SECTION 8.0 - ELECTRICAL POWER SYSTEMS

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SECTION 8.0

ELECTRICAL POWER SYSTEMS

8.1 SUMMARY DESCRIPTION

The electrical power system is designed to provide a diversity of dependable power sources which are physically isolated so that any failure affecting one source of supply does not propagate to alternate sources. The auxiliary electrical power systems are designed to provide electrical and physical independence, and to supply the necessary power for startup, operation, shutdown, and other station requirements.

The station receives power from two separate offsite sources. In the event of total loss of power from offsite sources, auxiliary power is supplied from diesel generators located on the site. These power sources are independent of any normal power system. Each power source, up to the point of its connection to the auxiliary power bus, is capable of complete and rapid electrical isolation from any other sources. Loads important to plant safety are split and diversified between auxiliary bus sections, and means are provided for rapid isolation of system faults. Station batteries are provided as a reliable source of control power for specific engineered safeguards, and for other functions required when ac power is not available.

In the event that all offsite and diesel generator sources of power are unavailable, a dedicated station blackout circuit is available. This alternate AC (AAC) source is powered from the Susquehanna Substation and is dedicated to Peach Bottom Atomic Power Station through a series of manual breaker and switch manipulations performed at both sites.

8.2 GENERATOR

The generator, manufactured by General Electric Company, is a three phase, 60 Hz, 22 kV generator operating at 1,800 rpm with 75 psig hydrogen pressure. The Unit 2 generator is rated at 1,530 MVA with a 0.92 power factor and a 0.510 short circuit ratio. The Unit 3 generator is rated at 1,530 MVA with a 0.90 power factor and a 0.540 short circuit ratio. The stator conductors are water cooled. Excitation is provided from a shaft-driven alternator with stationary rectifier banks converting the AC to DC. The generator is grounded through a grounding transformer and a secondary resistor. Refer to Drawings E-4 and E-6 for details of the excitation and protective relay systems for the generator.

8.2.1 Stability

Steady-state load flow and transient stability conditions have been studied for PBAPS and for the Pennsylvania-New Jersey-Maryland (PJM) Interconnected System. This was done using digital computer programs to simulate the system characteristics. These computer studies are updated as deemed necessary taking into account any changes in the transmission system. The studies have simulated 500 kV and 230 kV transmission line faults, the loss of each of the Peach Bottom generators, and the loss of the largest generator on the 500 kV grid. The results of the computer runs show that the transmission system is stable and there will be no cascading transmission outages. Since the offsite power to PBAPS is provided by the 230 kV system, a continuous supply is assured.

8.3 TRANSMISSION SYSTEM

8.3.1 General

Units 2 and 3 feed power to the 500 kV transmission system through two separate substations. These 500 kV substations are connected by two tie lines, and are also interconnected with the PJM and PECO Energy 500 kV grid system.

8.3.2 Description

Each generator is connected by an isolated phase bus to a transformer to step up the 22 kV generator voltage to 500 kV. As shown in Figure 8.3.1, step-up transformers from Units 2 and 3 connect to respective 500 kV Peach Bottom South and North Substations, which are approximately 3,300 ft apart. Each substation is arranged in a two-element, breaker-and-one-half scheme. Two 500 kV transmission lines connect the substation buses resulting in a four-element, breaker-and-one-half arrangement. Four lines (Rock Springs, Conastone, Delta, and Three Mile Island) connect the substations to the PJM Interconnection, and one line (Limerick) connects to the PECO Energy 500 kV system.

Figure 8.3.2 shows the aerial transmission lines from the 500 kV North and 500 kV South Substations from Units 2 and 3 to the South and North Substations, respectively, and the two aerial bus tie lines between the substations. The drawing also shows the underground and aerial routes of the 13 kV startup feed and the 230 kV lines. The transmission lines and startup feeds are oriented to minimize crossovers.

Normal auxiliary power for the station is supplied from unit auxiliary power transformers connected to the generator leads. Startup auxiliary power is provided from any of the three offsite sources:

1. The tap on the 230 kV Nottingham-Cooper line feeds the 230/13 kV regulating transformer (startup and emergency auxiliary transformer no. 2) at the station.

2. At the North Substation, thirteen kilovolts from the tertiary winding on the 500/230 kV auto-transformer feeds the 13/13 kV regulating transformer (startup and emergency auxiliary regulating transformer no. 3) which connects to the 13 kV switchgear at the station.

3. At the North Substation, thirteen kilovolts can be supplied from the 230/13 kV regulating transformer (startup transformer no. 343) which is supplied by the

230 kV Peach Bottom-Newlinville line, and connects to the 13 kV switchgear.

The power sources for the station auxiliary power system are sufficient in number and independent electrically and physically such that no single event would be likely to cause a simultaneous outage of all sources.

8.3.2.1 Switchyard Breaker Control

The switchyard breaker controls for the three offsite power sources are independent. The North and South substations are physically separated by approximately 3300 ft; the 500 kV and 220 kV control houses in the North Substation are separated by approximately 200 ft. The control house for each source contains independent AC light and power and independent batteries and DC control power distribution. Each battery is normally connected to a battery charger which is powered from the respective AC light and power bus. The AC sources have automatic switching to provide a highly reliable AC source for each substation control house. Each battery is sized to provide the normal DC load for 3 hr. with the capability of then meeting peak power demand without the AC source.

8.3.2.2 Station Blackout

An alternate AC (ACC) source is available in the event of a station blackout condition, when offsite power sources and emergency diesel generator power is not available to bring Units 2 & 3 to a safe shutdown condition and maintain that status. A dedicated 34.5 kV submarine cable, powered from the 33 kV bus at Susquehanna Substation, terminates at the Station Blackout (SBO) Substation at PBAPS. A transformer steps down voltage to 13.8 kV and is available for connection to Unit 2 SUB 00A03C to maintain Units 2 & 3 in shutdown status. This AAC source is dedicated to Peach Bottom Atomic Power Station through a series of manual breaker and switch manipulations performed at both sites.

8.4 AUXILIARY POWER SYSTEMS

8.4.1 Safety Objective

The safety objective of the auxiliary power system is to provide highly reliable power sources for loads which are important to station safety under accident conditions.

8.4.2 Safety Design Basis

1. The auxiliary power system sources, distribution equipment, power and control cabling, and loads are arranged so that failure of a single component does not impair plant safety. Loads important to plant safety are split and diversified among systems.

2. Plant design and circuit layout provide for physical separation of redundant power sources, distribution equipment, power and control cabling, instrumentation and control devices, and associated utilization devices for all equipment essential to plant safety.

3. The design of the auxiliary power system is in accordance with the intent of "Proposed IEEE Criteria for Class 1E Electrical Systems for Nuclear Power Generating Stations," dated June, 1969.

8.4.3 Power Generation Objective

The power generation objective of the auxiliary power system is to provide power for station auxiliaries during startup, planned operation, and shutdown.

8.4.4 Power Generation Design Basis

The auxiliary power system is designed to provide adequate power to operate all the plant auxiliary loads necessary for plant operation.

8.4.5 Description

The auxiliary power system consists of power sources, distribution equipment, and instrumentation and controls. The principal elements of the auxiliary power system are shown in Drawings E-1, E-5, E-7, E-8, E-10, E-12, E-1615, E-1617, E-1619, E-1621, E-1715, E-1717, E-5010 and the equipment listings are shown in Table 8.4.1.

The normal power sources, during plant operation, for all auxiliary system buses except the emergency buses and cooling tower equipment are the main generators. Power is supplied from each generator's main 22 kV isolated-phase bus, through a unit auxiliary transformer, to the 13 kV unit auxiliary switchgear buses.

Power from the 13 kV unit auxiliary buses is fed through load center transformers to the 480 V load center switchgear buses. Power from the 480 V switchgear buses is fed to motor control centers for distribution to power panels and motors.

There are three independent sources of offsite power. One source is an overhead 230 kV transmission line which is stepped down to 13 kV by the #2 startup and emergency auxiliary transformer. The second source is the 230 kV Newlinville overhead transmission line that is stepped down to 13 kV by the #343 startup transformer. The third source is a 13 kV overhead/underground cable from the tertiary winding of the #1 autotransformer which connects the 500 kV system to the 230 kV system transmission lines from the Muddy Run Pumped Storage Generating Station.

An agreement between the System Operations and the Plant Operations staff requires the System Operator to alert the Plant Reactor Operator at PBAPS if the voltage of an offsite source cannot be maintained at or above predetermined values or the post trip contingency percentage voltage drop limits will be exceeded for any offsite source as evaluated in the plant Voltage Regulation Study. Upon receipt of the System Operation notification, the operator shall follow direction provided in plant procedures to determine operability of the source.

Each offsite source can be used to supply the unit auxiliary buses for plant startup and shutdown and the cooling tower equipment. In addition, each source is stepped down from 13 kV to 4 kV through an emergency auxiliary transformer, and is connected through interlocked circuit breakers to every 4 kV emergency switchgear bus. Every 4 kV emergency switchgear bus is energized from one of these two sources at all times during normal operation. Upon loss of power, automatic transfer is made to the second source. If neither offsite source is available, the 4 kV emergency switchgear buses are supplied from diesel generator units as described in subsection 8.5, "Standby AC Power Supply and Distribution."

To ensure adequate power and improve voltage regulation during a Unit 2 or Unit 3 LOCA event, the 3SU Bus 13kV breakers feeding noncritical site buildings and miscellaneous loads are tripped if less than three off-site sources are available. Likewise, the alternate source for the noncritical site buildings and miscellaneous loads, 13kV breaker 3US, is tripped during a Unit 3 LOCA if it is supplying these loads.

The 4 kV emergency switchgear buses supply all power required for safe shutdown of the plant. Power is fed directly to motors larger than 200 hp, and through load center transformers to the 480 V emergency auxiliary load center switchgear buses. Power from the 480 V emergency auxiliary load center switchgear buses is fed to the emergency motor control centers for distribution to the smaller motors and loads.

Power delivery to electrical systems and components that are relied on for post-fire safe shutdown is provided by the Class 1E AC distribution system or the Class 1E DC distribution system. The source of power may be the Onsite Class 1E standby power supplies or the Offsite non-Class 1E power supplies as described in the PBPAS Fire Protection Plan, Section 6.1.1.

All 13 kV and 4 kV switchgear is the metal-clad type with three-pole circuit breakers having stored-energy closing mechanisms. Circuit breakers are normally electrically operated, but can be manually operated if needed. Control power for all 13 kV and 4 kV breakers is 125 VDC, supplied from the batteries. Control power for all 480 V load center switchgear breakers is 120 VAC, supplied from control power transformers within the respective load center.

Isolation for nonsafety related loads connected to the safety related electrical buses is provided by a safety related overcurrent device (i.e. circuit breaker or fuse) located within safety related equipment.

Loss of power has been provided for in the design. The multiplicity of sources feeding the emergency auxiliary buses, the redundancy of transformers and buses within the plant, and the division of critical loads between buses provides a system that has a high degree of reliability. Also, the buses and service components are also physically separated to limit or localize the consequences of electrical faults or mechanical accidents occurring at any point in the system.

The TSC will normally be fed from the Station Blackout Power Supply. In the event the Station Blackout Power Supply is taken out of service, the TSC will be supplied by a separate power source (351 line). The backup power source (351 line) is provided to maintain continuity of TSC functions and to immediately resume data acquisition, storage, and display of TSC data if loss of the primary TSC power source occurs. In the event of a station blackout, the Station Blackout Power Supply will supply power to Units 2 and 3 safety related buses and will continue to supply power to the TSC. Because the TSC is a minimal load, keeping the TSC as a load will not degrade the power supply to Units 2 and 3 safety buses.

Cables serving engineered safety feature systems and Class 1E electrical systems are routed separately when duplicate or backup equipment is affected. Separation for these safety systems is achieved by routing through separate rooms or corridors where possible. When wiring for two or more redundant safety systems passes through the same compartment having rotating heavy machinery or containing high-pressure steam lines, a horizontal separation of 20 ft is maintained between raceways groups. The Unit 2 and 3 MG sets are abandoned in place and therefore do not represent a missile hazard. Where spacing less than 20 ft is provided in zones of potential mechanical damage, protective walls or barriers equal to a 6-in thick reinforced concrete wall are provided between groups. Cables identified as required for Safe Shutdown in accordance with Appendix R to 10CFR, Part 50 are routed in accordance with the separation criteria identified in Section III.G.2 of Appendix R. Cables between Class I structures are run in conduits embedded in reinforced concrete banks. To facilitate cable pulling on long runs, separate reinforced concrete manholes per safeguard channels are utilized.

Any switchgear or electrical panel associated with redundant systems has a minimum horizontal separation of 20 ft or is separated by a protective wall, ceiling, or floor equivalent to a 6-in thick reinforced concrete wall. This applies only in zones of potential missile damage.

To protect against the potential hazard of an electrical fire, where practical, cable trays of redundant systems have a minimum horizontal separation of 3 ft and a minimum vertical separation of 5 ft, or a crossover separation of 18 in. Where these separations cannot be maintained, fire resistant barriers are installed between the trays, or cables are run in rigid steel conduit, steel intermediate metal conduit (IMC) or steel electrical metallic tubing (EMT), until this separation exists.

In the cable spreading room, where cables of redundant systems approach the same or adjacent control panels with a spacing less than 3 ft horizontally or 5 ft vertically, separation is established by an analysis of the installation, or both cables run in rigid steel conduit, steel IMC or steel EMT or where this separation does not exist. Flexible steel conduit is used only for final bend to the tray or through floor sleeves when conduit is required to panels. A barrier exists between the cable spreading room and the main control room.

In other areas where cables of redundant systems approach the same or adjacent control panels or components with a spacing less than 3 feet horizontally or 5 feet vertically, both cables run in rigid steel conduit, steel IMC, steel EMT or, for control and instrument cables, separation is established by an analysis of the installation. Flexible steel conduit is used only for final bend to the tray, component, or through floor sleeves when conduit is required to panels.

