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HUNTINGTON BEACH DESALINATION PROJECT

REPORT ON

LOCAL AND REGIONAL ELECTRIC POWER REQUIREMENTS AND GENERATION RESOURCES

December 10, 2004

Prepared by

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Background

The Huntington Beach Generating Station ("HBGS") is located within the City of Huntington Beach ("City") and consists of four gas-fired steam turbine generators; Units 1&2 have a nominal capacity of 215 MW each while the nominal capacity of Units 3&4 is 225 MW each. Huntington Beach utilizes seawater in a once-through cooling system. Poseidon Resources Corporation ("Poseidon") has proposed the development of the 50 MGD Huntington Beach Desalination Plant ("Project") that would be located in the proximity of the HBGS and would utilize the cooling water intake/outfall facilities (drawing water from the discharge side of the facilities) of the HBGS. At present it is anticipated that the Project will be placed in service during the first quarter of 2008. The intake structure for the Project will be located on the discharge side of the cooling water system of the HBGS and, therefore, will utilize the water only after it has been used by the HBGS. As a result, the operation of the Project will not increase the flow or volume of water in or out of the HBGS and the Project will be shutdown when the HBGS conducts its heat treatment process. The estimated load for the Project is 30–35 MW and it is anticipated that it will be operating at this level unless the HBGS is conducting its heat treatment process.

This report addresses the following areas:

- The identification of estimated electric power demands in the proximity of the Project and other areas of southern California and an assessment of the impacts of the Project load on these requirements,
- The development of information related to the future operation of the HBGS, and
- The design and operational characteristics of once-through cooling systems.

Executive Summary

As discussed in greater detail below NCI's analysis of the above areas shows that:

Electric Power Demands

Table ES-1 summarizes information on projected loads in the Huntington Beach area, the Orange County area, the Los Angeles Basin, and Southern California for the years 2008 and 2013 and the amounts by which these projected loads would increase if a Project-related load of 35 MW were added to them. Additional information on a year-by-year basis is presented in Section 1 of this report. Review of the information in Table ES-1 shows that the addition of the 35 MW Project load has very little impact on the demand for electric energy in Orange County or Southern California. For example, the Project load would be equal to slightly more than one-half of the 66 MW average annual increase in Orange County loads during the 2008-2013 period.

TABLE ES-1 PROJECTED AREA LOADS AND RESULTS OF ADDING THE PROJECT LOAD				
	Estimated Peak Demand (MW)		Project-Related Increase (%)	
	2008	2013	2008	2013
Huntington Beach Area	390	413	9.0	8.5
Orange County	4,445	4,775	0.8	0.7
Los Angeles Basin	22,880	24,130	0.2	0.2
Southern California	34,870	37,720	0.1	0.1

Future Operation of Huntington Beach

As discussed in Section 2 of this report there are a number of factors that will likely result in continued operation of the HBGS units for the next several years. These are summarized as follows:

- To provide reliability services:
  - Two of the four units at the HBGS have received Reliability Must-Run (RMR)[1] contracts from the California ISO for each of the last four years.
  - In addition to the above, an existing ISO operating procedure [2] requires that two units at the HBGS or one HBGS unit plus a 320 MW unit at Alamitos be on-line during peak load conditions on the SCE system.
  - On a going forward basis it would appear as though at least two HBGS units will be considered RMR and at least one unit will be required to meet the requirements of the above referenced ISO operating procedure unless other generation were added in the same geographic area or if SCE were to make additions and/or modifications to the transmission system into and within the area. At present there are no announced plans for either to occur.
- To serve existing power contracts:
  - At the present time there is a power supply contract between the State of California and Williams Energy Marketing and Trading[3] that extends through 2018 and for which HBGS generation provides a portion of the capacity.

[1] RMR units are those that have been identified by the ISO as required to be on-line to maintain local area reliability in the event a forced outage should occur on a transmission element or a generator in the local area.
[2] ISO *Management Recommendations for 2004 RMR Designations from the LARS Process* (September 19, 2003); Page 35.
[3] Williams Energy Marketing and Trading is an entity in the business of buying and selling natural gas and electricity.

  - At the present time the output of HBGS Units 3 and 4 is being sold to SCE under the terms of a five-year tolling agreement.[4] In the ***Huntington Beach Master Site Plan*** (September 28, 2004) AES stated its belief that there would be significant interest in extending this contract beyond its present 2008 termination date.

