



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

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September 15, 2006

Song Her, Clerk to the Board
State Water Resources Control Board
1001 I Street
Sacramento, CA 95814



SUBJECT: Comment Letter - Proposed Statewide Policy for Once Through Cooling

Dear Song Her:

NRG Energy, Inc. ("NRG") submits these comments on the State Water Resource Control Board ("SWB") Scoping Document: Proposed Statewide Policy on Clean Water Act Section 316(b) Regulation ("Draft Policy"), on behalf of the El Segundo Generating Station ("ESGS") and the Encina Power Station ("EPS"). ESGS is owned by El Segundo Power, LLC and EPS is owned by Cabrillo Power I LLC, both being subsidiary companies owned by NRG Energy, Inc. Both ESGS and EPS utilize once through cooling systems that would be affected by the Draft Policy.

NRG is extremely concerned with the Draft Policy's likely, but unintended adverse consequences on energy, economics, and the environment. NRG believes if this Draft Policy is adopted as it is currently configured, it would have far reaching negative impacts to resource adequacy of the state electrical grid, including degradation of power plant operating efficiencies, reductions in power generating capacity, and even plant shutdowns.

The need for this Draft Policy is very questionable. Why is it necessary when the federal Phase II 316(b) regulations already apply a reasonably balanced approach to dealing with impingement and entrainment at California coastal power plants? The United States Protection Agency ("US EPA") spent nearly a decade working on this regulation and properly considered impacts to energy supply, efficiency, and cost, as well as potential environmental consequences associated with the regulations, to produce the right balance of environmental protection and economic considerations. Based on those facts and the fact that facility specific 316(b) studies continue to demonstrate that ecosystem level impacts are biologically insignificant, NRG does not see any reason for the SWB to elevate the compliance requirements at this time.

If the SWB is compelled to move forward regardless, NRG urges the SWB to develop a state policy that maximizes compliance flexibility, options, and alternatives; most importantly expanding the use of restoration measures as a compliance option. Further, the development of a policy should carefully consider consequences to energy, economics, and the environment throughout the policy development. Finally, any new state policy should produce a balanced approach that considers each of these consequences and creates a technically and economically feasible path of compliance for

all of the facilities in California using once through cooling. California simply cannot afford to lose the generating capacity from these critical generating resources.

Environmental Benefit & Justification

The Draft Policy comes to the immediate conclusion that OTC facilities are causing significant and adverse impacts to marine resources and that a state 316(b) policy that is more stringent than the federal Phase II 316(b) regulations is needed. However, there is no substantial evidentiary support for those conclusions anywhere in the Draft Policy.

Prior to moving forward with a more stringent state 316(b) policy, the expected additional benefits above and beyond those expected to be created by compliance with the federal Phase II 316(b) regulations must be evaluated and quantified. Then, those benefits must be compared to the cost and environmental consequences of the more stringent state policy to understand the overall impact. Only then would it be possible to determine if a more stringent set of requirements is justified.

A comprehensive discussion of how OTC facilities affect the marine environment has been, or soon will be, submitted to the SWB. This document was authored by EPRI Solutions and Tenera Environmental, two of the foremost authorities on the 316(b) subject nationwide. NRG would like to specifically express its support and concurrence with the comments by EPRI Solutions and Tenera Environmental, and to incorporate by reference all of their comments into NRG's position on the Draft Policy.

Compliance Options

NRG finds that the Draft Policy would substantially limit compliance options at facilities using OTC. The restrictive use of restoration measures as a compliance option, the use of the highest range of the impingement and entrainment performance standards, and the establishment of "actual" cooling water flow rates as the baseline level, all combine to raise the required action and cost by each power plant owner to comply.

Additionally, OTC facilities are faced with very few structural or technological compliance solutions that would comply with the Draft Policy short of complete retrofit of the facility with closed cycle cooling. What this means is that facilities that cannot feasibly retrofit or cannot absorb the economic investment in conversion to closed cycle cooling would be forced to either shutdown or accept very substantial reductions in how much power they can produce.

SWB staff came to the conclusion that structural controls are technically feasible for impingement reduction up to 95% control and for entrainment controls up to at least 60% control. These conclusions are contrary to the findings of owners of OTC facilities, and staff did not provide any information to support their contrary conclusions. NRG believes the SWB must fully evaluate the technical feasibility and efficacy of these structural controls prior to making such determinations.

The Draft Policy, as currently written, leaves OTC facilities with only three potentially viable compliance options:

1. Convert to closed cycle cooling (wet cooling towers or air cooled condensers);
2. Restrict cooling water flow to 60-90% less than the actual historical average water use, thus resulting in 60-90% less power generating capability;
3. Generating unit or full facility shutdown.

