9.0 ALTERNATIVES

The following sections discuss alternatives to the Russell City Energy Center (RCEC) as proposed in this 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 RCEC is to produce economical, reliable, and environmentally sound electrical energy and ancillary services for California's restructured energy market.

The Energy Facilities Siting Regulations (Title 20, California Code of Regulations, 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.

They 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.

9.1 PROJECT OBJECTIVES

The basic objectives of the RCEC project are discussed throughout this application. Some of the key project objectives include the following:

- To sell clean and efficiently generated energy to California's electricity market
- To benefit the electrical supply and transmission system within the San Francisco Bay Area
- To provide system reliability and transmission congestion benefits
- To locate the generating station near the centers of demand for maximum efficiency and system benefit
- To serve the electrical power needs of the East Bay, San Francisco Peninsula, and City of San Francisco
- To begin generating power as soon as possible (currently projected to be by the Summer 2004).

As discussed in Section 3.0, Demand Conformance, the CEC has determined that California will need a substantial amount of additional baseload generation capacity over the next several years to meet rapidly growing demand, and to relieve the current shortage and provide a stable energy supply to Californians at a reasonable cost. The RCEC will provide competitively priced power to the California electricity market to help meet the state's growing demand for electricity and to help replace nuclear and fossil fuel generation resources retired due to age or cost of producing power. It would enhance the reliability of a currently imperiled electrical system by providing baseload power generation near the centers of electrical demand.

9.2 THE "NO PROJECT" ALTERNATIVE

If Calpine/Bechtel were not to build the RCEC (the "no project" alternative), it would be difficult to meet the project objectives. The "no project" alternative would forego all of the benefits associated with the RCEC project. In addition, the "no project" alternative would result in more energy production from existing power plants than would otherwise occur with the RCEC competing for the opportunity to generate power. Since the RCEC will employ advanced combustion turbine technology and state-of-the-art emissions control systems, existing power plants operating in place of the RCEC would most likely consume more fuel and emit more air pollutants per kilowatt-hour generated.

As a merchant power plant, the business risk associated with construction and operation of the RCEC will be borne entirely by the Applicant. No ratepayer or public monies will be placed at risk. The "no project" alternative would not serve to insulate ratepayers or taxpayers from risk, but instead could harm ratepayers by decreasing competition and thereby increasing electricity prices.

In summary, the "no project" alternative would not serve the growing needs of California's residents and businesses for economical, reliable, and environmentally sound generation resources. Furthermore, the project objective of providing such a resource fueled with locally-produced natural gas would not be realized.

9.3 POWER PLANT SITE ALTERNATIVES

For comparison purposes, and to meet the requirements of CEQA and Title 20, alternative sites were chosen that could feasibly attain most of the project's basic objectives. The alternative sites are shown in Figure 9-1.

The key siting criteria in choosing these alternatives and the proposal RCEC site included the following factors:

- Location more than 1,000 feet from the nearest residential uses or other sensitive receptor
- Location near the centers of electrical demand
- Land zoned for industrial use or heavy industry
- Location near a sufficient source of cooling water, preferably treated wastewater
- Location near electrical transmission facilities
- Location near ample natural gas supply
- A parcel or adjoining parcels of sufficient size for a power plant (14-16 acres)
- Site control (lease or ownership) feasible
- Feasible mitigation of potential environmental impacts

9.3.1 Proposed Russell City Energy Center Site

The proposed site for the RCEC on Enterprise Avenue in Hayward, California meets all of the project's objectives and, in addition, would have no significant, unmitigated, environmental impacts. The site is a 14.7-acre area located in the West Industrial District of Hayward, California. The site is zoned Industrial and is located on Enterprise Avenue near its intersection with Whitesell Street. The project would be sited on two existing parcels. One of these is a 11.1-acre parcel that is currently in use as the transmitter site for radio station KFAX. The adjacent parcel, 3.6 acres on the corner of Enterprise Avenue

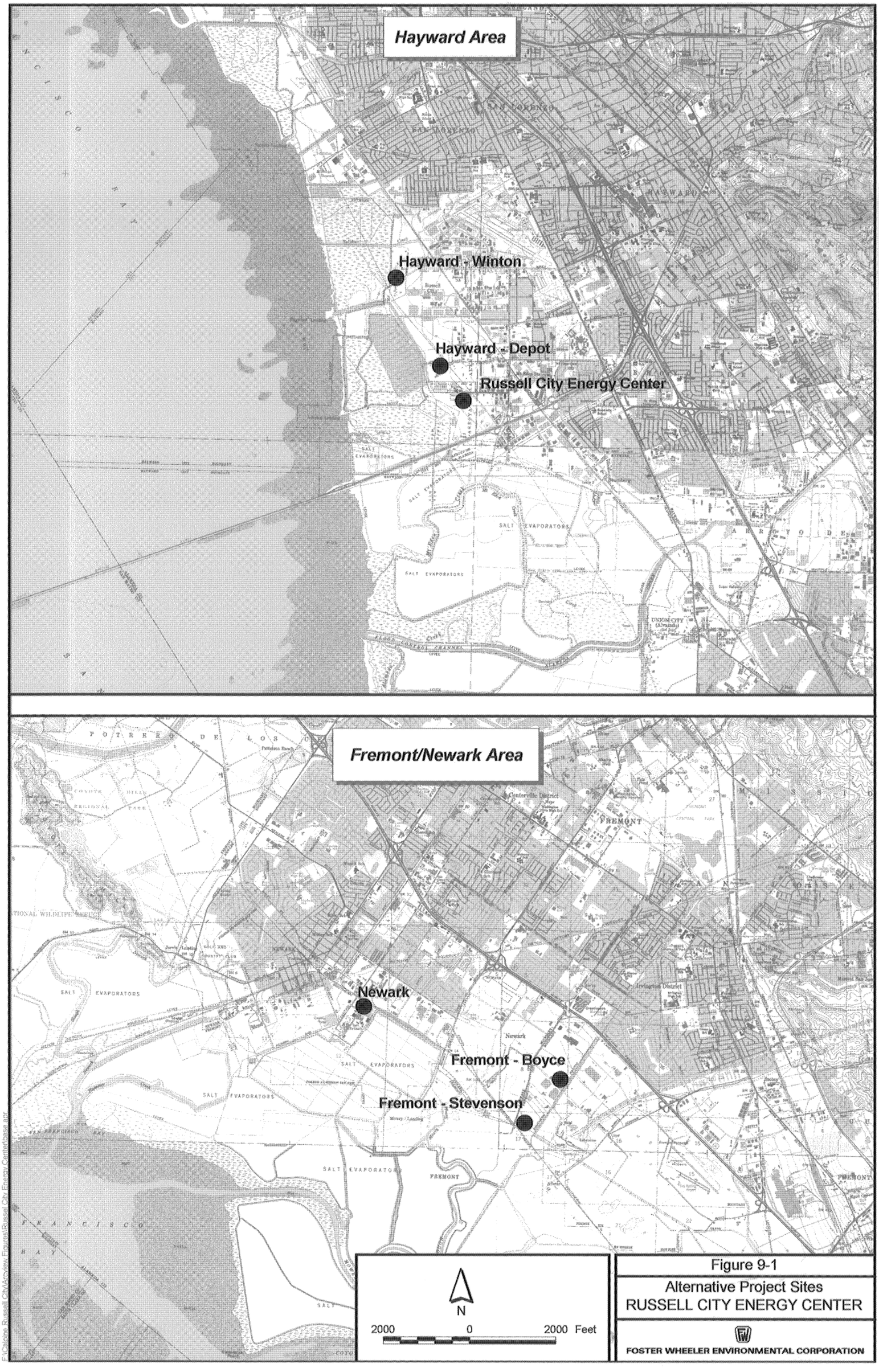

Figure 9-1

Alternative Project Sites
RUSSELL CITY ENERGY CENTER

FOSTER WHEELER ENVIRONMENTAL CORPORATION

and Whitesell Street, is currently occupied by Runnels Industries, a metal sandblasting and painting operation. This site was chosen, among other things, because it is:

- Located near the centers of electrical demand in the East Bay Area, San Francisco Peninsula, and City of San Francisco.
- Located adjacent to a source of reclaimed wastewater sufficient for plant cooling (the City of Hayward Water Pollution Control Facility) such that a lengthy pipeline would not be necessary, thus reducing environmental effects.
- Located near transmission facilities, such as the Eastshore Substation, 115-kV north-south line and 230-kV trans-bay line, making it unnecessary to construct significant new transmission facilities, thus reducing environmental effects.
- Zoned for industrial use and meets all City zoning requirements, including visual (height) and noise requirements.
- Located nearly a mile from the nearest residential area and far from any sensitive receptors
- Located approximately one mile from a readily available gas supply through the PG&E system
- A 14.7-acre area (two parcels) is available.

