12/7/05 WS 316(b)

2 December 2005

State Water Resources Control Board
1001 "I" Street
Sacramento, California 95814

Dear Commissioner:

AES Southland LLC (AES) appreciates the opportunity to comment on the potential state policy to regulate cooling water intake structures. AES owns and operates three coastal generating stations which utilize seawater for once through cooling. These generating stations provide enough electricity to power more than four million homes and businesses in the state of California. Representatives from AES attended the §316(b) Workshop sponsored by the State Water Resources Control Board in Laguna Beach on September 26, 2005. The workshop was intended for public comment on issues that should be addressed in a potential statewide §316(b) policy. Commissioners invited comments on (1) the magnitude of biological effects as presented by Michael Foster of Moss Landing Marine Laboratories, and (2) the costs of retrofitting generating stations with closed-cycle cooling systems. AES is pleased to provide the Board with information on this point as well as other issues raised at the meeting that are relevant to the decision on a State 316(b) policy. The key points that AES wishes to make are as follows:

1. The current level of impingement and entrainment impacts resulting from Phase II facilities were significantly overstated by many stakeholders and AES provides information and references to support its position that no significant adverse impacts have been demonstrated to occur as a result of operation of its three Phase II facilities.
2. The cost and feasibility of retrofitting existing Phase II facilities with wet or dry closed cycle cooling would not make sense from either an economic or environmental standpoint.
3. The most rational 316(b) policy for California is ensuring that Regional Boards administer the Federal Phase II Rule in a consistent manner that fully conforms to the final Rule.

Current Level of Cooling Water Intake Structure Impacts

A number of Stakeholders presented comments regarding the magnitude of current impingement and entrainment impacts suggesting that they were highly adverse and warranted addressing through a requirement to retrofit all California Phase II facilities with wet or dry closed cycle cooling. AES wishes to point out that it strongly disagrees that any significant adverse impacts are occurring, or will occur, through use of once through cooling at its facilities. Our position is technically supported by numerous sources of available information that are summarized below.

- **Use of an Unrealistic Assumption to Estimate Once Through Cooling Water Impacts**

The analysis presented by the CEC staff assumed that all 21 of California's once through cooling facilities operated continuously at design flow (i.e. all cooling water pumps running 24 hrs/day year round). This is a highly unrealistic assumption. The operation of cooling water pumps is closely linked to capacity utilization (i.e. the percent actual generation in terms of design generation). When units are not generating electric power, some or all pumps are turned off, resulting in either reduced or zero impingement or entrainment. The new Federal Rule recognizes this relationship, and if a facility can demonstrate that capacity utilization does not exceed an average of 15% over a five-year period, the impact is deemed to be

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sufficiently low that the facility is not required to meet the entrainment performance standard. Four of AES's Units (Alamitos 1 and 2 and Redondo Beach Units 5 and 6) are well below the 15% capacity factor threshold, and their intakes are not subject to the entrainment standard (Table 1). Table 1 also shows that, while the entrainment performance standard does apply to other Phase II units, the overall capacity between 2000 and 2004 has not exceeded 39% for any unit and most units are demonstrating a substantial downward trend. Thus entrainment losses projected based on design flow are highly unrealistic.

Table 1 – Capacity utilization rate for AES's three Phase II facilities

Facility	2000*	2001*	2002	2003	2004	5 Years
	Alamitos Generating Station					
AL1	6.03%	9.95%	9.48%	7.90%	6.19%	7.89%
AL2	14.93%	20.66%	11.17%	8.25%	6.55%	12.23%
AL3	30.13%	45.52%	35.69%	49.77%	22.90%	34.00%
AL4	40.60%	47.60%	23.89%	28.11%	18.40%	30.02%
AL5	50.75%	66.90%	34.05%	32.00%	24.17%	38.88%
AL6	40.93%	63.77%	18.98%	29.17%	10.38%	30.15%
	Redondo Beach Generating Station					
RB5	7.94%	10.76%	5.42%	8.06%	2.30%	6.86%
RB6	18.26%	24.78%	3.02%	1.64%	1.42%	9.69%
RB7	40.79%	65.79%	22.42%	19.47%	16.63%	31.40%
RB8	21.62%	66.28%	22.91%	13.26%	10.57%	25.77%
	Huntington Beach Generating Station					
HB1	23.42%	36.63%	36.45%	40.35%	35.81%	33.66%
HB2	4.21%	37.20%	37.73%	40.18%	37.81%	30.62%
HB3&4	New Units have not operated long enough to establish annual capacity utilization					

* Statistical outliers due to the energy crisis.

