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Alternatives

This section discusses alternatives to Stanton Energy Reliability Center, LLC's (SERC, LLC's) proposed Stanton Energy Reliability Center (SERC). These include the "no project" alternative, power plant site alternatives, linear facility route alternatives, technology alternatives, and water supply alternatives. This discussion focuses 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 potential impacts.

The California Environmental Quality Act (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" (Title 14, California Code of Regulations [CCR] 15126.6[a]).

Thus, the focus of an alternatives analysis should be 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" (Title 14, CCR 15126.6[c]). The CEQA Guidelines further provide that "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."

The Energy Facilities Siting Regulations (Title 20, CCR, Appendix B) guidelines titled *Information Requirements for an Application* require the following:

A discussion of the range of reasonable alternatives to the project, including the no project alternative... 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 an evaluation of the comparative merits of the alternatives.

The data adequacy regulations also require the following:

A discussion of the applicant's site selection criteria, any alternative sites considered for the project and the reasons why the applicant chose the proposed site.

A range of reasonable alternatives are identified and evaluated in this section, including the "no project" alternative (i.e., not developing a new power generation facility), alternative site locations for constructing and operating SERC, alternative project design features (including linear routes and water supply source), and various technology alternatives. This section also describes the site selection criteria used in determining the proposed location of SERC.

6.1 Project Objectives

The SERC's primary goal is, as its name implies, to be a state-of-the-art *energy reliability* resource. SERC has been designed to deliver superior reliability services with a minimal carbon footprint and a low emissions profile. The project will be one of the first commercial applications of the EGT technology. Using this technology, SERC is able to combine dispatchable, operationally flexible, and efficient energy generation with state-of-the-art energy storage technology to meet the need for new local capacity and reliability services specifically in the West Los Angeles (LA) Basin local reliability area of Southern California Edison's (SCE's) service territory. To achieve this primary objective, project owner, SERC, LLC, participated in SCE's 2013 Local Capacity Requirements Request for Offers (2013 LCR RFO) by submitting several project proposals. SCE, with the assistance of an independent evaluator and the California Public Utilities Commission's (CPUC's) Procurement Review Group, considered over 100 proposals in this

procurement and selected SERC. SCE and SERC, LLC entered into a Resource Adequacy Purchase Agreement (RAPA) resulting from the 2013 RFO, which has been approved by the CPUC. SCE and SERC, LLC entered into a second RAPA pursuant to SCE's 2014 Energy Storage Request for Offers, which was approved by the CPUC in September 2016.