9.3.2 Alternative Site A: Newark-Cargill

Alternative site A is located just off Central Avenue in Newark, Alameda County, at the Cargill Corporation's salt processing complex. Sixteen acres are available at the site of Cargill's cooling water pond, just south of Central Avenue and west of the Union Pacific railway tracks. This site is zoned General Industrial. Cargill has in the past been willing to discuss the replacement of their cooling pond with a different kind of cooling system, such that this parcel would become available for a power plant. Key characteristics are as follows:

- Zoned General Industrial by the City of Newark
- Natural gas would be available to this site at the PG&E Irvington Station, some 3.5 miles distant.
- Access to the transmission system would be by a direct tie-in (loop) to an existing PG&E 230-kV line located about 2 miles south of the project site.
- Union Sanitary District could provide an ample supply of secondary treated wastewater for cooling from the Alvarado Treatment Plant, located 7 miles north of the project site.
- Located one-half mile from the nearest residence.

9.3.3 Alternative Site B: Fremont-Stevenson

Alternative site B is located near the western end of Stevenson Boulevard in Fremont, Alameda County, near the southern boundary of the City of Newark. The site is a 55.62-acre parcel owned by the Catellus Development Corporation and is currently open and undeveloped land. The site is bisected by a PG&E 230-kV transmission line, but has unoccupied land large enough to accommodate a 15-acre power plant development. Key characteristics of the site are as follows:

- Zoned General Industrial (GI) in the City of Fremont
- Located approximately 0.5 mile from the PG&E Newark Substation (which is located in Fremont)

- Natural gas supply is available at PG&E's Irvington station, on PG&E's backbone line 303, located about 1.9 miles from the site
- A supply of recycled water would be available either through the Union Sanitary District's Alvarado Treatment Plant, approximately 9 miles north of the project, or from the Santa Clara/San Jose Wastewater Treatment Plant, which has recycled water available through the South Bay Recycling Program, at an existing pipeline in Milpitas, approximately 8 miles south.
- Union Pacific Railroad tracks are located immediately south for convenient construction transport.
- Located 0.6 mile from the nearest residence.

9.3.4 Alternative Site C: Fremont-Boyce

Alternative C is located on Boyce Road in Fremont, near the Fremont-Stevenson site. The site consists of 15.89 acres, 6 acres of which are occupied by the Borden chemical facility (approximately 10 acres available).

- Zoned General Industrial (GI) in the City of Fremont
- Located approximately 0.6 mile from the PG&E Newark Substation (which is located in Fremont)
- Natural gas supply is available at PG&E's Irvington station, on PG&E's backbone line 303, located about 1.3 miles from the site
- A supply of recycled water would be available either through the Union Sanitary District's Alvarado Treatment Plant, approximately 9 miles north of the project, or from the Santa Clara/San Jose Wastewater Treatment Plant, which has recycled water available through the South Bay Recycling Program, at an existing pipeline in Milpitas, approximately 8 miles south.
- Located 0.25 mile from the nearest residence.

9.3.5 Alternative Site D: Hayward-Depot Road

Alternative site D is a located in an unincorporated portion of Alameda County that is surrounded by the City of Hayward on Depot Road, approximately 0.4 mile north of the project site (3636 to 3798 Depot Road). The site is currently occupied by 7 automobile salvage yards, a pallet storage yard, a recreational vehicle storage yard, and a general contracting firm. Combining several of these lots would create a parcel sufficiently large for a power plant (49 acres). Key characteristics are:

- Zoned for Heavy Industry (M-2) by Alameda County
- The City of Hayward could provide a sufficient supply of treated secondary wastewater for cooling from its wastewater treatment plant located adjacent to this site
- Natural gas would be available on a local distribution line (Line 153) less than a mile from the site
- A PG&E 115-kV transmission line crosses the project site, leading to the Eastshore Substation, 1.5 miles to the south
- Located 0.7 mile from the nearest residence.

9.3.6 Alternative Site E: Hayward-Winton Avenue

Alternative site E is a located in the City of Hayward near the west end of West Winton Avenue. The site currently consists of 10 separate land parcels totaling 22.8 acres, occupying two vehicle salvage yards owned by Pick Your Part and E&J Auto Salvage. Key characteristics are:

- Zoned for Industry (I) by the City of Hayward
- The City of Hayward could provide a sufficient supply of treated secondary wastewater for cooling from the wastewater treatment plant located 1.4 miles south of this site
- Natural gas would be available on a local distribution line within 2 miles of the site
- A PG&E 115-kV transmission line runs approximately 0.1 miles west of the project site, leading to the Eastshore Substation, 4.1 miles to the south.
- Located 1.1 mile from the nearest residence.

9.4 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? What is the distance to the nearest residential area? What is the distance to sensitive receptors?
- **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?
- **Water Supply**—Is a supply of recycled water readily available such that it is not necessary to use potable water for all or part of the cooling water?
- **Visual Resources**—Are there significant differences between the sites in their potential for impact on visual resources?
- **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 to a residential or recreation 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?

Table 9-1 compares the alternatives sites in terms of their basic site characteristics.

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, though 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. Similarly, some sites are accessible by rail. This may assist in transportation of large items during construction, but is not necessary and provides only a small and temporary advantage. Most 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.

Similarly, 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.

9.4.1 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 cooling water, are met at each of the alternative sites. There are, however, some differences between the sites in terms of site quality and distance to transmission, gas supply, and recycled water for cooling purposes.

For example, the proposed RCEC project site is located adjacent to a wastewater treatment plant (City of Hayward) that can supply all of its cooling water without the need to construct a long pipeline. The other two Hayward sites (Depot Road and West Winton) are also relatively near the Hayward Water Pollution Control Facility. The Newark and the two Fremont alternatives, by contrast, would involve construction of long pipelines (8+ miles) to supply recycled water for plant cooling. The proposed RCEC site and each of the alternatives are situated relatively near a natural gas pipeline and electric transmission facilities.

Table 9-1. Characteristics of the alternative sites.

Site or Alternative	Proposed Project site	A	B	C	D	E
Characteristic	**Russell City**	**Newark-Cargill**	**Fremont-Stevenson**	**Fremont-Boyce**	**Hayward-Depot Rd.**	**Hayward-Winton Ave.**
Acreage available for building	14.7	16	55.62	10	49	22.8
Number parcels	2	Portion	1	1	14	10 (2 owners)
Current use	Radio station/metal painting	Salt works cooling pond	Undeveloped, conservation easement	Chemical plant, partly vacant	Auto salvage, RV and pallet storage	Auto salvage
Previously disturbed area	Yes	Yes	No	Yes	Yes	Yes
Distance to nearest residence	0.82 mile	0.5 mile	0.6 mile	0.25 mile	0.7 mile	1.1 mile
Transmission line	1.1 mile	2 miles	0.5 mile	0.6 mile	0.1 mile	0.1 mile
Water supply pipeline length	0.1 mile	7 miles	8 miles	8 miles	0.1 mile	1.5 mile
Natural gas line	0.9 mile	3.5 miles	1.9 miles	1.3 miles	1 mile	1.4 mile
Total length, linears	2.1 miles	12.5 miles	10.4 miles	9.9 miles	1.2 miles	3.0 miles
Recycled water available	Yes	Yes	Yes	Yes	Yes	Yes
Zoning	Industrial	General Industrial	General Industrial	General Industrial	Heavy Industrial	Industrial
Height limit	None	Yes (35' for t-line)	Yes (40')	Yes (40')	No	No
Agricultural conversion	No	No	No	No	No	No
Contamination	Small TPH plume	No	Unknown	Unknown	Petroleum hydrocarbons from auto salvage	Petroleum hydrocarbons from fuel spills, auto salvage

Though there is sufficient land at each of these locations to develop a project, the Fremont-Boyce site is more constrained by space than the others. Though nearly 16 acres are available, 6 of these are currently occupied by the Borden chemical facility, possibly leaving a site too small for a power plant that would meet Calpine/Bechtel's project objectives.