- **Data Collected in Recent Huntington Beach Studies Does Not Support the Conclusion of Significant Adverse Impacts**

Michael Foster's presentation focused on thermal, entrainment, and impingement effects associated with once-through cooling water systems in California. This presentation appeared to serve as the primary basis of the potential for significant adverse impacts. AES believes it is important to comment on some of the points raised by Dr. Foster during his presentation. The impingement mortality and entrainment (IM&E) impacts presented by Dr. Foster and others were not representative of most coastal facilities. In addition to the unrealistic assumption of maximum design flow for 365 days per year, the recent Huntington Beach Generating Station (HBGS) Entrainment and Impingement Study[1] determined the Probability of Mortality (P_M) for the species analyzed was 1.2% or less for each respective population at risk of entrainment. The Area of Production Foregone (APF; an equivalent area of nearshore water where annual larval production was equivalent to the annual entrainment estimate) ranged from 0.1 km^2 to 4.5 km^2 (Figure 1). These estimates were calculated assuming maximum cooling water flow, even though actual flow during the study was only 69% of the maximum achievable flow.

[1] MBC Applied Environmental Sciences and Tenera Environmental. 2005. AES HBGS Entrainment and Impingement Study: Final Report. Prepared for AES Huntington Beach L.L.C. and the California Energy Commission. April 2005. 224 p. plus appendices.

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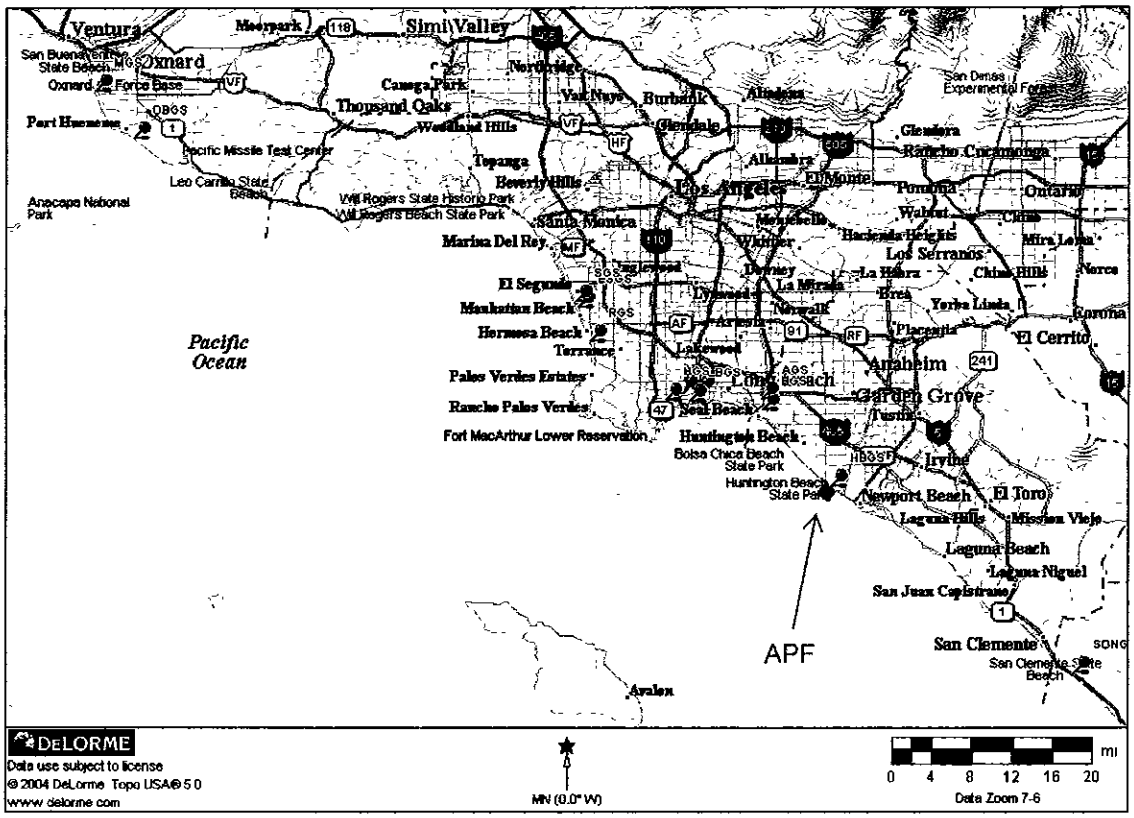