- To assist in serving long-term load requirements:
  - There will be a significant need for generation resources located within Southern California to serve the loads summarized in Table ES-1. Because of the nature of the SCE transmission system these generation resources will have to include either existing or new generation in the Orange County area so as to avoid significant transmission system investments and to provide the same reliability benefits as do HBGS Units 1 and 2.

- Due to the regulatory status of the HBGS units
  - HBGS Units 3 and 4, which had been shut down by SCE in 1995, have been refurbished by AES and were placed in operation in July of 2002 and August of 2003, respectively.[5] In 2001 these units received a certificate from the California Energy Commission (CEC) that allows them to operate for an initial period of 10 years with conditions.
  - Because HGBS Units 1 and 2 were not removed from service prior to their acquisition by AES it was not necessary for them to go through a CEC certification process in order to continue to operate. Therefore the regulatory life of these units is indefinite, as long as they comply with the pertinent air and water permits.

- Due to siting issues for new generation:
  - A developer/electric utility would likely face significant difficulties in siting a new generating plant in Orange County that would provide the same system support benefits as does the HBGS plant.

Design and Operation of Once-Through Cooling Systems

As discussed in Section 3 of this report, there are benefits to continuous operation (as opposed to pumping water only when units are generating electricity) of once-through cooling water systems at plants such as the HBGS. These include:

- Continuous monitoring and control of steam condenser fouling (biofilm formation)
- Reduction of potential leaching of steam condenser metals (copper) typically caused by shutdowns
- Reduction of potential cold shock (loss of thermal plume) to affected aquatic life.

[4] A tolling agreement is one in which the entity receiving the output from a generating facility owned by another party supplies the fuel which is burned in the generating facility.
[5] California Energy Commission *Energy Facility Status* summary of June 30, 2004.

Section 1 - Demands for Electric Power

Southern California Edison (SCE) and other utilities routinely develop forecasts of electrical loads on their systems. Most times the publicly available information resulting from these forecasts is aggregated such that the only data available is that for the load served from the major substations or on a system wide basis. For use in the assessment, NCI has:

- Extracted information on the estimated amounts of power delivered through each of SCE's major 230-kV and 115-kV substations from SCE's ***CAISO Controlled SCE Transmission – 2004-2008 and 2013 Expansion Plan*** (March 2004).
- Obtained information for the total peak loads on the systems of the Los Angeles Department of Water and Power (LADWP), the other municipal utilities in the Los Angeles Basin, and the Imperial Irrigation District from a load forecast prepared by NCI in 2002.
- Derived information for the total peak load on the San Diego Gas & Electric (SDG&E) system from information in the 2003 and 2004 RMR studies for the SDG&E area.

The SCE system in the Los Angeles Basin consists of:

- A 230-kV transmission network which delivers power to a number of 230/66-kV substations, and
- 66-kV lines which interconnect the 230-kV substations with numerous 66-kV substations from which the power is delivered to lower voltage facilities that ultimately serve the load.

NCI has available maps prepared by SCE and the California Energy Commission (CEC) which show the geographic locations of the SCE 230-KV and 66-kV substations and information prepared by SCE that shows which of SCE's 66-kV substations are interconnected with each of the various 230-kV substations. This information was used to identify the SCE 230-kV and 66-kV substations that serve load in the Huntington Beach area and the balance of Orange County.

Table 1-1 contains information relative to the location of these 230-kV substations as well as estimates of the amount of the total SCE load in Orange County that is served from each substation. Figure 1-1 depicts the relative location of the SCE 500-kV and 230-KV transmission lines and substations in Orange and Los Angeles counties. In addition to SCE substations listed in Table 1-1, the Lewis 230/66-kV Substation, located in Anaheim, serves the electrical load in the City of Anaheim.

The information discussed above was also used to develop the information in Table 1-2 relative to estimated loads for the years 2008-2013 in the Huntington Beach area, Orange County, the Los Angeles Basin, and southern California.

