APPENDIX 10D

Electrical Engineering Design Criteria

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10D.1 Introduction

This appendix summarizes the codes, standards, criteria, and practices that will be generally used in the design and construction of electrical engineering systems for the City of Vernon Power Plant. More specific project information will be developed during execution of the project to support detailed design, engineering, material procurement, and construction specifications.

10D.2 Codes and Standards

The design of the electrical systems and components will be in accordance with the laws and regulations of the federal government, State of California, City of Vernon ordinances, and industry standards. The current issue or revision of the documents at the time of the filing of this Application for Certification (AFC) will apply, unless otherwise noted. If there are conflicts between the cited documents, the more conservative requirement shall apply.

The following codes and standards are applicable to the electrical aspects of the power facility.

- American National Standards Institute (ANSI)
- American Society for Testing and Materials (ASTM)
- Anti-Friction Bearing Manufacturers Association (AFBMA)
- California Building Standards Code 2001
- California Electrical Code 1998
- Insulated Cable Engineers Association (ICEA)
- Institute of Electrical and Electronics Engineers (IEEE)
- Illuminating Engineering Society (IES)
- National Association of Corrosion Engineers
- National Electrical Code (NEC)
- National Electrical Manufacturers Association (NEMA)
- National Electrical Safety Code (NESC)
- National Fire Protection Association (NFPA)
- Underwriters Laboratories, Inc. (UL)

10D.3 Switchyard and Transformers

10D.3.1 Switchyard

One 230-kV switchyard will be included at the City of Vernon Power Plant (VPP) site. Each combustion turbine generator unit and the steam turbine generator will connect to the switchyard via a generator step-up transformer

The switchyard will consist of SF6 Gas Insulated Switchgear (GIS) arranged in a breaker and a half switching scheme for the transformer connections to the grid. Surge arresters will be provided for the outgoing lines in the area of the takeoff towers.

The switchyard will be located close to the main step-up transformers and will require several underground solid dielectric cable connections.

The GIS breakers will be supplied with current transformers. Disconnect switches will be located on each side of the breakers to isolate the breaker, and one switch will be provided for each line termination or transformer connection for isolation of the lines or transformer for maintenance. Connections between the GIS SF6/air bushings and outgoing lines will be by ACSR, cables. Cables will meet all electrical and mechanical design requirements. Instrument transformers (current and voltage transformers) will be included for protection and synchronization. The switchyard design will meet the requirements of the National Electrical Safety Code—ANSI C2.

A grounding grid will be provided to control step and touch potentials in accordance with IEEE Standard 80, Safety in Substation Grounding. All metallic equipment, structures and fencing will be connected to the grounding grid of buried conductors and ground rods, as required for personnel safety. The switchyard ground grid will be tied to the plant ground grid.

Lightning protection will be provided by shield wires and/or lightning masts. The lightning protection system will be designed in accordance with IEEE 998 guidelines.

All faults will be detected, isolated, and cleared in a safe and coordinated manner as soon as practical to ensure the safety of equipment, personnel, and the public. Protective relaying will meet IEEE requirements and will be coordinated with the utility.

Each bus will be protected with a bus differential scheme. Each outgoing line will be provided with redundant high speed relay systems with transfer trip capability. Transmission lines will have microprocessor based distance relays with communication capability to the remote substation. Relay equipment for the remote ends are not included in this scope.

Each circuit breaker will be provided with independent breaker failure relay protection schemes.

Interface with the utility supervisory control and data acquisition (SCADA) system will be provided. Interface will be at the interface terminal box and RTU. Communication between the facility switchyard and the substation at the other end of the overhead transmission lines will be included. Remote Terminal Units (RTUs) will allow interface and remote control of the switchyards.

Revenue metering will be provided on the 230-kV transmission line(s) to record net power to or from the switchyard. Meters and the metering panel will be provided.

10D.3.2 Transformers

The generators will be connected to the 230-kV switchyard through main step-up transformers. The step-up transformers will be designed in accordance with ANSI standards

C57.12.00, C57.12.90, and C57.91. The main transformers will be two-winding, delta-wye, OA/FA/FA. The neutral point of HV winding will be solidly grounded. Each main step-up transformer will have metal oxide surge arrestors connected to the HV terminals and will have manual de-energized ("no-load") tap changers located in HV windings.

The auxiliary power to the plant will be provided by three 16.5-kV to 4.16-kV unit auxiliary transformers. The high voltage side (16.5 kV) of the unit auxiliary transformers will be connected to the outputs of each of the combustion turbine generators.