Figure 1. Depiction of Area of Production Foregone (APF) for five fish species found off HBGS (depicted as blue square). The largest area was for northern anchovy (4.5 km^2), and the smallest was for black croaker (0.1 km^2). The APF for 5 of the 10 species analyzed was <1 km^2. Notice that this area is much smaller than that implied by some stakeholders at the public hearings.

Dr. Foster referenced estimates from the HBGS report that southern California impingement losses as a whole were equivalent to either 8% or 30% of recreational catches in southern California, depending on the sportfish database utilized. It is important to note that the species entrained have high natural mortality rates. For example, the most abundant larval fishes entrained were CIQ gobies, a group of up to three species of gobies that cannot be distinguished at their earliest larval stages. While the annual goby entrainment estimate was about 113 million larvae, the estimated number of those larvae that would have survived to adulthood was only about 148,000, which is indicative of the high natural mortality in most fishes. Gobies are also not fished by commercial or recreational anglers in California. The estimates made in Dr. Foster's presentation are at the very least misleading in this context.

- **General California Biological Points that Support Lack of a Significant Adverse Impact**

The policy of the State of California encourages the siting of power plants on the ocean to take advantage of the State's abundant seawater and conserve the limited supplies of freshwater for other purposes.

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The State basin plans for bays and estuaries explicitly recognize that use of ocean water for industrial cooling water is a compatible, beneficial use.

No evidence of negative impacts was found during recent impingement mortality and entrainment (IM&E) studies at power plants throughout the state. In fact, the source water communities of entrained fish and invertebrate larvae from several of the studies were remarkably similar to levels measured in previous studies conducted over twenty-five years ago[23].

The California Department of Fish & Game has stated in their 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. This is important for the following reasons:

- The entrained fraction of the population measured from recent studies averages between 2 and 10 percent of the estimated source populations and is much lower for most species.
- The majority of the larval fish entrained are species that are not commercially or recreationally harvested.
- The absolute numbers entrained may seem large but these large numbers do not equate to large impacts because the plant related mortality is only a very small fraction of the total population and is insignificant to sustaining the population.
- This Plan is the basis of fishery management used to regulate and assure sustainable harvests of natural populations.

The numbers of larvae entrained by power plants do not equate to large effects because many fishes produce millions of larvae during their reproductive years, but only two of the larvae from each female need to survive to adult to maintain a stable population level. 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 anywhere from 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%.

This position is supported by evidence from several studies on the Pacific coast including the following:

- Entrainment estimates for goby larvae showed very little change in San Diego Bay between studies in 1979–1980 and studies in 2001 and 2003. The absence of any long-term changes in larval productivity is supported by abundant data on adult gobies that showed increases in the population over time from 1994-1999.
- Long-term monitoring in central California at the Diablo Canyon Power Plant, with a cooling water volume of 2.5 billion gallons per day, showed no significant declines in nearshore fish populations over the 20 years of plant operation. The health of the nearshore fish populations is supported by recent fishery studies showing that the stocks in central California have not experienced the same declines seen elsewhere in the state.