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TABLE 1-1 SCE 230-KV SUBSTATIONS SERVING LOAD IN ORANGE COUNTY		
Substation	**Location (City)**	**% of County Load Served**
Alamitos	Long Beach	<1
Barre	Stanton	20
Del Amo	Cerritos	1
Ellis	Huntington Beach	18
Johanna	Santa Ana	12
Olinda	La Habra	7
Santiago	East Irvine	23
Villa Park	Orange	19

TABLE 1-2 SUMMARY OF ESTIMATED LOADS (MW)						
	Year					
	2008	**2009**	**2010**	**2011**	**2012**	**2013**
Huntington Beach Area Load	390	393	397	402	408	413
Orange County Load						
SCE	3,870	3,920	3,980	4,030	4,100	4,140
City of Anaheim	575	585	600	610	620	635
Total Orange County	4,445	4,505	4,580	4,640	4,720	4,775
Los Angeles Basin Load						
SCE	14,470	14,640	14,720	14,820	15,060	15,230
LADWP	6,240	6,310	6,370	6,420	6,470	6,520
Other Municipal Utilities[6]	2,170	2,200	2,240	2,290	2,330	2,380
Total Los Angeles Basin	22,880	23,150	23,330	23,530	23,860	24,130
Southern California Load						
SCE System Load	21,150	21,460	21,800	22,130	22,520	22,840
SDG&E Load	4,460	4,570	4,680	4,800	4,920	5,040
LADWP Load	6,240	6,310	6,370	6,420	6,470	6,520
Other Municipal Utilities	2,170	2,200	2,240	2,290	2,330	2,380
Imperial Irrigation District	850	870	890	900	920	940
Total Southern California	34,870	35,410	35,980	36,540	37,160	37,720

[6] Anaheim, Azuza, Banning, Burbank, Colton, Glendale, Pasadena, and Riverside

As noted above, the Project load is anticipated to be as much as 35 MW starting in the first quarter of 2008. Table 1-3 presents information on the amounts by which the estimated loads summarized in Table 1-2 would increase when a 35 MW Project load is added to them. Review of the information in Table 1-3 shows that the addition of the 35 MW Project load would increase the demand for electric energy in the Huntington Beach area by approximately 9%. However, the impact of the addition of this load on the demand for electric energy in Orange County or Southern California is insignificant (less than 1%).

TABLE 1-3
CHANGE IN ESTIMATED LOADS DUE TO ADDITION OF THE PROJECT
(%)

	Year					
	2008	2009	2010	2011	2012	2013
Huntington Beach Area Load	9.0	8.9	8.8	8.7	8.6	8.5
Orange County Load	0.8	0.8	0.8	0.8	0.7	0.7
Los Angeles Basin Load	0.2	0.2	0.2	0.2	0.2	0.2
Southern California Load	0.1	0.1	0.1	0.1	0.1	0.1

