DOCKETED

Docket Number:	07-AFC-06C
Project Title:	Carlsbad Energy Center - Compliance
TN #:	204007
Document Title:	Licensed CECP Exhibit 214 -- Application for Certication, Alternatives Section, 9/11/2007
Description:	CECP 2007a â€“ Carlsbad Energy Center Project/T. Hemig (tn: 42299). Application for Certification for the Carlsbad Energy Center Project. 09/11/2007. Duplicate of Exhibit 4 and therefore not received into evidence.
Filer:	Mike Monasmith
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	3/30/2015 9:09:40 PM
Docketed Date:	4/1/2015

SECTION 6.0

Alternatives

6.1 Introduction

This section considers whether reasonable alternatives to the Carlsbad Energy Center Project (CECP) exist that may reduce or eliminate any significant, adverse environmental impacts of the project, while still being able to feasibly attain most of the basic project objectives.

6.1.1 Project Objectives

The CECP objectives are to develop an electrical generating facility that:

- Meets the commercial qualifications for long-term power contract opportunities in southern California
- Meets the expanding need for new, highly efficient, reliable electrical generating resources located in the load center of the San Diego region.
- Improves San Diego electrical system reliability through fast starting generating technology, creating a rapid responding resource for peak demand situations and providing a dependable resource to backup less reliable renewal resources like wind generation.
- Modernizes existing aging electrical generation infrastructure in north, coastal San Diego County. Modernization of aging electrical generation infrastructure is a primary objective shared by the energy and environmental agencies in California, including the California Public Utilities Commission (CPUC), California Energy Commission (CEC), California Independent System Operator (CAISO), and publicly owned utilities.
- Accomplish "brownfield" redevelopment of an existing power plant for a net increase in electrical generation capacity to support electrical system and local resource supply requirements in the San Diego area. The CPUC has a state preference for "brownfield" power projects pursuant to Decision No. 04-12-048.
- Facilitates the retirement of existing Units 1, 2, and 3 at the Encina Power Station consistent with the following City of Carlsbad's land use programs (see Section 5.6, Land Use, for a completed discussion of the various land use programs) and to set in motion actions that are likely to facilitate the eventual retirement of Units 4 and 5 at the Encina Power Station:
  - City of Carlsbad General Plan
  - City of Carlsbad Zone Code
  - Encina Power Station Specific Plan 144
  - Encina Power Station Precise Development Plan

  - Agua Hedionda Land Use Plan
  - South Carlsbad Coastal Redevelopment Plan, including moving forward with the primary Plan objective to "Facilitate the redevelopment of the Encina Power Generating Facility to a physically smaller, more efficient power generating plant."

- Utilizes existing Encina Power Station infrastructure to reduce environmental impacts and costs. The infrastructure at the Encina Power Station will support the CECP with only minor new connections including to the existing: high pressure natural gas, industrial/sanitary sewer, potable water, and the existing SDG&E 138-kV and 230-kV switchyards at the Encina Power Station.

  The only new infrastructure requirement for CECP is the use of California Code of Regulations (CCR) Title 22 reclaimed water as the CECP's raw water source. The use of reclaimed water by CECP represents a significant Project benefit as use of potable water will be limited to sanitary uses and fire protection.

- Significantly reduces the volume of seawater used for once-through-cooling at the existing Encina Power Station by facilitating the retirement of existing Units 1, 2, and 3.

- Meets applicable laws, ordinances, regulations, and standards (LORS) of the CEC, City of Carlsbad, and other agencies.

6.1.2 Project Overview

CECP site was chosen by the Applicant based on its physical, environmental, and land use characteristics consistent with the project objectives above. The CECP site consists approximately 23 acres of land at the existing Encina Power Station. The CECP site is located in one of two areas designated as Public Utility in the City of Carlsbad General Plan and zoning code that allows for electrical generation and transmission facilities in the City of Carlsbad Zoning Code. The surrounding land use include the Agua Hedionda Lagoon to the north, commercial and residential uses to the south, Interstate 5 and SDG&E property to the east, and the Agua Hedionda Lagoon, Carlsbad Boulevard, and Pacific Ocean to the west. The Encina Power Station site has been used for electrical generation since 1952.