- **Empirical Information from a National Perspective on Entrainment and Impingement Impacts**

[2] MLPP 316(b)
[3] SBPP 316(b)

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- Comments were made at the Workshop as to large numerical losses for entrained fish or shellfish. It is important to recognize that well in excess of 95% of the entrained fish eggs and larvae will die from natural mortality and never reach adulthood. The result is that the actual loss to fish and shellfish populations is orders of magnitude less than the number of entrained eggs and larvae.
- The analysis assumes no compensation for losses. Compensation is the biological principle whereby fish compensate for losses to their populations. When there are fewer larvae, there are more food and habitat available for those larvae resulting in faster growth and increased survival rates, which act as a means of maintaining a stable population. The entire premise of commercial and recreational fishing is that populations of fish and shellfish can be harvested without detrimental effects to those harvested stocks. It is for this reason that a reduction in entrainment may result in no measurable difference in fish populations in the source water body (Rose, 2001).
- EPA's biannual Water Quality reports to Congress over the last decade have listed numerous impairments to the Nation's waters and aquatic ecosystems. It is noteworthy that impingement and entrainment of fish eggs and larvae has never been identified as a source of impairment
- The Electric Power Research Institute (EPRI), in a comprehensive review of the study relating water withdrawal and fishery impacts conducted by the Oak Ridge National Laboratory, found no relationships between cooling water use and fishery impacts (EPRI 2003).
- Many Phase II facilities are located on cooling ponds or lakes which were constructed to provide a source of cooling water for these facilities in arid areas such as Texas or the southwest. These cooling ponds or lakes were sized to be large enough to supply the condenser cooling water needs for these facilities. Because of the large amount of cooling water withdrawn each day from these lakes and ponds one would assume that they would contain few fish. To the contrary, populations of fish in these ponds and lakes are similar to populations in lakes without power plants utilizing once through cooling. Many of these lakes and ponds have become important recreational fisheries and have proven to support balanced populations of fish after decades of use. While these are not marine species, many have pelagic eggs and larvae (eggs and larvae that float in the water column and are subject to entrainment) but have not been demonstrated to have depressed populations (EPRI 1979, 1980).
- Maryland DNR, which has one of the largest power plant research programs in the U.S. and one of the largest power plant withdrawals in terms of volume of State waters withdrawn for cooling water use, has concluded that power plant water withdrawal has had no identifiable impact on Chesapeake Bay fisheries (Richkus, 2000).
- Much of the initial concern over cooling water impacts was generated on the Hudson River in New York as a result of dramatic declines in striped bass fish populations. It is noteworthy that despite the presence of five generating stations with cooling water withdrawals exceeding 5 billion gallons per day striped bass populations have increased by a factor of ten.
- The Connecticut Yankee Nuclear Station located on the Connecticut River (i.e. a tidal river) was retired from service several years ago. Extensive studies were conducted prior to, during and after retirement. These studies revealed no footprint as a result of facility operations (EPRI 2003b).

The above information is not offered to suggest that cooling water withdrawals have zero impact, but rather to point out that there is no basis to assume that adverse impacts are occurring in California's coastal waters which warrant extraordinary measures or additional policies. While speculation of potential impacts has been discussed by some stakeholders, to date no technical data or compelling information has been offered to support allegations that significant impacts are in fact occurring.

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Closed-Cycle Cooling System Costs

At the Laguna Beach 316(b) workshop the Board requested information on the cost of retrofitting Phase II facilities with wet or dry closed cycle cooling. AES Alamitos, AES Huntington Beach, and AES Redondo Beach Generating Stations are located in southern California and all utilize once-through cooling technology. Closed-cycle cooling was not initially selected and has not replaced once-through cooling at existing coastal facilities primarily due to its high cost, but for other factors as well, such as space constraints and aesthetics. The estimated annualized costs to retrofit each of the three AES facilities are presented in Table 1. The total capital costs alone to retrofit each of these generating stations varied between $112.5 million and $337.2 million.

Table 1. Annualized Capital costs and Operation & Maintenance (O&M) costs to replace the once-through cooling water systems with closed-cycle cooling systems at each AES facility.

Facility:	Annualized Capital Cost: Recovery	Annual O&M Cost:	Total Annualized Cost:
Alamitos	$48,010,000	$9,750,000	$57,760,000
Huntington Beach	$16,017,000	$3,228,000	$19,245,000
Redondo Beach	$39,508,000	$7,665,000	$47,173,000

Costs are in 2002 dollars, a discount rate of 7 percent, an amortization period of 10 years was assigned to Capital Costs, and a 30-year amortization period was assigned to pilot study and plant downtime costs.