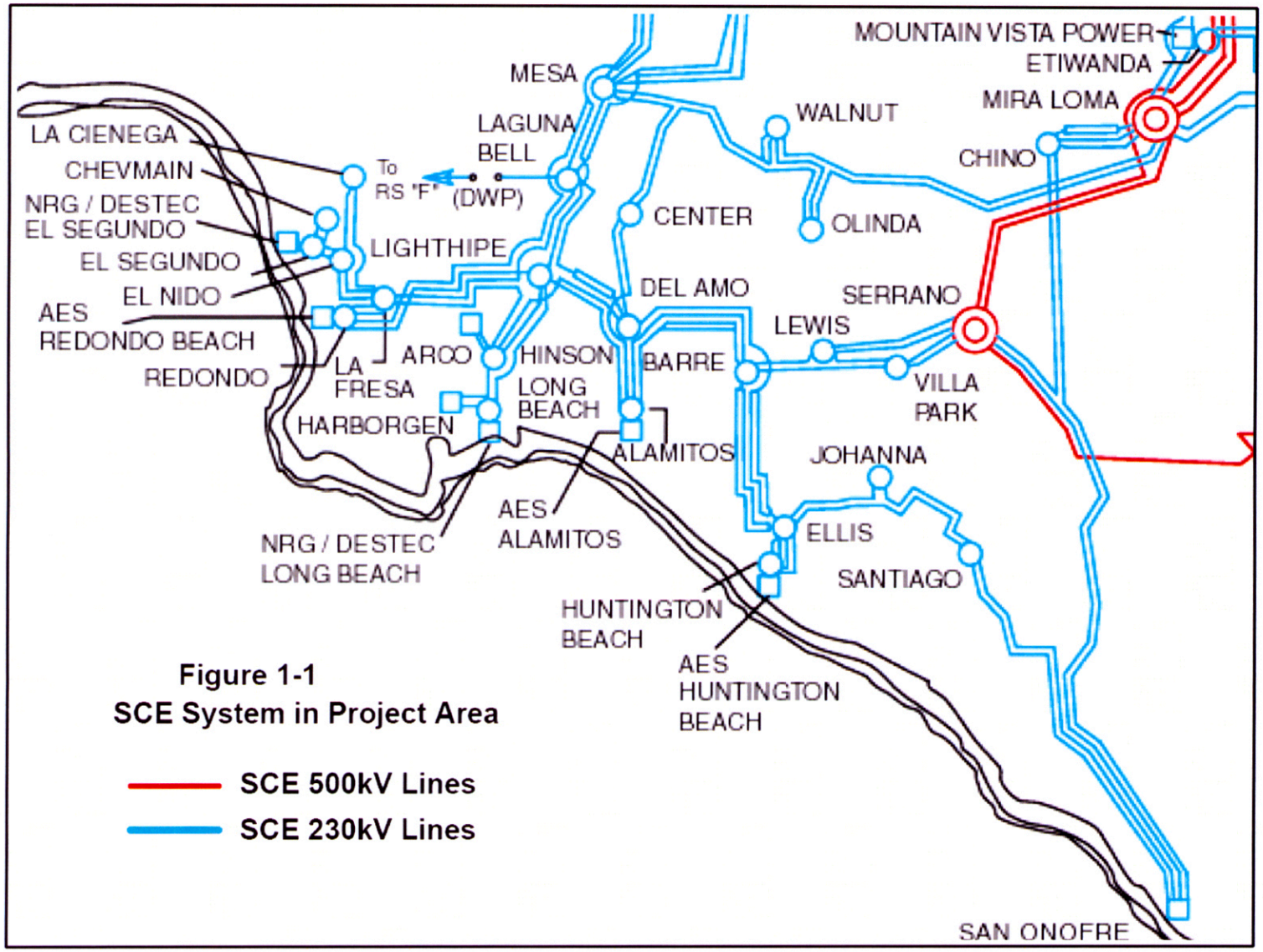

Figure 1-1
SCE System in Project Area

SCE 500kV Lines
SCE 230kV Lines

Section 2 – Continued Operation of the HBGS

The primary factors related to the future operating of the HBGS include:

- The need for at least some of the HBGS units to provide Reliability Must-Run (RMR) capacity to support the transmission grid in the Orange County area.
- Any other reliability related needs for generation at Huntington Beach,
- Any long-term power contracts involving one or more of the HBGS units, and
- Regulatory matters relating to the HBGS and the difficulty in siting a new power generating plant that would provide the same degree of system support as the HBGS.

A discussion on each of these factors follows.

Need for RMR Capacity

Prior to the restructuring of the electric market in California, an integrated process was used in identifying the generation and/or transmission projects that were developed to serve increasing demands for electricity. This resulted in several instances in which generating facilities in a given area would have to be on-line during peak load conditions to avoid overloads and other problems on the transmission system, particularly during system emergencies.

Because the restructured market in California could allow for some generators to be shut down on a temporary or permanent basis the California ISO instituted the annual Local Area Reliability Service (LARS) process during which:

- Technical studies are undertaken to identify those areas of the system where the potential exists for reliability problems should a single Extra-High Voltage (EHV) line or transformer be forced out of service and to identify the amounts of Reliability Must-Run (RMR) capacity that would be required to mitigate these problems, and
- An RFP is issued soliciting bids from generators in the area or from the transmission owner(s) in the area to supply the capacity needed to mitigate the potential reliability problems.

In the case of the SCE system three local sub-areas have been identified where reliability problems could exist.[7] These three sub-areas (Eastern, Western, and Ventura) are depicted in Figure 2-1. As shown in Figure 2-1 the Western Sub-Area includes the SCE system in the southern portion of Los Angeles County and the northern portion of Orange County and includes the generating facilities at the Huntington Beach, Alamitos, Long Beach, Redondo Beach, and El Segundo powerplants.

