SECTION 6.0

Alternatives

The following section discusses alternatives to the Lodi Energy Center (LEC) as proposed in this Application for Certification (AFC). These include the "no project" alternative, power plant site alternatives, linear facility route alternatives, technology alternatives, water supply alternatives, and wastewater disposal alternatives. These alternatives are discussed in relation to the environmental, public policy, and business considerations involved in developing the project. The main objective of the LEC is to produce economical, reliable, and environmentally sound baseload electrical energy for the Northern California Power Agency's (NCPA) project participants.

The Energy Facilities Siting Regulations (Title 20, California Code of Regulations [CCR], Appendix B) guidelines titled *Information Requirements for an Application* require:

> 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 regulations also require:

> 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.

According to the Warren-Alquist Act, evaluation of alternative sites is not required when a natural gas-fired thermal power plant is (1) proposed for development at an existing industrial site, and (2) the project has a strong relationship to the existing industrial site [Public Resource Code 25540.6(b)]. LEC is the type of project that was envisioned by this code section. LEC would be sited on a 4.4-acre parcel sited between the City of Lodi's White Slough Water Pollution Control Facility (WPCF) to the east, treatment and holding ponds associated with the WPCF to the north, the existing NCPA Combustion Turbine Project #2 (STIG plant) to the west, and the San Joaquin County Mosquito and Vector Control facility to the south. The LEC project site is within a 1,040-acre parcel owned by and incorporated into the City of Lodi. LEC will be sharing some infrastructure with the current STIG plant, will tie in to the existing STIG switchyard, and will obtain process water from the WPCF.

Due to these strong relationships, evaluation of alternative sites outside the boundaries of the LEC is not legally required. However, in order to provide some level of information to the CEC Staff and in accordance with pre-filing guidance from CEC Staff, a description of some alternative sites has been provided.

6.1 Project Objectives

The key objective of the LEC is to provide cost-effective and efficient electric generation capacity to NCPA member utilities and the other project participants in the California market. The project site is on the southeast portion of a 1,040-acre parcel annexed by the City of Lodi. The proposed project includes the grading of the existing area and construction of the new facility. As part of this effort, the Applicant has identified the General Electric (GE) Energy Frame 7FA CTG as one of the most efficient generation technologies currently available. The GE 7FA CTG has rapid-response and load-following capability to make it excellent technology to provide electric generation capacity.

The LEC will provide needed electric generation capacity to respond to the demand for electricity by NCPA project participants. The LEC would help to meet identified generation needs. Of equal or greater importance is the LEC's ability to produce electricity more efficiently than other currently generating out-dated power plants, thereby furthering the statewide goals of limiting the environmental effects of power generation.

In addition to technology alternatives, an objective of the site selection was to minimize or eliminate the length of any project linears, including water supply lines, discharge lines, and transmission interconnections. This objective both minimizes potential offsite environmental impacts and cost of construction.

To respond to the need for electric generation capacity for NCPA project participants, NCPA considered several key factors for power plant siting:

- Located within a NCPA project participant's jurisdiction
- Adjacent to or near high-pressure natural gas transmission lines
- Adjacent to or near water supply for cooling purposes to maximize efficiency
- Location near electrical transmission facilities
- Industrial land use designation with consistent zoning
- Site control readily available
- Large enough to accommodate the site including construction laydown
- Located more than 2,500 feet from the nearest residential area
- Potential environmental impacts can be mitigated and minimized

The LEC site meets all of these siting objectives.

The LEC will provide electric generation capacity to the grid to help meet the demand for electricity for project participants by enhancing the reliability of NCPA's electrical system. In addition, as demonstrated by the analyses contained in this AFC, the project would not result in any significant environmental impacts. Therefore, as will be demonstrated below, there are no alternatives that would be preferred over the project as proposed.

6.2 The "No Project" Alternative

If the Applicant were to not build the LEC (the "no project" alternative), it would not be possible to meet the project objectives. The "no project" alternative would forego all of the benefits associated with the LEC project. In addition, if the "no project" alternative was adopted, NCPA would fail to meet its obligations to the participants that are part of its

integrated planning unit. NCPA supplies and dispatches the electrical needs to its participants. If the project were not adopted, the participants, to the extent that they are able to do so would purchase capacity and energy from neighboring utilities or generate power on their own. Since power would be generated by others, the emissions and other environmental effects of the proposed project would not be entirely avoided. This would have negative economic consequences for the member cities, commercial and residential rate-payers, and for the regional economy.

