Enclosure 5

8.1.4 Lightning Protection

Lightning protection for the facility is described in Section 13.2.8.1 of this report.

8.2 Emergency Electrical Power Distribution

8.2.1 Design Basis

The design basis of the emergency electrical distribution system is to provide power to selected loads for a minimum of one hour following loss of off-site power. The selected loads are those necessary for lighting, communications, monitoring the reactor in a shutdown condition, and decay heat removal. The choice of a minimum of one hour is based on providing reactor information to the operator for a sufficient period following the power loss. This assures that the reactor is shut down as designed and the core is receiving adequate cooling.

8.2.2 System Description

The emergency electrical power distribution system consists of a 5 kVA (208-120 volt/three-phase) motor-generator set, the generator starting controls, a time-delay switching mechanism, transfer switches, circuit breakers, temperature-compensating battery charger, ~~and~~ a bank of sixty valve-regulated lead-acid (VRLA) batteries (lead-calcium storage cells), and under normal circumstances, a battery monitoring system that continuously provides performance tracking data (overall voltage, individual cell voltages, internal resistances, etc.), and alarms. The batteries are rated for ~~577~~ 840 ampere-hours at an eight-hour discharge rate, and have an expected service life of 20 years. With a nominal battery load of ~~72~~ ~60 amps, the battery bank has ~~sufficient~~ ample capacity to provide selected instrument and pump power ~~for approximately eight hours~~ following the loss of both external electrical power feeders, lasting up to 16 hours. If the total battery load ~~is increased~~ were doubled~~ to 150 amps~~, the battery bank ~~will~~ would still last for ~~approximately three~~ seven hours. A minimum of one hour of emergency power is the design requirement

for this system. A biennial discharge test, with one-hour duration at constant load, verifies battery capacity while also demonstrating system capability. The discharge test is a modified performance test, meaning it envelops both a performance test for capacity and a service test for capability.

The ~~130~~ 125-volt direct current (DC)~~d.c.~~ storage battery power supply is connected to the emergency power system through a 2-pole, 200-amp fused disconnect switch. The power supply then connects to a 2-pole, 100-amp switch at the motor-generator set and to a 2-pole, 100-amp circuit breaker at the emergency lighting panel. The system is normally aligned so that power will be available to start the MG set, if needed. A separate line from the batteries supplies ~~d.c.~~DC voltage to operate the ~~d.c.~~DC motor-drives that operate each of the two main 13.8 kV circuit breakers. The batteries also supply ~~d.c.~~DC lights in the utility room.

8.2.3 System Operation

The normal alignment of the emergency power system is as follows: 1) Panel No. 2 supplies 120/208 volt power to the emergency lighting panel transfer switch and thence to the emergency lighting panel itself, and 2) the 45 kVA transformer provides 120/208 volt power to both the motor-generator starter and to the Panel No. 1/1A transfer switch (and thence to Panel No. 1, Panel No. 1A, and pump MM-2). The MG starter is fed through a 30-ampere fused switch. The switches in Figure 8-1 are depicted in this configuration. When normal power fails, the following automatically occurs:

a) The emergency lighting panel transfer switch immediately shifts the emergency lighting panel from Panel No. 2 to the batteries.

b) The motor-generator starts after a twelve second delay. The delay is to prevent the MG set from starting during short duration power outages.

c) The Panel No. 1/1A transfer switch shifts to the MG set output. Hence, Panel No. 1 (Circuits 13-20), Panel No. 1A, and auxiliary coolant pump MM-2 are supplied with emergency power. The latter can be used for decay heat removal.

When normal power is restored, all transfer switches return to their normal positions and the relay at the motor-generator set is energized thereby stopping the unit.

Enclosure 6

8.1.4 Lightning Protection

Lightning protection for the facility is described in Section 13.2.8.1 of this report.

8.2 Emergency Electrical Power Distribution

8.2.1 Design Basis

The design basis of the emergency electrical distribution system is to provide power to selected loads for a minimum of one hour following loss of off-site power. The selected loads are those necessary for lighting, communications, monitoring the reactor in a shutdown condition, and decay heat removal. The choice of a minimum of one hour is based on providing reactor information to the operator for a sufficient period following the power loss. This assures that the reactor is shut down as designed and the core is receiving adequate cooling.

8.2.2 System Description

The emergency electrical power distribution system consists of a 5 kVA (208-120 volt/three-phase) motor-generator set, the generator starting controls, a time-delay switching mechanism, transfer switches, circuit breakers, temperature-compensating battery charger, a bank of sixty valve-regulated lead-acid (VRLA) batteries (lead-calcium storage cells), and under normal circumstances, a battery monitoring system that continuously provides performance tracking data (overall voltage, individual cell voltages, internal resistances, etc.), and alarms. The batteries are rated for 840 ampere-hours at an eight-hour discharge rate, and have an expected service life of 20 years. With a nominal battery load of ~60 amps, the battery bank has ample capacity to provide selected instrument and pump power following the loss of both external electrical power feeders, lasting up to 16 hours. If the total battery load were doubled, the battery bank would still last for seven hours. A minimum of one hour of emergency power is the design requirement for this system. A biennial discharge test, with one-hour duration at constant load, verifies battery capacity while also

demonstrating system capability. The discharge test is a modified performance test, meaning it envelops both a performance test for capacity and a service test for capability.

The 125-volt direct current (DC) storage battery power supply is connected to the emergency power system through a 2-pole, 200-amp fused disconnect switch. The power supply then connects to a 2-pole, 100-amp switch at the motor-generator set and to a 2-pole, 100-amp circuit breaker at the emergency lighting panel. The system is normally aligned so that power will be available to start the MG set, if needed. A separate line from the batteries supplies DC voltage to operate the DC motor-drives that operate each of the two main 13.8 kV circuit breakers. The batteries also supply DC lights in the utility room.

8.2.3 System Operation

The normal alignment of the emergency power system is as follows: 1) Panel No. 2 supplies 120/208 volt power to the emergency lighting panel transfer switch and thence to the emergency lighting panel itself, and 2) the 45 kVA transformer provides 120/208 volt power to both the motor-generator starter and to the Panel No. 1/1A transfer switch (and thence to Panel No. 1, Panel No. 1A, and pump MM-2). The MG starter is fed through a 30-ampere fused switch. The switches in Figure 8-1 are depicted in this configuration. When normal power fails, the following automatically occurs:

a) The emergency lighting panel transfer switch immediately shifts the emergency lighting panel from Panel No. 2 to the batteries.

b) The motor-generator starts after a twelve second delay. The delay is to prevent the MG set from starting during short duration power outages.

c) The Panel No. 1/1A transfer switch shifts to the MG set output. Hence, Panel No. 1 (Circuits 13-20), Panel No. 1A, and auxiliary coolant pump MM-2 are supplied with emergency power. The latter can be used for decay heat removal.

When normal power is restored, all transfer switches return to their normal positions and the relay at the motor-generator set is energized thereby stopping the unit.