damage fragile organisms, and pumps are easier to automate and quantify than systems in which sampling is done with nets suspended in the cooling water flow."

Another concern of Dr. Foster is the changing of mesh size from 335 to 202 microns "mid-way through the survey." He states: "It is not clear, however, if this was done for all the various nets used (the report mentions changing the nets used for the pump samples and 'surface' plankton samples, but not the mid-water or epibenthic plankton nets)." The summary work scope schedule presented in Table 6.2.2-4 (p. 6-12) of the 316(b) demonstration specifies which mesh was used on the various nets, and notes that the change in mesh size occurred after the 7th survey out of 64 surveys.

Dr. Foster states: "Impact was calculated as AEL only for 'critical taxa,' (often also referred to as 'target taxa') many of which were only identified to large taxonomic groups (e.g. 'Gobiid species complex'). The impingement study appears satisfactory." The USEPA Guidelines for 316(b) studies (EPA 1977) defined 'critical aquatic organisms' (or critical taxa) as follows (p. 17): "It is not practicable to study all species that may be directly or indirectly harmed by intake structure operations. The critical aquatic organisms concept is defined in the 316(b) Development Document. Generally, 5 to 15 critical aquatic organisms will be selected for consideration on a case-by-case basis." The Guidelines go on to further describe the selection process for critical taxa. The critical taxa proposed for study, which was submitted prior to commencing the study, was approved by the LA Board and DFG. In general, the critical taxa selection followed federal and state guidelines and represented those taxa that: (1) can and do support fisheries; (2) provide significant habitat to aquatic communities; and (3) constitute significant trophic links.

Additionally, the inability to distinguish some larvae to species level continues in 2005. Many gobies cannot be distinguished beyond the family level due to morphological similarities during early larval stages.

Dr. Foster states the impingement study appears satisfactory, yet deems it inadequate in the Summary Table on p. 14.

AEL (Adult Equivalent Loss) was not the only method of impact analysis during the 316(b) study. The study examined (1) entrainment mortality rates with passage through the generating station, (2) comparison of near-field and far-field communities and densities, (3) probability of entrainment isopleths, (4) comparison of entrainment losses with standing crop of the referenced source water, (5) adult equivalent loss, (6) comparison of impingement losses with source water populations, (7) comparison of impingement losses with commercial and recreational losses, (8) comparison of impingement with natural losses, and (9) a fisheries production model.

Harbor Generating Station

Page 42, Paragraph 4 – "The only effects of the plume on the biological environment were those determined based on benthic grab samples..."

As noted in the Draft Assessment Document and in the Thermal Study, the plume is confined to the upper 10 ft of the water column (p. VII-4). Therefore, it is unlikely that the plume had any impact on the benthic community. A wide range of factors could have influenced the health of the benthic community in the harbor environment in 1973. Historical reports in the scientific literature of the harbor environment from this era indicate that the benthic difference from station to station could also have been influenced by low dissolved oxygen levels above the sediment surface and within the pore water, the level of water pollution, and port dredging activities. LADWP believes it would be difficult to pin point the thermal effluent from the plant as a contributor to the state of the benthic environment.

Page 42, Paragraph 4 – "The study concluded that diversity, biomass, etc. increased with increasing distance from the outfall, but the differences were 'not significant'. However, no rigorous statistical analyses were done to test this conclusion, and it is admitted in the report (WEI 1973) that the data were 'not adequate to detect a discharge effect'."

On the contrary, the study concluded (p. I-1) "...the biomass and diversity of the West Basin benthic community is highest around the Harbor Steam Plant outfall."

LADWP's review of the Thermal Study (WEI 1973) could not find the statement quoted by Dr. Foster, that the data were: "not adequate to detect a discharge effect." In fact, the Thermal Study concluded (p. I-1) "From these results it can be concluded that the Harbor Steam Plant has no significant thermal effect on the West Basin benthic community, and that there appears to be a beneficial effect of the discharge on the benthic community in the immediate vicinity of the outfall. Comparison of the study results with results from

previous Los Angeles Harbor studies shows that a significant improvement has occurred in the water and sediment quality over the last twenty years."