In summary, the "no project" alternative would not serve the growing needs of NCPA's participants' businesses and residents for economical, reliable, and environmentally sound generation resources.

6.3 Power Plant Site Alternatives

For comparison purposes, alternative sites were chosen that could feasibly attain most of the project's basic objectives. The alternative sites are shown in Figure 6.3-1. The key siting criteria in considering these alternatives and the proposed LEC site included the following factors:

- Located within a NCPA project participant's jurisdiction
- Location near reliable natural gas supply
- Access to water supply for cooling water
- Location near electrical transmission facilities
- Land zoned for industrial use
- Site control (lease or ownership) feasibility
- A parcel or adjoining parcels of sufficient size for a power plant and construction laydown areas
- Location more than 2,500 feet from the nearest residential areas
- Feasible mitigation of potential environmental impacts

6.3.1 Proposed Lodi Energy Center Site

The proposed site for the LEC at 12751 North Thornton Road, in the City of Lodi, San Joaquin County, meets all of the project's objectives and, in addition, would have no significant, unmitigated, environmental impacts. The proposed site is approximately 4.4 acres. The site is owned by the City of Lodi and has been currently leased by NCPA. The LEC site is:

- Located within the boundaries of the City of Lodi, a project participant for the LEC project.
- Located near the PG&E natural gas supply pipeline #108. Interconnection will require an approximately 2.5-mile-long connection.
- Access to recycled water from the WPCF for cooling through a utility corridor linking the power plant and WPCF.

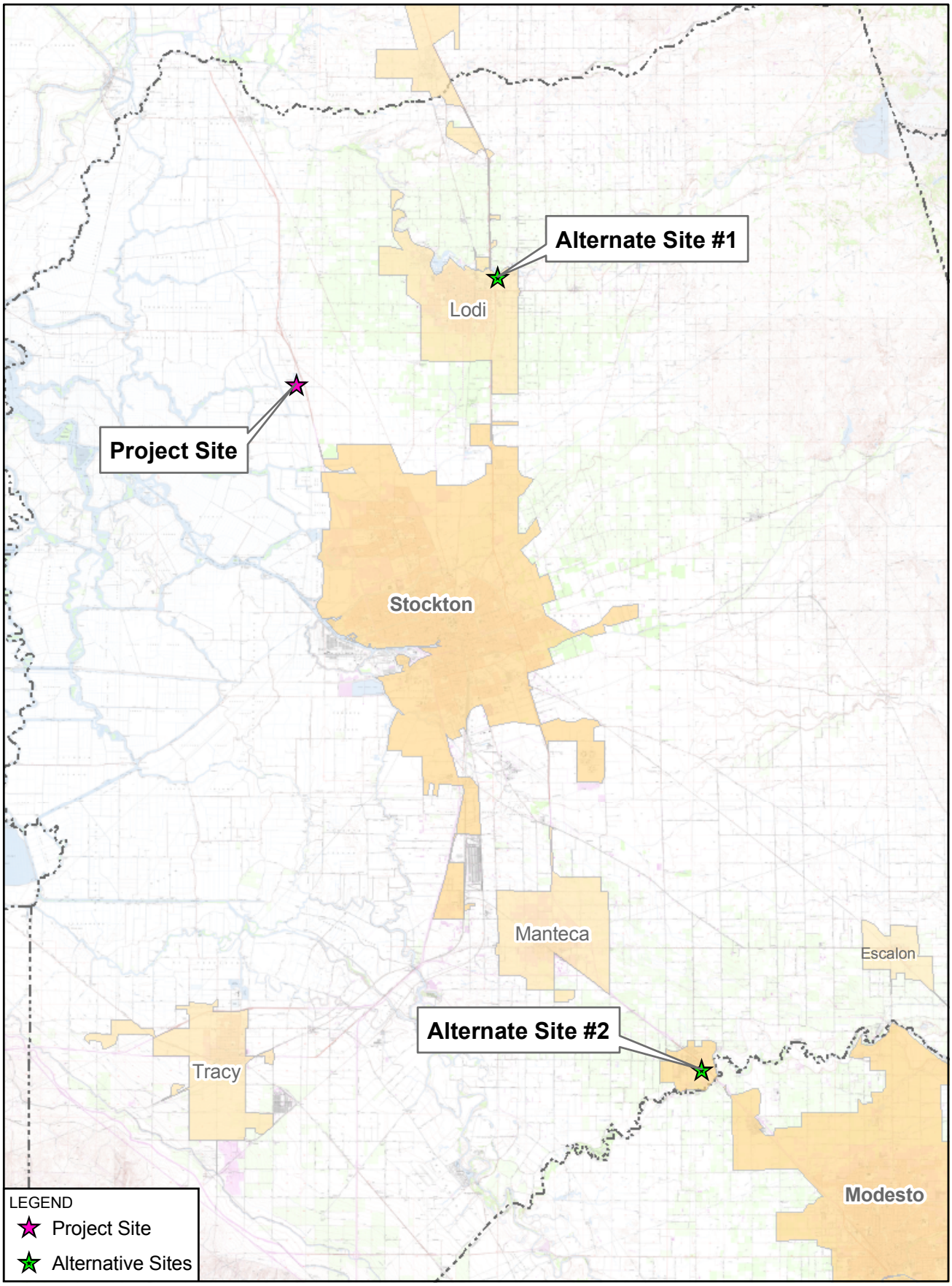
- Located adjacent to the Lodi STIG plant and electrical substation. The project would be able to tie-in to the 230-kV transmission system through the STIG plant's 230-kV switchyard and capacity would serve the need for reliable power.
- Designated as Public zoning with a Utility Facility as an allowable use.
- A signed lease with the City of Lodi for site control.
- Adjacent parcels for construction laydown areas.
- Located more than 2,500 feet from the nearest residential areas.
- Feasible mitigation of potential environmental impacts.
- Construction impacts are minimized to existing residences and businesses.