The CECP will utilize existing Encina Power Station infrastructure to reduce environmental impacts and costs. The infrastructure at the Encina Power Station that will support the CECP with only minor new connections including to the existing: high pressure natural gas pipeline, industrial/sanitary sewer line, potable water line, and onsite electrical connections to the existing SDG&E 138-kV and 230-kV switchyards at the Encina Power Station.

The only new infrastructure requirement for CECP is the use of CCR Title 22 reclaimed water as the CECP's raw water source. The CECP will require the construction of a 3,700-foot CCR Title 22 reclaimed water supply pipeline to connect with the existing City of Carlsbad reclaimed water pipeline. The use of reclaimed water by CECP represents a significant Project benefit as use of potable water will be limited to sanitary uses and fire protection.

6.2 Alternatives Analysis Requirements

The CEC's power plant siting procedure is a certified functional equivalent process to the environmental review required by California Environmental Quality Act (CEQA). The alternatives analysis required by CEC regulations in CCR, Title 20, Appendix B, is similar to the CEQA requirement to analyze alternatives. Thus, CEQA provides further guidance regarding the appropriate level of alternatives analysis to include in this Application for Certification (AFC).

The Guidelines for Implementation of CEQA (CEQA Guidelines) provide the framework for analyzing alternatives to a proposed project as part of an Environmental Impact Report (EIR). CEQA Guidelines, Section 15126.6, Consideration and Discussion of Alternatives to the Proposed Project, provides, in relevant part, the following:

> *(a) Alternatives to the Proposed Project. An EIR shall describe a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives. An EIR need not consider every conceivable alternative to a project. Rather, it must consider a reasonable range of potentially feasible alternatives that will foster informed decisionmaking and public participation. An EIR is not required to consider alternatives which are infeasible.*
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> *(c) Selection of a range of reasonable alternatives. The range of potential alternatives to the proposed project shall include those that could feasibly accomplish most of the basic objectives of the project and could avoid or substantially lessen one or more of the significant effects... Among the factors that may be used to eliminate alternatives from detailed consideration in an EIR are: (i) failure to meet most of the basic project objectives, (ii) infeasibility, or (iii) inability to avoid significant environmental impacts.*
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> *(f) Rule of reason. The range of alternatives required in an EIR is governed by a 'rule of reason' that requires the EIR to set forth only those alternatives necessary to permit a reasoned choice. The alternatives shall be limited to ones that would avoid or substantially lessen any of the significant effects of the project. Of those alternatives, the EIR need examine in detail only the ones that the lead agency determines could feasibly attain most of the basic objectives of the project...*
>
> > *(1) Feasibility. Among the factors that may be taken into account when addressing the feasibility of alternatives are site suitability, economic viability, availability of infrastructure, general plan consistency, other plans or regulatory limitations, jurisdictional boundaries (projects with a regionally significant impact should consider the regional context), and whether the proponent can reasonably acquire, control or otherwise have access to the alternative site (or the site is already owned by the proponent).*
> >
> > *(3) An EIR need not consider an alternative whose effect cannot be reasonably ascertained and whose implementation is remote and speculative.*

Section 30260 of the California Coastal Act has requirements related to siting industrial facilities, including power plants, in the coastal zone. Section 30264 allows for construction

of new or expanded power plants in the coastal zone when no alternative sites have greater relative merit to the proposed site.

6.2.1 Selection of Alternatives to Be Evaluated

As discussed above, CEQA requires consideration of "a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives" [14 CCR. 15126.6(a)]. Thus, the focus of an alternatives analysis is on alternatives that "could feasibly accomplish most of the basic objectives of the project and could avoid or substantially lessen one or more of the significant effects" [14 CCR 15126.6(c)]. As discussed above, the CEQA Guidelines further provide that "[a]mong the factors that may be used to eliminate alternatives from detailed consideration in an Environmental Impact Report (EIR) are: (i) failure to meet most of the basic project objectives, (ii) infeasibility, or (iii) inability to avoid significant environmental impacts" (*Id*.).

