# SECTION 4 ALTERNATIVES

SJS 1&2 is seeking regulatory approval from the CEC for the construction, operation, and long-term maintenance of the proposed Project. This alternatives analysis was prepared to meet the requirements of California Environmental Quality Act (CEQA).

The Project includes the construction and operation of two solar/biomass hybrid power generating plants. Each Plant will employ a conventional Rankin Cycle Steam Turbine Generator fueled by energy from two renewable sources: solar thermal and biomass. The two proposed Plants will each use 90 loops for their respective solar fields, where each loop includes six SCAs (each SCA is about 300 meters in length). Figures depicting the physical plant layout are presented in Section 3.0, Facility Description and Location (Figures 3.4-1 through 3.4-3). Title 20 of the CCR requires an Applicant to discuss "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."

Title 20 of the CCR requires an applicant to consider:

> *". . . the range of reasonable alternatives to the project, including the No Action Alternative, that would feasibly achieve most of the basic objectives of the project, but would avoid or substantially lessen any of the significant impacts of the project, and an evaluation of the comparative merits of the alternatives."*

CEQA also 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 impacts of the project, and evaluate the comparative merits of the alternatives." (14 CCR 15126.6[a])*

Thus, the focus of an alternatives analysis should be on those 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])*

The CEQA Guidelines (14 CCR 15126.6[c]) further provide that, "among the factors that may be used to eliminate alternatives from detailed consideration in an Environmental Impact Report" are:

- failure to meet most of the basic Project objectives,
- infeasibility, or
- inability to avoid significant environmental impacts.

The proposed Project is a solar electric generation project that will generate clean renewable energy produced from heat derived from the collection of solar radiation and the combustion of biomass employed to power a conventional steam turbine cycle. The Project has been designed and developed to

conform to the requirements of two 20-year power purchase agreement PPAs, the first between PG&E and San Joaquin Solar 1 LLC and the second between PG&E and San Joaquin Solar 2 LLC. The basic objectives include:

- Provide new dispatch-able, operationally flexible resources to meet the electric needs of the State of California.
- Generate electric power at a location near the electric load center to increase reliability of the regional electricity grid, while satisfying local capacity requirements and reducing regional dependence on imported power.
- Safely produce electricity without creating significant environmental impacts.
- Assist the State of California in meeting the objectives mandated by the Renewables Portfolio Standard (RPS) Program and the California Global Warming Solutions Act.

## 4.1 NO PROJECT ALTERNATIVE

If the Project were not constructed, the goals and objectives of the applicant would not be met. Additionally, the direction to PG&E by the CPUC to "plan for and procure the resources necessary to provide reliable service" would not be met. PG&E would not be able to utilize the Project to meet its commitments under the California RPS. Further, the State of California would have greater difficulty in achieving their objective of obtaining 20 percent of their power from renewable resources by 2010.

## 4.2 ALTERNATIVE SITE LOCATIONS

Several alternative site locations were assessed during initial screening for SJS 1&2 site (see Figure 4.2-1). First, a screening effort was conducted, as described in Section 4.2.1 below.

Initial efforts to screen sites left few alternative site locations for consideration. These include alternative sites in California near Coalinga (see Section 4.2.2) and SJS 1&2 site (see Figure 4.2-1). Although each of the alternative sites showed promise, SJS 1&2 site clearly became the preferred alternative for a variety of reasons, including high solar intensity, low number of fog days, no applicable Federal or State land acquisition/permitting, no biological constraints on cultivated land, proximity to electrical transmission, relatively flat topography, large land availability (640 acres), water availability, and few sensitive receptors.

### 4.2.1 Site Location Screening

In accordance with Public Resources Code Section 25540.6(b), initial screening for a preferred solar site location for SJS 1&2 included several key factors. First and foremost were the solar intensity thresholds for California, which helped define areas within California that had the potential to most efficiently generate solar power. Other site screening included evaluating proximity to necessary infrastructure (*e.g.*, an electrical transmission system), proximity to available water, sufficient land area (needed to accommodate a minimum 640 acres of solar area and construction laydown), minimal or no Federal or State land ownership restrictions, flat topography with preferred slope and aspect ratios, and a lack of or minimal effects on environmentally sensitive areas.

These screening criteria helped define the proposed site. In addition the proposed site is located near the Coalinga State Hospital which will benefit from the sale of heat by the proposed facility, thereby further offsetting fossil fuel use.

A survey of non-Williamson Act parcels within a seven mile radius of the site revealed that there are several sections of land that are not currently in Williamson Act contracts. However, due to habitat issues or topographical slopes that are not conducive to solar development, the majority of the non-Williamson Act lands were eliminated from consideration (See Figure 4.2-2).