6.3.2 Alternative 1: East Turner Site

This alternative is approximately 8 miles northeast of the LEC site near the intersection of North Cluff Avenue and East Turner Road. This property is currently an unused vacant lot. The property is zoned M-2, Heavy Industrial and is within the city limits of Lodi, a project participant for the LEC project. The site is surrounded to the north, west, and south by industrial facilities, and to the east by an RV/trailer park. The site would require an approximately 3,200-foot-long natural gas line to tie into a 6-inch, high-pressure, PG&E gas line to the east of the site. In addition a 12-mile-long process water pipeline would need to be constructed to tie this site to the WPCF, and an approximately 1,900-foot-long electrical transmission line would need to be built to an existing PG&E transmission line to the east. A substation would need to be built at this site. This site will also not be adjacent to an existing plant, so shared facilities such as an ammonia tank, administrative buildings, and warehouses will not be available and will need to be built at this site. Shared staff from an adjacent plant are not available, so additional workers will be needed. It is currently unknown whether or not site control would be feasible for NCPA at this location.

6.3.3 Alternative 2: Ripon Site

This alternative is approximately 28 miles southeast of the LEC site in Ripon, California, east of the intersection of South Stockton Avenue and East 4th Street. The site is within a combined service area of both Modesto Irrigation District (MID), as well as PG&E. MID is a project participant for the LEC project. This property is currently undeveloped. This property is zoned M-2, Heavy Industrial and is within the city limits of Ripon. The City of Ripon Wastewater Treatment Plant (Ripon WWTP) is to the south, Highway 99 runs adjacent to the eastern border, and several industrial facilities are to the north and west. The site would require an approximately 1,600-foot-long industrial water supply pipeline to tap into the current pipeline in South Stockton Avenue to the west, and a 3,000-foot-long gas line to tap into a 12-inch-diameter high pressure gas line to the south of the WWTP. This site would require a 500-foot-long electrical transmission line be built to the existing MID Stockton Substation to the west. This site will also not be adjacent to an existing plant, so shared facilities such as an ammonia tank, administrative buildings, and warehouses will not be available and will need to be built at this site. Shared staff from an adjacent plant are also not available, so additional workers will be needed. In addition, it is currently unknown whether or not site control would be feasible for NCPA at this location.



This map was compiled from various scale source data and maps and is intended for use as only an approximate representation of actual locations.

FIGURE 6.3-1
ALTERNATIVE SITE LOCATIONS
LODI ENERGY CENTER
LODI, CALIFORNIA

CH2MHILL

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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 AFC, as well as in terms of project development constraints. The most useful topics for comparison are as follows:

- **Project Development Constraints—** Are there site characteristics that would prohibit or seriously constrain development, such as significant contamination problems, or lack of fuel, transmission capacity, or water?
- **Land Use Compatibility—** Is the parcel zoned appropriately for industrial use and 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 valuable or protected viewsheds?
- **Biological Resources—** Would there be significant impacts to wetlands or threatened or endangered species such that mitigation of these effects would be unduly expensive or constrain the supply of available mitigation resources?
- **Contamination—** Is there significant contamination on site, such that cleanup expense would be high or such that cleanup would cause significant schedule delay?
- **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?
- **Other Environmental Categories—** Are there significant differences between the sites in their potential for impact in other environmental categories?