The RPS and primary containment isolation system are designed to meet the following requirements:

1. Wiring to duplicate sensors on a common process is run in separate conduits. The neutron monitoring system cables beneath the reactor vessel and the Main Steam Line Radiation Monitoring System cables in the steam tunnels are exceptions to the general rule. They are not routed in conduit because of space limitations and the need for flexibility of the cables. However, these cables are grouped and separated to obtain effective channel independence. The Main Steam Line Radiation Monitoring System cables are not routed in conduit within the steam tunnels because the installed stainless steel sheathed silicon dioxide cable is equivalent to coaxial cables installed in rigid steel conduit with respect to the physical and electrical requirements associated with this area and for this application.

2. Cables through drywell penetrations are so grouped that loss of all cabling in a single penetration cannot prevent a scram.

3. Wiring for sensors of more than one variable in the same trip channel may be run in the same conduit.

4. For the primary containment isolation system, the inboard primary containment isolation valve wiring between the control panel and the valve proper (Channel A) is separate from the outboard isolation valve wiring (Channel B).

Safety system cables are not installed in nonsafety system trays or conduits. Nonsafety-related cables may be installed in a safety system tray or conduit, but those of a nonsafety system are not installed in trays or conduits of more than one independent channel of safety system.

Part of the fire protection system, as described in subsection 10.12, is used to detect fire and protect safety-related cables in trays.

The permanent cable markers for engineered safeguard cables include a color dot to identify a particular wiring channel.

The cable pulled cards used by the electrician to pull cable identify the channel in which the cable is to be installed.

Identification of engineered safeguard cables and raceways are as follows:

Channel	Cable and Raceway Prefix	Color Code
A	ZA	Blue
B	ZB	Green
C	ZC	Red
D	ZD	Orange

No single control panel includes wiring essential to the function of two redundant systems unless there is a minimum of 6 inches of separation between cables and components of the two systems, except where the presence of wiring of two redundant systems is permitted by project specifications. If less than 6 inches separation between systems exists, a fire resistant barrier is provided or wiring for one of the two systems is run in conduit or fire resistant sleeving to separate the two systems. Penetration of separation barriers within a panel is not permitted, unless the penetration is so designed that fire cannot propagate through the penetration, or conduit is used. Devices or components of redundant systems on the same panel less than 6 in apart are considered adequately separated if one of the devices is totally enclosed in fire resistant material, or if their failure in any mode does not negate automatic system operation if required.

If two panels containing circuits of redundant systems are less than 3 ft apart, there is a steel barrier between the two panels. Panel ends closed by steel end plates are acceptable barriers provided that terminal boards and wireways are mounted at least 1 inch from the end plates.

Administrative responsibility for assuring compliance with criteria during the design stage rests primarily with project engineering. During the construction and installation stage, the field construction organization has the primary responsibility for assuring that the installation is in accordance with the design. The QA program provides second and third level surveillance and audit of the Q-listed portions of the cable installations as described in Appendix D.

All 13 kV and 4 kV cables, within the power block, are installed in conduit. Cables of 440 V power circuits and 125 V control circuits are installed in conduits and metal trays. The current carrying capacity of all cables is conservatively calculated. Cables are thermally sized and derated in accordance with the methods outlined in Insulated Power Cable Engineers Association (IPCEA) Standards. Power Cables installed in conduit are derated in accordance with IPCEA standard P-46-426, Power Cable Ampacities, Volume I or II. Power Cables installed in open-top cable trays are derated in accordance with ICEA standard P-54-440, Ampacities Cables in Open-top Cable Trays. For special cases where the use of these standards is restrictive, cables are derated using a heat transfer model which considers load diversity among cables (actual loading of cables) installed in the raceway.

Cable trays, battery racks, instrument racks and control consoles which are by definition seismic Class I (paragraph C.1.1) considering the safety functions required are supported or restrained to withstand, without loss of safety functions, the effects of the maximum credible earthquake (horizontal ground acceleration of 0.12g).

The design of the cable tray support systems is the product of extensive investigation of hanger systems. Design adequacy is verified by dynamic analysis. Battery racks are designed for static coefficients (0.24g) and the adequacy of these coefficients confirmed by dynamic analysis. Instrument racks and control consoles are dynamically analyzed and restrained for natural frequencies equal to or greater than 20 Hz.

8.4.6 Safety Evaluation

8.4.6.1 General

Auxiliary power to the 13 kV unit auxiliary switchgear buses is supplied from the unit auxiliary transformers during normal unit operation. The 13 kV unit auxiliary switchgear buses are supplied from offsite sources during startup and shutdown via the start-up bus. Provisions are made for automatic, fast transfer of the auxiliary load on each unit auxiliary bus from the unit auxiliary transformer to the respective offsite source upon unit trip-out. It is highly improbable that all three power sources would be lost simultaneously because each is an independent source.

During planned plant operation, auxiliary power to the 4 kV emergency switchgear buses is supplied from two preferred offsite sources via an emergency auxiliary transformer. Upon loss of power from a preferred offsite source, automatic fast transfer is made to the other preferred offsite source. Loss of both preferred offsite sources of power does not affect safe shutdown of the plant because emergency power can be supplied from four diesel generators. Furthermore, failure of any one diesel generator does not impair safe shutdown because each diesel serves an independent, redundant 4 kV bus for each unit. The remaining 4 kV buses have sufficient capacity to serve their respective loads, safely shut down the reactor, and maintain it in a safe condition (subsection 8.5).

An alternate AC source is available in the event of a station blackout condition to achieve and maintain safe shutdown condition.

8.4.6.2 Loss of Auxiliary Power

Total loss of power to the 13 kV unit auxiliary switchgear buses does not affect safe shutdown of the plant because all equipment required for safe shutdown is fed from the independent 4 kV emergency switchgear buses.

The 4 kV emergency system is continuously energized by an offsite source during planned plant operation. The voltage for each 4kV bus is monitored at five levels, which can be considered as two different undervoltage Functions: one level of loss of voltage and four levels of degraded voltage. The degraded voltage Function is monitored by four (Function 2 through 5) undervoltage relays per source (Section 8.4.6.3). The loss of voltage is monitored by one (Function 1) undervoltage relay for each 4kV bus.

Upon failure of the preferred offsite source, the degraded voltage low setting (Device No. 127, Function 2) relay trips the offsite source breaker and initiates auto-transfer to the alternate source. If the auto-transfer fails, the relay starts the associated diesel generator after a time delay.

When the diesel is up to rated speed, it is automatically connected to its 4.16 kV emergency bus. When voltage is restored to the emergency bus, a SV load sequencing relay (1 per 4 kV bus) permits each vital 4 kV load timer to start. Loads are then automatically applied in the required sequence, and the plant is brought to a safe shutdown condition.

An undervoltage relay (Device No. 127, Function 1) monitors the voltage on each Class 1E bus. The relay functions with no appreciable time delay when the voltage on the bus falls below 0.25 per unit. Actuation of this relay initiates load shedding and provides a permissive signal to allow the affected bus to transfer to the alternate source.

Each 480 V emergency load center feeding ECCS loads and the emergency cooling tower load center transformer 0CX026 has a time delay relay that will automatically restore its associated emergency load center following a restoration of voltage to the associated Class 1E bus.

In the event that emergency diesels and offsite power sources are not available, a station blackout source is available for connection, via the SBO Substation, to the 13 kV buses and thence to the 4 kV buses via one or both emergency auxiliary transformers. The power from the Susquehanna 33 kV bus is dependent only on operation of a minimum number of hydro generation units at the Conowingo Power Station, which can be made available on short notice without any dependence on the transmission grid from which normal offsite power is derived.

8.4.6.3 Degraded Voltage Protection

The degraded voltage function is monitored by the following four (Function 2 through 5) undervoltage relays:

1. Degraded Voltage Low Setting (Function 2) relay:

   An IAV53N relay (Device No. 127) is provided in each offsite source breaker to each Class 1E bus, and is set at 0.6 per unit voltage. Upon failure of this source (voltage less than 0.6 per unit), this relay trips the source breaker, initiates auto-transfer of the bus to the alternate source, and if auto-transfer fails, starts the associated diesel generator after a time delay.

2. Degraded Voltage High Setting (Function 3) relay:

   A CV-6 inverse time relay (Device No. 127Z) is also installed on the source side of each offsite source to each Class 1E bus. This relay is set at 0.87 per unit voltage. It performs the same functions as the IAV53N relay, and provides inverse time delay with degrading voltage for protection of Class 1E equipment between 0.87 and 0.6 per unit voltage.

3. Degraded Undervoltage LOCA (Function 4) relay:

   If a degraded voltage condition is detected together with a LOCA, a 27N relay (Device No. 127Y) is set at 0.9138 ($\pm$.0084) per unit voltage, and trips the affected source breaker after 10 seconds delay. An alarm is also actuated to indicate the degraded grid voltage condition. The relay has a high dropout-to-pickup ratio (0.995). The relay has an internal time delay of 1 second which is included in the 10 seconds delay time mentioned above.

4. Degraded Voltage Non-LOCA (Function 5) relay:

A 27N relay (Device No. 127E) in each offsite source breaker to each Class 1E bus is set at 0.9978 ($\pm$.0084) per unit voltage, and trips the affected source breaker after 61 seconds delay. This relay actuates an alarm if the degraded grid voltage condition persists for 10 seconds. The relay has a high dropout-to-pickup ratio (0.995). The relay has an internal time delay of 1 second which is included in the 61 seconds delay mentioned above.

8.4.7 Inspection and Testing

Inspection and testing, at vendor factories and during construction, were conducted to ensure the following:

1. Components operate within their design ratings.

2. Components were properly mounted.

3. Metering and protective devices were properly calibrated and function correctly.

4. Connections were properly made and the circuits were continuous.

Pre-operational testing of the auxiliary power systems was conducted to demonstrate the ability to carry the shutdown loads.

Also, the contactor pickup capability at or less than 80% of 120 V and the interposing relay coil pickup capability at or less than 70% of 120 V rated voltage, where required for the safety-related loads, were tested to assure the contactor and the control circuit operation under the degraded bus voltage condition to mitigate a LOCA event.

The auxiliary power system is tested and inspected as required during the life of the plant to demonstrate the capability of the system to provide sufficient power to the essential loads.
The undervoltage, auxiliary, and time delay relays in the 4 kV switchgear will be periodically tested to verify settings, operability, and functional performance in accordance with surveillance test procedures for the diesel generators and 4 kV emergency auxiliary switchgear. These tests will provide assurance that the undervoltage protection schemes for loss of offsite source and degraded voltage conditions (with and without a LOCA) will operate at the required voltage and time settings, and perform the intended functions when called upon to operate.

The timers used to sequence the emergency service water pumps, emergency cooling water pumps and fans, and the instantaneous auxiliary relays for starting the diesel generator room vent supply fans and the residual heat removal compartment fan coolers will be periodically tested in accordance with surveillance test procedures. The tests will verify settings, operability, and functional performance of the relays, and will provide assurance that the automatic loading sequence is being maintained and will perform as designed.

8.4.8 Compliance with Safety Guides

Safety Guide No. 6

The overall plant design, including the design of the onsite electrical power systems, was approved by the AEC/NRC and a construction permit issued significantly before issuance of AEC/NRC Safety Guide No. 6, "Independence Between Redundant Standby (Onsite) Power Sources and Between Their Distribution Systems" (published April 9, 1971), and General Design Criterion 17 (published February 20, 1971) cited therein. However, Peach Bottom Units 2 and 3 have been evaluated with respect to AEC/NRC Safety Guide No. 6. Nonsafety related loads are not addressed in Safety Guide No. 6. The design of the safety related electrical distribution system complies with Safety Guide No. 6, with two acceptable exceptions. The first is as described in paragraph 8.7.4 on ADS and non-ADS main steam relief valves and associated ADS logic. The second is for the RHR injection valves and recirculation pump discharge valves for Unit 2 and Unit 3. These valves have provisions for automatically transferring to a redundant power source upon loss of voltage of their normal power sources. For each valve, two electrical contactors are connected in series from each redundant power source and each contactor is interlocked with its corresponding contactor in the redundant power source to positively prevent interconnection between the redundant power sources.