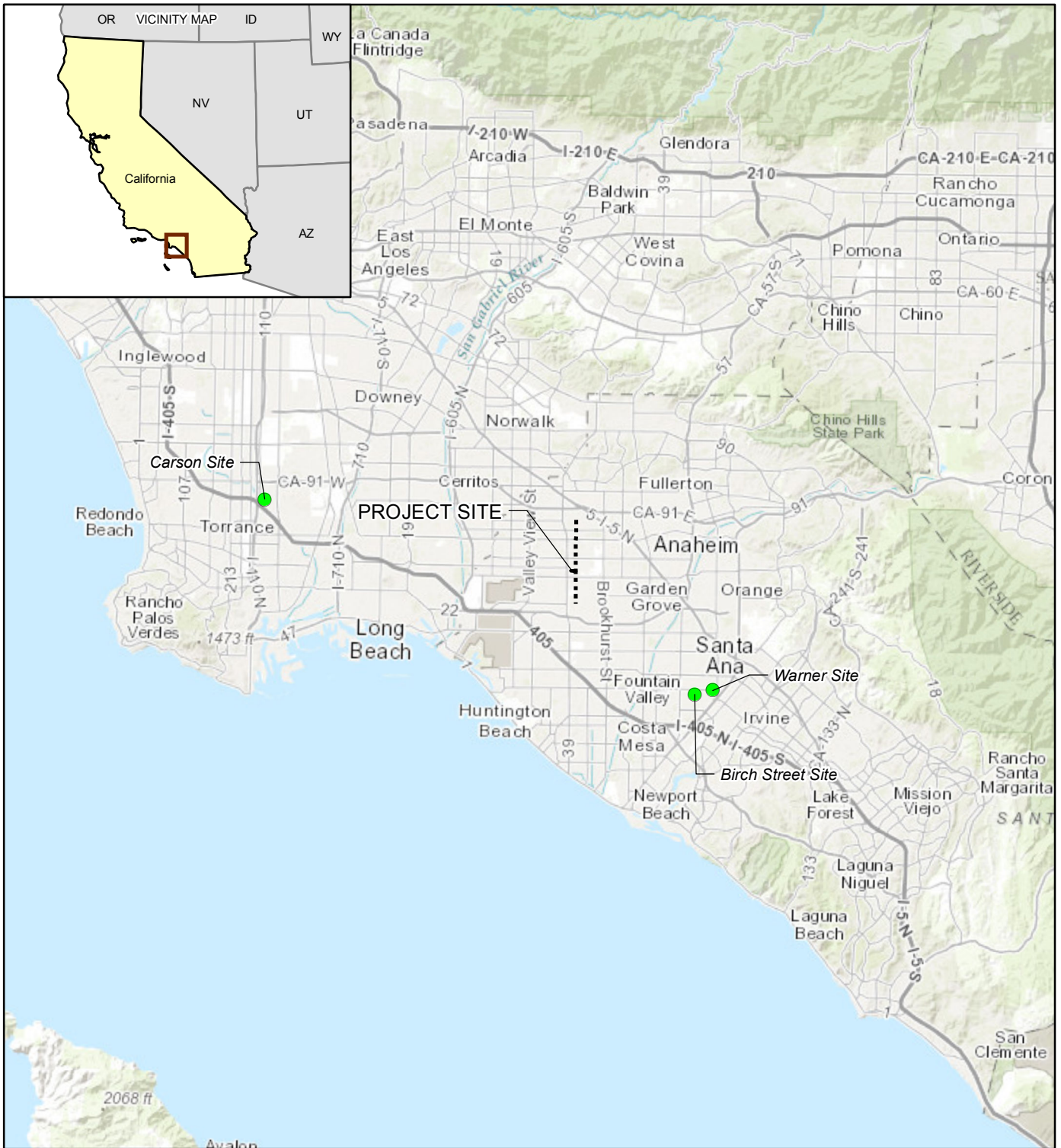
SERC's project objectives are as follows:

- Safely construct and operate an electrical energy reliability facility to meet SCE's need for local capacity in the West LA Basin local reliability area of its service territory.
- Use Wellhead's patent pending EGT technology to provide the following:
 - Greenhouse gas (GHG)-free operating reserve
 - Flexible capacity without start time
 - Peaking energy for local contingencies
 - Voltage support and primary frequency response without fuel burn
 - Superior transient response attributable to co-location of gas turbines and battery
 - Gas turbine management of battery state-of-charge in real time
- Site the project as near as possible to a SCE substation with available transmission capacity to serve the West LA Basin and minimize the generation tie-line length.
- Site the project in an existing industrial area on a previously disturbed site to minimize environmental impacts.
- Site the project in a community that embraces the project and its new technology.
- Safely construct and operate an electrical energy reliability project that would satisfy the commercial obligations of both RAPAs.

6.2 The “No Project” Alternative




If the project were not constructed, SERC LLC's basic project objectives would not be met, and the grid reliability, and environmental and policy benefits, as identified above, from this highly dispatchable and flexible project, would not be realized. SERC's wide range of operational capabilities offers crucial flexible capacity to support electrical system stability and reliability during periods of rapidly diminishing wind or solar output, and in response to other instances of grid instability. Enhanced stability of the electrical grid will also allow for further integration of renewable resources, providing the state with a path forward toward achieving the 50 percent Renewables Portfolio Standard mandate set forth in Senate Bill 350. Further, the no project alternative does not meet California's environmental policy goals of encouraging development and deployment of preferred resources, such as the energy storage features of SERC.

The no project alternative could result in greater fuel consumption, air pollution, and other environmental impacts in the state because older, less efficient plants with higher air emissions would continue to generate power instead of being replaced with cleaner, more flexible, and more efficient plants such as SERC. Therefore, because the no project alternative would not satisfactorily meet the project objectives specified above, the no project alternative was rejected in favor of the proposed project.