Parcel consolidation and site control could be a concern for some of these sites. Only Fremont-Stevenson and Newark are located on single parcels. These are owned by Catellus Development Corporation and Cargill Corporation, respectively. These are large corporations that may have an interest in land development. The RCEC site involves consolidation of two parcels for the power plant site (Salem Communications and Runnels Industries). Calpine/Bechtel has secured legal control of both parcels. The Hayward-Depot site would involve consolidation of up to 14 parcels with different ownership. These owners would all have to agree to sell and would have to be compensated for any business loss. The Hayward-Winton site would be more manageable, since it would involve consolidation of 10 parcels that currently have only two owners.

9.4.2 Air Quality

The quantity of emissions from project operation would be the same at any of the sites. Each of the sites is located in the Bay Area Air Quality Management District and would, therefore, be subject to the same review, emission reduction crediting, and permitting requirements. Each of the sites is located in relatively flat terrain that will help to promote dispersion of emissions. The two Fremont sites and the Newark site are slightly nearer to the Berkeley Hills, however, than the Hayward sites. Small differences between the sites in distance from the nearest residences should not make a significant difference in air quality impacts at these residences. Mitigation would bring any potential impacts to a level below significance for any of the alternatives.

9.4.3 Biological Resources

The Russell City project site contains some seasonal wetlands. Though the power plant site does not provide habitat for threatened and endangered species, it may provide adjacent upland habitat (as a refuge for flooding) for the endangered salt marsh harvest mouse. Potential impacts to wetlands and the salt marsh harvest mouse could be easily mitigated.

The Newark alternative would involve the removal of small amounts of wetland vegetation ringing the cooling pond. This pond may or may not be a jurisdictional wetland, however, since it is an artificially constructed pond that does not communicate with adjacent drainage. Construction of electrical transmission lines across the Cargill salt evaporation ponds to connect with the existing 230-kV line could cause collision obstacles for migratory waterfowl that could be mitigated. Construction of the eight-mile-long water supply pipeline in the existing Union Sanitary District force main right-of-way would cross several large wetland and marsh areas. This would require either open cut construction in the wetlands or very long directional bores, which require large setup and laydown areas, and include some risk of "frac-out," the release of drilling mud to the surface through ground seams. Though impacts would be temporary, they would involve consultation with the U.S. Fish and Wildlife Service, California Department of Fish and Game, and U.S. Army Corps of Engineers because of potential effects on populations of protected species, including the salt marsh harvest mouse, salt marsh harvesting shrew, clapper rail, and black-crowned night heron, among others.

The Fremont-Stevenson site currently consists of open land that contains seasonal wetlands. This area is likely to be habitat for protected species, including the red-legged frog. The site is currently under

conservation easement as partial mitigation for the potential effects of Catellus Land Corporation's construction of the Pacific Commons project, a large office and industrial development located nearby in Fremont. For this reason, development at this site would involve replacing the Pacific Commons easement with mitigation land of equivalent value, as well as adding additional land to mitigate the potential effects of a project on this parcel. Finding this quantity of mitigation land near the project area may be a limiting factor. If the cooling water supply and return line were constructed to the USD Alvarado Treatment Plant from this site, temporary disturbance of bay marshlands and the habitat of several protected species would occur. If the cooling water pipeline were constructed south in city streets to connect with the South Bay Water Recycling Program (SBWR) pipeline in Milpitas, this disturbance would not take place.

The Fremont-Boyce site currently contains some open field that is periodically mowed or disked. There does not appear to be quality habitat for protected species. As with the Fremont-Stevenson site, if the cooling water supply and return line were constructed to the USD Alvarado Treatment Plant from this site, temporary disturbance of bay marshlands and the habitat of several protected species would occur. If the cooling water pipeline were constructed south in city streets to connect with the SBWR pipeline in Milpitas, this disturbance would not take place.

The Hayward-Depot site would probably not directly affect protected species, since the site is currently occupied by auto salvage yards. There is a possibility of burrowing owls, which are known to nest in vacant lots. This potential effect is easily mitigated, however.

The Hayward-Winton site would, similarly, not directly affect protected species, since the site is also comprised of automobile salvage yards. The site is located adjacent to a marsh restoration project in the Hayward shoreline area, but effects to wildlife and plants would be unlikely with proper mitigation measures.

For each of the Hayward alternatives (RCEC, Depot, Winton), electrical transmission construction would be limited to upgrading an existing right-of-way that runs through a densely developed industrial area. There would be little or no resulting effect on plants or wildlife.

9.4.4 Cultural Resources

There would be few significant differences in cultural resources among the different alternatives, based on current information. Known archaeological sites would not be directly affected (buried sites are possible in any location). There would be a greater possibility of encountering buried archaeological deposits with the alternatives that would involve longer underground linear appurtenances (such as water and gas lines). The water supply pipeline to USD's Alvarado Treatment Plant, and the Alvarado alternative to supply water to the Fremont-Boyce and Fremont-Stevenson alternatives would thus be more likely to encounter significant prehistoric remains. This route (the USD's twin force main easement) passes relatively near prehistoric Native American shell mounds near the Coyote Hills. In this lowland, depositional environment, buried sites are somewhat likely to occur and, if found, would be somewhat likely to qualify as significant archaeological resources. The route between the Fremont alternatives and the SBWR network in Milpitas would also be likely to encounter buried resources, since it would run relatively near the former Bay margins.

At the Newark site, the power plant would be constructed next to the Cargill Corporation's salt production facility, which raises a historical resources issue. The Cargill salt production facility is more than 50 years old and is one of the few remaining reminders of the bayshore salt production industry that has been in operation since the 19th century. Two key questions about the facility are: 1) is the salt production facility a historic property (eligible for listing on the California Register of Historic Places or National Register of Historic Places), and 2) if so, would the presence of a power plant next to Cargill be sufficiently out of

keeping with its historical character to cause a significant impact to the integrity of feeling and association of this site and, hence, reduce its significance? Both questions would clearly require additional study to resolve. If the salt facility were to be determined significant and if building a power plant near it would be considered a significant adverse impact, it might be possible to mitigate the impact, either by detailed recording (archival photography and engineering drawings) of the salt production works before building the power plant, or by applying architectural treatment to the power plant exterior that would be compatible with the appearance of the salt production works.

9.4.5 Geological Resources and Hazards

There would be no significant differences between the sites in terms of geological resources and hazards. There are no geological resources located at or near any of the sites. Each of the sites is located approximately the same distance from the Hayward, San Andreas, and Calaveras faults. The Hayward sites (RCEC, Depot, and Winton) are further from the Silver Creek fault (5 miles or more), whereas the Newark and Fremont sites are relatively near (1 mile). This fault, however, is considered inactive. Proper design to the standards of Seismic Zone IV would mitigate geological hazards.

9.4.6 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.

9.4.7 Land Use

Each of the six sites is zoned appropriately for industry. Two of the three Hayward area sites (RCEC and Winton) lie within the City of Hayward in its Industrial Corridor and are zoned Industrial (the only zoning designation for industry in the City of Hayward). The City of Hayward Planning Department staff have made a preliminary determination that energy generation is a use similar to manufacturing and, as such, is a permitted use in the Industrial District (see Appendix 8.6-A). There is no specified height limit for structures in the Hayward Industrial District. Similarly, the City has made a preliminary determination that broadcast studios are a permitted use in the Floodplain district.

The third Hayward area site, Hayward-Depot, is located on unincorporated land under Alameda County jurisdiction that is zoned M-2 (Heavy Industry) and that is surrounded by the City of Hayward. This piece of land is part of the County's Mt. Eden Redevelopment zone. Although electrical generation is not specifically addressed in the County zoning ordinance as a permitted use, the M-2 zone does include "public utilities" and "industrial operations." Electrical generation is frequently not mentioned specifically as a use in city or county zoning ordinances because the zoning ordinances were written before market deregulation; hence, the siting of power plants took place under public utility zoning regulations, which are different from those that apply to private entities.