There is no precise mathematical weighting system established for considering potential impacts in alternatives analyses. Some of the criteria used to compare the alternatives are more or less important to consider than others. For example, an impact that could affect public health and safety or could result in significant environmental impacts is obviously of greater concern than a purely aesthetic issue associated with an advisory design guideline. It is important in comparing alternatives to focus on the key siting advantages and the potential adverse environmental effects of a particular site. Comparing each of the environmental disciplines and giving each discipline equal weight would provide a misleading analysis because effects in one area are not necessarily equivalent in importance to effects in another area.

For example, although the sites may differ in terms of available local road and street capacities and the current levels of traffic congestion, the number of workers during the

operational phase of the project is low and would be unlikely to have a significant effect on local traffic. The sites may differ widely in the amount of traffic congestion they would cause during construction, but this is a temporary impact and should not be a strong consideration in site selection, as long as measures to mitigate this impact are feasible. The sites would not differ significantly in terms of geological hazards, though close proximity to a major fault would call for more rigorous and expensive seismic engineering. Hazardous materials handling and worker health and safety issues would be the same or nearly the same for most sites. Though the risk of a release of hazardous materials during transport might be seen as more or less likely depending on location (roadway hazards, in particular), the record of safe transport and handling of such materials is clear. Further, the sites considered here are all in or near urban areas that are served by good transportation networks and are close to the sources of supply.

Project effects on paleontological and cultural resources are not often consequential in comparing alternatives. Once an initial screening for effects on highly significant sites is completed, the probabilities of encountering hidden paleontological or cultural resources during construction are difficult to calculate or compare.

6.4.1 Project Development Constraints

As indicated in the introductory descriptions of each of the alternative sites, the basic needs of power plant siting for land, access to electrical transmission, gas supply, and water, are met at the LEC site. Both the East Turner site and Ripon site are not near the 230-kV transmission system accessed through the STIG plant's 230-kV switchyard and would require construction of a new transmission line. The LEC site is ideally located in this regard, because fuel gas, process water supply, electrical transmission, and wastewater discharge all have existing onsite tie-ins. The East Turner site would require a 1,900-foot-long electrical transmission line, a 3,200-foot-long natural gas line, and a 12-mile-long process water line. The Ripon site would require a 500-foot electrical transmission line, a 3,000-foot-long natural gas line, and a 1,600-foot-long industrial water supply pipeline.

6.4.2 Air Quality

The quantity of emissions from project operation would be the same at any of the sites. Each of the sites has similar contributions to airsheds and would, therefore, be subject to similar review, offset/mitigation, and permitting requirements. Each site is located in relatively flat terrain that will help to promote dispersion of emissions. The differences between the sites in terms of their distances from the nearest residences should not make a significant difference in air quality impacts at these residences. Since the two alternative sites would require a full operational staff of 21 or 23 employees, versus the addition of only 5 to 7 employees at the proposed site, minor increases of emissions from vehicle traffic could occur if the East Turner or Ripon site were selected. Mitigation would bring any potential impacts to a level below significance for any of the alternatives.

6.4.3 Biological Resources

The LEC site has no biological resources or habitat value. The entire site is either graveled over, or disturbed. The East Turner site is paved, undeveloped land adjacent to industrial facilities and does not appear to be in use and has no biological resources or habitat value.

The Ripon site is undeveloped land adjacent to the Ripon WWTP, and does not appear to be in use. The site has limited biological resources or habitat value.

6.4.4 Cultural Resources

There are no known significant cultural resources at the LEC site. Resources of the East Turner and Ripon sites are unknown. Each of the sites has approximately the same general cultural resource sensitivity.

6.4.5 Geological Resources and Hazards

There would be no significant difference between the sites in terms of geological resources and hazards. There are no geological resources on or near any of the sites.

6.4.6 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. Though there might be differences in the distances that trucks carrying hazardous materials would travel to deliver the materials, these differences would be minor and would not necessarily be consequential, given the effective mitigation measures available and the excellent safety record for transport of these materials.