NRG recommends that the SWB not restrict in any way the federal Phase II 316(b) compliance options until after a complete evaluation of options and alternatives as well as a full understanding of the environmental benefits and consequences expected to be realized from the Draft Policy.

Energy Production & Cost Impacts

As you know, the Draft Policy would affect over 21,000 megawatts (“MWs”) of reliable power generating capacity in California, which is over 40% of the power generating capability in California. This summer, California witnessed peak electrical demand increases of over 6,000 MWs as compared with last summer. Every MW from these critical once through cooled power plants was needed to meet that peak demand as well as during many other non-peak periods throughout the year.

NRG believes that if the Draft Policy were adopted by the SWB as it is drafted today, there would be drastic consequences to the supply, cost, reliability, and efficiency of California’s once through cooled power generation capacity, which would adversely affect the state’s ability to meet peak power demand situations. These consequences are potentially so great that at least several power generating units would be expected to shutdown based on the current draft. There would also likely be substantial losses of production efficiencies and reduction in peak generating capacity associated with the potential for mandatory retrofit from once through cooling to closed cycle cooling.

If it were feasible to retrofit these OTC facilities, which many facilities have determined is not the case, it would result in total costs that are truly astounding. Based on available literature on the estimated costs of retrofit, capital costs would range from \$2 billion to \$2.5 billion to retrofit all of California’s OTC facilities, not including lost revenue during construction and not including increases in annual operating and maintenance costs. Further, the estimated loss of generating capacity associated with conversion of California’s OTC facilities is 287 MWs for conversion to closed cycle cooling towers and 1,724 MWs for conversion to air cooled condensers. That is equivalent to one to five average sized power plants that would have to be constructed to replace that lost capacity. The capital cost to construct new power plants to replace that lost capacity would be approximately \$300 million to nearly \$2 billion, based on average project costs for new fossil fueled power plants. Therefore, the total costs to retrofit and then replace lost generating capacity would range from \$2.3 to \$4.5 billion, not including lost revenue during construction and increases in annual operations and maintenance costs, which would add hundreds of millions of dollars to these numbers.

Because the Draft Policy deletes the site specific provisions of the federal Phase II 316(b)

requirements, facilities that face these extremely high compliance costs and only operate during peak electrical demand periods, could be forced to shutdown. Alternatively, they could reduce cooling water flow and power generating operations by 90% to 95%, which would effectively eliminate their ability to respond to local and regional electrical grid needs. The appropriate way to deal with these types of facilities is to include the site specific determination approach into the Draft Policy.

All of these energy consequences need to be thoughtfully and thoroughly evaluated prior to making any determination of the need for adopting a more stringent 316(b) policy for California.

Environmental Consequences

It appears that the Draft Policy attempts to steer OTC facilities toward retrofit with closed cycle cooling. However, the Draft Policy does not consider or evaluate the environmental consequences associated with such retrofits, nor does it evaluate whether conversions are even feasible at California's OTC facilities.

Should an OTC facility find it feasible and cost-effective to convert to closed cycle cooling to comply with the Draft Policy, the estimated environmental consequences include significant increases in emissions of oxides of nitrogen ("NO_x"), emissions of particulate matter of less than 10 microns in size ("PM₁₀"), and emissions of climate change causing carbon dioxide ("CO₂"). For example, the estimated increases in CO₂ emissions from the need to burn more fuel to make up for the generating efficiency losses caused by plant conversions to air cooled condensers would be up to 2 million metric tons of additional CO₂ a year. To bring that into perspective, this is equivalent to adding 4.4% new CO₂ emissions to California's CO₂ inventory associated with power production and is equivalent to adding about half a million mid-sized passenger cars. Therefore, the Draft Policy is clearly at odds with recently passed California Global Warming Solutions Act of 2006 (Assembly Bill 32), which mandates a 25% reduction in CO₂, not substantial increases like those potentially caused by the Draft Policy.

Additionally, conversion to closed cycle cooling towers could create a new and additional draw on potable or reclaimed water supplies in California of approximately 20.5 billion gallons of water per year. The installation of the large footprint closed cycle cooling towers, whether wet or dry, can also create significant impacts to visual resources and may conflict with local and regional land use requirements. Installing closed cycle cooling towers may also result in an increase in the existing noise profile at the facility, which may be an adverse impact depending on the proximity to sensitive receptors. Lastly, closed cycle wet cooling towers also directly emit PM₁₀ emissions and potentially have visible moisture plumes, which could create impacts to air quality and visual resources.