It should also be noted that the 2004 RWM study reported that diversity and abundance was greater in the station nearest the plant effluent than in the station farthest away. Lastly, as it was reported in the Thermal Study, the presence of the power plant discharge within the back recesses of the harbor provides a net benefit by improving circulation and oxygenation to what would otherwise be a stagnant environment.

Page 43, Paragraph 1, Conclusion – The document reports that "no studies have been done of effects of the plume contact on the shoreline."

There are no shorelines within the Los Angeles Harbor in the vicinity of the power plant, only concrete bulkheads.

Page 43, Paragraph 2 – "This approach does not define a source water as the term is currently used: the water containing larvae of a particular species that are subject to entrainment. The dye approach ignores variation in the length of larval life, mobility of larvae, and temporal variation in currents and larval production."

The Probability of Entrainment isopleths calculated in the Harbor Generating Station 316(b) Demonstration (IRC 1981) were the result of "combining dye experiment, current meter, wind, and temperature data" (p. 5-97). The methods followed the 316(b) Guidelines published by the USEPA for conduct of such studies (EPA 1977). The Guidelines specified (p. 31):

> "The zone of potential involvement of the cooling water intake varies with species of organisms and time but the core concept is the determination of probability of entrainment. The predictive models are useful for mapping probability isopleths. This could be done by the simulation of drifters with the hydraulic model, or the spread of mass from point sources into the intakes with the concentration model. Drogue or dye studies could be used for verification."

The dye approach did not ignore temporal variation in currents and larval production. The probability-of-entrainment isopleths were determined from several different dye-release studies performed during various cooling water flow variations, which would account for different current patterns. The method was different than the current PE-ETM approach; however, that does not mean it was insufficient.

Scattergood Generating Station

General

Dr. Foster did not have a copy of, nor did he review, the Scattergood Thermal Study. He admits, "There was insufficient time available to contact the station, arrange a visit and search its library for other reports. However, the setting of the discharge is similar to that

of Huntington Beach and El Segundo Generating Stations. The 316(a) studies at these plants suggest plumes from such discharges have little contact with the benthos or beaches, and their overall effects on the environment may be small. Therefore, similar effects might be expected for the Scattergood Generating Station."

Any comments made regarding Scattergood's thermal study are essentially circumstantial based on the results from similar studies conducted at surrounding power plant facilities. It is unclear how Dr. Foster can even begin to evaluate thermal impacts without reviewing the study. Therefore, all of the observations and conclusions made are suspect to say the least.

Page 68, Paragraph 2 – "However, the [1996] monitoring stations...were well away from the intakes and discharges, so the results cannot be used to evaluate thermal effects."

As previously commented, the RWM studies are a direct outgrowth from the Thermal Studies and comply with the Thermal Plan directive to continue to conduct periodic assessments of the discharge for thermal impacts on beneficial uses. The RWM stations locations are virtually the same as those monitored in the Thermal Study, therefore, it is inconceivable how Dr. Foster can make such a conclusion. If the 1996 monitoring stations are in a different location than the Thermal Study, it does not mean the fingerprint of the thermal plume cannot be detected. If stations are added, subtracted, or relocated, it is to better serve the purpose of RWM program's purpose, namely, to assess whether there is an impact to beneficial uses.

Sampling stations off Scattergood ranged upcoast, downcoast, and offshore of the Scattergood and El Segundo Generating Stations. It is unclear why these cannot be used to evaluate thermal effects. Dr. Foster admits, "During this review, no studies of the effects of the thermal plume on nearshore marine communities could be found (see above)."

Page 69, Paragraph 1 – The document reports that the CEC evaluated the 316(b) report and found "a number of serious scientific problems... and concluded the Scattergood analysis are highly unreliable."