#### *4.2.1.1 Harris South Alternative Site Location*

Harris South - Section 7 of Township 19S Range 16E; APN 065-050-56S, 065-050-60S, 065-050-15S, 065-050-17. Section 7 is located south-west of the Harris Ranch Feeding Company (HRFC), and is traversed by Interstate 5 on the eastern portion and bisected by the Fresno Coalinga Road. The land owners have indicted that a contiguous parcel of up to 640 acres is available by utilizing the adjacent section to the west, Section 13 of Township 18S Range 15E. The exact boundaries and shape of the available parcel were not defined for this study, but an east-west oriented rectangular shape is expected. Section 7 was used for the purposes of this evaluation. This site is feral, undeveloped land with a rolling hill topography on the western side that levels out to the east. The proximity to HRFC presents a potential for the sale of excess steam generated by the Projects to the feedlot for use in feed processing. This option was eliminated from consideration due to an increased potential for environmental impacts, the topography and distance to transmission interconnection.

#### *4.2.1.2 Harris Ranch Alternative Site Location*

Harris Ranch – The eastern halves of Sections 30 and 31 of Township 18S Range 16E: APN numbers; 060-140-68S, 060-140-06, 060-140-71S, 060-140-70S. The site is a north–south oriented rectangle of level land adjacent to the north of HRFC. The site is currently cultivated for crops; tomatoes were being harvested during the site reconnaissance. The proximity to HRFC presents a potential for the sale of excess steam generated by the Projects to the feedlot for use in feed processing. This option was eliminated from consideration due to an undesirable site orientation and distance to transmission interconnection.

#### *4.2.1.3 Oil City Road Alternative Site Location*

Oil City Road - Section 9 of Township 20S Range 15E; APN numbers; 070-020-41, 070-020-44S, 070-020-39S, 070-020-45. The site is a one mile square parcel of recently cultivated, relatively flat land. The parcel is adjacent to the south of the Coalinga Feed Yard, Inc. This site location was eliminated from consideration due to distance to transmission interconnection.

#### *4.2.1.4 Gale Avenue Alternative Site Location*

Gale Avenue - Section 15 of Township 20S, Range 15E; APN numbers; 070-050-59S, 070-050-39S, 070-050-58S, 070-050-57S, 070-050-56S, 070-050-55S, 070-050-54S, 070-050-53S, 070-050-52S, 070-050-51S. The site is a one mile square parcel of recently cultivated, relatively flat land. The parcel is located

one mile northwest of the Coalinga Municipal Airport. This option was eliminated from consideration due to its proximity to the airport and distance to transmission interconnection.

## 4.3 ALTERNATE PROJECT CONFIGURATIONS

The current Project description utilizes an east-west orientation of the solar fields. An alternative project configuration would have the solar lines aligned in the north-south direction. Modeling and power generation estimates are being prepared to verify that the east-west orientation would be preferred for the Project. Although not specifically addressed in the environmental evaluation, the change of orientation is likely to cause only minimal changes to the existing environmental analysis.

## 4.4 ALTERNATE TECHNOLOGIES

### 4.4.1 Conventional Simple Cycle

The conventional simple cycle technology uses a combustion turbine to drive a generator. The high temperature exhaust is released directly to the atmosphere rather than routed to a heat recovery steam generator (HRSG) and steam turbine generator, as is the case with combined cycle technology. Although simple cycle combustion turbines have relatively low capital cost and rapid startup capability, the technology is relatively inefficient (with a maximum of up to approximately 38 percent). Simple cycle equipment also produces more air emissions (criteria and greenhouse gas [GHG] emissions) than more efficient technologies because the high exhaust temperature makes it difficult to add post-combustion emission control equipment, and because more fuel must be burned to generate a given amount of electrical power. Conventional simple cycle was eliminated from consideration because of its relatively low efficiency and environmental (emissions) shortcomings. Most importantly, this technology would not provide renewable energy. For these reasons, conventional simple cycle technology was eliminated from consideration.

### 4.4.2 Integrated Gasification Combined Cycle

Integrated Gasification Combined (IGCC) technology gasifies coal or petroleum coke that is burned in a gas turbine. The coal gasification equipment is located at the same site as the power generating equipment (combustion turbine, HRSG, and steam turbine). There is limited commercial operating experience with IGCC, and its cost-effectiveness is uncertain. It would also require the importation by truck and/or rail of coal to the Project area from outside California or of coke from petroleum refineries. Additional issues include increased traffic levels and onsite coal/coke storage, which would require a larger site than a comparable conventional combined-cycle facility. While IGCC can have lower emissions than conventional coal-fired power plants, an IGCC plant would still have substantially more pollutant emissions (criteria and GHG emissions) than a gas-fired combined-cycle plant. Additionally, IGCC would not provide renewable energy. For these reasons, IGCC was eliminated from consideration.