TABLE 8.4.1

MAJOR ELECTRICAL EQUIPMENT

AUXILIARY POWER SYSTEM

Transformers

Generator Transformer 2AX01, 2BX01, 2CX01	510 MVA, 1-ph. 539.5-22 kV
Generator Transformer 3AX01, 3BX01, 3CX01	510 MVA, 1-ph. 539.5-22 kV
Unit Aux. Trans. 20X02	24.3/32.4/40.5/45 MVA, 3-ph. 22-13.8 kV
Unit Aux. Trans. 30X02	24.3/32.4/40.5/45 MVA, 3-ph. 22-13.8 kV
Startup and Emergency Aux. Trans. 00X03	27/36/45/50.4 MVA, 3-ph. 230-13.8 kV
Startup and Emergency Aux. Regulating Trans. 00X05	27/36/45/50.4 MVA, 3-ph. 13.8-13.8 kV
Startup and Emergency Aux. Trans. 00X11	30/40/50 MVA, 3-ph. 230-13.8 kV
Emergency Aux. Trans. 0AX04	10.7/13.4/15 MVA, 3-ph. 13.2-4.16 kV
Emergency Aux. Trans. 0BX04	10.7/13.4/15 MVA, 3-ph. 13.2-4.16 kV

Switchgear

13.2 kV Switchgear 20A01, 20A02, 30A01, 30A02	500 MVA 2,000 A Main Breakers 500 MVA 1,200 A Feeder Breakers
13.2 kV Switchgear 00A03, 00A04, 00A009	500 MVA 2,000 A Main and Tie Breakers 500 MVA 1,200 A Feeder Breakers
4.16 kV Emergency Switch-gear 20A15, 20A16, 20A17, 20A18 30A15, 30A16, 30A17, 30A18	250 MVA 1,200 A Main and Feeder Breakers

TABLE 8.4.1 (Continued)

Load Centers

480 V Load Centers 20B01, 20B02 20B04, 30B01, 30B02 30B04	2-1,000 kVA, 13,200 V-480 V, 3 ph. Double Bus 1,600 A Main and Bus Tie Breakers 600 A Feeder Breakers
00B03, 00B14 (common to Units 2 and 3)	
480 V Emergency Load Centers, 20B10,20B11,20B12,20B13 30B10,30B11,30B12,30B13	1000 kVA, 4160V-480 V, 3 ph. Single Bus 1,600 A Main Breakers 600 A Feeder Breakers
480 V Cooling Tower Load Centers 00B06, 00B07, 00B08	2-1,500 kVA, 13,200-480 V, 3-ph. Double Bus 2,000 A Main Breakers 600 A Feeder Breakers
480 V Screen Structure Area Load Center 00B05	2-500 kVA, 13,200-480 V, 3-ph. Double Bus 1,600 A Main Breaker 600 A Feeder Breaker

Bus Loads - Unit 2

13.2 kV Switchgear 20A01	Reactor Recirc. Pump ASD	9,051 hp
	Condensate Pump	5,000 hp
	Circ. Water Pump	2,000 hp
	Service Water Pump	700 hp
	480 V Load Centers	
13.2 kV Switchgear 20A02	Reactor Recirc. Pump ASD	9,051 hp
	Condensate Pump	5,000 hp
	Condensate Pump	5,000 hp
	Circ. Water Pump	2,000 hp
	Circ. Water Pump	2,000 hp
	Service Water Pump	700 hp
	Service Water Pump	700 hp
	480 V Load Centers	

TABLE 8.4.1 (Continued)

Bus Loads - Unit 3

13.2 kV Switchgear 30A01	Same as 20A01 above with exception to the Reactor Recirc. Pump M-G set that was replaced with the Reactor Recirc. Pump ASD (9,051 hp).	
13.2 kV Switchgear 30A02	Same as 20A02 above with exception to the Reactor Recirc. Pump M-G set that was replaced with the Reactor Recirc. Pump ASD (9,051 hp).	
4 kV Emergency Switchgear 30A15	RHR Pump	2,000 hp
	Core Spray Pump	600 hp
	HP Service Water Pump	1,000 hp
	480 V Load Center	
	Emergency Cooling Water Pump	250 hp
	ECT 480 V Load Center	
4 kV Emergency Switchgear 30A16	RHR Pump	2,000 hp
	Core Spray Pump	600 hp
	HP Service Water Pump	1,000 hp
	CRD Water Pump	250 hp
	480 V Load Center	
	ECT 480 V Load Center	
4 kV Emergency Switchgear 30A17	RHR Pump	2,000 hp
	Core Spray Pump	600 hp
	HP Service Water Pump	1,000 hp
	CRD Water Pump	250 hp
	480 V Load Center	
	ECT 480 V Load Center	
4 kV Emergency Switchgear 30A18	RHR Pump	2,000 hp
	Core Spray Pump	600 hp
	HP Service Water Pump	1,000 hp
	480 V Load Center	
4 kV Emergency Switchgear	RHR Pump	2,000 hp

20A15	Core Spray Pump	600 hp
	HP Service Water Pump	1,000 hp
	CRD Water Pump	250 hp
	480 V Load Center	
4 kV Emergency Switchgear 20A16	RHR Pump	2,000 hp
	Core Spray Pump	600 hp
	HP Service Water Pump	1,000 hp
	Emergency Service Water Pump	250 hp
	480 V Load Center	
4 kV Emergency Switchgear 20A17	RHR Pump	2,000 hp
	Core Spray Pump	600 hp
	HP Service Water Pump	1,000 hp
	Emergency Service Water Pump	250 hp
	480 V Load Center	
4 kV Emergency Switchgear 20A18	RHR Pump	2,000 hp
	Core Spray Pump	600 hp
	HP Service Water Pump	1,000 hp
	CRD Water Pump	250 hp
	480 V Load Center	

<u>Bus Loads (Cooling Tower)</u>
<u>Units 2 and 3</u>

13.2 kV Switchgear 00A03B	Cooling Tower Pump	5,000 hp
	Cooling Tower Pump	5,000 hp
	Screen Wash Pump	450 hp
	Screen Wash Pump	450 hp
	480 V Load Center	
00A03C	Cooling Tower Pump	5,000 hp
	Screen Wash Pump	450 hp
	480 V Load Centers	

8.5 STANDBY AC POWER SUPPLY AND DISTRIBUTION

8.5.1 Safety Objective

The safety objective of the standby AC power supply is to provide a reliable source of electrical power for the safe shutdown of the reactors.

8.5.2 Safety Design Basis

1. The standby AC power supply design conforms to the intent of "Proposed IEEE Criteria for Class 1E Electrical Systems for Nuclear Power Generating Stations," dated June, 1969.

2. The standby AC power supply is located on the plant site, and is independent of offsite power sources.

3. The total number of standby diesel generator units is such that sufficient power is available to provide for the functioning of required engineered safeguard systems for one reactor unit and the shutting down of the other unit, assuming failure of one standby diesel generator and loss of all offsite power sources.

4. Each diesel generator unit is housed in a seismic Class I structure, and located such that the equipment is protected against other natural phenomena such as flood, tornado, rain, ice, snow, and lightning.

5. Equipment conforms to applicable standards of the NEMA, DEMA, ASME, ASTM, IEEE, ANSI, and state and local regulations.

6. The diesel generator sets have the ability to pick up loads in the sequence necessary for safe shutdown following the design basis accidents. (See Table 8.5.1 for sequence and time period and Table 8.5.2 for loads.)

7. Each diesel generator unit has a day tank supplied from an individual storage tank. The four storage tanks contain sufficient fuel to support one week of EDG operation at the post accident loads specified in Table 8.5.2.

8. Auxiliary motors and controls required for starting each diesel generator operate from separate station batteries. Other auxiliaries required to ensure continuous operation are supplied from the emergency

buses or control power transformers associated with the diesel generator.

9. The engines start automatically upon the total loss of offsite power, low water level in the reactor, or high drywell pressure.

10. The diesel generators are not operated in parallel with each other during the period of time when offsite power is not available.

8.5.3 Description

The standby AC power supply consists of four diesel generator units. Each unit consists of a diesel engine, a generator, and the associated auxiliaries mounted on a common base. Table 8.5.3 provides the data on the diesel generator units.

The continuous (annual, 8,760 hour) rating of the diesel generators is 2,600 kW. The 2,000 hour rating is 3,000 kW. The 200 hour rating is 3,100 kW and the 30 minute rating is 3,250 kW.

The units are capable of being started or stopped manually from local control stations near the engines as well as from remote stations in the control room. The generators are capable of being connected to the emergency buses from the control room, but not locally at the engines. The E2 and E4 diesel generators are also capable of being started and connected to the emergency buses from the alternative control station in the event of a fire affecting operation from the main control room.

Each standby diesel generator is automatically started on total loss of offsite power, low reactor water level, or high drywell pressure. Since two offsite power sources are available to each 4 kV emergency bus, the failure of one offsite source supplying power to the bus results in transfer to the second offsite source. Diesel generators are automatically connected to their associated 4 kV emergency buses after the generator voltage and frequency are established, bus voltage is zero, and all bus loads are tripped. The necessary safeguard loads and selected non-safeguard loads are then automatically sequenced onto the emergency diesel generators. Automatic sequencing of loads without offsite power available, with one offsite source available, and with two offsite sources available is shown in Tables 8.5.1, 8.5.4, and 8.5.5, respectively. The loading sequences are based on meeting ECCS requirements following a LOCA, while providing adequate voltage levels at emergency auxiliary buses in accordance with a comprehensive voltage regulation study. The loading of other loads onto the EDG is controlled by the circuit design. Beyond 10 minutes,the major loads are manually switched. Additional loads may be manually applied as permitted by the available capacity of the diesel generators. The diesel generator may be stopped by the operator after determining that continued operation of the diesel is not required.

Each diesel generator is connected to only one 4 kV emergency bus per reactor unit, and the four emergency buses for each reactor unit are operated as separate buses (split bus system) and are not synchronized.

Diesel generator monitoring information, data, and annunciation of trouble is provided from instrumentation and alarms either in the main control room and/or locally at each diesel generator unit. A common trouble alarm in the main control room is also provided in the event of any local alarm.

All necessary information, data, and annunciation of trouble at the diesel generator units are provided both in the main control room and locally at the diesel building.

Drawings E-8 and E-12 show the protective relaying for the diesel generators. Each generator breaker can be tripped by the following relays:

1. Generator differential overcurrent.*

2. 4 kV bus differential overcurrent.

3. Generator phase overcurrent.

4. Generator ground neutral overcurrent.*

5. Anti-motoring.

6. 4 kV bus phase overcurrent and gnd. neutral overcurrent.

The overcurrent relays and anti-motoring relays are set so that they do not trip the generator on transient overcurrents or power surges due to starting or tripping large loads. Other protective relays and devices are provided to annunciate abnormal generator conditions at the local control panel such as:

1. Generator field ground.

2. Generator loss of field.

3. Generator bearing high temperature.

Each diesel engine and related generator circuit breaker is tripped by the protective devices under the following abnormal conditions:

1. Engine overspeed.*

2. Jacket coolant high temperature.

3. Jacket coolant low pressure.

4. Lube oil high temperature.

5. Lube oil low pressure.

6. Crankcase high pressure.

7. After cooler coolant low pressure.

8. Fuel oil low pressure.

9. CO_2 fire extinguishing system discharged.*

Items marked with an (*) are considered as critical trips. Critical trips are trips that are <u>not</u> bypassed in the event that a LOCA signal is present. The reason that these trips are not bypassed with a LOCA signal present is that these trips are indicative of an equipment failure such that the equipment will no longer be able to perform its safety function. Therefore, bypassing these critical trips is not appropriate and may actually result in personnel injury or other substantial equipment damage. All other trips above are considered as non-critical trips. This means that these trips are indicative of a degradation of the EDG, but are not likely to result in a near term failure that would result in a loss of the safety function. Therefore, during conditions when a LOCA signal is present, it is appropriate that the EDG is not allowed to trip automatically for these causes. These conditions could be potentially assessed and actions could be taken to allow for continued EDG operation during a LOCA.

Protective tripping of the engines or generators is annunciated in the control room and locally at the diesel generator.

In order to prevent spurious tripping of the engine due to malfunction of an engine protective device, three independent sensors are provided and connected in two-out-of-three tripping logic with the exception of engine overspeed and CO_2 fire extinguishing system discharge. The overspeed trip is a highly reliable centrifugal flyweight system that actuates when engine speed exceeds the predetermined limit to trip the fuel racks and override the governor. It also closes an electrical limit switch to cause appropriate response of the engine control system. To further improve reliability, engine trips 2 through 8 are all blocked by a LOCA signal. A deliberate manual discharge of CO_2 is not blocked. This block is removed if the engine is manually shut down from the control room following a LOCA signal without loss of offsite power. A time-delay relay prevents diesel shutdown until after ten minutes have elapsed following receipt of the accident signal. These engine trips are not bypassed if the diesel generator restarts upon a subsequent Loss of Offsite Power (LOOP).

To ensure high reliability starting, each engine has a compressed air starting system consisting of an electric motor driven compressor, two air accumulators (receivers) each capable of storing air for five normal starts, and necessary check, isolation, and relief valves. Each engine has two rust-and-particulate resistant air start control valves; operation of only one is necessary to achieve a successful fast (< 10 second) engine start. To optimize plant flexibility, the discharge lines of all four compressors are capable of being tied together, as shown on Drawing M-377, sheet 1. To preclude the potential for common-mode failure, the compressor interconnections are separated by sealed-closed isolation barriers (locked closed valves) which are under plant administrative control.

Each engine is provided with a fuel day tank and two fuel pumps (Drawing M-377, Sheet 4). One pump is driven by the engine and one is driven by a 125 VDC motor supplied from the station batteries. The auxiliary motor driven pump is provided only for system reliability in the event that the engine driven pump fails. The auxiliary pump does not perform any active safety function in support of EDG operability. The day tank has a capacity when full to provide 2 1/2 hours of operation of the engine at continuous rating and that a minimum volume will be maintained in the tank to satisfy the limits stated in the Technical Specifications and to operate the engine commensurate with the guidance stated in ANSI N195-1976, Paragraph 6.1 and Appendix A. The day tank is, in turn, supplied from an individual storage tank containing sufficient fuel for operating the diesel for seven days at the post accident loads specified in Table 8.5.2. The fuel transfer pumps are interconnected. Procedurally controlled manual actions for manually operating local hand valves and control switches associated with the EDG fuel oil transfer system may be credited for system operability to support transfer of fuel oil between EDGs, testing and chemistry activities. Procedure controls to credit this manual action include:

a) Constant communication with the control room.

b) No other collateral duties by the qualified individual in charge of placing the EDG fuel oil transfer pump from the

"Off' to the "Auto" position and restoring manual valve positions.

c) Briefing of the qualified individual(s) that their actions are credited for maintaining the transfer of fuel oil from the underground storage tank to the day tank.

d) Direction to ensure that the EDG fuel oil transfer pump control switch is restored to the "Auto" position and valves realigned to allow automatic transfer of fuel oil if there is: 1) an automatic start of an EDG, 2) notification by licensed control room personnel that the EDG is required to operate, or 3) a receipt of the associated day tank low level alarm.

The instrumentation that monitors the status of the diesel generator fuel system is shown in Drawing M-377, Sheet 4. Any trouble annunciated on the local diesel generator annunciator panel gives annunciation on a control room annunciator window for each diesel generator ("DIESEL-GEN TROUBLE"). In addition, the following annunciator windows are located in the main control room for each diesel generator: "DIESEL-GEN DIFFERENTIAL AND GROUND," "DIESEL FAILED TO START," "DIESEL NOT IN AUTO," "DIESEL RUNNING," AND "DIESEL-GEN NOT RESET."

