SECTION 6.0

Alternatives

6.1 Introduction

The following section discusses alternatives to the GWF Tracy Combined Cycle Power Plant (GWF Tracy) as proposed in this Application for Certification (AFC). These include the "no project" alternative, power plant site alternatives, linear facility route alternatives, and technology alternatives. These alternatives are discussed in relation to the environmental, public policy, and business considerations involved in developing the project. The main objective of GWF Tracy is to produce economical, reliable, and environmentally sound electrical energy in the San Joaquin County and City of Tracy areas.

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)]. GWF Tracy is the type of project that was envisioned by this code section. GWF Tracy would be sited at the existing Tracy Power Plant (TPP) (01-AFC-16), and will be utilizing a significant portion of TTP's infrastructure.

Due to this strong relationship, evaluation of alternative sites outside the boundaries of the TPP is not legally required. However, in order to provide some level of information to the California Energy Commission (CEC) staff, a discussion of alternative sites has been provided.

6.2 Project Objectives

The objectives of GWF Tracy are to develop an electrical generating facility that:

- Meets the expanding need for efficient and reliable electrical generating resources located in the load center of the San Joaquin County and City of Tracy region.

- Accomplishes "brownfield" redevelopment and expansion of an existing power plant for a net increase in electrical generation capacity of 145 megawatts (MW) to support electrical system and local resource supply requirements in San Joaquin County and the City of Tracy. The California Public Utility Commission (CPUC) has a state preference for "brownfield" power projects pursuant to Decision No. 04-12-048.
- Provides additional electrical capacity in the San Joaquin County and City of Tracy area while reducing emissions of greenhouse gases through more efficient electrical generation.
- Utilizes existing TPP infrastructure to reduce environmental impacts and costs. The infrastructure at TPP will support GWF Tracy with only minor changes needed. A new electrical interconnection will be required, and installation of two termination structures outside the current project boundaries will be added as part of the project.

GWF Tracy meets all of these siting objectives.

GWF Tracy would provide power to the grid to help meet the demand for electricity and to help replace less-efficient fossil fuel generation resources retired because of age or cost of producing power. GWF Tracy would enhance the reliability of the state's electrical system by providing power generation near the centers of electrical demand. In addition, as demonstrated by the analyses in this AFC, the project would not result in any significant environmental impacts. Therefore, there are no alternative sites that would be preferred over the project as proposed.

6.2.1 Project Overview

The GWF Tracy site was chosen by the Applicant based on its physical, environmental, and land use characteristics consistent with the project objectives previously discussed. The GWF Tracy site consists of 16.38 acres within a 40-acre parcel in San Joaquin County. The GWF Tracy site is located within an industrial and agricultural area and includes the existing TPP. The San Joaquin County General Plan designates the project site as General Agriculture and the County Zoning Designation is AG 40, which allows electrical generation facilities. The site is bounded by the Delta-Mendota Canal to the southwest, agricultural property to the south and east, and the Union Pacific Railroad to the north. Immediately north of the railroad are the Owens-Brockway glass container manufacturing plant and the Nutting-Rice warehouse. The Tracy Biomass power plant is approximately 0.6 mile northwest of the site.

GWF Tracy will use the existing TPP infrastructure to reduce environmental impacts and costs. This infrastructure includes the existing natural gas line, water supply pipeline, and 115-kilovolt (kV) transmission line, and the relocation of the existing stormwater retention basin and equipment storage area. GWF Tracy will require a new electrical interconnection with two termination structures. There will also be a new equipment storage area that will be added outside the current TPP footprint, but within area that was previously disturbed during construction of the TPP. The three short segments of the transmission line (downstream of the first point of interconnection) will require reconductoring (totaling approximately 3 miles). The reconductoring segment include the 0.7 mile of transmission line adjacent to the GWF Tracy site, and two segments, approximately 1.6 miles and

0.7 mile, respectively, near the intersection of I-5 and I-205 near the Kasson Substation (see Figure 1.1-3).

Process water would be supplied by the existing pipeline from the Delta-Mendota Canal by the Byron Bethany Irrigation District. Drinking water for the facility would be provided by a local bottled-water vendor. The plant would be a near-zero wastewater discharge facility.

6.3 The "No Project" Alternative

If the Applicant were not to build GWF Tracy (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 GWF Tracy. In addition, the "no project" alternative would result in more energy production from the existing onsite power plant at a lower thermal efficiency. This would have negative economic consequences for the region's commercial and residential rate-payers and for the regional economy. The "no project" alternative would also result in higher greenhouse gas emissions per megawatt of electricity generated as compared to the proposed project.

In summary, the "no project" alternative would not serve the growing needs of San Joaquin County, the City of Tracy, and California's businesses and residents for economical, reliable, and environmentally sound generation resources.

