8.7 120-V AC POWER SUPPLY AND DISTRIBUTION

8.7.1 Power Generation Objective

The objective of the 120-V AC Power Supply and Distribution System is to supply both safety related and non-safety related 120-V AC power to all equipment and instrumentation requiring it during all modes of plant operation.

8.7.2 Power Generation Design Basis

The 120-VAC Power Supply and Distribution System shall be capable of supplying all required loads through the use of several independent systems, depending on the continuity of power required by each load.

8.7.3 Description

The supply and distribution of 120-V AC power is accomplished by the following systems:

a. 208/120-V AC Instrument and Control Power Supply System;

b. Plant Preferred 240/120-V AC System;

c. Unit Preferred 240/120-V AC System;

d. Reactor Protection System Power Supply;

e. Plant Nonpreferred 240/120-V AC System; and

f. 208/120-V AC Plant Computer Power System.

g. 120/240-V AC Non-Safety-Related Lighting Power System.

The 120-V AC Power Supply and Distribution System, and its relation with other plant electrical systems, is shown in Figures 8.6-1c, -1d, -1e, and -1f of Subsection 8.6.

8.7.3.1 208/120-V AC Instrument and Control Power Supply System

The 208/120-V A-C Instrument and Control Power Supply System consists of six redundant, Class 1E instrument and control, buses (two buses for each unit). Each 120-V bus receives its normal or alternate power supply from an appropriate divisional 480-V shutdown board through a 480-208/120-V A-C 3-phase

instrumentation and control transformer and a 208-208/120-V regulating transformer.

Control room distribution Panel 9-9, Cabinets 2 and 3, are equipped with a normal and an alternate feeder. Transfer from the normal to the alternate supply is automatic upon I & C Bus undervoltage. The alternate supply is from the regulating transformer of another unit with the same electrical division as the normal supply.

On loss of normal auxiliary power, all I and C loads will lose power until the diesel generators have picked up the 480-V shutdown board loads.

8.7.3.2 Plant Preferred 240/120-V AC System

The Plant Preferred 240/120-V AC System bus normally receives power from an AC lighting board with an automatic transfer to an alternate AC lighting board upon loss of power from the normal source. The preferred bus has, as an alternate source of power, a 250-V DC motor-driven generator (plant preferred M-G set). The plant preferred M-G set is started on loss of voltage to the bus and automatic transfer is made on presence of voltage from the generator. The M-G set will pick up all loads that do not require manual start. Plant preferred loads will lose power while the M-G set is started and transfer is made.

Transfer of the bus back to the normal power supply is automatic after the normal power supply becomes available for sufficient time to ensure its stability. The M-G set is then disconnected automatically from its DC power supply.

8.7.3.3 Unit Preferred 240/120-V AC System

The unit preferred 240/120-V AC system, for Units 2 and 3, consists of a distribution bus with a M-M-G set as the primary source of supply. Upon failure of a M-M-G set, the bus can be transferred manually to either the unit preferred M-M-G set of one of the other units or to the appropriate 480-V reactor MOV board through the unit preferred AC bus transformer, as shown in Figure 8.7-3.

Each M-M-G set consists of a 480-V AC motor, a 250-V DC motor, a flywheel, and a 240/120-V 1-phase, AC generator (all direct-coupled) with the necessary controls. The unit preferred bus is normally supplied from the generator driven by the AC motor with the flywheel and DC motor being driven. On loss of power to the AC motor, the DC motor is automatically energized with the flywheel driving the generator during the transfer period. Therefore, the unit preferred buses do not normally lose power at any time during loss of auxiliary power.

The unit preferred 240/120-V AC system for Unit 1 consists of a distribution bus with an uninterruptible power supply (UPS) as the primary source of power. Upon failure of the UPS, the bus is transferred automatically through a static switch to the 480-V

RMOV board via the unit preferred regulating transformer or transferred manually to the Unit 2 preferred M-M-G set as shown on Figure 8.7-3a.

The UPS consists of a 480-V AC to 250-V DC rectifier, 250-V DC to 120-V AC inverter, and a 120-V AC static switch. The rectifier is supplied from the 480-V RMOV Board. The inverter is normally supplied from the output of the rectifier. On loss of the output from the rectifier, a blocking diode conducts, and the 250-V DC is provided from the station batteries. The 120-V AC outputs of both the inverter and the regulating transformer are inputted to the static switch. On loss of the inverter output, the static switch transfers the load to the unit preferred regulating transformer. Therefore, the unit preferred bus does not normally lose power at any time during loss of auxiliary power.

8.7.3.4 Reactor-Protection System Power Supply

The 120-V AC Reactor Protection System Power Supply is shown in Figures 7.2-1 and 7.2-7c and is described in paragraph 7.2.3.2.

8.7.3.5 120-V AC Distribution Panels

There are four control room distribution panels (circuit breaker boards) supplied by one or more of the 120-V AC systems. There is one panel for each unit and one plant panel common to all units. The 120-V AC loads supplied from these panels are shown in Figures 8.7-4a, -4b sheets 1 and 2, -4c sheets 1, 2, and 3, and -4d.

8.7.3.6 Plant Nonpreferred 240/120-V AC System

The Plant Nonpreferred 240/120-V AC System bus normally receives power from an AC lighting board with automatic transfer to an alternate AC lighting board upon loss of power from the normal source.

8.7.3.7 208/120-V AC Plant Computer Power System

The 208/120-V AC plant computer power system consists of a 120/208-V AC UPS system which includes 480-120/208-V AC regulating transformer, a rectifier, an inverter and an automatic static transfer switch. The system provides a highly reliable 208/120-V AC normal power supply to the computer power distribution panel. The UPS receives input power from an appropriate 480-V AC Non-Class 1E Common Board. The output of the UPS provides normal and alternate 120/208-V AC power to a plant computer distribution panel through a static transfer switch. An appropriate 250-V DC non-1E battery board provides back-up power supply to the UPS. Provision for manual switching is also included to allow manual transfer of power between the inverter/rectifier and the regulating transformer for maintenance purposes.

8.7.3.8 120/240-V AC Non-Safety-Related Lighting Power System

This system provides power to non-safety-related loads and is available from cabinets throughout the plant.

8.7.4 Inspection and Testing

All equipment associated with the 120-V ac power supply system, except the plant preferred M-G set, is normally in operation at all times. The plant preferred M-G set and the DC motor drives of the unit preferred M-M-G sets can be periodically energized to ensure operability. Inspection of all other equipment is accomplished based upon the manufacturer's instructions and sound maintenance practices.