Each of the four diesel generator oil day tanks is provided with a high temperature switch to stop operation of the fuel oil transfer pump and actuate an alarm at the local control panel, in the event of a fire in the day tank or its enclosure.

The diesel generators reject heat to the jacket coolant system, the air cooler coolant system, and the lube oil system. Cooling water for the diesel engines is provided from the emergency service water system (subsection 10.9, Emergency Service Water System). The heat rejected to these systems is removed in shell and tube heat exchangers.

The jacket coolant system is provided to maintain the temperature of the jacket coolant in its optimum range during all loads and ambient temperatures. Electric immersion heaters are provided to maintain the jacket water at proper temperature for optimum standby starting conditions. Temperature switches and low pressure switches are provided to shut down the engine on high temperature or low pressure.

The air cooler coolant system reduces the temperature of the combustion air after the air leaves the turbocharger and before it enters the engine. The air cooler water flow is controlled to obtain fast warmup and to keep the engine combustion air temperature high enough to reduce condensation in the air induction system. The engine will be shutdown if coolant pressure is not restored within a predetermined time delay.

The lube oil system consists of an engine-driven lube oil pump, a lube oil filter, a lube oil cooler, a strainer, a motor driven pre-lube pump, a motor driven standby circulating pump and associated temperature and pressure switches, sensors, and alarms. The lube oil cooler maintains the temperature of the lube oil out of the engine at proper operating temperature under all conditions of load and ambient temperatures.

When the engines are shut down, a standby heating system maintains the engine jacket coolant and the engine lube oil temperatures high enough to permit the engines to reach rated speed within 10 seconds after starting without any delay to allow for engine warmup.

Sufficient capacity in the diesel cooling water system is provided so that the unit may be started from the standby condition and operated at the continuous rating for 3 min without the emergency service water in operation.

Each diesel generator has a combustion air intake system which consists of two air filters: a disposable filter unit connected to the positive displacement blower and a dual cleanable filter at the turbocharger inlet. The system provides clean air to the engines.

The diesel generators are designed to start and attain rated voltage and frequency within 10 sec. The generator, static exciter, and voltage regulator are designed to permit the unit to accept loading and to accelerate the motors in the sequence and time requirements shown in Table 8.5.1. The voltage drop from starting large motors has been calculated to ensure proper acceleration of the pumps under the required conditions for core cooling after a design basis accident. Proper control and timing relays are provided so that each load is applied automatically, at the proper time, in the starting sequence as indicated in Table 8.5.1. Upon application of emergency AC loads to each diesel generator, the voltage decreases to 59 percent of nominal when the 2,000 hp RHR pump motor is started. It has been determined that the diesel generator set starts and accelerates the RHR pump motor in the required sequence, and the voltage is restored to within 10 percent of nominal before the second load application, which is the 480 V auxiliary load. When the automatic loading sequence of the safeguards loads is completed, the operator may manually add other loads up to the rating of the diesel generator. He may also trip safeguards loads if their continued operation is not necessary.

The diesel generators are housed in a reinforced concrete, seismic Class I structure with the floor at Elevation 127 ft; the structure is watertight to the design flood level of Elevation 135 ft. Each unit is completely enclosed in its own concrete cell and is isolated from the other units. Interconnecting doorways are present for access between cells. Each unit is also protected against other natural phenomena such as tornado, lightning, rain, ice, and snow. The units are connected by cables, run in underground ducts and in rigid steel conduits, to 4 kV metal-clad switchgear. Each 4 kV switchgear is housed in a separate room within the seismic Class I emergency switchgear room (Drawing M-3). Fire detection systems and CO_2 fire extinguishing systems are provided in the diesel generator building. Drawing C-2 shows the location of the diesel generator building.

Each diesel generator, its auxiliary systems, its connections to 4 kV emergency switchgear, its control systems, and the distribution of power to various safeguards loads through 4 kV and 480 V systems are segregated and separated from the corresponding systems of the other diesel generator units. Each diesel generator unit is operated independently of the other units, and is disconnected from the utility power system, except during testing. During the test period, the diesel generator unit is manually synchronized to the utility system and loaded.

8.5.4 Safety Evaluation

The diesel generators are selected on the basis of their proven reliability as standby power supplies. By providing redundancy in the auxiliary pumps and in the air starting system components, by providing two-out-of-three tripping of the engine protective devices, and by properly selecting the generator and excitation characteristics, the reliability of the diesel generator units has been further improved.

The diesel generator units are capable of operating continuously for a period of 7 days without any offsite supplies. Fuel for 7 days operation at the post accident loads specified in Table 8.5.2 is stored in underground tanks. The starting air supply is stored in receivers and maintained at proper pressure. Station batteries are used for electrical control power to the air-start system. The units and all necessary auxiliary systems are housed in seismic Class I structures and are protected against other natural phenomena such as tornado, flood, lightning, rain, ice, and snow. The fuel oil storage tank and the day tank vents are not protected against tornados; however, analyses have been completed to demonstrate that the operation of the diesel generators will not be impaired by tornado damage to these vents.

The normal offsite power sources are extremely reliable and the probability of failure of all offsite power is low. Probability of failure of one of the diesel generators with simultaneous loss of offsite power is even lower. However, with one diesel out of service, the standby AC supply system is capable of furnishing power for safe shutdown of both reactors, assuming the hypothetical design basis accident has occurred in one reactor. The engineered safeguards loads are so divided (Drawings E-8 and E-12) among the four 4 kV emergency buses for each reactor that the failure of one diesel generator or one 4 kV emergency bus would not prevent a safe shutdown of both reactor units. Each diesel generator and its associated system are separated so that failure of any one component affects the operation of only one diesel generator system.

The capability of the diesel generator to start and attain rated voltage and frequency within 10 sec, and to accept the engineered safeguards loads in the required time, meets the necessary requirements for the standby AC supply system.

Tables 8.5.1 and 8.5.2A through 8.5.2l provide tabulation of the automatic and manual sequenced emergency loads on each of the diesel generators with a design basis accident on one unit and shutdown of the other unit. It also includes the time for energizing and deenergizing each electrical load from the initiating signal to a point where no further load changes are required.

An analysis of the loading of the diesel generators is presented in Tables 8.5.2 and 8.5.2A through 8.5.2L. The analysis shows that for the entire diesel loading sequence, the maximum loading presented by the engineered safeguards and certain selected non-safety loads is below 3,000 kW, the 2,000 hour rating for all four diesels (E1, E2, E3, and E4).

8.5.5 Inspection and Testing

Since the diesel generators are utilized as standby units, readiness is of prime importance. Readiness can best be demonstrated by testing in accordance with plant Technical Specifications. The testing program is designed to test the system's ability to start and to run under load for a period of time long enough to bring all system components into equilibrium conditions to assure that cooling and lubrication are adequate for extended periods of operation. Functional tests of the automatic starting circuitry are conducted as required to demonstrate proper operation.

In accordance with station blackout requirements, an emergency diesel generator reliability program which meets the requirements of USNRC Regulatory Guide 1.155, "Station Blackout" is in place.

Each diesel generator is equipped with a feature to automatically convert its controls from the droop to isochronous mode in the event that certain signal inputs occur while the DG is being tested. These signal inputs are LOCA, 4 kV Dead bus (LOOP), or manual operation of the Quick-Start push button from the main control room. Each of these signals will individually provide the necessary logic for the automatic conversion of the diesel generator under test from droop to isochronous mode.

Upon a receipt of a LOCA signal, the diesel generator breaker trips open, the controls automatically convert the test DG from droop to isochronous mode and the diesel generator remains running in a ready to load condition, defined as the diesel generator running at rated speed and voltage. With the DG output breaker open, the affected 4 kV bus remains connected to the Offsite source.

The 4 kV dead bus signal (LOOP) serves as a protective feature to prevent the diesel generator from converting from droop to isochronous mode while the diesel generator is being operated parallel to the grid under test. If the bus which shares the diesel generator as a power source experiences a dead bus condition (i.e., not the 4 kV bus being used to parallel the diesel generator with the grid), the diesel generator breaker will trip open, the diesel generator will automatically convert from droop to isochronous mode, and the diesel generator will continue to run in the ready to load condition. Thus the diesel generator is protected against damage that could occur if a droop to isochronous conversion were to occur while the diesel generator is connected to the grid.

Upon a Manual operation of the Quick-Start push button from the main control room, the diesel generator breaker trips open, the controls automatically convert the test DG from droop to isochronous mode and the diesel generator remains running in a ready to load condition. It also gives the operator a means by which he may manually separate the test DG from the 4 kV bus quickly.

When a DG is in test mode and upon receipt of a LOOP signal, 4 kV DG breaker lockouts could occur due to anti-pumping protective feature actuation. Anti-pumping is a breaker protective feature for receipt of a close signal with inadequately charged closing springs or simultaneous receipt of close and trip signals. This breaker lockout condition could be resolved by simple manual action of the breaker control switch from the main control room.

Colt Industries Fairbanks Morse Power System Division, the supplier of the diesel generator, has demonstrated that they meet the essential requirements of diesel generator sets for nuclear power plant protection including positive start, rapid acceleration, and load acceptance with acceptable voltage drop and fast recovery to rated voltage. The demonstration was described in IEEE Conference Paper 69 CP 177-PWR. Pre-operational tests were performed by simulation of the actual worst load cases to demonstrate adequate performance. Pre-operational tests included testing of all circuitry for automatic starting, switching, and load sequencing. All protective devices were tested.

The Technical Specification surveillance requirements are limited to ensuring that the EDGs' non-critical trips are bypassed when a LOCA signal is present. However, all the above protective instrumentation (whether critical or non-critical) are appropriately calibrated / tested in accordance with the station preventive maintenance program. An appropriate test is performed for each EDG to ensure that the EDG control logic operates properly such that only the non-critical trips are bypassed with a LOCA signal present. Also testing is performed to ensure that the critical trips occur. The testing is performed by placing jumpers into the control logic to simulate a LOCA signal and ensuring appropriate control logic relays operate (whether critical trips or non-critical trips). This test ensures that critical trips are not bypassed.

8.5.6 Compliance with Safety Guides

Safety Guide No. 9

The overall plant design, including the design of the onsite electrical power systems, was approved by the AEC/NRC and a construction permit issued significantly before issuance of AEC/NRC Safety Guide No. 9, "Selection of Diesel-Generator Set Capacity For Standby Power Supplies" (issued March 10, 1971), and General Design Criterion 17 (published February 20, 1971) cited therein. However, Peach Bottom Units 2 and 3 have been evaluated with respect to AEC/NRC Safety Guide No. 9, and with the acceptable exceptions of the RHR pump motor starting voltage, the E2 loading described in Section 8.5.4 and other EDG loadings described in the tables referenced in Section 8.5.2, the design complies with the regulatory positions of Safety Guide 9.

TABLE 8.5.1

SEQUENCE OF EVENTS IN THE AUTOMATIC

APPLICATION OF EMERGENCY AC LOADS ON LOSS-OF-COOLANT*

WITHOUT OFFSITE POWER

Event	Time (sec)	Comment
Accident	0	
Signal to start diesel	3	
Diesel ready to load Start one RHR pump motor	13	
Apply power to 460 V auxiliaries and motor operated valves	16	
Start one core spray pump motor	19	
Start opening core spray valves and selected RHR injection valves	23.5	
Start closing recirculation line discharge valves	30	
Core spray injection valves open	41.5	This completes the core spray start sequence

* This sequence applies to one diesel and its associated loads for a recirculation suction line break. The other diesels have a similar sequence and load.

TABLE 8.5.1 (Continued)

Event	Time (sec)	Comment
Start one emergency service water pump motor	49	
RHR injection valves open	57.5	This completes the RHR start sequence.
Recirculation line valves close	59	This completes the ECCS start sequence.

Table 8.5.2

Table 8.5.2 has been deleted
(Refer to information provided in Tables 8.5.2.C through 8.5.2.L)

TABLE 8.5.2A
NOTES TO
TABLE 8.5.2B

1. MOVs are started automatically in functional groups. Maximum stroking time is 30 sec. MOV loads are included in diesel generator loading tables to follow with a 0.15 load factor, during the 0-10 minute operating period only, because of the short MOV operating time.

2. Design Basis Accident - Minimum operation of emergency core cooling pumps in order to meet the ECCS Acceptance Criteria of 10CRF50.46 under conditions of a design basis accident is as follows:

0-10 min	Acceptable for Discharge Side DBA Break	2 CS 1 CS + 1 LPCI 2 CS + 1 LPCI 1 CS + 2 LPCI (in same loop)	Unacceptable for Suction-Side DBA Break
		2 CS + 2 LPCI (in same loop) 1 CS + 2 LPCI (one each loop) 2 CS + 2 LPCI (one each loop) 1 CS + 3 LPCI 2 CS + 3 LPCI 1 CS + 4 LPCI 2 CS + 4 LPCI	Acceptable for Suction-Side DBA Break
10 min - 1 hr & Beyond	Unit 3: 1 RHR pump and 1 high-pressure service water pump and 1 core spray loop (2 pumps) or 2 RHR pumps and 1 high-pressure service water pump Unit 2: 1 RHR pump and 1 high-pressure service water pump (10 min – 1 hr), 2 high pressure service water pumps (1 hr and beyond), and 1 core spray loop (2 pumps) or 2 RHR pumps and 1 high-pressure service water pump (10 min – 1 hr), 2 high pressure service water pumps (1 hr and beyond)		

(In addition to the above pumps, one emergency service water pump is required under all conditions.)

Emergency Shutdown - Minimum operation of emergency core cooling pumps to effect an emergency shutdown is as follows:

0-1 hr	None
Beyond 1 hr	1 RHR pump and 1 high-pressure service water pump

(One emergency service water pump is required under all conditions.)