### 4.4.3 Coal or Other Solid Fuel Conventional Furnace/Boiler – Steam Turbine

With this technology, coal, petroleum coke, or other solid fuels are burned in a boiler, creating steam that is used in a steam turbine generator. The steam is then condensed and returned to the boiler. Efficiencies

would be in the range of 35 to 40 percent, which is comparable to a gas-fired boiler/steam turbine unit. This technology would require importing by rail and/or truck coal from outside the state or coke from in-state petroleum refineries, which would increase traffic and also require onsite coal/coke storage. It would also produce more emissions (criteria and GHG emissions) than a natural gas-fueled facility of equivalent size, require a larger site, and be more costly to build and operate. This technology, like the ones discussed above, would not provide renewable energy. For these reasons, this technology was eliminated from consideration.

### 4.4.4 Nuclear

Nuclear fission is an established technology. However, California law currently prohibits nuclear fission as an energy generation technology.

### 4.4.5 Geothermal

Geothermal was eliminated from consideration because there is no geothermal resource in the Pleasant Valley area.

### 4.4.6 Wind

Wind energy involves the use of wind power to drive a rotor or propeller, which in turn drives a generator. Wind energy equipment is large (in height) and has potentially significant visual impacts. There are limited sites where there is sufficient wind available for energy generation purposes. The Pleasant Valley area is not identified as an important wind energy resource area in the Renewable Energy Atlas of the West (Nielsen *et al.,* 2006). For these reasons, wind technology was eliminated from consideration.

### 4.4.7 Hydroelectric

Hydroelectric was eliminated from consideration because there is no hydroelectric resource in the Fresno Valley area.

### 4.4.8 Other Solar Technologies

There are many solar technologies commercially available and in use or proposed to be in use in the California region. These include the Power Tower, the Stirling Solar Dish, Photovoltaic, and Parabolic Trough, to name a few. The Project has a proven reliable technology using the hybrid solar model which utilizes a parabolic trough solar technology. The Project's technology is the most cost-efficient due to widely available materials and its ability to convert biomass into power during off-peak hours. In addition, the success of its technology has proven it to be efficient, reliable, and able to achieve all Project objectives (as outlined in Section 2.0, Project Objectives). Other solar technologies do not meet all of SJS objectives outlined in Section 2.0, Project Objectives, and therefore, were not considered.

## 4.5 ALTERNATE LINEAR ROUTES

There are two proposed transmission routes. One anticipated electrical transmission linear for the alignment, (the northern route), is adjacent to the PG&E's right-of-way (ROW) on the south side of West Jayne Avenue. The second proposed linear route (the southern route) would parallel West Jayne Avenue, approximately one mile south. The southern route would bend north after crossing Interstate 5. Another transmission route would be to create a ROW along the north side of West Jayne Avenue. This final option has an increased potential for environmental impacts and was eliminated from consideration.

## 4.6 WATER SUPPLY

The CEC studies use of water for power plant cooling in its 2003 Integrated Energy Policy Report (IEPR) proceeding. The proceeding produced the following policy:

> *"Consistent with the State Water Resources Control Board Policy 75-58 and the Warren-Alquist Act, the Energy Commission will approve the use of fresh water for cooling purposes by power plants that it licenses only where alternative water supply sources and alternative technologies area shown to be "environmentally undesirable" or "economically unsound" (CEC 2003)."*

The Project will not use fresh water for cooling purposes. The Project investigated numerous sources of water required to supply the Project. The preferred water supply for the Project will be effluent from the future City of Coalinga wastewater treatment facility, supplemented by brackish groundwater as needed. To that end, the Project has already signed a Letter of Intent with the City of Coalinga to confirm access to the primary water supply: the future City of Coalinga wastewater treatment facility. Additional discussion of alternative water and wastewater options are located in Section 5.5, Water Resources. The following water supply alternatives were evaluated:

Ocean Water

Ocean water is not feasible for SJS 1&2 site due to the Project's distance from the ocean.

Surface Water

Surface water is not considered reliable nor is there surface water located in sufficient proximity to SJS 1&2 site for consideration as a source of water supply.

Brackish Water

Brackish water does not contain total dissolved solids (TDS) at the levels as ocean water, but it contains higher TDS than fresh water. SJS 1&2 proposed to supplement the primary water source (City of Coalinga wastewater treatment system effluent) with brackish groundwater from an existing on-site well.

State Water Project

The State Water Project delivers water from Northern California to Southern California and the Central Valley through the California Aqueduct. The California Aqueduct is not in close proximity to the Project

site and, therefore, undesirable. Also, water from the California Aqueduct is a viable source of water for domestic and agricultural uses that may take priority over power plant cooling water.

Reclaim Water

Effluent from the future City of Coalinga wastewater treatment facility will serve as the primary water supply source for SJS 1&2.