The Newark site is located in the City of Newark's General Industrial (MG) zone. In general, MG districts are intended to reserve appropriately located areas for heavy industries and other related activities; this district is meant to accommodate a wide range of manufacturing, warehousing and distribution uses and to minimize the impacts of these uses on adjacent properties. There are numerous permitted and conditional uses in MG districts. Public and private utility facilities are not a permitted use in MG districts, but are considered a conditional use requiring a conditional use permit. The project would also be required to apply

for a zoning variance for the broadcast towers, since these would be taller than 35 feet, the height limit in the Agricultural zone (Cargill's salt ponds are zoned agricultural), through which the transmission line would pass. Under this zoning designation, public and private utility facilities and equipment are also considered a conditional use.

The two Fremont sites (Stevenson and Boyce), are zoned General Industry (GI) under the Fremont Zoning ordinance. This designation is for all types of industrial uses. As with Alameda County, the Fremont Zoning Ordinance does not specifically identify power plants as a permitted use. The Zoning Administrator can, however, permit uses found to be similar in nature, function, or operation to other uses permitted within the district. The Fremont Zoning Ordinance also restricts building heights in the Industrial District to 40 feet, with exceptions possible for unique building requirements. The project would thus be required to apply for a zoning variance in order to construct the project, with its 145-foot-high HRSG stacks.

All six sites appear to be consistent with existing general plans and zoning, though the Fremont-Stevenson and Fremont-Boyce sites exceed the existing height limitation and the Newark-Cargill and Hayward-Depot sites may require conditional use permits.

9.4.8 Noise

Since it is technically feasible to mitigate potential power plant noise impacts to a level of insignificance, there would be no significant differences between the projects, as mitigated with sound baffling equipment. There are differences in the distance to the nearest residential receptor to the project. The three Hayward sites are furthest from a residence (0.6 mile to 1.1 mile). The Newark site is approximately 0.5 miles from the nearest residence. The Fremont-Boyce site is only 0.25 miles from the nearest receptor, a high-density housing development. The Fremont-Stevenson site is 0.6 miles from this same receptor.

9.4.9 Paleontology

There would be no significant differences between the project sites in terms of potential effects on paleontological resources. None of the sites is located at a known paleontological find spot, though Pleistocene fossils have been found in the alluvial deposits that ring the Bay margins. The probability of encountering significant fossils is approximately the same at all sites.

9.4.10 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.

9.4.11 Socioeconomics

All six sites are located in Alameda County. The number of workers, construction costs, payroll, and property tax revenues would be nearly the same for the project at each of the sites. The majority of the workers would come from the East and South bay cities between Oakland and San Jose. 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, though there is a relatively high percentage of minority population in most of the communities near the project sites (30-50 percent), the minority population is widespread and is 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.

9.4.12 Soils and Agriculture

There would not be significant differences between the alternative sites in terms of their potential effects on soils and agriculture. None of the sites would result in the loss of prime and unique farmlands or farmlands of statewide importance.

9.4.13 Traffic and Transportation

Though there are differences between the project sites in terms of the amounts of current traffic congestion in their immediate areas, each of the sites is located in an urban area with relatively congested local traffic and near access to major freeways that are also relatively congested. The number of employees working at a given time during project operation (approximately 18), will not significantly impact local traffic conditions at any of the sites. The peak number of employees during construction (485) will have much more impact, but the impact will be temporary, and can be mitigated by providing off-site parking and busing for workers during peak periods. The effect on construction-phase traffic, therefore, should not figure as a major consideration in evaluating or comparing the sites.

The Hayward area sites (RCEC, Depot, Winton) are located in the Hayward Industrial Corridor, which is congested. Levels of Service in this area and along the major freeway arteries that serve the area (Interstate 880 and State Route 92) are poor. Access to the RCEC and Depot Road is through the Clawiter Road/Eden Landing Road exit to State Route 92. Access to Winton is through the Winton Avenue exit from Interstate 880. Off-site parking during construction might be necessary at these sites. The effects of the project on operation phase traffic would be negligible.

The City of Hayward plans to help ameliorate this traffic congestion by connecting Cabot Boulevard through land belonging to the existing wastewater treatment plant to Whitesell Street and expanding Whitesell to four lanes. Under this plan, Cabot would cross through some of the parcels on Depot Road that would otherwise be part of the Hayward-Depot site. Caltrans has plans to add capacity to State Route 92.

Traffic in the Newark industrial corridor is not particularly congested. There is relatively good access from Interstate 880 through the Thornton and Mowry Avenue interchanges, less than 1.5 miles away. There are plans, however, to install a Central Avenue overpass to the Union Pacific Railroad tracks adjacent to the Cargill salt production works. If this were completed, the most likely access point to the power plant site, at the west end of the Cargill property, would not be feasible, and would require a longer access right-of-way from a point further east.

The Fremont-Boyce and -Stevenson sites are both served by the four-lane Boyce and Stevenson Roads. Stevenson connects with Interstate 880 via an overpass about a half mile from the Boyce site and a mile from the Stevenson site. Automall Parkway and Boyce (in Fremont)/Cherry (in Newark) are four-lane distribution links that are relatively uncongested.

9.4.14 Visual Resources

The project at each of these sites would be visible to a large number of viewers. Viewer sensitivity depends on the distance from recreational areas, scenic highways, and residences.

9.4.14.1 Russell City Energy Center Site

The RCEC site would be visible by commuters on State Route 92 and recreational users along the Bay Trail and at the Hayward Area Recreation District's Shoreline Interpretive Center, at a distance of about 0.7 miles. The project would be most visible to eastbound commuters on the Hayward-San Mateo Bridge, however,

since the view for westbound travelers would be blocked by buildings and trees. Commuters on State Route 92 would see the plant to the north in the middleground, at a distance of about 0.4 miles (at the nearest).

The City of Hayward considers the State Route 92 corridor a gateway to the City and has adopted a policy of promoting landmark quality visual treatment in this area (the General Plan suggested windmills or some other landmark of distinction). With its high quality proposed architectural treatment, the RCEC provides this landmark with a dramatic structure. This architectural treatment overshadows and mutes the effect of the existing large Rohm and Haas plant building and its 180-foot-high stack. It will also provide considerable visual interest to commuters and others on the Hayward-San Mateo Bridge.

Recreational viewers at the Shoreline Interpretive Center and along the Bay Trail to the north would see the project as they look east towards the City of Hayward as a taller mass among the buildings of the Industrial Corridor. The trailhead at the Shoreline Interpretive Center is approximately 0.73 miles from the project. From this location, the RCEC is a part of the middleground viewscape. This viewscape includes bay marshlands in the foreground, the Hayward Industrial Corridor in the middleground, and the East Bay Hills and Mount Diablo in the background.

Within the Industrial Corridor, most viewers would be commuters on their way to and from work or to delivery or transport goods and services. Views are obstructed by landscaping and buildings. There is a variety of building types, including warehouses, office buildings, and larger industrial structures for the Berkeley Farms dairy products processing plant, Rohm and Haas chemical plant, Tuscarora Corporation, and others. The RCEC would appear as a large and dominant structure from some viewpoints within this area, particularly those near the project.

Few residential viewers would see the project, none at close range. Most of those who could see the RCEC would do so from the East Bay hills, about 5 miles distant. At this distance the RCEC would be noticeable, but not a dominating presence. Some second floor windows of newer homes at the western edge of the Mount Eden neighborhood may have views of the top structures of the RCEC, about 1 mile distant.

9.4.14.2 Hayward-Depot

The project at the Hayward-Depot site would not be as visible from travelers on State Route 92 as the project at the RCEC site on Enterprise Avenue, because of intervening structures. Recreational viewers along the Bay Trail would see the project in the middleground at a distance of 1.3 miles near the western edge of the Industrial Corridor. As with the RCEC site, the bay marshlands would be in the foreground and the East Bay Hills in the background, with the project among buildings of the Industrial Corridor in the middleground. Viewers within the Industrial Corridor would mostly be commuters and transport and delivery persons.