Dr. Foster explains that the Energy Commission has previously documented its view of the Scattergood 316(b) Demonstration in the Final Staff Assessment (FSA) for the El Segundo Power Redevelopment Project. The concerns with the Scattergood Study in the FSA (Davis et al. 2002) are described in the following section.

Davis et al. (2002) note that in the SGS 316(b) study, "there was generally poor correlation in fish larval concentrations between the different locations sampled.[10]" The referenced footnote further explains: "The plan was to estimate entrainment, in part, by computing the loss of organisms between the velocity cap and the forebay."

This is incorrect. The collection of organisms at both the velocity cap and forebay was

done to calculate entrainment mortality due to intake conduit grazing (see 316[b] p. 6-21). After determination in the study that conduit grazing was affecting results, the authors of the 316(b) report developed a correction factor based on significant correlation analyses, and it was therefore "possible to estimate the true population entrained by the conduit system and it was also possible to ascertain the amount of grazing, on the entrained organisms, by the biofouling community (p. 7-16)." The statement quoted from the 316(b) report that entrainment estimates for several species were 'unrealistic' and 'should be treated with caution' (FSA footnote 11) stemmed not from potential sampling errors, but from the extremely low abundance or frequency of occurrence of those particular species.

The FSA further states that due to the differences between sampling locations, "the lack of reliable concentration estimates in the Scattergood study makes that analysis of little use...(p. 4.2-22)" As noted previously, the authors of the report corrected those differences through correlation analysis, and enabled a true estimation of entrainment.

Page 69, Paragraph 2 – The Document notes that the cooling water velocity at the velocity cap is 1.5 feet per second (fps), "high by current standards".

LADWP is unaware of any velocity cap design standards. Fish behavioral studies conducted periodically since the mid-1970's have reported that velocity caps with a velocity of between 1 and 2 fps are optimum. This is because horizontal velocities lower than that cannot be detected by the fish in time to initiate avoidance behavioral actions, and velocities higher than that make behavioral responses irrelevant. In a 1982 American Society of Civil Engineers publication entitled, Design of Water Intake Structures for Fish Protection, it was reported that studies conducted by Southern California Edison indicated that entrapment of several species involved in the study did not rise markedly as the average inflow velocity through the velocity cap was raised fro 0.5 to 1.5 fps.

Page 69, Paragraph 3, Conclusions – The document reports that the 316(b) study is fundamentally flawed and the impacts have never been accurately assessed.

For all of the reasons previously commented, LADWP disagrees with Dr. Foster's conclusion.

Page 69, Paragraph 3, Conclusions – A complete impingement assessment has never be done.

In the 316(b) study, LADWP assessed impingement in conjunction with the facility's heat treatments. An understanding of the hydraulics and configuration of Scattergood's cooling water intake structure concludes that all the fish and macroinvertebrates that are drawn into the forebay are eventually brought up onto the traveling screens and baskets during a heat treatment. In essence, there is no escape from the forebay and an accurate impingement accounting can be obtained by quantifying impingement losses in conjunction with heat treatments. A review of El Segundo Generating Station impingement data, which gathered impingement information during both normal

operational events and during heat treatments, found that there were only 58 more individuals impinged during operational events. This difference is virtually inconsequential when the impingement data is reviewed in its totality.

Page 69, Paragraph 3, Conclusions – The document characterizes the intake velocities as high and comments that the intake design "tends to maximize fish impingement (relative to short, shoreline intakes,"

The USEPA 1977 316(b) Guidelines note that velocity caps and offshore intakes, in general, are the technology of choice because it places the cooling water intact structure out of the zone of production. Historical sitting studies for some of the east coast power plants showed a near 10-fold reduction in impingement for an offshore intake structure versus a shoreline intact structure. The CEC, for the SONGS relicensing in the mid-1980"s, assigned an impingement reduction to the facility due to the presence of an offshore intake structure. Thus LADWP does not believe there is any credibility to the inference that Scattergood's intake design, as compared to short, shoreline intakes, tends to maximize fish impingement.