Source: Esri World Terrain Imagery

LEGEND

-  Project Site
-  Proposed Natural Gas Pipeline Route Alternatives
-  Alternative Site Locations

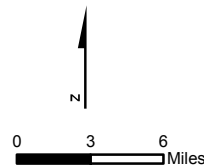


FIGURE 6.3-1
Alternative Site Locations
 Stanton Energy Reliability
 Center AFC
 Stanton, California



6.3 Power Plant Site Alternatives

The project owner submitted a number of project proposals for SCE's 2013 Local Capacity Requirements Request for Offers and the 2014 Energy Storage Request for Offers. These proposals encompassed project configurations of natural gas-fired only, battery storage only, and the EGT on over 15 sites. Finding available real estate on which to site a facility such as SERC, while meeting SCE's requirements in the West LA Basin, is a significant hurdle. Three of these alternatives are shown in Figure 6.3-1. The key screening criteria used to select the SERC site and alternative sites included the following:

- Location within SCE's service territory
- Ability to gain site control
- Availability of sufficient land area
- A host city that would see the benefits in hosting this type of reliability resource
- Proximity to existing transmission and distribution lines, and to an existing substation with transmission capacity
- Location near a source of water supply of sufficient quantity and quality
- Consistency and compatibility with the applicable zoning ordinances and existing land uses
- The ability to avoid or minimize potentially significant impacts on the environment

All sites not large enough to accommodate SERC were rejected on the basis that they could not attain the primary project goal and most of the project objectives, resulting in six sites remaining. Two of these remaining sites were rejected because a project located on any of these sites was not acceptable to the local communities. The following four sites (SERC and three alternatives) were carried forward for further environmental analysis.

6.3.1 Proposed Project Site

SERC will be located in the City of Stanton, Orange County, at 10711 Dale Avenue (Figure 1.2-1). The site is located in an area that is zoned Industrial General (City of Stanton IG zoning district). Land uses surrounding the site include the City of Stanton's industrial area to the north and south, the City of Stanton's municipal maintenance facility to the west, public/quasi-public utility areas to the east consisting of the SCE Barre Peaker power plant and SCE's Barre Substation, and high- and medium-density residential uses to the southeast and northwest.

SERC will interconnect with SCE's Barre Substation via a 0.35-mile-long underground generator tie-line that runs from the SERC site east to the substation, as described in Section 3, Electrical Transmission. The natural gas pipeline connection will be via either a new 12- or 16-inch-diameter pipe that will extend either 2.75 miles north along Dale Avenue to Southern California Gas Company's (SoCalGas's) Line 1014 in La Palma Avenue or 1.78 miles south along Dale Avenue to SoCalGas's Line 1244 in Lampson Avenue. More information regarding the natural gas supply can be found in Section 4, Natural Gas Supply.

Process and potable water supply is available from Golden State Water Company via connections in Dale Avenue and Pacific Street. Industrial wastewater will be discharged to a City of Stanton sanitary sewer line in either Pacific Street, to the northwest of Parcel 2, or in Dale Avenue, to the east of Parcel 1.

The SERC site meets the project objectives well. It is a brownfield site with easy access to the SCE Barre Substation, is at a critical location within SCE's service territory, is zoned appropriately for industry, and is supported by the City of Stanton.

6.3.2 Alternative 1: Warner Site

The Warner Site is a rectangular parcel encompassing approximately 4.5 acres at 1312 East Warner Avenue within the City of Santa Ana. The Warner Site is approximately 10 miles southeast of the SERC project site. The site is bounded by East Warner Avenue to the north, Orange County Fire Station No. 79 property to the east, the existing SCE Johanna Substation to the south, and Beeson Lane to the west. The site is within a large industrial area, with residential areas to the west.

The Warner Site is currently being used by an asphaltic concrete contractor. An existing warehouse building is located in the northwestern corner of the property and is used for equipment maintenance and storage. The remainder of the property is used for truck parking and stockpiling of materials for use in the making of asphaltic concrete. The current zoning and General Plan are consistent with industrial uses. The site is adjacent to the Johanna Substation and was selected for evaluation because of SCE's need for generation at the Johanna Substation.

The natural gas pipeline would extend easterly along Warner Avenue and interconnect to an existing natural gas pipeline on the eastern side of South Grand Avenue. The generation tie-line would be underground directly into the adjacent Johanna Substation. Water would be provided to the site by the City of Santa Ana Municipal Utility via an existing water pipeline located in Warner Avenue.

Alternative 1, the Warner Site, was not selected for SERC for the following reasons:

- The site is located near the flight path for the primary runway for John Wayne Airport, creating potential issues with thermal plumes from the plant.
- The area around the Johanna Substation is culturally sensitive to the Delhi Latino community.
- Contaminated soils and groundwater are potentially present beneath the site, with known California Department of Toxic Substances Control issues at the site immediately to the north.