9.4.14.3 Hayward-Winton

The project at the Hayward-Winton site would be most visible to commuters within the Hayward Industrial Corridor and to recreational viewers along the Bay Trail. Though the project would be located on Winton Avenue, a major thoroughfare of the Industrial Corridor, it would be located at the extreme western end of Winton, where the traffic and number of viewers is smaller than further to the east along Winton. Recreational viewers along the Bay Trail would see the project miles at the western edge of the Hayward Industrial Corridor in the middleground at a distance of 0.7 miles. The PG&E 115-kV transmission line and KCTC radio towers would also be a part of this view. The foreground from the Bay Trail would also include the All Cities landfill and asphalt and concrete crushing operation. As with the RCEC site, the bay marshlands would be in the foreground and the East Bay Hills in the background, with the project among buildings of the Industrial Corridor in the middleground. Recreational users driving down Winton Avenue

on their way to the Hayward Shoreline Regional Park trailhead at the end of West Winton Avenue would pass directly by the project at this location. The project would be a dominating element within their field of view at this point.

9.4.14.4 Newark

The project at Newark would be most visible to commuters to the Newark industrial and business park area along Central, Thornton, Cherry, and Mowry avenues. Commuters crossing the Union Pacific railroad tracks on Central Avenue would pass very near to the project, which would be a dominant presence at this range. Recreational viewers at Coyote Hills Regional Park, about 4 miles away, would see the project in the background. Similarly, the project would barely be visible from travelers on the Dumbarton Bridge, also about 4 miles away. Viewers at a recently developed recreational complex located at the end of Mowry Avenue would see the project at a distance of about 1.2 miles against the backdrop of the Newark business park.

A commuter rail line runs directly next to the Newark site and viewers in the train would see the power plant at close range as they pass by. The power plant would block views of the Cargill Salt works and Coyote Hills from the train for a short distance. The Bay Trail also runs near the plant, but the trail in this location runs along paved streets and roads through this area.

9.4.14.5 Fremont-Boyce

Viewers of the project at the Fremont-Boyce site would include commuters along Stevenson , Boyce, and Cherry Streets (Boyce Avenue in Newark). Travelers on Interstate 880 might see the tops of the HRSGs and stacks. The local viewscape consists of open lands to the southwest, along the bay margins, industrial and residential uses in the immediate area, and the East Bay hills to the east, most notably Mission Peak, a local landmark. The large and disparate buildings of the industrial park area, and also the large Newark Substation and several large-scale transmission lines which serve it, help to imprint a largely industrial character to this viewscape. Residential viewers living in a townhouse complex are within one-quarter mile of the Boyce site, however, on Cherry Street (same as Boyce). Views from within and near these residences, without screening, could possibly cause a significant adverse impact. The Bay Trail is planned to run along side Boyce Avenue at some point in the future. This would introduce recreational viewers to the project viewshed.

9.4.14.6 Fremont-Stevenson

The potential project viewers of the Fremont-Stevenson project would be very similar to those at Fremont-Boyce site and would include commuters along Stevenson , Boyce, and Cherry Streets (Boyce Avenue in Newark). The local viewscape is also similar to Fremont-Boyce, except that the Stevenson site is bisected by a large transmission line, is adjacent to the Union Pacific Railroad tracks, and lies near the open spaces along the bayshore floodplain. Residential viewers are located about one half mile away, at Cherry Street/Boyce Avenue. To these viewers, the project would be visible as a large structure rising above the surrounding industrial buildings against the backdrop of the bay and Peninsula hills.

9.4.15 Water Resources

All six sites would be able to use treated wastewater for power plant cooling and so would not differ significantly in their use of water resources. 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 other waters (such as treated wastewater) are available. Cooling tower blowdown would, in each case, be returned to the wastewater treatment facility supplying the cooling water, to be discharged under that

facility's NPDES permit. Reducing the volume of fresh water discharged into San Francisco Bay would help to increase the salinity of the Bay, and this is important for the health of the Bay ecosystem.

None of the Hayward or Newark sites are located within a 100-year floodplain. The Fremont-Stevenson site is also not located on a 100-year floodplain, but the eastern edge of the Fremont-Boyce parcel is shown on Federal Emergency Management Agency (FEMA) maps as containing some areas where the 100-year average flood depth would be between 1 and 3 feet.

9.4.16 Waste Management

The management of wastes would differ between the project site and the five alternatives, though these differences would not necessarily lead to a site preference. Some of the sites (Fremont-Stevenson and Fremont-Boyce) are currently partly or entirely vacant. This means there would be a smaller quantity of waste generated during demolition to prepare for construction. The RCEC site, by contrast, would require the demolition of the KFAX radio station broadcast towers, a small transmitter building, and a few small structures at the current Runnels Industries. Both Hayward sites would require the removal of a large quantity of automobiles in various states of salvage.

Some of these sites might have contaminated soils, requiring cleanup before constructing the energy generation project. At the Hayward-Depot and Hayward-Winton sites, for example, the salvage of automobiles, as well as the spillage of fuels over the years has led to a petroleum hydrocarbon problem. The Winton property, for example, is under order from the State Water Resources Control Board to collect contaminated surface runoff and resolve several contamination issues. Some of the businesses at the Depot Road site, similarly, have been under order by state and federal agencies to clean up contamination or face penalties. At the Runnels Industries property, part of the RCEC site, there is a small plume of petroleum hydrocarbons that has migrated westward onto the KFAX property. Also at the RCEC, there is a plume of Volatile Organic Compounds (VOC), possibly from an off-site source, in the soil. The pollutant levels are very low, however, and cleanup or closure should be relatively straightforward.

9.4.17 Summary and Comparison

Returning to our original site selection criteria, it is clear that power plant siting is feasible at most of these alternative sites. A summary of environmental and project development constraints is presented in Table 9-2.

- **Location more than 1000 feet from the nearest residential receptor**—All of the sites are more than 1,000 feet from the nearest residential receptor. Most are more than a half-mile from the nearest residence. The RCEC is 0.82 miles from the nearest residence. Hayward-Winton is 1.1 miles. The Fremont-Stevenson site, however, is only about 0.25 miles from a high-density residential development. This may cause a significant visual impact.
- **Location near the centers of electrical demand**—All of the sites are in highly urbanized areas with residential and industrial demand for power.
- **Land zoned for industrial heavy industrial use**—The RCEC site and each alternative site is zoned for industrial or heavy industrial use. There appear to be no zoning restrictions, though the definition of "public utility" and "industrial operation" would have to be clarified to site the project within Alameda County jurisdiction at the Hayward-Depot location.

Table 9-2. Project development and environmental constraints of the RCEC and alternative sites.

Site or Alternative	Project site	A	B	C	D	E
Name	**Russell City**	**Newark-Cargill**	**Fremont-Stevenson**	**Fremont-Boyce**	**Hayward-Depot**	**Hayward-Winton**
Multiple parcels	3 parcels (controlled)	1 parcel	1 parcel	1 parcel	14 lots/14 owners	10 lots, 2 owners
Site control feasible	Yes	Unknown	Unknown	Unknown	May be difficult, given number of owners	Unknownn
Biological Resources						
Wetlands	Seasonal wetlands	Isolated wetland	Seasonal wetlands	None	None	None
Protected species	None	None	California red-legged frog	None	None	None
Other	None	Bird collision with t-line	Land now in conservation easement	None	None	None
Cultural Resources	None	Cargill salt works historic site	None	None	None	None
Land Use and zoning	Permitted use	Conditional Use Permit	Zoning administrator approval, height limit	Zoning administrator approval, height limit	Permitted or conditional use	Permitted Use
Noise	None	None	None	0.23 mile to residence	None	None
Traffic	Congested area	None	None	None	Congested area	Congested area
Visual	View from Bay Trail	Blocks view of salt works and Coyote Hills from train	Future Bay Trail	Residence very near, Future Bay Trail, site on major street	View from Bay Trail	View from Bay Trail
Waste Management	Minor contamination	Remove cooling pond	Open lot (contamination unknown)	Open lot (contamination unknown)	Remove salvaged vehicles, contamination	Remove salvaged vehicles, contamination
Fatal Flaw or significant unmitigated impacts?	No	No	Replacement habitat may be unavailable; conservation easement may be difficult to remove.	May be too near residences; parcel may be too small.	Site control may be difficult (many owners)	Contamination cleanup may be expensive