## 4.7 WASTEWATER DISPOSAL

Process wastewater will be recovered from the RO system, steam system and cooling tower blowdown and recycled back to the water treatment system. Sanitary wastewater will be discharged to a leach field. The following a summary of alternative wastewater disposal methods:

Zero Liquid Discharge System

Zero Liquid Discharge (ZLD) is a mechanical system utilizing membrane technology and heat to effectively reduce liquid wastes to a dry waste for landfill disposal. ZLD is not considered to be a highly reliable method of wastewater disposal, is not energy efficient, has high capital and operation and maintenance, and results in landfill of produced wastes. Therefore, ZLD was not selected as the preferred method of wastewater disposal.

Evaporation Pond

The Project will utilize large, lined surface impoundment(s) for disposal of wasterwater via atmospheric drying, resulting in a sludge that will be disposed in a landfill system. The evaporation pond(s) will be located in the middle portion of the 640-acre site.

Surface Discharge

Discharge of wastewater to the ground or receiving waters including lakes, rivers, and streams would not meet state and local discharge limitations and, therefore, was dropped from further consideration.

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Adequacy Issue: Adequate ____ Inadequate ____

# DATA ADEQUACY WORKSHEET

Revision No. 0 Date ____

Technical Area: **Alternatives** Project: San Joaquin Solar 1&2 Technical Staff: ____

Project Manager: ____ Docket: ____ Technical Senior: ____

| SITING REGULATIONS | INFORMATION | AFC PAGE NUMBER AND SECTION NUMBER | ADEQUATE YES OR NO | INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS |
|---|---|---|---|---|
| Appendix B (b) (1) (D) | A description of how the site and related facilities were selected and the consideration given to engineering constraints, site geology, environmental impacts, water, waste and fuel constraints, electric transmission constraints, and any other factors considered by the applicant. | Section 4.2 | | |
| Appendix B (f) (1) | A discussion of the range of reasonable alternatives to the project, or to the location of 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. In accordance with Public Resources Code section 25540.6(b), 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. | Section 4.3<br>Section 4.4 | | |
| Appendix B (f) (2) | An evaluation of the comparative engineering, economic, and environmental merits of the alternatives discussed in subsection (f)(1). | Section 4.4.1 through 4.4.8<br>Section 4.5 | | |

OVERVIEW MAP


San Benito County

Coalinga Mendota Rd

Fresno Coalinga Rd

S Lassen Ave

Harris Ranch Site

Harris South Site

Dorris Ave

W Dorris Ave

Coalinga Substation 2

Fresno County

Oil City Road Site

Gale Avenue Site

E Elm Ave

Coalinga Substation 1

5

Gates Substation

San Joaquin Solar 1 & 2

25

198

Monterey County

W Elm Ave

Alpine Ave

Skyline Blvd

Kings County

LEGEND

County Boundary

SOURCES:
USDA FSA Aerial Photography Field Office (aerial 2005); CA Dept of Conservation (Williamson Act Contract Zones 2005); ESRI (roads).

# ALTERNATE SITE LOCATIONS CONSIDERED FOR SAN JOAQUIN SOLAR 1 & 2

URS

1.5 0 1.5 3 Miles

SCALE: 1" = 3 Miles (1:190,080)
SCALE CORRECT WHEN PRINTED AT 11X17

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## OVERVIEW MAP


## LEGEND

- 100 Year Flood Zone
- Coalinga Airport 11,500-foot buffer
- City Limits
- CA Dept of Fish and Game
- Potential Parcels
- 7-mile buffer
- San Joaquin Solar 1 & 2
- Gates Substation

**Percent Slope**

- 0 - 25
- 25.00000001 - 576.5562134

**CNDDB Points**

- American badger
- Burrowing owl
- Blunt-nosed leopard lizard
- Hopping's blister beetle
- Le Conte's thrasher
- Long-eared owl
- Morrison's blister beetle
- Nelson's antelope squirrel
- San Joaquin dune beetle
- San Joaquin kit fox
- San Joaquin pocket mouse
- San Joaquin whipsnake
- Silvery legless lizard
- Swainson's hawk
- Tricolored blackbird
- Western spadefoot
- Brittlescale
- California jewel-flower
- Great Valley Mesquite Scrub
- Hoover's eriastrum
- San Joaquin woollythreads

COALINGA

COALINGA

COALINGA

HURON

HURON

Fresno County

Kings County

Gates Substation

San Joaquin Solar 1 & 2

AVENAL

SOURCES:
USDA FSA Aerial Photography Field Office (aerial 2005); CA Dept of Conservation (Williamson Act Contract Zones 2005); ESRI (roads).

# AVAILABLE NON-WILLIAMSON ACT LANDS
# SAN JOAQUIN SOLAR 1 & 2

URS

1 0 1 2 Miles

SCALE: 1" = 2 Miles (1:126,720)
SCALE CORRECT WHEN PRINTED AT 11X17

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