6.4.7 Land Use and Agriculture

The proposed LEC site is zoned Public, which allows for the use of utilities such as power plants. Both the East Turner and Ripon sites are zoned M-2, Heavy Industrial. The Ripon site is adjacent to the Ripon WWTP, and the MID Modesto Electric Generation Station (MEGS), a peaker power plant.

The proposed LEC site and the Ripon site are designated by the California Department of Conservation as Developed. The East Turner site is designated as Prime Farmland. None of the sites have a Williamson Act Contract (San Joaquin County, 2008).

6.4.8 Noise

Developments at each site would be able to meet the appropriate City and County noise standards. The proposed LEC site is approximately 4,400 feet from the nearest residence, while the East Turner site has a RV/trailer park along the western boundary of the site. The Ripon site is approximately 650 feet to the east (across Highway 99) from the nearest residences.

6.4.9 Paleontology

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

6.4.10 Public Health

The project would not be likely to cause significant adverse long-term health impacts (either cancer or non-cancer) from exposure to toxic emissions, regardless of the site chosen.

6.4.11 Socioeconomics

All three sites are in San Joaquin County and are within the boundaries of a NCPA LEC project participant. The number of workers, construction costs, and payroll would be nearly the same for the project at each of the sites. The majority of the workers would come from the greater western San Joaquin County area depending on the site. Most workers would commute daily or weekly to the plant site. Some may move temporarily to the local area during construction, causing site-specific impacts to schools, utilities, and emergency services. These impacts would be temporary. Disproportionate impacts to minority and low income populations would be unlikely since minority populations are not concentrated in an area or areas that are also high potential impact areas. The project is not likely to cause significant adverse public health impacts to areas that are disproportionately minority or low income.

6.4.12 Soils and Agriculture

Both the proposed LEC site and East Turner site are within an industrial area that is developed, urban land. The Ripon site is currently undeveloped and appears to be fallow agricultural land; however, it is surrounded by industrial facilities including the Ripon WWTP.

6.4.13 Traffic and Transportation

During operations, the number of employees working at a given time during project operation (21 to 23) will not significantly impact local traffic conditions at any of the sites. However, since the LEC facility will share employees with the STIG facility, only an additional 5 to 7 employees are anticipated at the site, which would not impact local traffic conditions. The peak number of employees during construction (305) will have a larger impact. The impact will be temporary, and can be mitigated by transportation management planning. The effect on construction-phase traffic, therefore, should not figure as a major consideration in evaluating or comparing the sites.

6.4.14 Visual Resources

The proposed LEC site would be visible at a distance from residences in the area; however several existing facilities including the WPCF and STIG facility would block portions of the view. Some structures at the proposed LEC plant would extend above the current structures at the WPCF and STIG facility. Although the LEC would be a large structure, residences are more than 4,400 feet away. Both the East Turner site and the Ripon site would be visible from residences nearby. At the East Turner site, a RV/trailer park is located along the western boundary of the property, and a power plant would be visible. In addition, drivers along East Turner Road and North Cluff Avenue would be able to see the plant as other industrial facilities in the area would provide limited screening.

At the Ripon site the residences on the western side of Stockton Avenue would be partially blocked by the existing warehouses to the west and north of the property. The residents on the east side of Highway 99 however, would have an unobstructed view of the site, as would drivers traveling along Highway 99. The Ripon site is in an area of mixed use, including agricultural, residential, and some industrial, including the Ripon WWTP. In

addition, the MEGS peaking power plant is present to the west of the site, within ½ mile of the site.

6.4.15 Water Resources

Two of the sites (LEC and East Turner) would be able to use recycled water for power plant cooling from the City of Lodi. The Ripon site would be able to use the non-potable industrial water system approximately 1,600 feet to the west in South Stockton Avenue which is provided by the City of Ripon for industrial uses. This is consistent with the State Water Resources Control Board's Policy 75-58 indicating that water for power plant cooling should avoid using fresh inland waters if other waters (such as treated wastewater) are available. Water in sufficient quantities is available near all three sites.

6.4.16 Waste Management

The management of wastes would differ slightly between the proposed project site and the two alternatives, though these differences would not necessarily lead to a site preference. Two of the three sites would be vacant at the time NCPA assumes site control, and no demolition would be necessary. The East Turner site might require some demolition and removal of existing concrete, although there is sufficient landfill capacity in the region to handle these wastes.