6.3.3 Alternative 2: Birch Street Site

The Birch Street Site encompasses approximately 7.8 acres and is located at 2620 Birch Street in Santa Ana. This site is approximately 9 miles southeast of the SERC site and approximately 1 mile west of the Alternative 1 Warner Site. The site is bounded on the north by a restaurant depot and parking area for food trucks, on the east by Birch Street, on the south by an existing nursery, and on the west by an abandoned rail spur and industrial uses. The zoning and General Plan are consistent with industrial uses. The area is generally dominated by industrial uses with the closest residential areas approximately 0.25 mile to the west and to the south of the site.

The parcel is currently developed with a large unoccupied building that would need to be demolished. A preliminary records search has revealed that the property was once used by BASF for the making of high-quality recording tape and was subject to groundwater cleanup.

The natural gas pipeline for the Birch Street Site would extend northward along Birch Street and then would proceed easterly along Warner Avenue and interconnect to an existing natural gas pipeline on the eastern side of South Grand Avenue, 1.45 miles away. The generator tie-line would be underground and would likely be in the same route as the natural gas pipeline stopping at Johanna Substation, 1.33 miles away. Water would be provided to the site by the City of Santa Ana Municipal Utility via an existing water pipeline located in Birch Street.

Alternative 2, the Birch Street Site, was not selected for SERC for the following reasons:

- The site is located near the runway for John Wayne Airport, creating potential issues with thermal plumes.
- The natural gas pipeline and the generator tie-line would need to travel through the neighborhood of Delhi, an historical Latino community that reportedly would have significant concerns about further industrial development in that area and would be likely to strongly oppose the project.

6.3.4 Alternative 3: Carson Site

The Carson Site is located at 18937 Main Street in Carson, California. It encompasses approximately 4.6 acres and is zoned Heavy Manufacturing. The site is bounded on the north by Griffith Street, on the east by Main Street, on the south by an existing trucking facility, and on the west by Broadway Street. The site was historically used for manufacturing wood-based products between approximately 1940 and 1980.

The Carson Site was not selected for SERC for the following reasons:

- Contaminated soils and groundwater are potentially present beneath the site.
- The Goodyear Blimp operates less than 1,000 feet away, and there would be a potential for thermal plumes that may adversely impact Blimp operations.

6.4 Comparative Evaluation of Alternative Sites

In the discussion that follows, the sites are compared in terms of each of the 16 topic areas required in the Application for Certification. The following topics are of particular interest:

- **Land Use Compatibility**—Is the parcel zoned appropriately for industrial use, and is it compatible with local land use policies?
- **Routing and Length of Linear Facilities**—Can linear facilities be routed to the site along existing transmission lines, pipelines, and roads? Will linear facilities be significantly shorter for a given site?
- **Visual Resources**—Are there significant differences between the sites in their potential for impact on significant or protected viewsheds?
- **Biological Resources**—Would there be significant impacts on wetlands or threatened or endangered species?
- **Noise**—Is the site sufficiently near a sensitive receptor area such that it would be difficult to mitigate potential noise impacts below the level of significance?
- **Use of Previously Disturbed Areas**—Has the site been previously disturbed? Does the site minimize the need for clearing vegetation and otherwise present low potential for impact on biological and cultural resources?

6.4.1 Air Quality

The plant's configuration and operation would be essentially the same from an air quality perspective at each location. These sites are all in the same air district (South Coast Air Quality Management District), and any offsets acquired by SERC would be equally appropriate for each site. The type and quantity of air emissions from the alternative sites would be identical. The impacts on the human population and the environment would also be very similar because all are in densely developed urban areas within industrial zones but with residential districts relatively near.

6.4.2 Biological Resources

Special-status species recorded, or potentially occurring in the region, are generally the same for all sites. The sites are all in densely developed urban areas and would not damage or destroy, either temporarily or permanently, significant biological resources habitat. Each of the sites is currently paved.

Generator tie-line and natural gas pipeline routes for each are also in densely developed urban areas and would be placed underground in trenches in existing streets. None of the sites has significant habitat areas nearby, although the Carson Site is relatively near a golf course.

6.4.3 Cultural Resources

There are no known significant cultural resources at the SERC site. Resources of the other two sites are unknown. None of the sites appear to require the demolition of existing historical structures of significance.