TABLE 8.5.2A
NOTES TO
TABLE 8.5.2B

3. a. Unit 3: The RHR pump operating load is 1,604 kW for maximum flow (only one pump operating in a division), 1,504 kW for intermediate flow (initial two pump operation per division), and 1,480 kW for flow (after operator action to throttle the pump discharge valves, back to 10, 000 gpm). The RHR pump operating load varies from pump to pump. The valves used in the tables are worst case loads. These load valves take credit for a post accident torus water temperature of 130°F.
   b. Unit 2: The RHR pump operating load is 1,475 kW for maximum flow and 1,380 kW for flow after operator action to throttle the pump discharge valves to 8,600 pgm. The RHR pump operating load varies from pump to pump. The values used in the tables are worst case loads. These load values take credit for a post-accident torus water temperature of 130°F.

4. Tables 8.5.2.C, D, E, H, I, and J are based on the Case B or Case C analysis of Chapter 14, Section 14.6.3.3.2 "Containment Response;" and Tables 8.5.2F, G, K and L are based on Case C analysis.

5. The core spray pump operating load varies from pump to pump. The 511 kW value used in the tables is the worst case load and is associated with the 2C pump. This value takes credit for a post accident torus water temperature of 130°F

TABLE 8.5.2b
ASSIGNMENT OF SAFEGUARDS & SELECTED

NON-SAFEGUARDS LOADS TO
DIESEL GENERATORS & EMERGENCY BUSES

ITEM NO	LOAD DESCRIPTION	NUMBER OF OPERATION UNITS			CAPACITY EACH	RATED HP EACH	OPER KW EACH	STARTUP MODE & OPERATING REQUIREMENTS (NOTE 2)								DIVISION I KW LOAD				DIVISION II KW LOAD			
		UNIT 2	COMMON	UNIT 3				UNIT 2 DBA				UNIT 3 EMER SHUTDOWN				DIESEL E1		DIESEL E3		DIESEL E2		DIESEL E4	
								AUTO	STANDBY AUTO	STANDBY MAN	MAN	AUTO	STANDBY AUTO	STANDBY MAN	MAN	UNIT 2 BUS E12	UNIT 3 BUS E13	UNIT 2 BUS E32	UNIT 3 BUS E33	UNIT 2 BUS E22	UNIT 3 BUS E23	UNIT 2 BUS E42	UNIT 3 BUS E43
1	RHR PUMPS	4		4	1 / 3	2000	(Note 3)	4						4		1380	1480	1380	1480	1380	1480	1380	1480
2	CORE SPRAY PUMPS	4		4	1 / 2	600	481	4								511	511	511	511	511	511	511	511
3	HP SERVICE WATER PUMPS	4		4	Full	1000	802 / 795				4				4	802	802	802	802	802	802	802	795
4	ESW & ECW PUMPS		3		Full	250	205	2				1				0	0	205	0	205	0	0	205
5	CONTROL ROD DRIVE PUMPS	2		2		250	212			2					2	212	0	0	212	0	212	212	0
6	MOTOR OPERATED VALVES	GR		GR				GR								100	88	105	118	78	42	127	126
7	EMERGENCY LIGHTING	5	8	4				12				5				53	14	25	0	20	39	78	68
8	EDG COOLANT & LUBE OIL PUMPS		4 & 4		Full	25 & 50	21 & 41		4							62	0	62	0	0	62	0	62
9	EDG FUEL XFER & AFTER COOLER PP		4 & 4		Full	5.9 & 7.5	5 & 7		4							12	0	12	0	0	12	0	12
10	EDG START AIR COMPRESSOR		4		Full	8	7		4							7	0	7	0	0	7	0	7
11	24 V BATTERY CHARGERS	4		4	Full		3	4	4			4				3	3	3	3	3	3	3	3
12	125 V BATTERY CHARGERS	4		4			30	4				4				30	30	30	30	30	30	30	30
13	INSTRUMENT PANELS & UPS POWER	5 & 1		4 & 1	Full		GR & 19	5 & 1				4 & 1				19	37	7	7	19	19	25	0
14	RX BLDG COOL WATER PUMPS	2		2	Full	75	62	1		1		1		1		0	62	62	0	62	62	0	0
15	DRYWELL COOLER FANS	4 / 14		4 / 14	1 / 2 & 1 / 7	15 / 5	13 / 4					1 & 7	1 & 7			43	43	13	13	22	22	34	34
16	CONTROL ROOM VENT FANS		2 & 2		Full	10 & 2	10	1	1							0	0	10	0	0	0	10	0
17	EMERGENCY SWGR SUPPLY FANS		2		Full	50	41		1		1					0	0	41	0	0	0	41	0
18	EMERGENCY SWGR EXHAUST FANS		2		Full	25	21		1		1					0	0	21	0	0	0	21	0
19	BATTERY ROOM EXHAUST FANS		2		Full	15	13		1		1					0	0	13	0	0	0	13	0
20	EDG VENT & PUMP ROOM FANS		4 / 4 & 2 / 2		Full	20 / 21 & 5 / 1	25 / 17 & 4 / 1	8 & 1	1							38	0	39	0	0	42	0	35
21	RHR ROOM COOLING UNITS	8		8	Full	15	13	4				4				26	26	26	26	26	26	26	26
22	HPCI ROOM COOLING UNITS	2		2	Full	5	4	1				1				0	0	0	0	8	8	0	0
23	RCIC ROOM COOLING UNITS	2		2	Full	2	1	1				1				2	2	0	0	0	0	0	0
24	CORE SPRAY ROOM COOLING UNITS	8		8	Full	5	4	4				4				8	8	8	8	8	8	8	8
25	SGTS EXHAUST FANS	1	1	1	Full	50	40	1	1				1			40	0	0	40	40	0	0	0
26	SGTS EXHAUST HEATER		2				46	1					1			46	0	0	0	0	46	0	0
27	STANDBY LIQUID CONTROL PUMP	2		2	Full	50	42			2				2		42	42	0	0	42	42	0	0
28	SLC TANK HEATER & HEAT TRACE	1 & 1		1 & 1	Full		60 & 15		1				1			75	0	0	75	0	0	0	0
29	SERVICE WTR SCREENS & WASH PP		GR						GR							48	0	0	0	46	0	0	0
30	120 / 208 V DISTRIBUTION PANELS	GR	GR	GR				GR								37	20	33	18	32	29	38	40
31	PLANT STACK DILUTION FANS		3		Full	20	17				3					17	0	17	0	0	0	17	0
32	RX AREA, RFL FLR, & COMP RM AC	GR	GR	GR				GR				GR				0	0	157	136	0	0	157	136
33	EDG SKID EQUIPMENT & CRANE		GR					GR			GR					50	0	50	0	0	50	0	50
34	AIR COMPRESSORS	1		1	Full	100	81	2				2				0	81	81	0	0	0	0	0
35	MISC LOADS & SYSTEM LOSSES	GR	GR	GR				GR			GR	GR			GR	180	81	81	63	537	112	148	117
36	EMERGENCY COOLING TOWER FAN		3		1 / 3	20	159									0	159	0	0	0	159	0	159
37	EMER COOLING TOWER FAN HTR PANEL		1		Full		95									0	0	0	0	0	95	0	0

FOR NOTES SEE TABLE 8.5.2a

Table 8.5.2.C

PBAPS TABLE 8.5.2.C

DIESEL GENERATOR & EMERGENCY BUS LOADING
FOUR DIESEL GENERATORS IN SERVICE
UNIT 2 - DESIGN BASIS ACCIDENT
UNIT 3 - EMERGENCY SHUTDOWN

0 - 10 MINUTES

ITEM	LOAD DESCRIPTION	DIVISION I				DIVISION II			
		EDG E1		EDG E3		EDG E2		EDG E4	
		E12	E13	E32	E33	E22	E23	E42	E43
1	RHR PUMPS	1475	0	1475	0	1475	0	1475	0
2	CORE SPRAY PUMPS	511	0	511	0	511	0	511	0
3	HP SERVICE WATER PUMPS	0	0	0	0	0	0	0	0
4	ESW & ECW PUMPS	0	0	205	0	205	0	0	205
5	CONTROL ROD DRIVE PUMPS	0	0	0	0	0	0	0	0
6	MOTOR-OPERATED VALVES	8	0	0	0	7	0	1	0
7	EMERGENCY LIGHTING	53	14	22	0	20	39	80	68
8	EDG COOLANT & LUBE OIL PUMPS	0	0	0	0	0	0	0	0
9	EDG FUEL XFER & AFTER CLR PP	3	0	3	0	0	3	0	3
10	EDG START AIR COMPRESSOR	7	0	7	0	0	7	0	7
11	24 V BATTERY CHARGERS	3	3	3	3	3	3	3	3
12	125 V BATTERY CHARGERS	30	30	30	30	30	30	30	30
13	INSTRUMENT PNLS & UPS POWER	22	18	7	8	11	19	14	0
14	RX BLDG COOL WATER PUMPS	0	62	62	0	62	62	0	0
15	DRYWELL COOLER FANS	0	22	0	4	0	4	0	26
16	CONTROL ROOM VENT FANS	0	0	10	0	0	0	10	0
17	EMER SWGR SUPPLY FANS	0	0	41	0	0	0	41	0
18	EMER SWGR EXHAUST FANS	0	0	21	0	0	0	21	0
19	BATTERY ROOM EXHAUST FANS	0	0	13	0	0	0	13	0
20	EDG VENT & PUMP ROOM FANS	38	0	38	0	0	42	0	35
21	RHR ROOM COOLING UNITS	13	0	13	0	13	0	13	0
22	HPCI ROOM COOLING UNITS	0	0	0	0	4	4	0	0
23	RCIC ROOM COOLING UNITS	1	1	0	0	0	0	0	0
24	CORE SPRAY ROOM COOLING UNITS	4	0	4	0	4	0	4	0
25	SGTS EXHAUST FANS	40	0	0	40	40	0	0	0
26	SGTS EXHAUST HEATER	46	0	0	0	0	46	0	0
27	STANDBY LIQUID CONTROL PUMP	0	0	0	0	0	0	0	0
28	SLC TANK HEATER & HEAT TRACE	0	0	0	0	0	0	0	0
29	SERVICE WTR SCRNS & WASH PP	46	0	0	0	46	0	0	0
30	120 / 208 V DISTRIBUTION PANELS	36	20	33	18	32	30	34	39
31	PLANT STACK DILUTION FANS	17	0	17	0	0	0	17	0
32	RX AREA RFL FLR. & COMP RM AC	0	0	8	0	0	0	8	0
33	EDG SKID EQUIPMENT & CRANE	0	0	0	0	0	0	0	0
34	AIR COMPRESSORS	0	81	81	0	0	0	0	0
35	MISC LOADS & SYSTEM LOSSES	85	14	80	16	126	18	49	72
	4kv BUS SUBTOTAL (kw)	2436	265	2664	119	2589	307	2323	488
	DIESEL GENERATOR TOTAL (KW)	2701		2783		2896		2811	

10 - 60 MINUTES

ITEM	LOAD DESCRIPTION	DIVISION I				DIVISION II			
		EDG E1		EDG E3		EDG E2		EDG E4	
		E12	E13	E32	E33	E22	E23	E42	E43
1	RHR PUMPS	1380	0	0	0	0	0	0	0
2	CORE SPRAY PUMPS	0	0	0	0	511	0	511	0
3	HP SERVICE WATER PUMPS	0	0	802	0	0	0	0	0
4	ESW & ECW PUMPS	0	0	205	0	0	0	0	0
5	CONTROL ROD DRIVE PUMPS	0	0	0	0	0	0	0	0
6	MOTOR-OPERATED VALVES	0	0	0	0	0	0	0	0
7	EMERGENCY LIGHTING	53	14	22	0	20	39	80	68
8	EDG COOLANT & LUBE OIL PUMPS	0	0	0	0	0	0	0	0
9	EDG FUEL XFER & AFTER CLR PP	3	0	3	0	0	3	0	3
10	EDG START AIR COMPRESSOR	0	0	0	0	0	0	0	0
11	24 V BATTERY CHARGERS	3	3	3	3	3	3	3	3
12	125 V BATTERY CHARGERS	30	30	30	30	30	30	30	30
13	INSTRUMENT PNLS & UPS POWER	22	18	7	8	11	19	14	0
14	RX BLDG COOL WATER PUMPS	0	62	62	0	62	62	0	0
15	DRYWELL COOLER FANS	0	22	0	4	0	4	0	26
16	CONTROL ROOM VENT FANS	0	0	10	0	0	0	10	0
17	EMER SWGR SUPPLY FANS	0	0	41	0	0	0	41	0
18	EMER SWGR EXHAUST FANS	0	0	21	0	0	0	21	0
19	BATTERY ROOM EXHAUST FANS	0	0	13	0	0	0	13	0
20	EDG VENT & PUMP ROOM FANS	38	0	38	0	0	42	0	35
21	RHR ROOM COOLING UNITS	13	0	0	0	0	0	0	0
22	HPCI ROOM COOLING UNITS	0	0	0	0	4	0	0	0
23	RCIC ROOM COOLING UNITS	1	0	0	0	0	0	0	0
24	CORE SPRAY ROOM COOLING UNITS	0	0	0	0	4	0	4	0
25	SGTS EXHAUST FANS	40	0	0	40	40	0	0	0
26	SGTS EXHAUST HEATER	46	0	0	0	0	46	0	0
27	STANDBY LIQUID CONTROL PUMP	0	0	0	0	0	0	0	0
28	SLC TANK HEATER & HEAT TRACE	0	0	0	0	0	0	0	0
29	SERVICE WTR SCRNS & WASH PP	46	0	0	0	46	0	0	0
30	120 / 208 V DISTRIBUTION PANELS	36	20	33	18	32	30	34	39
31	PLANT STACK DILUTION FANS	17	0	17	0	0	0	17	0
32	RX AREA RFL FLR. & COMP RM AC	0	0	8	0	0	0	8	0
33	EDG SKID EQUIPMENT & CRANE	0	0	0	0	0	0	0	0
34	AIR COMPRESSORS	0	81	81	0	0	0	0	0
35	MISC LOADS & SYSTEM LOSSES	151	79	80	37	225	117	84	107
	4kv BUS SUBTOTAL (kw)	1877	328	1476	139	989	395	869	310
	DIESEL GENERATOR TOTAL (KW)	2205		1615		1384		1179	