- **Location near a sufficient source of cooling water, preferably treated wastewater**—There is an excellent match for any one of these sites, with available recycled water. The Hayward Water Pollution Control Facility (the RCEC, Hayward-Depot, Hayward-Winton), USD Alvarado Treatment Plant (Newark, Fremont-Boyce, Fremont-Stevenson), and SBRP wastewater treatment plant (Fremont-Boyce, Fremont-Stevenson) can all provide a sufficient quantity of wastewater to cool a power plant of this size. A project at the RCEC and Hayward-Depot sites would be located adjacent to the water source, so would not require a long pipeline, as the Newark and Fremont sites would. One additional advantage of the Hayward sites is that it would also be possible to obtain backup treated wastewater from the USD downstream of their treatment plant by tapping the East Bay Dischargers Authority pipeline, which runs very near each of these sites.
- **Location near electrical transmission facilities**—Each of the sites is relatively near a feasible tie-in to the transmission system. The Hayward sites are within 1.1 to 2.5 miles of PG&E's Eastshore Substation, and from this location, can help supply much needed power to the San Francisco peninsula and City of San Francisco. It would be possible to loop into a 230-kV transmission line from Newark, and the two Fremont sites are within 0.6 miles of the Newark Substation.
- **Location near ample natural gas supply**—Each of the sites is convenient to ample natural gas supply. The two Fremont sites and the Newark site could connect with the PG&E backbone line 303. The Hayward sites would connect, via a short pipeline, to a PG&E distribution line.
- **Parcel or adjoining parcels of sufficient size for a power plant**—There is sufficient land available at each parcel to develop a power plant, except for the Fremont-Boyce site. The site is 15.89 acres in size but 6 acres are occupied by the Borden Chemical facility. This may mean that a power plant of this scale would not be feasible on this site or would require careful engineering.
- **Site control feasible**—Site control appears to be feasible for most of the sites. There are two owners of the Hayward-Winton site. The most difficult would appear to be the Hayward-Depot site, since there are 14 separate parcels with a number of different owners, and therefore site control may or may not be feasible at this site.
- **Mitigation of potential impacts feasible**—Mitigation of potentially significant environmental impacts appears feasible at each of the sites, with one or two exceptions. Visual impacts at the Fremont-Boyce site may be problematic, because it is located on a major thoroughfare and because it is very near (0.25 miles) a residential area. Also, mitigation of biological resources impacts might be difficult at the Fremont-Stevenson location. Since the property is currently in conservation easement to mitigate for the Pacific Commons development, a large amount of mitigation land would have to be provided to replace this easement and to mitigate potential site effects.

The Fremont-Boyce site may be too small for a large power plant, since much of the project site is taken up by the Borden Chemicals facility. This site may also be too near (0.25) to high-density residential uses to avoid possibly significant impacts. There may be contamination issues at Hayward-Winton and Hayward-Depot due to auto salvage operations that may be expensive to remedy. Also, at the Winton and Depot sites, it would be necessary to combine parcels of multiple ownership.

The Fremont-Stevenson parcel may pose an insurmountable obstacle in that the parcel appears to contain seasonal wetlands and to be habitat for endangered species. Replacing the conservation easement as well as providing additional mitigation might be very expensive or difficult to accomplish due to a scarcity of high quality mitigation land near the project site.

The RCEC site and Newark site appear to present the fewest potentially serious developmental and environmental constraints. Of these, the RCEC is preferred because of its closer proximity to required interconnection facilities (electrical transmission, natural gas, recycled water). Newark, would require much longer pipelines to supply cooling water and these would be expensive to construct, more difficult to permit, and would have greater construction-related impacts on wetlands, local streets, and rights-of-way. The RCEC site, in conclusion, is the most feasible site with the lowest potential environmental impact, in comparison with the other alternatives.

9.5 ALTERNATIVE PROJECT DESIGN FEATURES

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

9.5.1 Alternative Natural Gas Supply Pipeline Routes

Natural gas fuel for the RCEC will be supplied by Pacific Gas and Electric (PG&E) by a 16-inch pipeline from a major gas distribution line (Line 153) that parallels the Union Pacific Railroad tracks about a mile east of the RCEC site. PG&E's preliminary route selection report is presented in Appendix 5-A.

The nearest connection points to the PG&E transmission system lie along the Union Pacific Railroad right-of-way through Hayward. There are several potential routes to access PG&E line 153. The route most feasible, and the that the City of Hayward prefers because it offers less interference with existing underground infrastructure, would run due east along Enterprise Avenue to Clawiter Road, across Clawiter, then along an existing city sewer right-of-way that runs between the Berkeley Farms dairy processing and the Gillig bus manufacturing plants to the railroad right-of-way. Another possible connecting point is located near the intersection of Clawiter and Depot roads. There are several possible routes to reach this point, including Enterprise to Clawiter to Depot, and north across the City's Water Pollution Control Facility and private land to Viking, then north on Viking to Depot and east on Depot to the connecting point.

9.5.1.1 Selection Criteria

In general, the alternative routes for the gas supply pipeline were selected based on engineering and construction feasibility, the expected delivery pressure of the natural gas supply, length of pipeline, cost, and the potential for environmental impacts. Engineering/construction feasibility is an assessment of whether the pipeline can be physically placed along a route. Length of pipeline is important because pressure drop, cost, and potential environmental impacts are usually functions of length. Environmental impacts must be either not significant or mitigatable to a level of insignificance.

No major differences between the routes evaluated were seen with regards to engineering and construction feasibility, the expected delivery pressure of the natural gas supply, length of pipeline, and cost to construct or operate. All routes included pipeline construction along city streets that involve temporary reduction or rerouting of traffic during pipeline construction and the potential for some temporary disruption of utility services.

Since all of the candidate routes follow City streets or otherwise previously disturbed surfaces within Hayward's Industrial Corridor or an unincorporated industrial area of Alameda county, impacts to natural and/or cultural resources are not likely to be significant for any of the candidate routes. In addition, because the lengths of the candidate routes are of the same order of magnitude, noise, visual, air quality, and water quality impacts are not expected to differ significantly for the candidate routes. Pipeline

construction impacts on traffic are seen as the most important environmental impact that allows discrimination between the alternates considered. The preferred route is expected to be constructed with less disruption of traffic and streets than the other routes considered.

The selected route (east along Enterprise Avenue, across Clawiter, and along an existing pipeline right-of-way south of Berkeley Farms) was selected because this route will minimize temporary traffic impacts during construction. While nearly the entire length of Enterprise Avenue will be affected, this route has much lower traffic volumes than the alternatives.

9.5.2 Electrical Transmission System Alternatives

Calpine/Bechtel plan to connect the RCEC to the regional transmission grid at the PG&E Eastshore Substation, which is located 1.1 miles south of the project site. A 115-kV transmission line runs north-south through a transmission corridor located 0.1 miles east of the project site, and this corridor is the most feasible location for a transmission system upgrade to carry power from the RCEC.

This section describes alternatives to the proposed electrical transmission interconnection discussed in Section 6.2. One of the results of the transmission resource analysis was the development of several additional conceptual transmission interconnection options. Factors considered in the development and selection of the preferred transmission interconnection were: a) the ability of the existing transmission resources to carry the power generated by the RCEC, b) environmental consequences, c) ability to secure any additional rights-of-way (if needed), and d) engineering considerations and constraints. This location has several interconnection options that all might be feasible.

Several alternatives were identified, analyzed, and discounted due to subjective differences with the proposed transmission interconnection. Figure 6.1-2 illustrates three alternative alignment options that were considered. They are labeled A, B, and C. These alternatives are presented below. In addition several other interconnection configurations (electrical) were analyzed. The are also discussed below. Other alternatives, not discussed below, were delineated, assessed, and rejected as clearly inferior.

Alternative 1–Alignment A

Alternative 1 would involve a radial connection of the RCEC switchyard to the 230 kV bus at PG&E's Eastshore Substation with an overhead 230 kV transmission line (Alternative Route A in Figure 6.1-2). As a result of the physical layout of the plant and location of the switchyard, routing inside the facility would require the line to run along the east side the entire length of the site. The line would exit the power plant site at the southeast corner and would align along the Union Pacific railroad spur in an easterly direction for approximately 4,650 feet to the Union Pacific mainline tracks. There the line would parallel the mainline tracks in a southeasterly direction for approximately 1,950 feet to where it intersects with the San Mateo-Contra Costa (Eastshore) 230 kV transmission lines. The alignment would then parallel the existing 230 kV lines approximately 1,400 feet to the Eastshore Substation. The total length of the this alternative transmission line will be approximately 8,000 feet.