6.4.17 Summary and Comparison

Based on the site selection criteria as described in Section 6.3, it is clear that power plant siting is feasible at all three sites. Following is a summary of site selection factors:

- **Location with the boundaries of a LEC Project Participant—** Two of the sites are within the boundaries of a LEC Project Participant. Both the LEC and East Turner sites are with the City of Lodi boundaries. The Ripon site is in the jurisdiction of both MID and PG&E, and may not be considered completely within the jurisdiction of a project participant.

- **Location near ample natural gas supply—** Each of the sites are near a sufficient source of fuel gas. There are high pressure gas lines within the vicinity of all three sites; however a gas line to each of the sites would need to be constructed. The LEC site will require a 2.5-mile-long gas line to be constructed to PG&E natural gas line #108. The East Turner site would require an approximately 3,200-foot-long gas line to be constructed to a 6-inch-diameter PG&E natural gas line to the east and the Ripon site would require an approximately 3,000-foot-long gas line to be constructed to a 12-inch-diameter PG&E natural gas line to the south of the Ripon WWTP.

- **Location near a sufficient source of cooling water, preferably treated wastewater—** Each of the sites are near a sufficient source of water for use of process water. The LEC site will connect via a short connection to the WPCF to the east. The East Turner site would require a 12-mile-long connection to the WPCF. The Ripon site would require an approximately 1,600-foot-long connection to the industrial wastewater supply pipeline in South Stockton Avenue.

- **Location near electrical transmission facilities—** The LEC site will connect to the existing STIG switchyard which ties into PG&E's 230-kV transmission line to the west of

the STIG facility. A 1,900-foot-long transmission line would need to be constructed to connect the East Turner to the PG&E transmission line to the east, and would require construction of a new substation. A 500-foot-long transmission line would be required to connect the Ripon site to the Stockton substation.

- **Land zoned for industrial use—**The LEC site is zoned Public, which allows for the use of public facilities including utilities. The East Turner site and the Ripon site are zoned M-2, Heavy Industrial.
- **Site control feasible—**Site control is feasible at the LEC site. It is unknown whether or not the East Turner site or Ripon site are available for lease or purchase. Therefore, site control feasibility for these sites is undetermined.
- **Parcel or adjoining parcels of sufficient size for a power plant—**There is sufficient land available at each parcel to develop a power plant.
- **Location more than 2,500 feet from the nearest residential areas—**The LEC site is approximately 4,400 feet from the nearest residence. The East Turner site is adjacent to a RV/trailer park to the west, approximately 50 feet from the property boundary. The nearest residence to the Ripon site is approximately 650 feet to the east, on the other side of Highway 99.
- **Mitigation of potential impacts feasible—**Mitigation of potentially significant environmental impacts appears feasible at all three sites.

In conclusion, the LEC site offers some project design advantages over the both the East Turner and Ripon sites. The site is adjacent to an existing process water supply source from the WPCF, is located in an industrial zoned pocket within a predominantly agricultural area, and will be adjacent to an existing power plant, which offers the ability to share staff and facilities between the two plants, including the STIG switchyard. In addition, the nearest resident is approximately 4,400 feet away.

The East Turner site would require a 1,900-foot-long interconnection to the nearest PG&E transmission line, and would require the construction of a substation. Process water for the East Turner site would require a 12-mile-long pipeline to the WPCF. In addition, the site is approximately 50 feet away from the nearest residence. The East Turner site is designated as Prime Farmland and may require some mitigation. In addition, it is unknown if the East Turner site is available for long-term lease or purchase.

The Ripon site would connect to the Stockton substation and would require only a 500-foot-long transmission line. In addition similar to the LEC site, the Ripon site could tie in directly to a nearby water source, the City of Ripon industrial water supply. Since this site appears to be relatively undisturbed and located on ruderal land, the site may have some limited plant and wildlife habitat. In addition, it is unknown if the Ripon site is available for long-term lease or purchase.

Taken all together, the LEC site best meets the project objectives without resulting in any adverse environmental impacts as compared to the East Turner and Ripon sites. As a result, the East Turner and Ripon sites were rejected in favor of the LEC site. Table 6.4-1 lists the environmental and project development constraints of the LEC and alternative sites.