The costs to retrofit an existing facility are significantly higher than just incorporating closed-cycle cooling into the design of a new facility. This was a major factor in EPA's decision to not require use of closed cycle cooling in the final rule. Additional information on general costs for wet and dry closed-cycle cooling can be found in "Comparison of Alternate Cooling Technologies for California Power Plants – Economic, Environmental and Other Tradeoffs (Feb. 2002) prepared by the California Energy Commission (CEC). This report includes a comparison of costs for wet versus dry closed-cycle cooling cost. Dry cooling is estimated to be approximately an order of magnitude higher.

It is also important to note that while wet and dry cooling do reduce or eliminate use of condenser cooling water they also have other adverse environmental impacts. The nature of these impacts was discussed extensively in the final Marine Resources Review Committee Report issued for the San Onofre Nuclear Generating Station (SONGS) and is also discussed in the 2002 CEC report. These factors include:

- Air Quality as a result of burning more fuel to make up lost generation and efficiency to operate in a closed-cycle manner.
- Salt Drift as a result of concentrating salts in cooling towers which are carried in water droplets that escape from the cooling towers
- Blowdown disposal of pollutants concentrated in the closed-cycle cooling water
- Cloud formation and fogging under certain meteorological conditions due to huge quantities of water vapor released into the atmosphere from wet cooling
- Noise due to operation of additional water pumps, fans or waterfall, estimated to be between 80 to 90 DB
- Aesthetics, as all of California's Phase II facilities are located along the coastline

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Importance of a California 316(b) Policy Consistent with the Final Federal Rule

AES believes that there are no rational reasons to support a policy that goes beyond the Federal Rule, and that a California 316(b) guidance document that endorses consistent application of the new Federal Rule is the only reasonable course of action. We believe this for the following reasons:

- There is an absence of evidence supporting significant adverse impacts, and no technical evidence to support a policy that goes beyond the Federal Rule.

- AES is required to comply with the new Federal Rule by submitting a Comprehensive Demonstration (CDS) Study by January 7, 2008. To meet that deadline it has already submitted three Proposals for Information Collection (PICs) which are the first documents required for compliance. Any significant deviations from the Rule are likely to have a major negative impact on the ability to comply with the Federal Rule.

- EPA took over five years reviewing existing 316(b) study information, technologies, use of restoration and evaluation of economic information to formulate the final Rule which underwent extensive public review and comment. AES believes that the Rule incorporates all of the knowledge obtained during this extensive review and represents a total package that recognizes the significant differences in the way that facilities are designed, operated, and interact with aquatic organisms. It would be an extremely difficult and costly process for the Board in any reasonable time frame to develop a different compliance approach.

- California has made significant use of Restoration Measures in addressing impingement and entrainment impacts. Restoration is a preferred approach for AES to meet the entrainment performance standards. AES is concerned with the feasibility and/or cost of the available technologies and operational measures to meet the entrainment performance standard, and we believe that the environmental benefits of a restoration project are more directly quantifiable and may be more environmentally beneficial than the use of technologies and/or operational measures. This is due to the fact that restoration projects such as wetland habitat creation can provide benefits that go beyond offsetting entrainment losses and can provide those benefits over a longer period than technologies and/or operational measures.

AES is committed to achieving 316(b) compliance at all three of its southern California generating stations and is prepared to address any questions or concerns relative to these comments. Please contact Steve Maghy at (562) 493-7384.

Respectfully,

C.J. Thompson
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References:

EPRI 1979: 1980: Evaluation of a Cooling Lake Fishery Vols 1 -4, Illinois Natural History Survey, Urbana, IL.

EPRI 2003a: Impacts of Volumetric Flow Rate of Water Intakes on Fish Populations and Communities. Report 1005178, March 2003

EPRI 2003b: Connecticut River Ecological Study: Re-Visiting the Impacts of a Power Plant (EPRI Orderable E220186, December 2004)

Richkus 2000: Historical Overview of the Efficacy of Two Decades of Power Plant Fisheries Impact Assessment Activities in Chesapeake Bay, in Environmental Science and Policy, Vol 3, 293 – 293.

Rose 2001, Compensatory Density Dependence in Fish Populations: Importance, Controversy, Understanding and Prognosis, Fish and Fisheries, 2, 293-327.

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