Pursuant to Section 15126.6(a) of the CEQA Guidelines, a reasonable range of alternatives to the CECP has been defined, and the alternatives are evaluated in the following sections. The alternatives were selected based on their potential to feasibly attainment most of the basic project objectives and to avoid or substantially lessen the significant environmental effects of the CECP. For the purpose of this analysis, a range of reasonable alternatives that could feasibly attain most of the basic objectives of the CECP are identified and evaluated in this section including: (1) the "No Project" alternative (that is, not developing a new power generation facility); (2) alternative site locations for constructing and operating CECP; (3) alternative combined-cycle configurations to the combustion turbine and steam turbine arrangement proposed for CECP; and (4) alternative power generation technologies.

6.3 No Project Alternative

6.3.1 Description

If the No Project alternative is selected, Carlsbad Energy Center LLC would not receive a license from the CEC to construct and operate new power generation facility (i.e., CECP). As a result, the CECP site would not be redeveloped and existing Units 1 -3 at the Encina Power Station would continue to operate into the foreseeable future. The electrical energy that would have been produced by the CECP would partially be produced from the existing Encina Power Station, and would also be generated by another source and/or imported to San Diego County. Commonly available sources include older power generation facilities, like the Encina Power Station, that operate less efficiently with higher air emissions per megawatt of power generated than the proposed CECP.

Because of the growing need for new generating resources, the No Project alternative would likely result in development of new generating resources in San Diego to meet that need, and because of limited availability of repowering potential, like the Encina Power Station, such new resources would likely be "Greenfield" sites, which generally have greater environmental and community impacts than "brownfield" redevelopment project like CECP.

6.3.2 Ability to Meet Basic Project Objectives and Potential Environmental Impacts

The No Project alternative would not attain the following basic project objectives of the CECP:

- Meet the expanding need for new, highly efficient, reliable electrical generating resources located in the load center of the San Diego region.
- Improve San Diego electrical system reliability through fast starting generating technology, creating a rapid responding resource for peak demand situations and providing a dependable resource to backup less reliable renewal resources like wind generation.
- Modernize existing aging electrical generation infrastructure in north, coastal San Diego County.
- Accomplish "brownfield" redevelopment of an existing power plant for a net increase in electrical generation capacity to support electrical system and local resource supply requirements in the San Diego area.
- Facilitate the retirement of existing Units 1, 2, and 3 at the Encina Power Station consistent with the City of Carlsbad's land use programs and to set in motion actions that are likely to facilitate the eventual retirement of Units 4 and 5 at the Encina Power Station.
- Use existing Encina Power Station infrastructure to reduce environmental impacts and costs.
- Significantly reduces the volume of seawater used for once-through-cooling at the existing Encina Power Station by facilitating the retirement of existing Units 1, 2, and 3.

In addition, through the use of the modern, high-efficient, low air emission natural-gas fired, combine-cycle technically that used air cooled condensers rather than seawater or other water sources for cooling, the CECP has significant environmental benefits as compared to existing Units 1, 2, and 3 at the Encina Power Station that will be retired as part of the CECP, but would not be retired if the CECP is not developed. Therefore, the CECP has no significant effects and, therefore, by definition the No Project alternative would not avoid or substantially lessen one of more of the significant effects of the CECP.

Based on the above, the No Project alternative, while required for analysis by CEQA, does not meet the requirements of the CEQA Guidelines as being included the "range of reasonable alternatives to the CECP [14 CCR. 15126.6(a)] "…which would feasibility attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives."

CECP will produce electricity for the SDG&E service area while consuming less fuel and discharging fewer air emissions for each energy unit generated when compared to other existing, older fossil fuel generation facilities. This is a beneficial environmental result.

Potential environmental impacts from the No Project alternative would result in greater fuel consumption and air pollution because new power plants, including CECP, would not be brought into operation to displace production from older, less efficient plants that have

higher air emissions. Additionally, because of the growing need for new generating resources, the No Project alternative would likely result in development of new generated resources in San Diego to meet the need, and because of limited availability of repowering potential like at the Encina Power Station, such new resources would likely be "Greenfield" sites, which generally have greater environmental and community impacts than "brownfield redevelopment projects like CECP.

6.4 Proposed and Alternative Sites

6.4.1 Proposed Site

CECP will be located on approximately 23 acres of land at the existing Encina Power Station. The CECP site is located in one of two areas designated as Public Utility in the City of Carlsbad General Plan and zoning code that allows for electrical generation and transmission facilities in the City of Carlsbad Zoning Code. The surrounding land use include the Agua Hedionda Lagoon to the north, commercial and residential uses to the south, Interstate 5 and SDG&E property to the east, and the Agua Hedionda Lagoon, Carlsbad Boulevard, and Pacific Ocean to the west. The Encina Power Station site has been used for electrical generation since 1952.