[7] *2004 Reliability Must-Run Technical Study of the ISO-Controlled Grid* (May 2003)

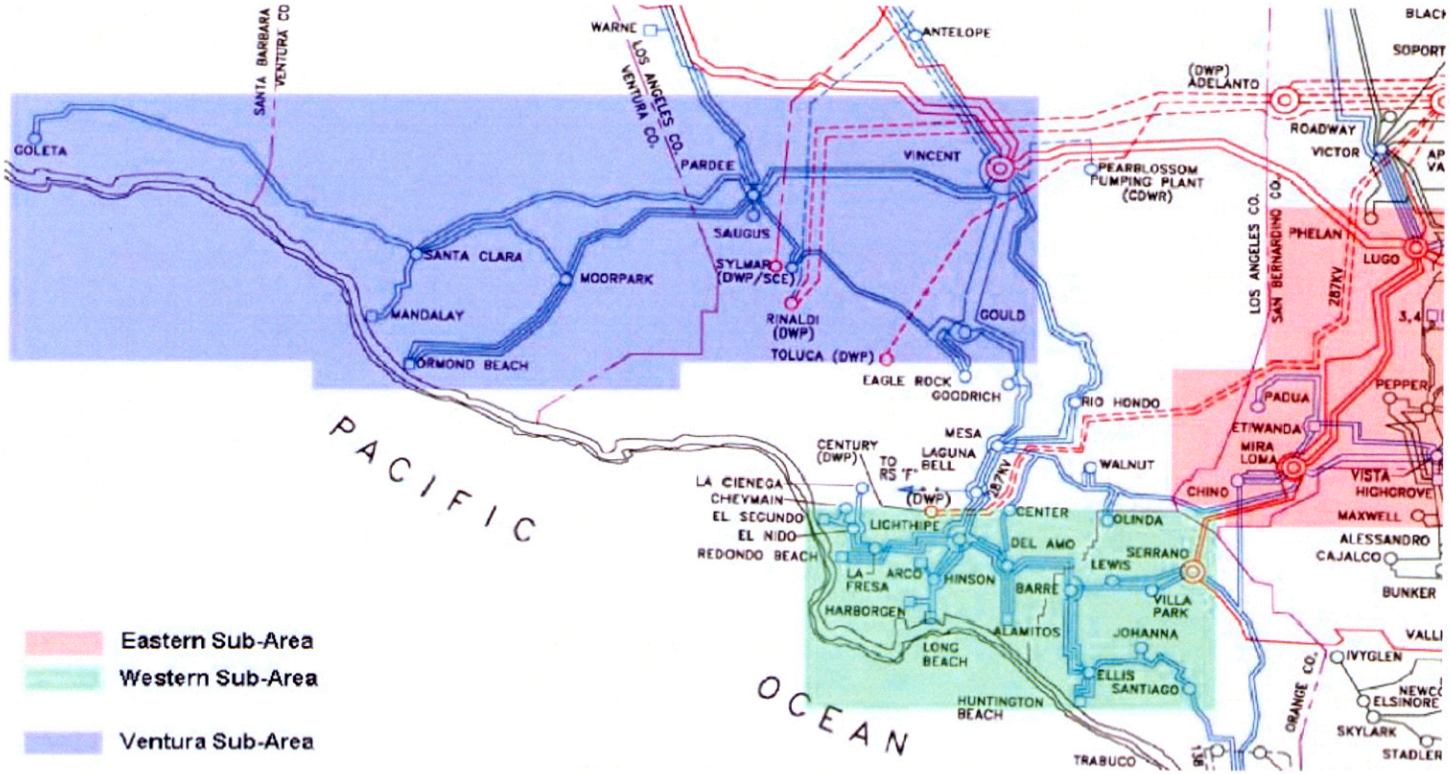

Figure 2 -1
SCE System RMR Areas

Table 2-1 summarizes information on the generating units in the Western Sub-Area which have been designated as RMR units for each year during the 2000-2004 period. As shown in Table 2-1:

- The RMR requirement for the Western Sub-Area peaked at 1,420 MW in 2002 and then was reduced to 750 MW as a result of additions and modifications to the SCE transmission system.
- At least one HBGS unit has been RMR since 2000.
- Two of the four units at the HBGS and at least one 320 MW unit at Alamitos have been RMR units since 2001.