1 HOUR AND LONGER

ITEM	LOAD DESCRIPTION	DIVISION I				DIVISION II			
		EDG E1		EDG E3		EDG E2		EDG E4	
		E12	E13	E32	E33	E22	E23	E42	E43
1	RHR PUMPS	1380	0	0	0	0	0	0	1380
2	CORE SPRAY PUMPS	0	0	0	0	511	0	511	0
3	HP SERVICE WATER PUMPS	802	0	802	0	0	802	0	0
4	ESW & ECW PUMPS	0	0	205	0	0	0	0	0
5	CONTROL ROD DRIVE PUMPS	0	0	0	0	0	0	0	0
6	MOTOR-OPERATED VALVES	0	0	0	0	0	0	0	0
7	EMERGENCY LIGHTING	53	14	22	0	20	39	80	68
8	EDG COOLANT & LUBE OIL PUMPS	0	0	0	0	0	0	0	0
9	EDG FUEL XFER & AFTER CLR PP	3	0	3	0	0	3	0	3
10	EDG START AIR COMPRESSOR	0	0	0	0	0	0	0	0
11	24 V BATTERY CHARGERS	3	3	3	3	3	3	3	3
12	125 V BATTERY CHARGERS	30	30	30	30	30	30	30	30
13	INSTRUMENT PNLS & UPS POWER	22	18	7	8	11	19	14	0
14	RX BLDG COOL WATER PUMPS	0	0	0	0	0	0	0	0
15	DRYWELL COOLER FANS	0	0	0	0	0	0	0	0
16	CONTROL ROOM VENT FANS	0	0	10	0	0	0	10	0
17	EMER SWGR SUPPLY FANS	0	0	41	0	0	0	41	0
18	EMER SWGR EXHAUST FANS	0	0	21	0	0	0	21	0
19	BATTERY ROOM EXHAUST FANS	0	0	13	0	0	0	13	0
20	EDG VENT & PUMP ROOM FANS	38	0	38	0	0	42	0	35
21	RHR ROOM COOLING UNITS	13	0	0	0	0	0	0	13
22	HPCI ROOM COOLING UNITS	0	0	0	0	4	0	0	0
23	RCIC ROOM COOLING UNITS	1	0	0	0	0	0	0	0
24	CORE SPRAY ROOM COOLING UNITS	0	0	0	0	4	0	4	0
25	SGTS EXHAUST FANS	40	0	0	40	40	0	0	0
26	SGTS EXHAUST HEATER	46	0	0	0	0	46	0	0
27	STANDBY LIQUID CONTROL PUMP	0	0	0	0	0	0	0	0
28	SLC TANK HEATER & HEAT TRACE	0	0	0	0	0	0	0	0
29	SERVICE WTR SCRNS & WASH PP	46	0	0	0	46	0	0	0
30	120 / 208 V DISTRIBUTION PANELS	36	20	33	18	32	30	34	39
31	PLANT STACK DILUTION FANS	17	0	17	0	0	0	17	0
32	RX AREA RFL FLR. & COMP RM AC	0	0	8	0	0	0	8	0
33	EDG SKID EQUIPMENT & CRANE	0	0	0	0	0	0	0	0
34	AIR COMPRESSORS	0	0	0	0	0	0	0	0
35	MISC LOADS & SYSTEM LOSSES	148	72	40	24	120	62	49	54
	4kv BUS SUBTOTAL (kw)	2676	157	1292	122	820	1077	834	1625
	DIESEL GENERATOR TOTAL (KW)	2833		1414		1897		2459	

Note: Bus SubTotals and DG Totals are summed prior to individual load rounding, and may not reflect the sum of the indicated rounded loads on the table due to rounding erro

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Table 8.5.2.D

PBAPS TABLE 8.5.2.D

DIESEL GENERATOR & EMERGENCY BUS LOADING
DIESEL GENERATOR E1 OUT OF SERVICE
UNIT 2 - DESIGN BASIS ACCIDENT
UNIT 3 - EMERGENCY SHUTDOWN

		0 - 10 MINUTES								10 - 60 MINUTES								1 HOUR AND LONGER							
		DIVISION I				DIVISION II				DIVISION I				DIVISION II				DIVISION I				DIVISION II			
		EDG E1		EDG E3		EDG E2		EDG E4		EDG E1		EDG E3		EDG E2		EDG E4		EDG E1		EDG E3		EDG E2		EDG E4	
ITEM	LOAD DESCRIPTION	E12	E13	E32	E33	E22	E23	E42	E43	E12	E13	E32	E33	E22	E23	E42	E43	E12	E13	E32	E33	E22	E23	E42	E43
1	RHR PUMPS	0	0	1475	0	1475	0	1475	0	0	0	0	0	0	0	1380	0	0	0	1380	0	0	0	0	1380
2	CORE SPRAY PUMPS	0	0	511	0	511	0	511	0	0	0	0	0	511	0	511	0	0	0	0	0	511	0	511	0
3	HP SERVICE WATER PUMPS	0	0	0	0	0	0	0	0	0	0	0	0	802	0	0	0	0	0	802	0	802	802	0	0
4	ESW & ECW PUMPS	0	0	205	0	205	0	0	205	0	0	205	0	0	0	0	0	0	0	205	0	0	0	0	0
5	CONTROL ROD DRIVE PUMPS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	MOTOR-OPERATED VALVES	0	0	2	0	7	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	EMERGENCY LIGHTING	0	0	22	0	20	39	80	68	0	0	22	0	20	39	80	68	0	0	22	0	20	39	80	68
8	EDG COOLANT & LUBE OIL PUMPS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	EDG FUEL XFER & AFTER CLR PP	0	0	3	0	0	3	0	3	0	0	3	0	0	3	0	3	0	0	3	0	0	3	0	3
10	EDG START AIR COMPRESSOR	0	0	7	0	0	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	24 V BATTERY CHARGERS	0	0	3	3	3	3	3	3	0	0	3	3	3	3	3	3	0	0	3	3	3	3	3	3
12	125 V BATTERY CHARGERS	0	0	30	30	30	30	30	30	0	0	30	30	30	30	30	30	0	0	30	30	30	30	30	30
13	INSTRUMENT PNLS & UPS POWER	0	0	7	8	11	19	14	0	0	0	7	8	11	19	14	0	0	0	7	8	11	19	14	0
14	RX BLDG COOL WATER PUMPS	0	0	62	0	62	62	0	0	0	0	62	0	62	62	0	0	0	0	0	0	0	0	0	0
15	DRYWELL COOLER FANS	0	0	0	4	0	21	0	30	0	0	0	4	0	21	0	30	0	0	0	0	0	0	0	0
16	CONTROL ROOM VENT FANS	0	0	10	0	0	0	10	0	0	0	10	0	0	0	10	0	0	0	10	0	0	0	10	0
17	EMER SWGR SUPPLY FANS	0	0	41	0	0	0	41	0	0	0	41	0	0	0	41	0	0	0	41	0	0	0	41	0
18	EMER SWGR EXHAUST FANS	0	0	21	0	0	0	21	0	0	0	21	0	0	0	21	0	0	0	21	0	0	0	21	0
19	BATTERY ROOM EXHAUST FANS	0	0	13	0	0	0	13	0	0	0	13	0	0	0	13	0	0	0	13	0	0	0	13	0
20	EDG VENT & PUMP ROOM FANS	0	0	38	0	0	42	0	35	0	0	38	0	0	42	0	35	0	0	38	0	0	42	0	35
21	RHR ROOM COOLING UNITS	0	0	13	0	13	0	13	0	0	0	0	0	0	0	13	0	0	0	13	0	0	0	0	13
22	HPCI ROOM COOLING UNITS	0	0	0	0	4	4	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4	0	0	0
23	RCIC ROOM COOLING UNITS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	CORE SPRAY ROOM COOLING UNITS	0	0	4	0	4	0	4	0	0	0	0	0	4	0	4	0	0	0	0	0	4	0	4	0
25	SGTS EXHAUST FANS	0	0	0	40	40	0	0	0	0	0	0	40	40	0	0	0	0	0	0	40	40	0	0	0
26	SGTS EXHAUST HEATER	0	0	0	0	0	46	0	0	0	0	0	0	0	46	0	0	0	0	0	0	0	46	0	0
27	STANDBY LIQUID CONTROL PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	SLC TANK HEATER & HEAT TRACE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	SERVICE WTR SCRNS & WASH PP	0	0	0	0	46	0	0	0	0	0	0	0	46	0	0	0	0	0	0	0	46	0	0	0
30	120 / 208 V DISTRIBUTION PANELS	0	0	33	18	32	30	34	39	0	0	33	18	32	30	34	39	0	0	33	18	32	30	34	39
31	PLANT STACK DILUTION FANS	0	0	17	0	0	0	17	0	0	0	17	0	0	0	17	0	0	0	17	0	0	0	17	0
32	RX AREA RFL FLR. & COMP RM AC	0	0	0	0	0	0	8	0	0	0	8	0	0	0	8	0	0	0	8	0	0	0	8	0
33	EDG SKID EQUIPMENT & CRANE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	AIR COMPRESSORS	0	0	81	0	0	0	0	0	0	0	81	0	0	0	0	0	0	0	0	0	0	0	0	0
35	MISC LOADS & SYSTEM LOSSES	0	0	60	16	126	16	49	79	0	0	89	37	225	118	84	114	0	0	40	24	120	62	49	60
	4kv BUS SUBTOTAL (kw)	0	0	2666	119	2589	324	2323	498	0	0	673	139	1791	413	2262	322	0	0	2685	122	1623	1077	834	1631
	DIESEL GENERATOR TOTAL (KW)	0		2785		2913		2822		0		812		2204		2584		0		2807		2700		2465	

Note: Bus SubTotals and DG Totals are summed prior to individual load rounding, and may not reflect the sum of the indicated rounded loads on the table due to rounding erro

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Table 8.5.2.E

PBAPS TABLE 8.5.2.E

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DIESEL GENERATOR & EMERGENCY BUS LOADING
DIESEL GENERATOR E2 OUT OF SERVICE
UNIT 2 - DESIGN BASIS ACCIDENT
UNIT 3 - EMERGENCY SHUTDOWN

		0 - 10 MINUTES								10 - 60 MINUTES								1 HOUR AND LONGER							
		DIVISION I				DIVISION II				DIVISION I				DIVISION II				DIVISION I				DIVISION II			
		EDG E1		EDG E3		EDG E2		EDG E4		EDG E1		EDG E3		EDG E2		EDG E4		EDG E1		EDG E3		EDG E2		EDG E4	
ITEM	LOAD DESCRIPTION	E12	E13	E32	E33	E22	E23	E42	E43	E12	E13	E32	E33	E22	E23	E42	E43	E12	E13	E32	E33	E22	E23	E42	E43
1	RHR PUMPS	1475	0	1475	0	0	0	1475	0	1380	0	0	0	0	0	0	0	0	1380	0	0	0	0	1380	0
2	CORE SPRAY PUMPS	511	0	511	0	0	0	511	0	511	0	511	0	0	0	0	0	511	0	511	0	0	0	0	0
3	HP SERVICE WATER PUMPS	0	0	0	0	0	0	0	0	0	0	802	0	0	0	0	0	0	0	802	802	0	0	802	0
4	ESW & ECW PUMPS	0	0	205	0	0	0	0	205	0	0	205	0	0	0	0	0	0	0	205	0	0	0	0	0
5	CONTROL ROD DRIVE PUMPS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	MOTOR-OPERATED VALVES	8	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	EMERGENCY LIGHTING	53	14	22	0	0	0	80	68	53	14	22	0	0	0	80	68	53	14	22	0	0	0	80	68
8	EDG COOLANT & LUBE OIL PUMPS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	EDG FUEL XFER & AFTER CLR PP	3	0	3	0	0	0	0	3	3	0	3	0	0	0	0	3	3	0	3	0	0	0	0	3
10	EDG START AIR COMPRESSOR	7	0	7	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	24 V BATTERY CHARGERS	3	3	3	3	0	0	3	3	3	3	3	3	0	0	3	3	3	3	3	3	0	0	3	3
12	125 V BATTERY CHARGERS	30	30	30	30	0	0	30	30	30	30	30	30	0	0	30	30	30	30	30	30	0	0	30	30
13	INSTRUMENT PNLS & UPS POWER	22	18	7	8	0	0	14	0	22	18	7	8	0	0	14	0	22	18	7	8	0	0	14	0
14	RX BLDG COOL WATER PUMPS	0	62	62	0	0	0	0	0	0	62	62	0	0	0	0	0	0	0	0	0	0	0	0	0
15	DRYWELL COOLER FANS	0	26	0	4	0	0	0	26	0	26	0	4	0	0	0	26	0	0	0	0	0	0	0	0
16	CONTROL ROOM VENT FANS	0	0	10	0	0	0	10	0	0	0	10	0	0	0	10	0	0	0	10	0	0	0	10	0
17	EMER SWGR SUPPLY FANS	0	0	41	0	0	0	41	0	0	0	41	0	0	0	41	0	0	0	41	0	0	0	41	0
18	EMER SWGR EXHAUST FANS	0	0	21	0	0	0	21	0	0	0	21	0	0	0	21	0	0	0	21	0	0	0	21	0
19	BATTERY ROOM EXHAUST FANS	0	0	13	0	0	0	13	0	0	0	13	0	0	0	13	0	0	0	13	0	0	0	13	0
20	EDG VENT & PUMP ROOM FANS	38	0	38	0	0	0	0	35	38	0	38	0	0	0	0	35	38	0	38	0	0	0	0	35
21	RHR ROOM COOLING UNITS	13	0	13	0	0	0	13	0	13	0	0	0	0	0	0	0	0	13	0	0	0	0	13	0
22	HPCI ROOM COOLING UNITS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	RCIC ROOM COOLING UNITS	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
24	CORE SPRAY ROOM COOLING UNITS	4	0	4	0	0	0	4	0	4	0	4	0	0	0	0	0	4	0	4	0	0	0	0	0
25	SGTS EXHAUST FANS	40	0	0	40	0	0	0	0	40	0	0	40	0	0	0	0	40	0	0	40	0	0	0	0
26	SGTS EXHAUST HEATER	46	0	0	0	0	0	0	0	46	0	0	0	0	0	0	0	46	0	0	0	0	0	0	0
27	STANDBY LIQUID CONTROL PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	SLC TANK HEATER & HEAT TRACE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	SERVICE WTR SCRNS & WASH PP	46	0	0	0	0	0	0	0	46	0	0	0	0	0	0	0	46	0	0	0	0	0	0	0
30	120 / 208 V DISTRIBUTION PANELS	36	20	33	18	0	0	34	39	36	20	33	18	0	0	34	39	36	20	33	18	0	0	34	39
31	PLANT STACK DILUTION FANS	17	0	17	0	0	0	17	0	17	0	17	0	0	0	17	0	17	0	17	0	0	0	17	0
32	RX AREA RFL FLR. & COMP RM AC	0	0	8	0	0	0	8	0	0	0	8	0	0	0	8	0	0	0	8	0	0	0	8	0
33	EDG SKID EQUIPMENT & CRANE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	AIR COMPRESSORS	0	81	81	0	0	0	0	0	0	81	81	0	0	0	0	0	0	0	0	0	0	0	0	0
35	MISC LOADS & SYSTEM LOSSES	85	14	60	16	0	0	49	72	151	79	80	37	0	0	83	107	148	72	40	24	0	0	49	54
	4kv BUS SUBTOTAL (kw)	2436	269	2584	119	0	0	2330	488	2393	333	1991	139	0	0	353	310	997	1550	1808	924	0	0	2514	232
	DIESEL GENERATOR TOTAL (KW)	2705		2703		0		2818		2726		2130		0		663		2547		2732		0		2746	