Implementation of this alternative, among other considerations, would use the corridor established by the existing railroad spur and mainline. The line would parallel the existing railroad right-of-way for approximately 6,600 feet. Placement of a 230 kV transmission line along this corridor would require placement outside (but immediately adjacent) to the railroad right-of-way. This placement may limit the available right-of-way needed to address EMF considerations, prompting the purchase and clearing of adjacent properties or other mitigative measures such as taller structures.

This alternative as with the preferred interconnection will require modifications to the Eastshore Substation to maintain system reliability. One modification would be the movement of the Eastshore-Contra Costa 230 kV line to allow the connection of both circuits of the RCEC interconnection.

This alternative was not selected because of the increased costs associated with the increase in line length and the need to purchase additional right-of-way. Additional costs would be associated with either clearing the new right-of-way or mitigative measures to address EMF concerns and nuisance effects associated with a line parallel to an active railroad.

Alternative 2–Alignment B

Alternative 2 involves looping the existing San Mateo-Pittsburg (Contra Costa) 230-kV transmission line into the RCEC switchyard. This would be accomplished with a new double circuit 230-kV transmission line (Alternative Route B in Figure 6.1-2). The line within the RCEC site would be routed to the southwest corner where it would exit the site in a southern direction. The line would be routed adjacent to the salt marshes and run approximately 3,800 feet south to the intersection of the San Mateo-Contra Costa line at tower 38/164. Figure 6.1-2 shows "B" interconnects at tower 38/164. Tower placement would occur along an existing dike separating the marshes from a saline pond.

This alternative would require securing new right-of-way for the entire length of the alignment and would result at least temporary construction impacts to the extensive saltwater wetlands present along virtually the entire length of the corridor. In addition, looping into the San Mateo-Contra Costa 230-kV line would necessitate reconductoring the entire length of the line between the Pittsburg and San Mateo Substations. Because the RCEC switchyard would be an integral part of the connection between Pittsburg (Contra Costa) and San Mateo, to maintain reliability, it is likely that this configuration would require additional land and result in other impacts associated with a breaker and one-half scheme at the RCEC switchyard. Additionally, new towers would be visible to a large group of bridge users.

This system analysis and anticipated construction impacts indicate that Alternative 2 clearly inferior to the preferred interconnection and the alternative was, therefore, rejected.

Alternative 3–Alignment C

This alternative also involves looping the existing San Mateo-Contra Costa 230 kV line into the RCEC switchyard.

This alternative has the same components and configurations as Alternative 2 with the exception of a different alignment between the RCEC switchyard and the existing San Mateo-Contra Costa transmission line. Alignment for the double circuit interconnection would be directly south out of the RCEC. As a result of the plant layout and switchyard location the interconnecting line would be routed west and then south within the plant site. Alternative 3 route alignment (see Alignment C on Figure 6.1-2) would then follow the extreme western edge of several parking lots where they adjoin the marshes approximately 3,700 feet to where it would intersect with the San Mateo-Contra Costa transmission line. Tower placement would be immediately off the paved areas in previously disturbed high ground between the parking lots and the marshes. The interconnection would be at tower 37/162 of the existing San Mateo-Eastshore 230-kV line.

This alternative would also require securing new right-of-way for the entire length of the alignment. Temporary construction impacts to the extensive wetlands along the route may occur as the right-of-way is surveyed and graded (at tower locations). However, the impacts are anticipated to be less than those anticipated in Alternative 2. In addition, looping into the San Mateo-Pittsburg (Contra Costa) 230-kV

line would also necessitate reconductoring the entire length of the line between the San Mateo and Eastshore Substation to ensure system reliability.

Following the system analysis and right-of-way evaluation, Alternative 3 was found to have environmental impacts that the preferred alignment did not. As a minimum, new towers would be visible to a large group of bridge users. Because the RCEC switchyard would be an integral part of the connection between Pittsburg (Contra Costa) and San Mateo, to maintain reliability, it is likely that this configuration would require additional land and have other impacts associated with a breaker and one-half scheme at the RCEC switchyard.

Alternative 4–Interconnection at 115 kV using the existing Eastshore-Grant 115-kV Transmission line

This alternative would loop both circuits of the existing 115-kV Grant to Eastshore line into a 115-kV RCEC switchyard. This alternative presumes that PG&E's project 667 to split this line into separate circuits has been completed. The major components of these alternatives would be:

- Rebuilding the 115-kV line between the RCEC and the Eastshore Substation. Depending on the approach chosen, the lines from Eastshore to Grant might also need to be rebuilt
- A 115-kV switchyard at the RCEC with at least seven breakers. Depending on the desired reliability, a larger switchyard might be required.
- Additional 115/230-kV transformer capability in the Eastshore substation. The existing two transformers are rated at 120 MVA each. To evacuate all the power from the RCEC during low load conditions, additional transformation capability would be required.
- Modifications to the Eastshore Substation

This alternative was rejected because the maximum continuous rating of 115-kV breakers is 3000 Amps, which is less than the 600-MW maximum nominal output of the RCEC (3662 Amps at a 0.85 power factor). If a solution to the breaker limitation could be found, the output of the RCEC would either require the reconductoring of all the 115-kV lines from Eastshore to Newark or a new Eastshore 230/115-kV transformer, or both. Even so, further upgrades to the 230-kV switchyard or the 230-kV lines at Eastshore might be required.

9.5.3 Water Supply Alternatives

The City of Hayward's wastewater treatment plant will supply water for the proposed project as described in Section 7.0. Other sources of water might include using municipal water from the City of Hayward. Due to the high quality of this water (very pure water from the City of San Francisco's Hetch Hetchy Reservoir in the Sierra Nevada Mountains) and its resulting suitability for other uses, and the availability of treated wastewater at a reasonable price, this alternative was not chosen. Well water would be another possible source of cooling water. Treated wastewater is clearly the better alternative, however, due to the expense of drilling wells, and the low quality of groundwater in the East Bay margins, particularly near the Bay itself, where saltwater intrusion is frequently a problem.

9.5.4 Wastewater Disposal Alternatives

Wastewater produced by the RCEC will be disposed of at City of Hayward's treatment plant through a 12-inch return line that will parallel the supply line from the treatment plant. Since the wastewater is

being returned to its original source and both supply and return water pipelines would be placed in the same trench, no wastewater disposal alternatives were evaluated.

In addition to alternatives that would use water for cooling, zero discharge was considered. A zero discharge alternative has the potential for significant impacts that may or may not be reduced to a level of insignificance. These different impacts result, in part, from the fact that a zero discharge system would require the addition of several plant design features:

- Raw water pretreatment to soften the water and allow operation of the cooling tower at higher cycles of concentration, thereby reducing the volume of cooling tower blowdown produced.
- Process equipment employing evaporation and crystallization technology to reduce the volume of wastewater and produce reusable water.
- Additional water reuse loops in the plant water management design.
- Sludge dewatering equipment and off-site sludge disposal.

Addition of the necessary processes and equipment to implement the zero discharge alternative would result in increased capital cost, increased operating and maintenance cost, additional auxiliary power consumption, and additional site space requirements. This alternative also significantly increases on-site chemical handling and storage requirements and produces large quantities of sludge that must be properly disposed of off-site. These disadvantages were found to outweigh the water saving advantage of the zero discharge alternative.

9.6 TECHNOLOGY ALTERNATIVES

The configuration of the RCEC was selected from a wide array of technology alternatives. These include generation technology alternatives, fuel technology alternatives, combustion turbine alternatives, NO_x control alternatives, inlet air cooling alternatives, and heat rejection alternatives.

9.6.1 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. The following provides a discussion of the suitability of such technologies for application to the RCEC.

9.6.1.1 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. Due to this low efficiency, the conventional boiler and steam turbine technology was eliminated from consideration.