TABLE 6.4-1
Environmental and Project Development Constraints of the LEC and Alternative Sites

Site or Alternative	LEC Site	East Turner	Ripon
Site control	Yes	No	No
Land Use and zoning	Zoned as Public – power plants are an allowable use	Zoned as M-2, Heavy Industrial	Zoned as M-2, Heavy Industrial
California Department of Conservation Designation	Developed	100% Prime Farmland	Developed
Williamson Act Contract	No	No	No
Sensitive noise receptors nearby	Few nearby residences (nearest approx. 4,400 feet to the northeast)	RV/trailer park on western boundary of site	Nearest residence approximately 650 feet to the east on the east side of Highway 99
Visual Resources	WPCF to the east of the proposed site, and STIG plant to the west of the proposed site. Both facilities will block views for residents to the east and west, but not to viewers traveling along I-5. Limited residences in surrounding area	Several industrial facilities in nearby vicinity to the north east and south. RV/trailer park adjacent to property on the west. Facility would be visible from both East Turner Road and Cluff Avenue	One existing peaking power plant within ½ mile of proposed site. Some industrial activities present in area, including the Ripon WWTP
Biological Resources	Land has been used as a laydown area for multiple WPCF expansion projects. Limited habitat available for wildlife and ground nesting birds.	Site is currently paved. No habitat available for wildlife and ground nesting birds.	Site has not been farmed, and is currently ruderal vegetation. Habitat is available for wildlife and ground nesting birds.
Cultural Resources	No	Unknown	Unknown
Significant unmitigated impacts or costly mitigation?	No	Site is on Prime Farmland, and may require some mitigation. A long pipeline would be needed to supply recycled water.	No.

6.5 Alternative Project Design Features

The following section addresses alternatives to some of the LEC design features, such as the locations of the natural gas supply pipeline, electrical transmission line, and water supply pipeline.

6.5.1 Alternative Natural Gas Supply Pipeline Routes

The preferred natural gas pipeline route would be adjacent to the existing 2.5-mile pipeline for the STIG Plant which is adjacent to the proposed LEC site. The existing gas pipeline exits the STIG plant approximately 400 ft to the south of the White Sough metering station and then turns east along the access road to the WPCF and under Interstate 5 (I-5). The pipeline continues east from I-5, along a utility easement, bordering several private agricultural fields until the intersection of De Vries Road and Armstrong Road. The pipeline then continues in an easement adjacent to the north side Armstrong Road to PG&E's high pressure natural gas pipeline #108. Due to the presence of the existing 2.5-mile gas pipeline, no other alternatives were analyzed.

6.5.2 Electrical Transmission System Alternatives

The preferred transmission route would be to link the LEC site to the power grid through the existing STIG plant's 230-kV switchyard substation by a three-phase 230-kV transmission circuit. The proposed 230-kV route will exit the project site at the northwest corner and will extend along the northern border of the STIG plant before turning south along the eastern boundary of the STIG plant and continuing to the existing 230-kV switchyard. From the switchyard, the line will tie into the PG&E 230 kV transmission corridor. Due to the presence of the existing electrical switchyard adjacent to the LEC site, no other alternatives were analyzed.

6.5.3 Water Supply Alternatives

The LEC project will connect with the WPCF for supplies of recycled water for cooling through a utility corridor linking the power plant and WPCF. Other sources of cooling water might include potable water from an onsite well used to supply potable water to LEC, or the potable water from the WPCF onsite well. Reclaimed water is clearly the better alternative because it provides for beneficial use for treated wastewater which might otherwise be wasted. Using potable water from the onsite well would involve consuming large quantities of scarce fresh water for power plant cooling that could be more beneficially used for other purposes.

6.6 Technology Alternatives

The configuration of the LEC was selected from a wide array of technology alternatives. These include generation technology alternatives, fuel technology alternatives, combustion turbine alternatives, NO_x control alternatives.

6.6.1 Generation Technology Alternatives

Selection of the power generation technology focused on those technologies that can utilize the natural gas readily available from the existing transmission system. Following is a discussion of the suitability of such technologies for application to the LEC.

6.6.1.1 Conventional Boiler and Steam Turbine

This technology burns fuel in the furnace of a conventional boiler to create steam. The steam is used to drive a steam turbine-generator, and the steam is then condensed and returned to

the boiler. This is an outdated technology that is able to achieve thermal efficiencies up to approximately 36 percent when utilizing natural gas, although efficiencies are somewhat higher when utilizing oil or coal. Because of this low efficiency and large space requirement, the conventional boiler and steam turbine technology was eliminated from consideration.