Note: Bus SubTotals and DG Totals are summed prior to individual load rounding, and may not reflect the sum of the indicated rounded loads on the table due to rounding erro

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Table 8.5.2.F

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DIESEL GENERATOR & EMERGENCY BUS LOADING
DIESEL GENERATOR E3 OUT OF SERVICE
UNIT 2 - DESIGN BASIS ACCIDENT
UNIT 3 - EMERGENCY SHUTDOWN

		0 - 10 MINUTES								10 - 60 MINUTES								1 HOUR AND LONGER							
		DIVISION I				DIVISION II				DIVISION I				DIVISION II				DIVISION I				DIVISION II			
		EDG E1		EDG E3		EDG E2		EDG E4		EDG E1		EDG E3		EDG E2		EDG E4		EDG E1		EDG E3		EDG E2		EDG E4	
ITEM	LOAD DESCRIPTION	E12	E13	E32	E33	E22	E23	E42	E43	E12	E13	E32	E33	E22	E23	E42	E43	E12	E13	E32	E33	E22	E23	E42	E43
1	RHR PUMPS	1475	0	0	0	1475	0	1475	0	0	0	0	0	0	0	1380	0	1380	0	0	0	0	0	0	1380
2	CORE SPRAY PUMPS	511	0	0	0	511	0	511	0	0	0	0	0	511	0	511	0	0	0	0	0	511	0	511	0
3	HP SERVICE WATER PUMPS	0	0	0	0	0	0	0	0	0	0	0	0	802	0	0	0	802	0	0	0	802	802	0	0
4	ESW & ECW PUMPS	0	0	0	0	205	0	0	205	0	0	0	0	205	0	0	0	0	0	0	0	205	0	0	0
5	CONTROL ROD DRIVE PUMPS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	MOTOR-OPERATED VALVES	8	0	0	0	7	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	EMERGENCY LIGHTING	53	14	0	0	20	39	80	68	53	14	0	0	20	39	80	68	53	14	0	0	20	39	80	68
8	EDG COOLANT & LUBE OIL PUMPS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	EDG FUEL XFER & AFTER CLR PP	3	0	0	0	0	3	0	3	3	0	0	0	0	3	0	3	3	0	0	0	0	3	0	3
10	EDG START AIR COMPRESSOR	7	0	0	0	0	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	24 V BATTERY CHARGERS	3	3	0	0	3	3	3	3	3	3	0	0	3	3	3	3	3	3	0	0	3	3	3	3
12	125 V BATTERY CHARGERS	30	30	0	0	30	30	30	30	30	30	0	0	30	30	30	30	30	30	0	0	30	30	30	30
13	INSTRUMENT PNLS & UPS POWER	22	18	0	0	11	19	14	0	22	18	0	0	11	19	14	0	22	18	0	0	11	19	14	0
14	RX BLDG COOL WATER PUMPS	0	62	0	0	62	62	0	0	0	62	0	0	62	62	0	0	0	0	0	0	0	0	0	0
15	DRYWELL COOLER FANS	0	22	0	0	0	4	0	30	0	22	0	0	0	4	0	30	0	0	0	0	0	0	0	0
16	CONTROL ROOM VENT FANS	0	0	0	0	0	0	10	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	10	0
17	EMER SWGR SUPPLY FANS	0	0	0	0	0	0	41	0	0	0	0	0	0	0	41	0	0	0	0	0	0	0	41	0
18	EMER SWGR EXHAUST FANS	0	0	0	0	0	0	21	0	0	0	0	0	0	0	21	0	0	0	0	0	0	0	21	0
19	BATTERY ROOM EXHAUST FANS	0	0	0	0	0	0	13	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	13	0
20	EDG VENT & PUMP ROOM FANS	38	0	0	0	0	42	0	35	38	0	0	0	0	42	0	35	38	0	0	0	0	42	0	35
21	RHR ROOM COOLING UNITS	13	0	0	0	13	0	13	0	0	0	0	0	0	0	13	0	13	0	0	0	0	0	0	13
22	HPCI ROOM COOLING UNITS	0	0	0	0	4	4	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4	0	0	0
23	RCIC ROOM COOLING UNITS	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
24	CORE SPRAY ROOM COOLING UNITS	4	0	0	0	4	0	4	0	0	0	0	0	4	0	4	0	0	0	0	0	4	0	4	0
25	SGTS EXHAUST FANS	40	0	0	0	40	0	0	0	40	0	0	0	40	0	0	0	40	0	0	0	40	0	0	0
26	SGTS EXHAUST HEATER	46	0	0	0	0	46	0	0	46	0	0	0	0	46	0	0	46	0	0	0	0	46	0	0
27	STANDBY LIQUID CONTROL PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	SLC TANK HEATER & HEAT TRACE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	SERVICE WTR SCRNS & WASH PP	46	0	0	0	46	0	0	0	46	0	0	0	46	0	0	0	46	0	0	0	46	0	0	0
30	120 / 208 V DISTRIBUTION PANELS	36	20	0	0	32	30	34	39	36	20	0	0	32	30	34	39	35	20	0	0	32	30	34	39
31	PLANT STACK DILUTION FANS	17	0	0	0	0	0	17	0	17	0	0	0	0	0	17	0	17	0	0	0	0	0	17	0
32	RX AREA RFL FLR. & COMP RM AC	0	0	0	0	0	0	8	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	8	0
33	EDG SKID EQUIPMENT & CRANE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	AIR COMPRESSORS	0	81	0	0	0	0	0	0	0	81	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	MISC LOADS & SYSTEM LOSSES	85	14	0	0	126	18	49	72	151	73	0	0	225	117	84	107	148	72	0	0	120	63	49	53
	4kv BUS SUBTOTAL (kw)	2436	265	0	0	2589	307	2323	492	484	328	0	0	1996	395	2262	315	2676	157	0	0	1828	1077	834	1624
	DIESEL GENERATOR TOTAL (KW)	2701		0		2896		2815		812		0		2391		2577		2833		0		2905		2458	

Note: Bus SubTotals and DG Totals are summed prior to individual load rounding, and may not reflect the sum of the indicated rounded loads on the table due to rounding erro

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Table 8.5.2.G

PBAPS TABLE 8.5.2.G PAGE : 1 of 1

DIESEL GENERATOR & EMERGENCY BUS LOADING
DIESEL GENERATOR E4 OUT OF SERVICE
UNIT 2 - DESIGN BASIS ACCIDENT
UNIT 3 - EMERGENCY SHUTDOWN

		0 - 10 MINUTES								10 - 60 MINUTES								1 HOUR AND LONGER							
		DIVISION I				DIVISION II				DIVISION I				DIVISION II				DIVISION I				DIVISION II			
		EDG E1		EDG E3		EDG E2		EDG E4		EDG E1		EDG E3		EDG E2		EDG E4		EDG E1		EDG E3		EDG E2		EDG E4	
ITEM	LOAD DESCRIPTION	E12	E13	E32	E33	E22	E23	E42	E43	E12	E13	E32	E33	E22	E23	E42	E43	E12	E13	E32	E33	E22	E23	E42	E43
1	RHR PUMPS	1475	0	1475	0	1475	0	0	0	0	0	1380	0	0	0	0	0	0	0	0	1380	1380	0	0	0
2	CORE SPRAY PUMPS	511	0	511	0	511	0	0	0	511	0	511	0	0	0	0	0	511	0	511	0	0	0	0	0
3	HP SERVICE WATER PUMPS	0	0	0	0	0	0	0	0	802	0	0	0	0	0	0	0	802	802	0	0	802	0	0	0
4	ESW & ECW PUMPS	0	0	205	0	205	0	0	0	0	0	205	0	0	0	0	0	0	0	205	0	0	0	0	0
5	CONTROL ROD DRIVE PUMPS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	MOTOR-OPERATED VALVES	8	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	EMERGENCY LIGHTING	53	14	22	0	20	39	0	0	53	14	22	0	20	39	0	0	53	14	22	0	20	39	0	0
8	EDG COOLANT & LUBE OIL PUMPS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	EDG FUEL XFER & AFTER CLR PP	3	0	3	0	0	3	0	0	3	0	3	0	0	3	0	0	3	0	3	0	0	3	0	0
10	EDG START AIR COMPRESSOR	7	0	7	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	24 V BATTERY CHARGERS	3	3	3	3	3	3	0	0	3	3	3	3	3	3	0	0	3	3	3	3	3	3	0	0
12	125 V BATTERY CHARGERS	30	30	30	30	30	30	0	0	30	30	30	30	30	30	0	0	30	30	30	30	30	30	0	0
13	INSTRUMENT PNLS & UPS POWER	22	18	7	8	11	19	0	0	22	18	7	8	11	19	0	0	22	18	7	8	11	19	0	0
14	RX BLDG COOL WATER PUMPS	0	62	62	0	62	62	0	0	0	62	62	0	62	62	0	0	0	0	0	0	0	0	0	0
15	DRYWELL COOLER FANS	39	39	13	13	4	4	0	0	39	39	13	13	4	4	0	0	0	0	0	0	0	0	0	0
16	CONTROL ROOM VENT FANS	0	0	10	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	10	0	0	0	0	0
17	EMER SWGR SUPPLY FANS	0	0	41	0	0	0	0	0	0	0	41	0	0	0	0	0	0	0	41	0	0	0	0	0
18	EMER SWGR EXHAUST FANS	0	0	21	0	0	0	0	0	0	0	21	0	0	0	0	0	0	0	21	0	0	0	0	0
19	BATTERY ROOM EXHAUST FANS	0	0	13	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	13	0	0	0	0	0
20	EDG VENT & PUMP ROOM FANS	38	0	38	0	0	42	0	0	38	0	38	0	0	42	0	0	38	0	38	0	0	42	0	0
21	RHR ROOM COOLING UNITS	13	0	13	0	13	0	0	0	0	0	13	0	0	0	0	0	0	0	0	13	13	0	0	0
22	HPCI ROOM COOLING UNITS	0	0	0	0	4	4	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4	0	0	0
23	RCIC ROOM COOLING UNITS	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
24	CORE SPRAY ROOM COOLING UNITS	4	0	4	0	4	0	0	0	4	0	4	0	0	0	0	0	4	0	4	0	0	0	0	0
25	SGTS EXHAUST FANS	40	0	0	40	40	0	0	0	40	0	0	40	40	0	0	0	40	0	0	40	40	0	0	0
26	SGTS EXHAUST HEATER	46	0	0	0	0	46	0	0	46	0	0	0	0	46	0	0	46	0	0	0	0	46	0	0
27	STANDBY LIQUID CONTROL PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	SLC TANK HEATER & HEAT TRACE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	SERVICE WTR SCRNS & WASH PP	46	0	0	0	46	0	0	0	46	0	0	0	46	0	0	0	46	0	0	0	46	0	0	0
30	120 / 208 V DISTRIBUTION PANELS	36	20	33	18	32	30	0	0	36	20	33	18	32	30	0	0	36	20	33	18	32	30	0	0
31	PLANT STACK DILUTION FANS	17	0	17	0	0	0	0	0	17	0	17	0	0	0	0	0	17	0	17	0	0	0	0	0
32	RX AREA RFL FLR. & COMP RM AC	0	0	8	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	8	0	0	0	0	0
33	EDG SKID EQUIPMENT & CRANE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	AIR COMPRESSORS	0	81	81	0	0	0	0	0	0	81	81	0	0	0	0	0	0	0	0	0	0	0	0	0
35	MISC LOADS & SYSTEM LOSSES	87	15	61	16	126	18	0	0	152	79	61	37	226	117	0	0	148	72	40	24	120	62	0	0
	4kv BUS SUBTOTAL (kw)	2477	282	2678	127	2593	307	0	0	1842	346	2596	148	478	395	0	0	1798	959	1006	1515	2501	274	0	0
	DIESEL GENERATOR TOTAL (KW)	2758		2805		2900		0		2188		2744		873		0		2757		2521		2775		0	