The CECP will use existing Encina Power Station infrastructure to reduce environmental impacts and costs. The infrastructure at the Encina Power Station that will support the CECP with only minor new connections including to the existing: high pressure natural gas pipeline, industrial/sanitary sewer line, potable water line, and onsite electrical connections to the existing SDG&E 138-kV and 230-kV switchyards at the Encina Power Station.

The only new infrastructure requirement for CECP is the use of CCR Title 22 reclaimed water as the CECP's raw water source. The CECP will require the construction of a 3,700-foot CCR Title 22 reclaimed water supply pipeline to connect with the existing City of Carlsbad reclaimed water pipeline. The use of reclaimed water by CECP represents a significant Project benefit as use of potable water will be limited to sanitary uses and fire protection.

6.4.2 Alternative Sites

The Applicant evaluated whether there are other sites for CECP that could potentially attain most of the basic project objectives of the CECP as outlined above in Section 6.1.1.

A review of the City of Carlsbad General Plan, identified only 158 acres of land designated in the City's General Plan and zoning code as Public Utility which allows electrical generation and transmission facilities, and which are consistent with a power plant development, such as the CECP. Of the 158 acres, the Encina Power Station comprises 130 acres, with SDG&E property east of the Encina Power Station and one other area due south of the Encina Power Station comprising the remaining 28 acres (location of the Encina Water Pollution Control Facility). Therefore, there are no available parcels within the City of Carlsbad with the appropriate General Plan and zoning code designation of Public Utility.

Potential sites outside the City of Carlsbad do not meet the not satisfy most of the project objectives. Therefore, no alternative sites were analyzed for this AFC.

Further, this determination documents that no feasible alternative sites exist that would attain most of the basic objectives of the CECP and, therefore, there are no feasible alternative sites that would have greater relative merit than the CECP site, pursuant to Section 30264 of the California Coastal Act. Additionally, in a CEC staff report dated June 1980, the CEC determined that expansion opportunities exist at the Encina Power Station, including up to 1,300 megawatts of expanded combined-cycle generation like that being proposed by the CECP (see Appendix 6A for the relevant sections of this CEC report).

6.4.2.1 Ability to Attain Basic Project Objectives and Potential Environmental Impacts

Potential sites outside the City of Carlsbad do not attain the following basic project objectives of the CECP:

- "Brownfield" redevelopment of an existing power plant for a net increase in electrical generation capacity to support electrical system and local resource supply requirements in the San Diego area.
- Facilitate the retirement of existing Units 1, 2, and 3 at the Encina Power Station consistent with the City of Carlsbad's land use programs and to set in motion actions that are likely to facilitate the eventual retirement of Units 4 and 5 at the Encina Power Station.
- Use existing Encina Power Station infrastructure to reduce environmental impacts and costs.
- Significantly reduce the volume of seawater used for once-through-cooling at the existing Encina Power Station by facilitating the retirement of existing Units 1, 2, and 3.

In addition, through the use of the modern, high-efficient, low air emission natural-gas fired, combine-cycle technically that used air cooled condensers rather than seawater or other water sources for cooling, the CECP has significant environmental benefits as compared to existing Units 1, 2, and 3 at the Encina Power Station that will be retired as part of the CECP, but would not be retired if the CECP is not developed. Therefore, the CECP has no significant effects and, therefore, by definition an alternative site would not avoid or substantially lessen one of more of the significant effects of the CECP.

Based on the above, there are no potential alternative site that meet the requirements of the CEQA Guidelines as being included in the range of reasonable alternatives to the CECP [14 CCR. 15126.6(a)] "…which would feasibility attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives."

Therefore, no feasible alternative sites were identified or analyzed in this AFC.