TABLE 2-1
SUMMARY OF WESTERN SUB-AREA RMR REQUIREMENTS (MW)[8]

Designated RMR Units	Year				
	2000	2001	2002	2003	2004
Alamitos 1 and 2	-----	-----	350	-----	-----
Alamitos 3	-----	320	320	320	320
Alamitos 4	320	320	320	-----	-----
HBGS 1	-----	215	215	215	215
HBGS 2	215	215	215	215	215
Redondo Beach 5 and 6	350	-----	-----	-----	-----
Total MW	885	1,070	1,420	750	750

On a going forward basis it appears that there would be a high probability that at least one HBGS unit would be required for RMR capacity unless other generation were added in the same geographic area or if SCE were to make additions/modifications to the transmission system in the area. However:

- Review of the power plant licensing information on the CEC website does not list any applications for new generation in the Orange County area. The closest project to Orange County is the El Segundo Repowering Project, which would replace El Segundo Units 1 and 2 (with a total capacity of 350 MW) with a new combined cycle unit with a nominal capacity of 630 MW. However, because of its location on the SCE transmission system, El Segundo does not provide the same RMR benefits as does the HBGS.
- Neither the ***Monthly Compliance Report (March 2004) of Southern California Edison Company (U 338-E) Regarding Status of Transmission Projects*** filed by SCE on July 1, 2004 with the California Public Utilities Commission nor the ***CAISO Controlled SCE***

[8] The decrease in RMR requirements between 2002 and 2003 was due to SCE's reconductoring of the Barre-Lewis and Barre-Villa Park 230-kV lines and adding shunt capacitors at the La Fresa, Laguna Bell, and Mesa substations.

Transmission – 2004-2008 and 2013 Expansion Plan (March 2004) list any proposed transmission system additions or modifications in the area.

Other Reliability Considerations

As noted above the RMR requirements for a given area are generally based on mitigating the impacts on an outage on a single EHV line or transformer. In addition there are instances where the ISO has identified the need to have generation on line in a specific area to avoid problems after the forced outage of two critical EHV lines. Specifically, with respect to the HBGS, the ISO's Operating Procedure G-219 requires that two units at the HBGS or one HBGS unit plus a 320 MW unit at Alamitos be on-line to provide voltage support after the loss of the two San Onofre-Santiago lines when the SCE load is above 15,500 MW.[9] While the simultaneous loss of both of these lines is a very low probability event, the Operating Procedure was developed to avoid the loss of significant amounts of load in the area should the outage occur.

On a going forward basis it appears that there would be a high probability that the above need for generation from the HBGS would continue unless other generation were added in the same geographic area or if SCE were to make additions/modifications to the transmission system in the area. As noted above, no such projects have been announced to the CEC or the CPUC nor are any discussed in the most recent SCE long-range transmission plan.

Long-Term Power Contracts

At the present time Williams Energy Marketing and Trading has a contract with the State of California to provide up to 1,320 MW of capacity to the State through the year 2010. Generation at HBGS provides a portion of the capacity for this contract. In addition, there are five-year tolling agreements in place under which the capacity from HBGS Units 3 and 4 is sold to SCE and fuel conversion services are provided to SCE. These agreements became effective in July 2002 (for Unit 3) and in August 2003 (for Unit 4).

Long Term Resource Needs

In its ***CAISO Controlled SCE Transmission – 2004-2008 and 2013 Expansion Plan*** (March 2004) report SCE performed studies to assess potential transmission system reinforcements in the 2013 time frame. Information on assumed SCE loads and resources in these studies are summarized in Table 2-2.

Review of the information in Table 2-2 shows that:

[9] ISO *Management Recommendations for 2004 RMR Designations from the LARS Process* (September 19, 2003)

- The existing and committed future resources within the SCE area are comprised of approximately 18,800 MW of market and must-take[10] generation and of approximately 1,200 MW of wind resources. If no generation is retired by 2013, the installed market and must-take generation in the SCE area would exceed total demand in the area by about 2,250 MW and would provide reserves equal to about 9% of the total demand. This amount is higher than the 6-7 percent of forecast demand for electric energy that is typically procured by the ISO for reserves.[11]

- Retiring of the Coastal Plants would result in a resource deficit of approximately 3,000 MW which would have to be made up by new combined cycle generation and/or increased power imports.