9.6.1.2 Simple Cycle Combustion Turbine

This technology uses a combustion turbine to drive a generator. Combustion turbines have relatively low capital cost, and aeroderivative units are able to achieve thermal efficiencies up to approximately 38 percent. Due to its quick startup capability and relatively low capital cost, this technology is used primarily in peaking application (less than 1,000 hours per year), where relatively low efficiency is not an overriding concern. Due to its relatively low efficiency, this technology tends to emit more air pollutants per kilowatt-hour generated than more efficient technologies. Due to less than optimal environmental

performance and relatively low efficiency, the simple-cycle combustion turbine technology was eliminated from consideration.

9.6.1.3 Conventional Combined Cycle

This technology integrates combustion turbines and steam turbines to achieve higher efficiencies. The combustion turbine's hot exhaust is passed through an HRSG to create steam used to drive a steam turbine-generator. This technology is able to achieve thermal efficiencies up to approximately 52 percent, considerably higher than most other alternatives. This high efficiency also results in relatively low air emissions per kilowatt-hour generated. For these reasons, the conventional combined cycle is considered the benchmark against which all other base load and intermediate load technologies are compared. Due to its high efficiency and superior environmental performance, this technology was selected for the RCEC as well as for most other new base load and intermediate load power plants being developed in the United States.

9.6.1.4 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. However, because this technology is still in the development phase and has not been commercially demonstrated, it was eliminated from consideration.

9.6.1.5 Advanced Combustion Turbine Engines

There are a number of efforts to enhance the thermal efficiency of combustion turbines by injecting steam, intercooling, and staged firing. These include the steam injected gas turbine (STIG), the intercooled steam recuperated gas turbine (ISRGT), the chemically recuperated gas turbine (CRGT), and the humid air turbine (HAT) cycle. The STIG it less efficient than conventional combined cycle technology and is only able to achieve thermal efficiencies up to approximately 40 percent. None of the remaining technologies, ISRGT, CRGT or HAT, is commercially available. Consequently, all of these technologies were eliminated from consideration.

9.6.2 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 Alameda County.
- Biomass fuels such as wood waste are not locally available in sufficient quantities to make them a practical alternative fuel.
- Solar and wind technologies are generally not dispatchable and are therefore not capable of producing ancillary services other than reactive power.
- 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.

9.6.3 Combustion Turbine Alternatives

The latest generation of commercially demonstrated combustion turbine generator (CTG) technology, commonly referred to as "F" technology, was selected for the RCEC. Selection of this class of combustion turbines was based on economies of scale, thermal efficiency, operational flexibility, and status of commercial demonstration.

For an overall combined cycle output of 600 MW, total combustion turbine output should be in the range of 400 MW. With this target in view, combustion turbine selection focused on models larger than 80 MW in order to take advantage of economies of scale. In addition, many of such larger combustion turbine models offer thermal efficiencies that are equivalent or superior to the efficiencies of smaller models.

Currently available, large combustion turbine models can be grouped into three classes: conventional, advanced, and next generation. Conventional combustion turbines operate at firing temperatures in the range of 2000°F to 2100°F and are available in sizes up to about 110 MW. Advanced combustion turbines operate at firing temperatures above 2300°F and are available in sizes up to about 160 MW. Next generation combustion turbines have higher firing temperatures than the advanced turbines and have additional features that provide greater output and higher efficiencies. Next generation turbines represent models that has been announced by the manufacturers as commercially available, with advertised outputs in the range of 230 to 240 MW.

Examples of commercially available combustion turbines in each class are shown in Table 9-3.

Table 9-3. Combustion turbines.

Manufacturer	Conventional	Advanced	Next Generation
ABB	GT 11N2	GT 24	None
GE	7EA	7FA	7H
Siemens-Westinghouse	W501.F	W501.F Phase 2	W501.G

Advanced combustion turbines offer significant advantages for the proposed project. Their higher firing temperatures offer higher efficiencies than conventional combustion turbines. They offer proven technology with numerous installations and extensive run time in commercial operation. Emission levels are also proven, and guaranteed emission levels have been reduced based on operational experience and design optimization by the manufacturers. In comparison, environmental performance and thermal efficiencies of next generation turbines have not been demonstrated in commercial operation. Furthermore, next generation turbines may not be suitable for the frequent startups and periods of low load operation anticipated for the RCEC. The CTG's selected for the RCEC are the Siemens-Westinghouse "F" technology CTG's.

9.6.4 NO_x Control Alternatives

To minimize NO_x emissions from the RCEC, the CTGs will be equipped with dry low NO_x combustors and the HRSGs will be equipped with post-combustion selective catalytic reduction (SCR) using aqueous ammonia as the reducing agent. The following combustion turbine NO_x control alternatives were considered:

- Steam injection (capable of 25 to 42 ppm NOx).

- Water injection (capable of 25 to 42 ppm NOx).
- Dry low NOx combustors (capable of 9 to 25 ppm NOx).

Dry low NO_x combustors were selected because they provide for lower NO_x emissions and lower HRSG makeup water requirements.

Two post-combustion NO_x control alternatives were considered:

- SCR.
- SCONOx

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.

$SCONO_x$™ is a new technology and has been installed on a 25 MW combined cycle plant since December 1996. $SCONO_x$™ consists of an oxidation catalyst, which oxidizes CO to CO_2 and NO to NO_2. The NO_2 is adsorbed onto the catalyst, and the catalyst is periodically regenerated. Although a potentially promising technology, $SCONO_x$™ has not been commercially demonstrated on a large power plant. There are several technological and commercial issues remaining to be resolved prior to application of this new technology to the class of large combustion turbines selected for the proposed 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 other diluted forms of ammonia. Aqueous ammonia (a 28 percent ammonia, 72 percent water solution) is proposed for the RCEC because of its safety characteristics. Urea has not been commercially demonstrated for long-term use with SCR and was therefore eliminated from consideration.

9.6.5 Inlet Air Cooling Alternatives

Combustion turbine output and efficiency both increase as inlet air temperature decreases. Ambient air temperatures for the proposed project are sufficiently high for a large portion of the year to warrant some form of inlet air cooling. Two common forms of combustion turbine inlet air cooling are evaporative cooling and air chilling.

Evaporative cooling is capable of cooling to temperatures near the ambient wet-bulb temperature. Air chilling is capable of cooling to temperatures far below the ambient wet-bulb temperature, and it is able to maintain a low temperature over a wide range of ambient conditions. Air chilling uses mechanical or absorption refrigeration to produce a cold fluid for cooling of the inlet air, and its capital cost greatly exceeds the cost of evaporative cooling. Air chilling systems may be designed to operate continuously or they may be designed to produce ice or cold water during off peak periods for cooling of the inlet air during peak periods.

Based on temperature profiles at the proposed site, evaporative cooling via an inlet air fogging system was selected for the RCEC to optimize output and efficiency versus capital cost. If warranted by market conditions, the more expensive air chilling alternative may be retrofitted in the future.

9.6.6 Heat Rejection Alternatives

The RCEC will employ a surface condenser cooled by circulating water, with heat rejection provided by a mechanical draft, wet cooling tower. An air-cooled condenser was considered as an alternative. The wet cooling tower was found to be the most cost-effective heat rejection system and produces the highest plant efficiency.

The advantages of an air-cooled condenser are reductions in makeup water requirements, water vapor plume, and cooling tower drift. Plume and drift are not completely eliminated because, even if an air-cooled condenser is used, a wet cooling tower is still required to provide cooling water for plant auxiliaries such as generator coolers and lubrication oil coolers.

Condenser performance is inversely related to the temperature of the cooling medium. The local climate in the project area is characterized by high dry-bulb temperatures and low wet-bulb temperatures (i.e., low relative humidity). Consequently, the performance of an air-cooled condenser (which is inversely related to dry-bulb temperature) is poor compared to the performance of a surface condenser cooled by circulating water (which is inversely related to wet-bulb temperature). The air-cooled condenser's relatively poor performance results in relatively high steam turbine backpressure, which negatively impacts steam turbine output and efficiency. This negative impact causes a decrease in overall plant output and efficiency. The air-cooled condenser also uses more auxiliary power due to the greater number and horsepower of its fans as compared to the wet cooling tower. As a result, net plant output and efficiency are further reduced. In addition, the capital cost of an air-cooled condenser greatly exceeds the cost of a surface condenser, circulating water system, and wet cooling s.

The air-cooled condenser's disadvantages of reduced plant output, reduced plant efficiency, and higher capital costs were found to outweigh the advantage of reduced water consumption.