6.4 Proposed and Alternative Sites

To meet the requirements of the California Environmental Quality Act (CEQA) and Title 20, an alternative site analysis was performed to determine if it was possible to feasibly attain most of the project's basic objectives. The key siting criteria in considering these alternatives and the proposed GWF Tracy site included the following factors:

- Meet the expanding need for efficient and reliable electrical generating resources located in the load center of the San Joaquin County and City of Tracy region.
- Accomplish "brownfield" redevelopment and expansion of an existing power plant for a net increase in electrical generation capacity to support electrical system and local resource supply requirements in San Joaquin County and the City of Tracy. The CPUC has a state preference for "brownfield" power projects pursuant to Decision No. 04-12-048.
- Provide additional electrical capacity in the San Joaquin County and City of Tracy area while reducing emissions of greenhouse gases on an electrical generation basis.
- Utilize existing TPP infrastructure to reduce environmental impacts and costs. The infrastructure at TPP will support GWF Tracy with only minor changes needed.
- Site control (lease or ownership) feasibility.

6.4.1 Proposed Site

The proposed site for GWF Tracy on Assessor's Parcel Number 799-000-45, in unincorporated San Joaquin County, meets all of the project's objectives and, in addition,

would have no significant, unmitigated, environmental impacts. The proposed site is 16.38 acres and is owned by GWF. The GWF Tracy site has the following attributes:

- It is located near the centers of demand for maximum efficiency and system benefit.
- It incorporates reuse of land within the existing TPP site for the siting of additional equipment, and will only require off-TPP footprint construction of two termination structures and the stormwater retention pond.
- The conversion of the TPP from a simple-cycle to a combined-cycle plant would result in a net decrease of greenhouse gases produced since more megawatts can be generated using the same amount of fuel (natural gas).
- It will be located within the boundaries of the existing TPP site, and will use the existing natural gas, transmission line, potable water, and non-potable water utilities for the site.
- GWF owns the proposed parcel, as well as buffer property around the site.

6.4.2 Alternative Sites

The Applicant evaluated whether there are other sites for GWF Tracy that could potentially attain most of the basic project objectives of GWF Tracy as outlined above. Potential sites outside the existing TPP site do not attain the basic project objective to expand an existing facility and use the existing infrastructure available at TPP.

In addition, through the use of the modern, high-efficient, low-air-emission, natural gas-fired, combined-cycle technology that uses air-cooled condensers rather than water sources for cooling, GWF Tracy has significant environmental benefits.

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

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

6.5 Alternative Project Design Features

The following section addresses alternatives to some of the GWF Tracy 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

Because an existing high-pressure natural gas line and metering station is available onsite, no other alternatives are deemed feasible for consideration.

6.5.2 Electrical Transmission System Alternatives

Because an existing 115-kV tie-in is available onsite, no other alternatives are deemed feasible for consideration. Two termination structures will be added outside of the existing TPP boundaries for GWF Tracy.

6.5.3 Water Supply Alternatives

The Tracy Wastewater Treatment Plant produces tertiary treated/Title 22 water that could be used by the GWF Tracy, however, the treatment plant is approximately 12 miles from the project site. The small quantities of additional water needed for GWF Tracy (24.9 acre-feet per year), and the construction costs of the new water supply pipeline make the use of this water prohibitively expensive, and, therefore, an additional alternatives analysis was not performed for the use of this water. Instead, GWF Tracy would use the existing onsite process water supply pipeline at the TPP plant.

As discussed in Section 5.15, Water Resources, State Water Resources Control Board Resolution 75-58 and CEC's freshwater policy preclude the use of fresh water for cooling purposes unless alternative water supply sources and alternative cooling technologies are shown to be "environmentally undesirable" or "economically unsound." Only a very small increase in water consumption will be associated with the project because it does not involve a cooling tower, as discussed in Section 5.15.3.4.1. Moreover, GWF Tracy's limited water demand can be met by the property's existing water allocation, thereby eliminating the need to procure additional water supplies or construct new water supply infrastructure, such as pipelines.

As discussed previously, even if additional wastewater were to become available, it would be economically infeasible for the project to construct a pipeline to utilize wastewater from the Tracy Wastewater Treatment Plant. In addition, the construction of such a pipeline and related water supply infrastructure could significantly increase environmental impacts related to water quality, air quality, soils, traffic, and biological resources. Therefore, GWF Tracy's use of the property's existing water allocation eliminates the need to construct new water supply infrastructure that would be both "environmentally undesirable" and "economically unsound."

6.6 Technology Alternatives

The configuration of GWF Tracy was selected from a wide array of technology alternatives. These include generation technology alternatives and fuel technology alternatives. Alternative technologies were evaluated with respect to commercial availability, implementability, and cost-effectiveness.

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. A discussion of the suitability of such technologies for application to GWF Tracy follows.