These environmental consequences are not minor and must be carefully analyzed prior to any consideration of a more stringent 316(b) policy for California. The proper way to fully consider these matters is through a comprehensive evaluation as part of an environmental impact report, which is mandated by Section 21159 of the Public Resource Code. This section requires the SWB to perform an environmental analysis that includes all of the following prior to adopting a rule or

regulation for a performance standard such as the Draft Policy: (1) an analysis of the reasonably foreseeable environmental impacts of the methods of compliance; (2) an analysis of reasonably foreseeable mitigation measures; and, (3) an analysis of reasonably foreseeable alternative means of compliance with the rule or regulation. PRC Section 21159(c) also requires that “The environmental analysis shall take into account a reasonable range of environmental, economic, and technical factors, population and geographic areas, and specific sites.”

NRG believes that it is premature to propose a Draft Policy that has such far reaching environmental consequences and adverse impacts to the cost and supply of electrical generating resources, before the environmental assessment required by PRC Section 21159 is performed and carefully evaluated, and that all feasible compliance measures must be retained until proven to be unacceptable through the environmental review.

Restoration

NRG believes that use of restoration measures is the only 316(b) compliance path that has the opportunity to create substantial and lasting benefits to the marine environment, to minimize the impacts to energy efficiency and capacity, and to provide a technically feasible way for OTC facilities to comply with 316(b). Further, federal Phase II 316(b) requirements allow for use of restoration measures to comply with the all of the performance standards. Yet, the Draft Policy substantially limits the use of restoration, but does not provide reasonable justification for that position.

If California wants to avoid the very significant impacts to electrical generating capacity and efficiency and adverse environmental impacts described above, the SWB must allow for restoration measures to be available for complete compliance with both the impingement and entrainment performance standards. Anything short of that will force OTC facilities to focus on the other three compliance options described above that all have significant impacts to energy and the environment.

Summary of Recommendations

1. Before moving forward with a state policy, the SWB needs to quantify the incremental benefits that such a policy would create above and beyond the expected benefits of the federal Phase II 316(b) requirements.
2. Next, the SWB needs to quantify the complete costs and energy and environmental consequences of complying with the policy to fully understand what the policy means to the energy and environmental situation in California today.
3. Only after a satisfactory and complete assessment of numbers 1 & 2 and a thorough comparison of both, should the SWB even begin to develop a state 316(b) policy. The appropriate method of such an analysis is through an environmental impact report that the SWB is mandated to complete pursuant to Section 21159 of the Public Resource Code.

4. Restoration measures must be allowed as a compliance option for fully meeting the entire range of the impingement and entrainment performance standards.
5. Design cooling water flow and early impingement and entrainment reduction actions by OTC facilities should be included in how the Calculation Baseline is determined.
6. Off ramps from the new monitoring requirements must be allowed for facilities that choose compliance approaches that make such monitoring unnecessary. For example, facilities that convert to closed cycle cooling, utilize cooling water flow reductions, or are exempt based on a low capacity utilization rate, should all be exempt from additional monitoring requirements.
7. Site specific determinations that include cost to benefit considerations must be included in the Draft Policy to provide a compliance path for facilities where compliance costs are significantly greater than the benefits.
8. SWB must fully evaluate the technical feasibility and efficacy of impingement and entrainment structural controls prior to making determinations that they can fully meet the performance standards. They must also evaluate the legal feasibility of compliance options, including the ability to permit cooling towers in the coastal zone and in areas of non-attainment with air quality standards.
9. Assure that any development of a state policy does not interfere with each facility's obligation to comply with federal Phase II 316(b) requirements and does not substantially change compliance requirements if a facility has already committed to a particular compliance path under the federal rule.

Thank you for the opportunity to comment on the Draft Policy. NRG hopes these comments are useful in determining the best path forward. If you have any questions or need additional information, please call me at (760) 710-2144.

Sincerely,
NRG Energy, Inc.

By: 
Tim E. Hemig
Director, Regional Environmental Business

Attachment: Summary of Facility Specific Costs and Impacts from SWB draft 316(b) Policy

ATTACHMENT A

Summary of Facility Specific Costs and Impacts from SWB draft 316(b) Policy

Summary of Facility Specific Costs and Impacts from SWB draft 316(b) Policy:

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 ^{1,4}	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) ^{1e}
Alamitos	AES	1950	1275	885,417	10.0%	Peaking	1956	None	Submitted PIC; IM&E Study underway	Uncertain	\$2,018,600
Contra Costa	Mirant	690	440	305,556	20.0%	Intermediate	1964	None	PIC due late Feb 06. Studies TBD.	Expires 2024	\$48,835,329
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	\$15,600,838
El Segundo 3 & 4 ³	NRG	670	398	278,389	15.0%	Intermediate	1964-1965	None	Submitted PIC; IM&E Study underway	Lease expired, renewal application complete	\$5,679,938
Encina	NRG	965	857	595,139	25.0%	Intermediate	1954-1978	None	IM&E Study 95% Complete	Lease expired, renewal applications complete	\$5,283,933
Haynes	LADWP	1619	1014	704,167	34.0%	Intermediate	1962-1970,2004	None	Submitted PIC; IM&E studies underway	No lease with State Lands	\$1,040,022
Humbolt Bay	PG&E	105	78	54,167	0.0%	Peaking	NA	Near Term	NA - Near term shutdown	NA - Near term shutdown	\$163,653
Hunters Point	PG&E	0	0	0	0.0%	Peaking	NA	2006	NA - Near term shutdown	NA - Near term shutdown	\$6,614,078
Huntington Beach	AES	880	507	352,083	18.0%	Intermediate	1958	None	Submitted PIC; IM&E Study underway	Expires in August 2006	\$264,632
Los Angeles Harbor	NRG	0	0	0	0.0%	Retired	1976-1977	Retired	Not Applicable	No lease with State Lands	\$2,336,881
Mandalay	LADWP	235	108	75,000	29.0%	Intermediate	1942-1972,1994,2001	None	Submitted PIC; IM&E studies underway	No lease with State Lands	\$4,341,494
Morro Bay	Duke	1002	668	465,889	4.0%	Peaking	1955-1963	None	PIC submitted; IM&E studies underway	Not applicable	\$9,044,216
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	\$2,707,565
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	\$2,960,066
Ormond Beach	Reliant	1500	668	477,778	15.0%	Intermediate	1971-1973	None	PIC submitted; IM&E studies underway	Renewed 403; expires 4/17	
Pittsburg	Mirant	660	432	300,000	25.0%	Intermediate	1960-1961	None	PIC proposed later in 06. Studies TBD.	Expires 2015	
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	611,808	5.0%	Peaking	1954	None	Submitted PIC; IM&E Study underway	Uncertain	
San Onofre	SCE	2254	2580	1,791,687	95.0%	Baseload	1963/1984	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 to begin late Feb early Mar	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:

- These are GENERAL estimates; based on average wet cooling retrofit cost estimates from Jim Maubetsch, Maubetsch Consulting at \$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
- 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.
- El Segundo 1 & 2 (350 MW) retired in 2003
- Long Beach (688 MW) retired in 2004
- 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
- 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
- Based on statewide average NOx rate of approximately 0.37 lbs/MWhr (Figure 3-5, Page 55, 2005 CEC Environmental Performance Report)
- Based on statewide average CO2 equivalent rate of approximately 0.38 tons/MWhr (Figure 3-6, Page 56, 2005 CEC Environmental Performance Report)
- 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
- Percentage increase in statewide 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)
- 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
- 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 proportionally to average capacity factor of the OTC facilities (Table 5-1, Page 110, CEC 2005 Environmental Performance Report)
- Assumed capital cost for adding a new natural gas fired combined cycle gas turbine plant with wet cooling towers operating at 90% capacity factor to use 1735 million gallons/year, reduced proportionally to average capacity factor of the OTC facilities (Table 5-1, Page 110, CEC 2005 Environmental Performance Report)
- 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)
- Estimated MW capacity is based on actual remaining capacity still operating that uses OTC. Imminent unit retirements are not included in total
- Dry lower retrofit capital cost estimates based on formulas 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
- 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 need

Facility Name	Wet or Dry Cooling Feasible?	Wet Cooling Capital Cost (Easy Retrofit Estimate) ¹	Wet Cooling Capital Cost (Shaw-LWAG Estimate) ²	Wet Cooling Capital Cost (Difficult Retrofit) ³	Dry Cooling Capital Cost (SONGS Estimate) ²	Dry Cooling Capital Cost (EPA Estimate) ⁴	Wet Cooling Retrofit Energy Penalty (EP) ⁵	Wet Cooling Lost MW Capacity - Energy Penalty ⁶	Dry Cooling Retrofit Energy Penalty (EP) ⁷	Dry Cooling Lost MW Capacity - Energy Penalty ⁸	Increased annual NOx tons from Wet EP ⁹	Increased annual NOx tons from Dry EP ⁷	Increased annual PM ₁₀ tons from Wet EP ¹⁰	Increased annual PM ₁₀ tons from Dry EP ¹³	Increased annual CO ₂ in metric tons from Wet EP ⁸	Increased annual CO ₂ in metric tons from Dry EP ⁸
Alamilos	Possible	\$110,677,033	\$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	\$506,000,000	\$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	\$86,560,000	\$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	\$122,295,633	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	\$156,062,345	0.4%	6.48	2.4%	38.66	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 ¹	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
Miss 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
Miss 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	17,804.4
San Onofre	Insufficient Space	\$223,988,333	\$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	\$2,650,620,833	\$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	1,914,837.2

Notes: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

% of state GHG inventory from power generation¹⁰ = from power generation¹⁰ = 0.7% 4.4%

Cost to replace lost MWs¹¹ = \$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