6.4.4 Geological Resources and Hazards

There are no significant differences in terms of geological hazards present at each site.

6.4.5 Hazardous Materials Handling

There would be no significant difference between the site locations in terms of hazardous materials handling. The uses of hazardous materials would be the same for any of the sites.

6.4.6 Land Use and Agriculture

The SERC, Warner, and Birch Street sites are in Orange County, and the Carson Site is in Los Angeles County. SERC is in the City of Stanton; Warner and Birch Street are in Santa Ana; and Carson is in the City of Carson. The General Plan land use designations, zoning designations, and current land uses of the sites are shown in Table 6.4-1.

Table 6.4-1. Land Use Designations and Uses

Site	General Plan Land Use Designation	Zoning District	Current Land Use
SERC (Stanton)	Industrial	Industrial General (IG)	Empty lot, storage
Warner (Santa Ana)	Industrial	Light Industrial (M1)	Asphalt processing
Birch Street (Santa Ana)	Industrial	Light Industrial (M1)	Warehouse, parking
Carson (Carson)	Heavy Industrial	Heavy Manufacturing (MH-D)	Open storage

6.4.6.1 SERC

The SERC site, generator tie-line alignment, and natural gas pipeline interconnection are all located on land zoned as IG. According to the City of Stanton Municipal Code, “The IG zone is applied to areas appropriate for light industry and manufacturing, heavy commercial service-type facilities, and warehousing facilities... ”

Allowable uses in this zone include utility infrastructure and minor utility service facilities. Per City of Stanton Code Section 20.220.020, major utility service facilities would require a conditional use permit land entitlement (20.550) with Planning Director or Planning Board approval. In the absence of the California Energy Commission’s (CEC’s) jurisdiction, a conditional use permit with planning commission approval would be required.

6.4.6.2 Warner Site

The Warner Site is located within the City of Santa Ana Light Industrial (M1) zoning district. The zoning code lists “Public Utility Structures” as a permitted use in the M1 district, but it does not specifically list permitted or conditional uses that would readily support the development of a natural gas power plant within the M1 district. The most applicable approved or conditionally approved uses within any of the M1 district is “public utility facilities.”

6.4.6.3 Birch Street Site

The City of Santa Ana zoning designation of the Birch Street Site is the same as for the Warner Site.

6.4.6.4 Carson Site

The Carson Site is in the City of Carson's Heavy Manufacturing zoning district, which "is created primarily for the full range of industrial uses" (City of Carson Zoning Code). Power generation is not specifically listed as a permitted use in the city's zoning code.

6.4.7 Noise

All of the sites are relatively near to residential areas, and the project would require noise attenuation measures to meet the standards of the CEC, CEQA, and local noise ordinances. The Birch Street Site is furthest from residential uses, at approximately 1,000 feet.

6.4.8 Paleontology

There would be no significant difference among the sites in terms of potential effects on paleontological resources. The probability of encountering significant fossils is approximately the same at each site.

6.4.9 Public Health

As discussed in Section 6.4.2, the plant's configuration and operation would be essentially the same from an air quality perspective at each location. The project and the alternative sites would not likely cause significant adverse long-term health impacts (either cancer or noncancer) from exposure to toxic emissions, regardless of the site chosen.

6.4.10 Socioeconomics

The number of workers, construction costs, payroll, and property tax revenues would be nearly the same for the project at each site. Workers would come from the surrounding urban areas and would commute daily or weekly to the plant site. Some may move temporarily to the local area during construction, thus causing site-specific impacts on schools, utilities, and emergency services. These impacts would be temporary. As discussed in Section 6.4.2 and Section 6.4.10, the project and the alternative sites would not have any potentially significant human health effects.

6.4.11 Soils

Neither SERC or the project at one of the alternative sites would involve the conversion of agricultural land to utility uses. The differences in soil erosion would be inconsequential, given proper use of best management practices during construction and operation.

6.4.12 Traffic and Transportation

None of the sites are underserved by transportation facilities. Therefore, the construction and operations traffic and transportation considerations are not a major consideration in evaluating or comparing the sites.

6.4.13 Visual Resources

The potential for visual resource impacts associated with each site varies depending on the relative visibility of the sites from roads and residences as well as the length and potential visibility of any new transmission lines that the power plant would require. Visual impacts are also a function of the surrounding facilities.