TABLE 2-2
SUMMARY OF ASSUMED LOADS AND RESOURCES
SCE 2013 STUDIES
(MW)

SCE Area Load Plus Losses	25,850
Imports Into SCE Area	9,300
SCE Area Generation Requirement	16,550
Installed Market Generation	
• Coastal Plants[12]	5,320
• New Combined Cycle Plants	1,700
• Other Existing Plants	3,790
Subtotal – Market Generation	10,810
Installed Must Take Generation	
• Nuclear	2,150
• Existing/Planned Thermal	3,760
• Hydroelectric	1,480
• Geothermal and Solar	600
Subtotal – Must Take Generation	7,990
Total – Market and Must Take Generation	18,800
Wind (100% of installed capacity)	1,180
Total Generation	19,980

[10] Must-take generation is that which SCE is obligated to utilize and includes capacity from the San Onofre Nuclear Generating Station (SONGS); the proposed Mountainview project; hydroelectric capacity from various SCE-owned facilities; and thermal, geothermal, solar, and hydro capacity acquired by SCE under QF contracts.

[11] ISO's Must-Offer Position Matrix (January 14, 2004)

[12] Plants in Orange and Los Angeles counties (Huntington Beach, Alamitos, Redondo Beach, El Segundo, and Long Beach)

Increasing power imports into the SCE area would require that major new transmission facilities both into and within the SCE area be developed to offset the lost generation and the reliability services provided by HBGS Units 1 and 2. If new generation is developed in the SCE area, approximately 430 MW of such generation would have to be sited in the proximity of the HBGS to provide the reliability services provided by HBGS Units 1 and 2 and thereby avoid significant transmission additions within Orange County.

CEC Certification of HBGS Units 3 and 4

HBGS Units 3 and 4 were retired from use by SCE in 1995 because of the limited use of the two units. In December 2000 AES filed an Application for Certification (AFC) with the CEC to retool the units such that they would result in emissions of the same magnitude as a combined-cycle unit of a similar size. In early 2001 AES offered to retool the units such that they could be in-service by the summer of 2001 to help ease the energy crisis on-going in California at the time. In May 2001 the CEC approved the AFC filed by AES subject to certain limitations. In its decision the CEC specified that, among other things:

- The certification would be effective for a period of ten years.
- In 2006 the CEC will determine if AES has complied with the Conditions of Certification and has implemented specified measures to mitigate environmental impacts. If the CEC determines that AES is not in compliance and if compliance is not achieved by AES the CEC may terminate the certificate or take other actions as permitted by law.

Information on the CEC website indicates that HBGS Unit 3 went on-line on July 31, 2002 and that Unit 4 went on-line on August 7, 2003.

Siting a New Alternative Plant

Identifying and permitting (siting) a location for a power generating plant is perhaps one of the most difficult and time-consuming development processes because of the myriad of factors that must be considered. The driving force is typically the need by the proponent to build generating capacity to serve the growing electric load of its customers at the lowest reasonable cost. Classical least cost electric system planning involves consideration of the capacity, fuel consumption (heat rate), reliability, availability, and total installed cost of potential new generating units on the system. Transmission impacts/upgrades must also be considered, as well as access to adequate fuel supplies at competitive prices. This planning process results in the preferred size, technology and general location of a new generating unit.

However, once the planning process is completed, a more difficult site-specific development process must then begin. Issues that must be addressed and resolved in order to bring a potential plant into construction include the following:

Site Requirements
Access
Air space restrictions
Buffering
Floodplain
Fuel interconnect routing
Site size, expandability
Site topography
Solid waste management
Transmission interconnect routing
Water supply

Environmental Impacts
Groundwater impacts
Protected species and wetlands
Stormwater runoff
Waste minimization, recycling, reuse
Wastewater treatment

Land Use Impacts
Land acquisition
Land use compatibility
Previous land use
Prime agricultural land
Recreational areas

Community Impacts
Visual - Aesthetics
Archeology-historic sites
Community service costs
Effects on wells
Labor availability
Number of relocations
Public attitude

Public Health & Safety
Air Quality
Dust
EMF
Noise
Operational odors
Traffic safety
Water treatment

Socioeconomic Impacts
Future development
Jobs and purchases
Local tax impact
Property values

Review of this long list of factors illustrates the difficulty that any developer would face in siting a new generating plant in Orange County that would provide the same system support benefits as does the HBGS. Conversely, it illustrates the value that is inherent in the HBGS, in that development of an alternative resource to serve the area may not be possible. Therefore, it is likely that the HBGS will remain in operation, with proper improvements and advancements, as a viable generating resource well into the future.