6.6.1.2 Conventional Simple-Cycle Combustion Turbine

Conventional aero-derivative turbine-generator units are able to achieve thermal efficiencies up to approximately 38 percent. A simple-cycle combustion turbine has a quick startup capability and lower capital cost than that of a combined-cycle, and is very appropriate for peaking applications. Because of its relatively low efficiency, conventional simple-cycle technology tends to emit more air pollutants per kilowatt-hour. Because of this relatively low efficiency, the conventional simple-cycle combustion turbine technology was eliminated from consideration.

6.6.1.3 Kalina Combined-Cycle

This technology is similar to the conventional combined-cycle, except a mixture of ammonia and water is used in place of pure water in the steam cycle. The Kalina cycle could potentially increase combined-cycle thermal efficiencies by several percentage points. This technology is still in the development phase and has not been commercially demonstrated; therefore, it was eliminated from consideration.

6.6.1.4 Internal Combustion Engines

Internal combustion engine designs are also available for small peaking power plant configurations. These are based on the design for large marine diesel engines, fitted to burn natural gas. Advantages of internal combustion engines are as that they: (1) use very little water for cooling, because they use a closed-loop coolant system with radiators and fans; (2) provide quick-start capability (on-line at full power in 10 minutes) and (3) are responsive to load-following needs because they are deployed in small units (for example, 10 to 14 engines in one power plant), that can be started up and shut down at will. Disadvantages of this design include somewhat higher emissions than comparable combustion turbine technology. In addition, internal combustion engine installations are generally deployed at less than 150 MW, and so would not meet one of the project objectives, which is for 255 MW of peaking power.

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 utilizing natural gas available from the existing transmission system. Additional factors rendering alternative fuel technologies unsuitable for the proposed project are as follows:

- No geothermal or hydroelectric resources exist in San Joaquin County.
- Biomass fuels such as wood waste are not locally available in sufficient quantities to make them a practical alternative fuel and LEC site space is limited.
- Solar and wind technologies are generally not dispatchable and are, therefore, not capable of producing ancillary services other than reactive power, and LEC site space is limited.
- Coal and oil technologies emit more air pollutants than technologies utilizing natural gas.

The availability of the natural gas resource provided by PG&E, as well as the environmental and operational advantages of natural gas technologies, make natural gas the logical choice for the proposed project.

6.6.3 NO_x Control Alternatives

To minimize NO_x emissions from the LEC, the combustion turbine generators (CTGs) will be equipped with water injection combustors and selective catalytic reduction (SCR) using anhydrous ammonia as the reducing agent. The following combustion turbine NO_x control alternatives were considered:

- Steam injection (capable of 25 to 42 parts per million [ppm] NO_x)
- Water injection (capable of 25 to 42 ppm NO_x)
- Dry low NO_x combustors (capable of 15 to 25 ppm NO_x)

Water injection or dry low NO_x were selected because these allow for lower acceptable NO_x emissions while being able to achieve an output turndown rate of 30 percent. This turndown is necessary to meet variable load demand.

Two post-combustion NO_x control alternatives were considered:

- SCR
- EMx™ (formerly SCONO$_x$™)

SCR is a proven technology and is used frequently in combined-cycle applications. Ammonia is injected into the exhaust gas upstream of a catalyst. The ammonia reacts with NO_x in the presence of the catalyst to form nitrogen and water.

EM_x™ consists of an oxidation catalyst, which oxidizes carbon monoxide to carbon dioxide and nitric oxide to nitrogen dioxide. The nitrogen dioxide is adsorbed onto the catalyst, and the catalyst is periodically regenerated.

The level of emission control effectiveness between the EM_x and SCR technologies are approximately the same. However, the EM_x technology does not employ the use of ammonia to reduce air emissions. The CEC recently summarized in the EPA's opinion (Colusa Generating Station Final Staff Assessment) "that EM_x is no more effective for reducing air quality impacts than selective catalytic reduction (or "SCR", which is what is proposed for CGS), and it also found EM_x to be significantly more expensive and arguably less reliable, particularly for larger facilities." Therefore, EM_x was not considered for the LEC project.

The following reducing agent alternatives were considered for use with the SCR system:

- Anhydrous ammonia
- Aqueous ammonia
- Urea

Anhydrous ammonia is used in many combined-cycle facilities for NO_x control, but is more hazardous than diluted forms of ammonia; however, because the anhydrous ammonia tank will be shared between the LEC and STIG facility, aqueous ammonia use was not investigated for this site. Urea has not been commercially demonstrated for long-term use with SCR and was eliminated from consideration.

6.7 References

San Joaquin County. 2008. http://sjmap.org/mapapps.asp (Accessed on July 24, 2008).