The portion of SERC on Parcel 1 will be visible from Dale Avenue and a residential area that is located to the southeast and across Dale Avenue and the railroad right-of-way. SERC, LLC is designing architectural treatment to reduce the visual impact. The Carson Site could be seen from residential properties across South Main Street.

6.4.14 Water Resources

Similar to the proposed SERC site, each alternative site would require the same, relatively small amount of water for process use, fire protection, and potable water uses (such as drinking water and safety showers). All three would be supplied by a local water provider.

6.4.15 Waste Management

The same quantity of waste will be generated at the proposed site as at all alternative sites. The environmental impact of waste disposal would not differ significantly among the alternative sites.

Warner, Birch Street, and Carson sites all potentially have onsite soil and/or groundwater contamination issues, based on preliminary records review. Phase I and Phase II environmental investigations have been performed for SERC; no site development constraints were identified.

6.4.16 Summary and Comparison

Although each of the alternative sites could meet most of the basic project objectives, the SERC site is the preferred alternative for a variety of reasons.

The Warner Site is unfeasible because it is in the flight path of John Wayne Airport and would cause significant controversy over thermal exhaust plumes potentially causing a hazard to aircraft. This site also has contaminated soils and groundwater onsite.

The Birch Street Site is unfeasible because it raises similar air navigation hazard issues as the Warner Site in relation to John Wayne Airport.

The Carson Site is unfeasible because the project sited there would cause a significant air navigation hazard for a lighter-than-air vehicle port (for the Goodyear Blimp) and because of significant contamination on the site that is the result of previous manufacturing.

Of these sites, only SERC could meet the project objectives because the other sites are infeasible due to significant permitting or development issues.

6.5 Alternative Project Design Features

This subsection addresses alternatives to some of the SERC design features such as the linear facility routing, interconnection location, and water supply source.

6.5.1 Alternative Linear Facility Routing

This subsection addresses alternative linear facility routing for the proposed natural gas supply pipeline, electrical transmission line, and water supply pipeline.

6.5.1.1 Natural Gas Supply Pipeline Route Alternatives

SERC will obtain a natural gas supply either via a new 12- or 16-inch-diameter pipe that will extend either 2.75 miles north along Dale Avenue to SoCalGas's Line 1014 in La Palma Avenue or 1.78 miles south along Dale Avenue to SoCalGas's Line 1244 in Lampson Avenue. These are the primary alternatives that SoCalGas identified in its preliminary study, and these routes represent the most direct routes to gas transmission lines. Both alternative routes would be constructed in existing streets and would therefore not result in disturbance to biological resources habitat. There are no significant differences between the two alternatives in terms of environmental effects.

6.5.1.2 Electrical Transmission Line Route Alternatives

The facility will connect with SCE's Barre Substation via a 0.35-mile-long generator tie-line. This is the most direct interconnection route and the only feasible route that will reach the 66-kilovolt bus at the Barre Substation. No other routes were considered.

6.5.2 Water Supply Source Alternatives

SERC will require small amounts of water, which will be supplied by Golden State Water Company. Orange County Water District and Orange County Sanitation District jointly manage recycled water treatment and reuse in the project area under the Groundwater Replenishment System (GWRS). A small amount of GWRS recycled water is used for select industrial uses, primarily the City of Anaheim's Canyon Power Plant. The primary GWRS pipeline, which delivers water to the spreading basins, is located near the Santa Ana River. Utilization of GWRS water would require a new pipeline of approximately 8 miles from the SERC project site. Given the lack of a local connection, the increase in potential environmental impacts associated with constructing additional and longer conveyance pipeline routes, and the relatively small quantity of water that is expected to be used at SERC, the use of recycled water is not economically feasible for this project and was not considered further. In addition, the Orange County Water District is currently not accepting new applications for recycled water purchase.

6.6 Technology Alternatives

6.6.1 Generation Technology Alternatives

Selection of the power generation technology focused on those technologies that are optimized for peaking power generation and that use natural gas readily available from the existing distribution system. The following is a discussion of the suitability of such technologies for application to SERC.

