SECTION 10.0

Engineering

This section and its related appendices, together with Sections 2, 5, 6, and 7, present information concerning the design and engineering of the Humboldt Bay Repowering Project (HBRP). Section 10.1 describes the design of the project facilities with reference to Section 2, Project Description. Section 10.2 discusses the reliability of the HBRP, and Section 10.3 presents the estimated thermal efficiency of the facility. Section 10.4 describes the laws, ordinances, regulations, and standards (LORS) applicable to the HBRP engineering, and Section 10.5 identifies agencies that have jurisdiction, and provides the contact persons within those agencies. Section 10.6 contains references cited.

10.1 Facility Design

Detailed descriptions of the HBRP are provided in Section 2.5. Design for safety is provided in Section 2.6, Facility Safety Design.

Summary descriptions of the design criteria are included in: Appendix 10A, Civil Engineering Design Criteria; Appendix 10B, Structural Engineering Design Criteria; Appendix 10C, Mechanical Engineering Design Criteria; Appendix 10D, Electrical Engineering Design Criteria; Appendix 10E, Control Engineering Design Criteria; and Appendix 10F, Chemical Engineering Design Criteria. A geotechnical assessment of the HBRP site is included in Appendix 10G, Geologic and Foundation Design Criteria.

Design and engineering information and data for the following systems are found in the following parts of the Application for Certification (AFC):

- **Power Generation**—See Section 2.5.4 regarding the reciprocating engine generator sets and Appendix 10C and Sections 2.5.5 through 2.5.13, and Appendix 10D, which describe the various plant auxiliaries.
- **Heat Dissipation**—See Section 2.5.8, Air Radiator Cooling System, and Appendix 10C.
- **Process Water Supply System**—See Sections 2.5.7, Water Supply and Use; 2.5.8, Air Radiator Cooling System; and 8.15, Water Resources; and Appendix 10F.
- **Air Emissions Control Systems**—See Sections 2.5.11, Emissions Control and Monitoring; and 8.1, Air Quality.
- **Waste Disposal Systems**—See Sections 2.5.9 and 8.14, Waste Management.
- **Noise Abatement Systems**—See Section 8.7, Noise; and Appendix 10C.
- **Switchyard/Transformer Systems**—See Sections 2.5.5, Major Electrical Equipment and Systems; 2.5.13.2, Grounding; 2.5.14, Interconnection to Electrical Grid; 5, Electrical Transmission; and Appendix 10D, Electrical Engineering Design Criteria.

10.2 Reliability

This section discusses the availability of fuel, the expected service life of the plant, and the degree of reliability to be achieved by the HBRP.

10.2.1 Fuel Availability

The reciprocating engines will be designed to burn natural gas but will also be capable of burning liquid fuels. Natural gas supply from the project comes from Pacific Gas and Electric Company's (PG&E's) regional supply, which is connected with the PG&E backbone, 145 pipeline miles to the east. Additional gas comes from wells at nearby Tomkins Hill.

The project area's natural gas supplies are limited, such that the existing Humboldt Bay Power Plant is required to reduce gas usage when the average temperature drops below 50 ^{o}F, which may occur during the winter months (December through March). When this takes place, the existing plant generally switches to a backup fuel, No. 6 fuel oil, or merely curtails load on one or two of the steam turbines and run the mobile emergency power plants, which burn distillate fuel.

To meet the contingency of potential wintertime natural gas shortages and other unforeseen events, the HBRP is designed for dual fuel capability and will have a four-day backup supply (assuming output of 100 MW) of California Air Resources Board- (CARB-) certified diesel fuel on site (634,000 gallons). CARB-certified diesel fuel is available from local distributors in sufficient quantities to support the planned use.

10.2.2 Plant Availability

The HBRP has the capability to be operated 7 days a week, 24 hours per day and is expected to have an annual plant availability of 90 to 97 percent. It will be possible for plant availability to exceed 97 percent for a given 12-month period. PG&E expects to operate the HBRP primarily as a load following and cycling unit to meet local area load and reliability requirements. The exact operational profile of the plant, however, cannot be defined in detail since operation of the facility depends on local area load, transmission system status, operations of near-by qualifying facilities under contract with PG&E, and future renewable resources being developed in the Humboldt region.

HBRP will be designed for an operating life of 30 years. Reliability and availability projections are based on this operating life. Operation and maintenance procedures will be consistent with industry standard practices to maintain the useful life status of plant components.

The HBRP will be designed to ensure high reliability, including the redundancy of critical components (see Section 2.3.2, Redundancy of Critical Components).