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 can 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 the large space

requirement, the conventional boiler and steam turbine technology was eliminated from consideration.

6.6.1.2 Conventional Simple-cycle Combustion Turbine

This technology uses a gas or combustion turbine to drive a generator. Air is compressed in the compressor section of the combustion turbine, and then passed into the combustion section where fuel is added and ignited. The resulting hot combustion gases pass through a turbine, which drives a generator. The combustion turbines have a relatively low capital cost and have efficiencies approaching 44 percent in the larger units (General Electric's LMS100). Because they are fast-starting and have a relatively low capital cost, they are used primarily for meeting high peak demand (about 1,000 hours per year), where their relatively low efficiency compared to combined-cycle technology is acceptable for peaking capacity, but not necessarily for base load capacity. The technology is commercially available and could be implemented. However, due to its lower efficiency compared to the selected combined-cycle technology, it will emit a greater quantity of air pollutants and greenhouse gases per kilowatt hour generated. Also, the incremental cost of generation would be higher.

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. However, for completeness, a discussion of these types of alternatives is provided below.

6.6.2.1 Nuclear

Nuclear technology includes nuclear fission and nuclear fusion. Nuclear fission breaks atomic nuclei apart, giving off large quantities of energy. For nuclear fission, pressurized water reactors, and boiling water reactors are commercially available. California law prohibits new nuclear plants until the scientific and engineering feasibility of disposal of high-level radioactive waste has been demonstrated. To date, neither the Nuclear Regulatory Commission nor the CEC have been able to make the findings of disposal feasibility required by law for this alternative to be viable in California. Nuclear fission would also require very large quantities of fresh water for cooling. The technology is not implementable, and, therefore, it was eliminated from consideration.

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

6.6.2.2 Water

Hydroelectric and geothermal technologies use water as fuel; they are discussed in more detail below.

6.6.2.2.1 Hydroelectric

This technology uses falling water to turn turbines that are connected to generators. A flowing river or, more likely, a dammed river, is required to obtain the falling water. This technology is commercially available. However, most of the sites for hydroelectric facilities

have already been developed in California, and any remaining potential sites face formidable environmental licensing problems. Therefore, this technology was eliminated from consideration.

6.6.2.2.2 Geothermal

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

6.6.2.3 Biomass

Major biomass fuels include forestry and mill wastes, agricultural field crop and food processing wastes, and construction and urban wood wastes. Several techniques are used to convert these fuels to electricity, including direct combustion, gasification, and anaerobic fermentation. While these technologies are available commercially on a limited basis, their cost tends to be high relative to a combined-cycle unit burning natural gas. Therefore, this technology was eliminated from consideration.

6.6.2.4 Solar

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

6.6.2.4.1 Solar Thermal

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

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

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

Another solar system with good commercial prospects is the Dish/Engine (D/E) system. This system is a solar collection/concentration array coupled to a Stirling engine. A D/E system collects solar energy in a similar manner. However, instead of the concentrators

heating a working fluid that is directed to a turbine generator, it heats a working gas in a Stirling engine/generator. The Stirling engine/generator works like a standard engine generator, with pistons being moved by the heated gases (from energy concentrated by the collector). Individual D/E systems range in size from 9 to 25 kilowatts and can be grouped to provide large efficient systems.

Solar thermal technologies require considerable land for the collection receivers and are best located in areas of high solar incidence. Land requirements for concentrating solar technologies are on the order of 5 acres per megawatt. Based on the GWF Tracy site size of approximately 16.3 acres, these technologies would not be able to generate a fraction of the electricity currently generated by the TPP.

In addition, solar power is typically only generated while the sun shines, so the units do not supply power when clouds obscure the sun or from early evening to late morning.[1] Based on a combination of the factors above, solar thermal technology was eliminated from consideration.

6.6.2.4.2 Solar Photovoltaic

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

6.6.2.5 Wind

This technology uses a wind-driven rotor (propeller) to turn a generator and generate electricity. Only limited sites in California have an adequate wind resource to allow for the installation of wind generators, and most of these sites have already been developed or are remote from electric load centers and have limited or no transmission access. Even in prime locations, the wind does not blow continuously, so capacity from this technology is not always available. In California, the average wind generation capacity factor has been approximately 22 percent (CEC, 2005). In addition, depending on the site and/or season, the technology cannot be relied upon to be available at system peak load, since the peak may occur when the wind is not blowing. The technology is commercially available and implementable at certain sites. The technology is relatively benign environmentally, although at some sites, land consumption and effects on visual resources and avian species are a concern. Due to the limited dependability and relatively high cost, this technology was eliminated from consideration.

6.7 References

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

[1] However, recently the Solar 2 plant near Barstow, California, successfully generated electricity. Solar Two successfully demonstrated power delivery to the electric grid continuously for nearly 7 days before cloudy weather interrupted operation.