6.5 Alternative Project Configurations

The configuration of CECP is the result of considering a variety of design and operating limitations. The main factors affecting the configuration include available gas turbine-generator sizes, economies of scale for both construction and operation of the plant, fuel supply, power transmission capacities, fuel efficiency, 10-minute start capability, and forecast market demand for electrical power. Two combustion turbine suppliers were

evaluated for the CECP project: GE Energy and Siemens Power Generation, the two largest suppliers of gas and steam turbine power generation equipment in the world. The evaluations included 3 months of communications; the exchange of engineering and commercial documents; and reviewing the technologies on the basis of cost, schedule, power, heat rate, 10-minute start capability and, most importantly, environmental considerations in respect to power generation emissions. Based on these evaluations, the decision was made to select Siemens Power Generation.

Two trains of 1x1 combined-cycle configuration using the Siemens Rapid Response Combined-Cycle SCC6-5000F combustion turbines provides excellent overall plant reliability and flexibility. Further, the Siemens units can achieve the 10-minute start feature required to commercially qualify for long-term power contract opportunities in the San Diego area.

6.6 Alternative Technologies

Other generation technologies considered for CECP are grouped according to the fuel used:

- Oil and natural gas
- Coal
- Nuclear
- Water
- Biomass
- Solar
- Wind

Alternative technologies were evaluated with respect to commercial availability, implementability, and cost-effectiveness.

6.6.1 Oil; Natural Gas; Coal; Conventional and Supercritical Boiler/Steam Turbine, or Simple Combustion Turbine

These technologies are commercially available, and could be implemented. However, for various reasons they emit a greater quantity of air pollutants per kilowatt-hour generated than the proposed technology. Further, only natural-gas fired turbine generators with 10-minute start features meet the commercial qualifications for long-term contract opportunities in southern California. Simple-cycle turbines with 10-minute start features are less fuel efficient then the proposed combine-cycle configuration and, therefore, have higher air emissions per unit of power generated.

6.6.2 Nuclear

Nuclear technology includes nuclear fission and nuclear fusion. Nuclear fission breaks atomic nuclei apart, giving off large quantities of energy. For nuclear fission, pressurized water reactors, and boiling water reactors are commercially available. California law prohibits new nuclear plants until the scientific and engineering feasibility of disposal of high-level radioactive waste has been demonstrated. To date, neither the Nuclear Regulatory Commission nor the CEC have been unable to make the findings of disposal feasibility required by law for this alternative to be viable in California. Nuclear fission

would also require very large quantities of fresh water for cooling, a resource that is not readily available. The technology is not implementable and, therefore, it was eliminated from consideration.

Nuclear fusion forces atomic nuclei together at extremely high temperatures and pressures, giving off large quantities of energy. Nuclear fusion is not available commercially, and it is not clear if or when it will become available. The technology, therefore, was eliminated from consideration.

6.6.3 Water

These technologies use water as fuel. They include hydroelectric, geothermal, and ocean energy conversion.

6.6.3.1 Hydroelectric

This technology uses falling water to turn turbines that are connected to generators. A flowing river or, more likely, a dammed river, is required to obtain the falling water. This technology is commercially available. However, most of the sites for hydroelectric facilities have already been developed in California, and any remaining potential sites face formidable environmental licensing problems. There are no large bodies of water near the CECP site that can be used for hydroelectric power. Therefore, it was eliminated from consideration.

6.6.3.2 Geothermal

These technologies use steam or high-temperature-water (HTW) obtained from naturally occurring geothermal reservoirs to drive steam turbine/generators. There are vapor dominated resources (dry, superheated steam) and liquid-dominated resources that use a number of techniques to extract energy from the HTW. Geothermal is a commercially available technology. Geothermal development is not viable at the project location. Therefore, it was eliminated from consideration.

6.6.3.3 Ocean Energy Conversion

A number of technologies use ocean energy to generate electricity. These include: tidal energy conversion, which uses the changes in tide level to drive a water turbine/generator; wave energy conversion, which uses wave motion to drive a turbine/generator; and ocean thermal energy conversion, which employs the difference in water temperature at different depths to drive an ammonia cycle turbine/generator. While all of these technologies have been made to work, they are not fully commercially available. Even if they were commercially available, they are considerably more costly than conventional combined-cycle technology. Therefore, they were eliminated from consideration.

6.6.4 Biomass

Major biomass fuels include forestry and mill wastes, agricultural field crop and food processing wastes, and construction and urban wood wastes. Several techniques are used to convert these fuels to electricity, including direct combustion, gasification and anaerobic fermentation. While these technologies are available commercially on a limited basis, their

cost tends to be high relative to a combined-cycle unit burning natural gas. Therefore, this technology was eliminated from consideration.