The on-going controversy regarding the certification of the El Segundo Modernization Project is an example of the time required to develop new generation along the coast in Southern California and the difficulties that can be faced in doing so. As noted above the El Segundo project would replace the 1950's vintage El Segundo Units 1 and 2 (with a total capacity of approximately 350 MW) with a new state-of-the-art combined cycle unit with a nominal capacity of 630 MW. The Application for Certification (AFC) for the El Segundo project was submitted to the CEC in December 2000 and was accepted as data adequate in February 2001.

However, the project has not yet been approved by the CEC due to concerns about potential environmental and community impacts.

Section 3 - Design and Operation of Once-Through Cooling Systems

Most industrial production processes need cooling water to operate efficiently and safely. Refineries, steel mills, petrochemical manufacturing plants, electric utilities and paper mills all rely on equipment or processes that require efficient temperature control. Cooling water systems control these temperatures by transferring heat from the hot process fluids into cool water. At power plants, such as the HBGS, the process fluid to be cooled is steam after it has passed through the steam turbine and generated power. As the cooling occurs, the cooling water itself gets warmer and must be cooled or discharged and replaced by a fresh supply of cool water. Where the cooling water is discharged, the system is known as once-through cooling.

Once-through cooling characteristically involves large volumes of water and small increases in water temperature. Information obtained from AES indicates that, in the case of the HBGS units, the maximum increase in temperature is 30 degrees while the temperature increase at low loads is approximately 3 degrees. Once-through cooling is usually employed when water is readily available in large volume at low cost. Once-through cooling systems for power plants are typically operated at a high load factor. They are started several hours prior to startup of the balance of the plant, and are operated several hours after plant shutdown in order to fully cool the steam condensing equipment.

Although simple in design and operation, once-through cooling systems are subject to corrosion, scale and microbial growth and fouling. Microbial growth and fouling result in energy losses due to increased frictional resistance and increased heat transfer resistance, increased capital costs for excess equipment capacity to account for fouling, increased maintenance costs for replacement of equipment with severe under-deposit corrosion, and shutdowns to clean equipment with loss of production. Information obtained from AES indicates that, with respect to the HBGS, the most significant problems are debris plugging the condenser tubes, algae growth, and mussel growth and that all three of these are controlled without removing the units from service.

The cleaning methods for bio-fouled systems consist of physical and chemical methods (biocides sanitization). Physical methods are simple but show limited efficacy (flushing) or are effective only for loosely adherent films (backwashing) or for not very thick deposits (non abrasive sponge balls). They also require plant shutdown to perform. The most common approach to biofouling problems in cooling water systems is the use of biocides, substances able to drastically reduce the total number of cells in the feedwater and to attack and weaken the stability of the biofilm. The efficacy of biocides depends on several factors like the kind of biocide and its mechanism of action, its concentration, its kinetics, the way it is dosed. Research has shown that a continuous biofouling monitoring system (on-line and side-stream monitors, visual inspections etc) and a chlorine dioxide (ClO2) dosage provides the best

results.[13] Information from AES indicates that the HBGS utilizes chlorination, heat treating, and mechanical cleaning to control condenser fouling problems.

In summary, there are benefits to continuous operation of once-through cooling water systems at plants such as the HBGS, including control of biofilm formation and reduction of potential metals leaching and cold shock to affected aquatic life. The HBGS is allowed to operate its pumps 24 hours per day, every day under its discharge permit, NPDES, issued and monitored by the Santa Ana Regional Water Control Board.

[13] Once-through cooling systems antifouling treatment by ClO2 M.Belluati 1, L.Bartole 2, G.Bressan 2, (1: Caffaro, Laboratorio Ricerche, via F.Nullo 8, 25126 Brescia [Italy] 2: Dipartimento di Biologia, Università degli Studi di Trieste, via L.Gorgieri 10, 34127 Trieste [Italy])