6.6.1.1 General Electric LM6000 PC

The General Electric (GE) LM6000 PC combustion turbine technology was selected primarily because it is proven, reliable equipment that also provides operational flexibility. The configuration of one LM6000 PC unit provides a well proven technology that is flexible in operation, efficient, cost effective, and easily dispatchable. The factors considered in selecting LM6000 PC units include the following:

- High reliability/availability – The LM6000 PC gas generator has an overall reliability of 99.42 percent and package availability of 98.36 percent, based on GE data.
- Low equivalent forced outage rate – The LM6000 PC had an equivalent forced outage rate of 1.43 percent from November 2004 to July 2007.

6.6.1.2 GE LMS100

The GE LMS100 combustion turbine technology was also considered for SERC. Based on the nominal 100-megawatt output of these units, one unit would be feasible to achieve the desired output for SERC. Using the LMS100 turbines, however, would reduce the ability to operate at varying low loads at the optimal full-load heat rate for each unit. Partial loading of larger turbines would decrease operating efficiency and increasing emissions of GHGs per megawatt of generation. In addition, because it uses intercooler technology, the LMS100 would require significantly more water for operations, and would also require a large cooling tower or air-cooled condenser structure.

6.6.1.3 Conclusion

The GE LM6000 PC combustion turbine technology is proven, reliable, efficient, and cost effective, and it provides operational flexibility and shaft redundancy (multiple units) while minimizing air emissions, GHGs, and water use. This technology clearly outperforms the others considered in meeting the project's objectives.

6.6.2 Fuel Technology Alternatives

Technologies based on fuels other than natural gas were eliminated from consideration because they do not meet the project objective of providing operationally flexible, dispatchable, quick start, and reliable power. Some of these alternative fuels have potential for additional air quality and public health impacts. Others, like certain biofuels, are not available in commercial quantities or are not available via pipeline or other reliable delivery system. Additional factors rendering alternative fuel technologies unsuitable for the proposed project are as follows:

- Biomass fuel facilities do not provide quick start capabilities and have additional environmental impacts related to air emissions and solid waste generation. Additionally, biomass facilities would require additional acreage, taller structures, and larger quantities of water.
- Coal, fuel oil, and other similar fuels emit more air pollutants and GHGs than technologies utilizing natural gas.

The availability of the natural gas resource provided by SoCalGas, as well as the environmental and operational advantages of natural gas technologies, makes natural gas the logical choice for SERC.

6.6.3 Cooling Alternatives

SERC is a simple-cycle power plant that does not generate steam thereby requiring a large cooling tower or air-cooled condenser. Therefore, cooling requirements are limited to combustion turbine generator (CTG) lubricating oil systems and inlet air cooling. The air inlet cooling system and cooling material is discussed in detail in the following subsections. The remainder of this subsection will address the lubricating oil system cooling technology.

The lubricating oil system uses a fin-fan cooler to reduce the temperature of the lubricating oil. This system functions similar to an automobile radiator where the oil is passed through a “radiator” as air is passed through the cooling fins. Heat is removed from the oil and is released to the atmosphere. None of the oil is entrained in the air and no contaminants are released from a fin-fan cooler. Additionally, this type of cooling system does not use water, and is referred to as an indirect heat exchanger.

6.6.4 Inlet Cooling Alternatives

The CTG inlet air cooling can be accomplished using evaporative coolers, foggers, or mechanical chillers. The evaporative cooling system and foggers use water to decrease the inlet air temperature and increase CTG efficiency and electrical generation during warm ambient conditions. An evaporative cooling system uses water evaporation to cool the inlet CTG air. Water is applied to a porous media in the CTG air inlet and, as the air passes through the media, water is evaporated, which results in cooling of the air. This system is similar to a residential evaporative (swamp) cooler. A fogger system is similar in principle to the evaporative cooling system, but this system sprays a fine mist of water into the CTG air inlet to result in cooling. A fogging system also uses less water than evaporative cooling.

Mechanical chillers use a refrigerant in cooling coils located in the CTG air inlet to cool the air. This system is similar in principle to a residential or commercial comfort cooling system. The refrigerant is reused in the system, and advances in refrigerant technology result in very low leak rates for refrigerant systems. Furthermore, most refrigerants are not considered air pollutants. Typical refrigerants include anhydrous ammonia and R134a. While anhydrous ammonia systems have a higher efficiency, they require the use of gaseous phase ammonia.

Water cooling uses less parasitic load, and therefore increases the cycle efficiency compared with mechanical chillers. Therefore, because LM6000 PC inlet air cooling system water usage requirements are low, an inlet fogging system is proposed for SERC to minimize parasitic load.