Deterioration of output capacity and efficiency of the HBRP over time, called performance degradation, is expected to be on the order of 2 to 3 percent over a 10-year period. Cleaning, maintenance, or overhaul will recapture some the loss. Over the expected 30-year life of the facility, the estimated total, non-recovered loss in output and efficiency will be on the order of 1 percent.

10.3 Efficiency

The maximum thermal efficiency that can be expected from each individual engine-generator set is approximately 45 to 47 percent. This level of efficiency will be achieved by the HBRP when the generator sets are operating at 75 to 100 percent of base load. Other types of operations, particularly those at less than 75 percent of full output, will result in lower efficiencies.

The maximum annual generation from the facility, based on the expected permitted operating limits, estimated to be between 350 and 1,059 gigawatt hours.

10.4 Laws, Ordinances, Regulations, and Standards

The LORS that are applicable to the design of the HBRP are referenced in Table 10.4-1 below. LORS applicable to the environmental areas of the AFC (Sections 8.1 through 8.16) are contained within each of the environmental sections. The project will conform to all of these LORS.

TABLE 10.4-1
Applicable Laws, Ordinances, Regulations, and Standards

LORS	Location in AFC for Facility Design Compliance	Conformance
Federal		
Occupational Safety and Health Act (OSHA)—29CFR1910 and 29CFR126	Section 10	Meet Requirements
Environmental Protection Agency (EPA)—40CFR60, 40CFR75, 40CFR112, 40CFR302, 40CFR423, 40CFR50, 40CFR100, 40CFR260, 40CFR300, and 40CFR400	Section 8 & 10	Meet Requirements
Federal Aviation Administration (FAA)—Obstruction Marking and Lighting AC No. 70/74601H	Section 6 & 10	Meet Requirements
California		
California Code of Regulations (CCR)—Title 8, Sections 450 and 750 and Title 24 (also known as the California Building Code), 1995, Titles 14, 17, 19, 20, 22, 23, and 26.	Section 10	Meet Requirements
California Department of Transportation (Cal-DOT)—Standard Specifications	Section 10	Meet Requirements
California Occupational Safety and Health Administration (Cal-OSHA)—Regulations and Standards	Section 10	Meet Requirement
California Business and Professions Code—Sections 6704, 5730, and 6736	Section 10	Meet Requirements
California Vehicle Code—Section 35780	Section 10	Meet Requirements
California Labor Code—Section 6500	Section 10	Meet Requirements

TABLE 10.4-1
Applicable Laws, Ordinances, Regulations, and Standards

LORS	Location in AFC for Facility Design Compliance	Conformance
Local		
Humboldt County—Regulations and Ordinances	Section 10	Meet Requirements
Industrial		
Civil Engineering Design Criteria	Appendix 10A	Meet Design Criteria
Structural Engineering Design Criteria	Appendix 10B	Meet Design Criteria
Mechanical Engineering Design Criteria	Appendix 10C	Meet Design Criteria
Electrical Engineering Design Criteria	Appendix 10D	Meet Design Criteria
Control Engineering Design Criteria	Appendix 10E	Meet Design Criteria
Chemical Engineering Design Criteria	Appendix 10F	Meet Design Criteria
Geologic and Foundation Design Criteria	Appendix 10G	Meet Design Criteria

The Section 10 appendices contain the discipline design criteria that will be used in design. Appendix 10A and Appendix 10B address the physical design criteria for the site-related features, structures, and foundations of the HBRP.

Appendices 10C through 10F provide the design criteria for the HBRP system and equipment, including the codes and standards that apply to the design, materials, fabrication and erection of the system and equipment.

Appendix 10G, Geologic and Foundation Criteria, discusses foundation design criteria. The project geotechnical report and the results of a subsurface investigation, laboratory testing program, and geotechnical assessment for the HBRP are in progress and a preliminary report is included as an attachment to Appendix 10G. The final geotechnical report is expected to be available by November 2006.

10.5 Involved Agencies and Agency Contacts

Building permits for the HBRP would be issued by the California Energy Commission's Delegate Chief Building Official (CBO). A detailed schedule for submittal of all plans and specifications that require review by the CBO will be prepared well in advance of the start of construction of the HBRP. Compliance with the Humboldt County building code requirements will also be met. A point of contact for the Humboldt County CBO is provided in Table 10.5-1.

TABLE 10.5-1
Agency Contacts

Agency	Contact	Telephone
Humboldt County County Building Official	Todd Sobolik	(707) 445-7245