6.6.5 Solar

Solar radiation (sunlight) can be collected directly to generate electricity with solar thermal and solar photovoltaic technologies, or indirectly through wind generation technology in which the sunlight causes thermal imbalance in the air mass, creating wind. Wind generation and two types of solar generation, thermal conversion and photovoltaics, were considered as alternative technologies to the combined cycle. These are described in the following sections.

6.6.5.1 Solar Thermal

Most of these technologies collect solar radiation, then heat a working fluid to power a turbine/generator. The primary systems that have been used in the United States capture and concentrate the solar radiation with a receiver. These more advanced technologies are referred to as concentrating solar systems and are classified by how they collect solar energy. The three main receiver types are mirrors located around a central receiver (power tower), parabolic dishes and parabolic troughs.

The power tower systems use many large helostats (sun-tracking mirrors) to concentrate and focus sunlight on a tower mounted receiver. The receiver contains the heat transfer fluid that is used to generate electricity in a turbine/generator. The Solar Two plant located near Barstow, California is a power tower solar project.

The parabolic dish and trough systems use parabolic structures (either dishes or troughs) to collect and concentrate sunlight onto receiver pipes (attached to the parabolic structures) containing a working fluid. The working fluid, typically oil, is used to generate electricity in a conventional steam generator.

Another solar system with good commercial prospects is the Dish/Engine (D/E) system. This system is a solar collection/concentration array coupled to a Stirling engine. A D/E system collects solar energy in a similar manner. However, instead of the concentrators heating a working fluid that is directed to a turbine generator, it heats a working gas in a Stirling engine/generator. The Stirling engine/generator works like a standard engine generator, with pistons being moved by the heated gases (from energy concentrated by the collector). Individual D/E systems range in side from 9 to 25 kilowatts and can be grouped to provide large efficient systems.

All require considerable land for the collection receivers and are best located in areas of high solar incidence. Land requirements for concentrating solar technologies are on the order of 10 acres per megawatt[1]. Based on the CECP site size of approximately 23 acres, these technologies would not be able to generate a fraction of the electricity currently generated by the CECP.

In addition, power is typically only generated while the sun shines, so the units do not supply power when clouds obscure the sun or from early evening to late morning.

[1] http://www.energylan.sandia.gov/sunlab/overview.htm

However, recently the Solar 2 plant near Barstow, California successfully generated electricity Solar Two successfully demonstrated power delivery to the electric grid continuously for nearly 7 days before cloudy weather interrupted operation. Based on a combination of the factors above, solar thermal technology was eliminated from consideration.

6.6.5.2 Solar Photovoltaic

This technology uses photovoltaic "cells" to convert solar radiation directly to direct current electricity, which is then converted to alternating current. Panels of these cells can be located wherever sunlight is available. This technology is environmentally benign and is commercially available, since panels of cells can theoretically be connected to achieve any desired capacity. While this technology may have a bright future, at the current time the cost is higher than the selected combined-cycle technology. Therefore this technology was eliminated from consideration.

6.6.6 Wind

This technology uses a wind-driven rotor (propeller) to turn a generator and generate electricity. Only limited sites in California have an adequate wind resource to allow for the installation of wind generators, and most of these sites have already been developed or are remote from electric load centers and have limited or no transmission access. Even in prime locations the wind does not blow continuously, so capacity from this technology is not always available. In California, the average wind generation capacity factor has been approximately 22 percent[2]. In addition, depending on the site and/or season, the technology cannot be depended upon to be available at system peak load since the peak may occur when the wind is not blowing. The technology is commercially available and implementable at certain sites. The technology is relatively benign environmentally, although at some sites land consumption and effects on visual resources and avian species are a concern. Due to the unavailability of good sites near the San Diego load center (excluding offshore sites), limited dependability, and relatively high cost, this technology was eliminated from consideration.

6.7 References

California Energy Commission. 1995. 1994 Biennial Electricity Report (ER94), P300-95-002. November.

City of Carlsbad. 2006. General Plan Land Use Element. November 7.

City of Carlsbad. 2006. Zoning Map. November 7.

[2] Wind Power Generation Trends at Multiple California Sites, Table 2.9, California Energy Commission (CEC-500-2005-185), December 2005.