Note: Bus SubTotals and DG Totals are summed prior to individual load rounding, and may not reflect the sum of the indicated rounded loads on the table due to rounding erro

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PBAPS TABLE 8.5.2.H

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DIESEL GENERATOR & EMERGENCY BUS LOADING
FOUR DIESEL GENERATORS IN SERVICE
UNIT 2 - EMERGENCY SHUTDOWN
UNIT 3 - DESIGN BASIS ACCIDENT

		0 - 10 MINUTES								10 - 60 MINUTES								1 HOUR AND LONGER							
		DIVISION I				DIVISION II				DIVISION I				DIVISION II				DIVISION I				DIVISION II			
		EDG E1		EDG E3		EDG E2		EDG E4		EDG E1		EDG E3		EDG E2		EDG E4		EDG E1		EDG E3		EDG E2		EDG E4	
ITEM	LOAD DESCRIPTION	E12	E13	E32	E33	E22	E23	E42	E43	E12	E13	E32	E33	E22	E23	E42	E43	E12	E13	E32	E33	E22	E23	E42	E43
1	RHR PUMPS	0	1475	0	1475	0	1475	0	1475	0	1380	0	0	0	0	0	0	0	1380	0	0	0	0	1380	0
2	CORE SPRAY PUMPS	0	511	0	511	0	511	0	511	0	0	0	0	0	511	0	511	0	0	0	0	0	511	0	511
3	HP SERVICE WATER PUMPS	0	0	0	0	0	0	0	0	0	0	0	802	0	0	0	0	0	802	0	802	802	0	0	0
4	ESW & ECW PUMPS	0	0	205	0	205	0	0	205	0	0	205	0	0	0	0	0	0	0	205	0	0	0	0	0
5	CONTROL ROD DRIVE PUMPS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	MOTOR-OPERATED VALVES	0	7	0	1	0	1	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	EMERGENCY LIGHTING	53	14	22	0	20	39	80	68	53	14	22	0	20	39	80	68	53	14	22	0	20	39	80	68
8	EDG COOLANT & LUBE OIL PUMPS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	EDG FUEL XFER & AFTER CLR PP	3	0	3	0	0	3	0	3	3	0	3	0	0	3	0	3	3	0	3	0	0	3	0	3
10	EDG START AIR COMPRESSOR	7	0	7	0	0	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	24 V BATTERY CHARGERS	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
12	125 V BATTERY CHARGERS	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
13	INSTRUMENT PNLS & UPS POWER	22	18	7	8	11	19	14	0	22	18	7	8	11	19	14	0	22	18	7	8	11	19	14	0
14	RX BLDG COOL WATER PUMPS	0	62	62	0	62	62	0	0	0	62	62	0	62	62	0	0	0	0	0	0	0	0	0	0
15	DRYWELL COOLER FANS	22	0	4	0	4	0	25	0	22	0	4	0	4	0	25	0	0	0	0	0	0	0	0	0
16	CONTROL ROOM VENT FANS	0	0	10	0	0	0	10	0	0	0	10	0	0	0	10	0	0	0	10	0	0	0	10	0
17	EMER SWGR SUPPLY FANS	0	0	41	0	0	0	41	0	0	0	41	0	0	0	41	0	0	0	41	0	0	0	41	0
18	EMER SWGR EXHAUST FANS	0	0	21	0	0	0	21	0	0	0	21	0	0	0	21	0	0	0	21	0	0	0	21	0
19	BATTERY ROOM EXHAUST FANS	0	0	13	0	0	0	13	0	0	0	13	0	0	0	13	0	0	0	13	0	0	0	13	0
20	EDG VENT & PUMP ROOM FANS	38	0	38	0	0	42	0	35	38	0	38	0	0	42	0	35	38	0	38	0	0	42	0	35
21	RHR ROOM COOLING UNITS	0	13	0	13	0	13	0	13	0	13	0	0	0	0	0	0	0	13	0	0	0	0	13	0
22	HPCI ROOM COOLING UNITS	0	0	0	0	4	4	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4	0	0
23	RCIC ROOM COOLING UNITS	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
24	CORE SPRAY ROOM COOLING UNITS	0	4	0	4	0	4	0	4	0	0	0	0	0	4	0	4	0	0	0	0	0	4	0	4
25	SGTS EXHAUST FANS	40	0	0	40	40	0	0	0	40	0	0	40	40	0	0	0	40	0	0	40	40	0	0	0
26	SGTS EXHAUST HEATER	46	0	0	0	0	46	0	0	46	0	0	0	0	46	0	0	46	0	0	0	0	46	0	0
27	STANDBY LIQUID CONTROL PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	SLC TANK HEATER & HEAT TRACE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	SERVICE WTR SCRNS & WASH PP	46	0	0	0	46	0	0	0	46	0	0	0	46	0	0	0	46	0	0	0	46	0	0	0
30	120 / 208 V DISTRIBUTION PANELS	36	20	33	18	32	30	34	39	36	20	33	18	32	30	34	39	36	20	33	18	32	30	34	39
31	PLANT STACK DILUTION FANS	17	0	17	0	0	0	17	0	17	0	17	0	0	0	17	0	17	0	17	0	0	0	17	0
32	RX AREA RFL FLR. & COMP RM AC	0	0	8	0	0	0	8	0	0	0	8	0	0	0	8	0	0	0	8	0	0	0	8	0
33	EDG SKID EQUIPMENT & CRANE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	AIR COMPRESSORS	0	81	81	0	0	0	0	0	0	81	81	0	0	0	0	0	0	0	0	0	0	0	0	0
35	MISC LOADS & SYSTEM LOSSES	85	14	80	16	125	18	49	72	151	79	80	36	226	117	84	106	147	72	40	24	120	62	49	53
	4kv BUS SUBTOTAL (kw)	446	2254	664	2119	582	2308	344	2472	505	1701	678	937	474	911	379	800	479	2353	490	926	1103	794	1712	747
	DIESEL GENERATOR TOTAL (KW)	2700		2783		2890		2816		2206		1615		1385		1179		2832		1414		1897		2459	

Note: Bus SubTotals and DG Totals are summed prior to individual load rounding, and may not reflect the sum of the indicated rounded loads on the table due to rounding erro

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Table 8.5.2.I

PBAPS TABLE 8.5.2.I PAGE : 1 of 1

DIESEL GENERATOR & EMERGENCY BUS LOADING
DIESEL GENERATOR E1 OUT OF SERVICE
UNIT 2 - EMERGENCY SHUTDOWN
UNIT 3 - DESIGN BASIS ACCIDENT

ITEM	LOAD DESCRIPTION	0 - 10 MINUTES								10 - 60 MINUTES								1 HOUR AND LONGER							
		DIVISION I				DIVISION II				DIVISION I				DIVISION II				DIVISION I				DIVISION II			
		EDG E1		EDG E3		EDG E2		EDG E4		EDG E1		EDG E3		EDG E2		EDG E4		EDG E1		EDG E3		EDG E2		EDG E4	
		E12	E13	E32	E33	E22	E23	E42	E43	E12	E13	E32	E33	E22	E23	E42	E43	E12	E13	E32	E33	E22	E23	E42	E43
1	RHR PUMPS	0	0	0	1475	0	1475	0	1475	0	0	0	0	0	0	0	1380	0	0	0	1380	0	0	1380	0
2	CORE SPRAY PUMPS	0	0	0	511	0	511	0	511	0	0	0	0	0	511	0	511	0	0	0	0	0	511	0	511
3	HP SERVICE WATER PUMPS	0	0	0	0	0	0	0	0	0	0	0	0	0	802	0	0	0	0	0	802	802	802	0	0
4	ESW & ECW PUMPS	0	0	205	0	205	0	0	205	0	0	205	0	0	0	0	0	0	0	205	0	0	0	0	0
5	CONTROL ROD DRIVE PUMPS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	MOTOR-OPERATED VALVES	0	0	0	7	0	1	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	EMERGENCY LIGHTING	0	0	22	0	20	39	80	68	0	0	22	0	20	39	80	68	0	0	22	0	20	39	80	68
8	EDG COOLANT & LUBE OIL PUMPS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	EDG FUEL XFER & AFTER CLR PP	0	0	3	0	0	3	0	3	0	0	3	0	0	3	0	3	0	0	3	0	0	3	0	3
10	EDG START AIR COMPRESSOR	0	0	7	0	0	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	24 V BATTERY CHARGERS	0	0	3	3	3	3	3	3	0	0	3	3	3	3	3	3	0	0	3	3	3	3	3	3
12	125 V BATTERY CHARGERS	0	0	30	30	30	30	30	30	0	0	30	30	30	30	30	30	0	0	30	30	30	30	30	30
13	INSTRUMENT PNLS & UPS POWER	0	0	7	8	11	19	14	0	0	0	7	8	11	19	14	0	0	0	7	8	11	19	14	0
14	RX BLDG COOL WATER PUMPS	0	0	62	0	62	62	0	0	0	0	62	0	62	62	0	0	0	0	0	0	0	0	0	0
15	DRYWELL COOLER FANS	0	0	4	0	21	0	29	0	0	0	4	0	21	0	29	0	0	0	0	0	0	0	0	0
16	CONTROL ROOM VENT FANS	0	0	10	0	0	0	10	0	0	0	10	0	0	0	10	0	0	0	10	0	0	0	10	0
17	EMER SWGR SUPPLY FANS	0	0	41	0	0	0	41	0	0	0	41	0	0	0	41	0	0	0	41	0	0	0	41	0
18	EMER SWGR EXHAUST FANS	0	0	21	0	0	0	21	0	0	0	21	0	0	0	21	0	0	0	21	0	0	0	21	0
19	BATTERY ROOM EXHAUST FANS	0	0	13	0	0	0	13	0	0	0	13	0	0	0	13	0	0	0	13	0	0	0	13	0
20	EDG VENT & PUMP ROOM FANS	0	0	38	0	0	42	0	35	0	0	38	0	0	42	0	35	0	0	38	0	0	42	0	35
21	RHR ROOM COOLING UNITS	0	0	0	13	0	13	0	13	0	0	0	0	0	0	0	13	0	0	0	13	0	0	13	0
22	HPCI ROOM COOLING UNITS	0	0	0	0	4	4	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4	0	0
23	RCIC ROOM COOLING UNITS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	CORE SPRAY ROOM COOLING UNITS	0	0	0	4	0	4	0	4	0	0	0	0	0	4	0	4	0	0	0	0	0	4	0	4
25	SGTS EXHAUST FANS	0	0	0	40	40	0	0	0	0	0	0	40	40	0	0	0	0	0	0	40	40	0	0	0
26	SGTS EXHAUST HEATER	0	0	0	0	0	46	0	0	0	0	0	0	0	46	0	0	0	0	0	0	0	46	0	0
27	STANDBY LIQUID CONTROL PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	SLC TANK HEATER & HEAT TRACE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	SERVICE WTR SCRNS & WASH PP	0	0	0	0	46	0	0	0	0	0	0	0	46	0	0	0	0	0	0	0	46	0	0	0
30	120 / 208 V DISTRIBUTION PANELS	0	0	33	18	32	30	34	39	0	0	33	18	32	30	34	39	0	0	33	18	32	30	34	39
31	PLANT STACK DILUTION FANS	0	0	17	0	0	0	17	0	0	0	17	0	0	0	17	0	0	0	17	0	0	0	17	0
32	RX AREA RFL FLR. & COMP RM AC	0	0	8	0	0	0	8	0	0	0	8	0	0	0	8	0	0	0	8	0	0	0	8	0
33	EDG SKID EQUIPMENT & CRANE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	AIR COMPRESSORS	0	0	81	0	0	0	0	0	0	0	81	0	0	0	0	0	0	0	0	0	0	0	0	0
35	MISC LOADS & SYSTEM LOSSES	0	0	60	16	126	18	49	79	0	0	80	36	227	117	65	113	0	0	40	24	120	62	49	60
	4kv BUS SUBTOTAL (kw)	0	0	664	2126	600	2308	349	2478	0	0	678	135	491	1713	384	2200	0	0	490	2317	1103	1586	1712	754
	DIESEL GENERATOR TOTAL (KW)	0		2790		2908		2827		0		813		2204		2584		0		2807		2699		2466	

Note: Bus SubTotals and DG Totals are summed prior to individual load rounding, and may not reflect the sum of the indicated rounded loads on the table due to rounding erro

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Table 8.5.2.J

PBAPS TABLE 8.5.2.J PAGE : 1 of 1

DIESEL GENERATOR & EMERGENCY BUS LOADING
DIESEL GENERATOR E2 OUT OF SERVICE
UNIT 2 - EMERGENCY SHUTDOWN
UNIT 3 - DESIGN BASIS ACCIDENT

		0 - 10 MINUTES								10 - 60 MINUTES								1 HOUR AND LONGER							
		DIVISION I				DIVISION II				DIVISION I				DIVISION II				DIVISION I				DIVISION II			
		EDG E1		EDG E3		EDG E2		EDG E4		EDG E1		EDG E3		EDG E2		EDG E4		EDG E1		EDG E3		EDG E2		EDG E4	
ITEM	LOAD DESCRIPTION	E12	E13	E32	E33	E22	E23	E42	E43	E12	E13	E32	E33	E22	E23	E42	E43	E12	E13	E32	E33	E22	E23	E42	E43
1	RHR PUMPS	0	1475	0	1475	0	0	0	1475	0	1380	0	0	0	0	0	0	1380	0	0	0	0	0	0	1380
2	CORE SPRAY PUMPS	0	511	0	511	0	0	0	511	0	511	0	511	0	0	0	0	0	511	0	511	0	0	0	0
3	HP SERVICE WATER PUMPS	0	0	0	0	0	0	0	0	0	0	0	802	0	0	0	0	0	0	802	802	0	0	0	796
4	ESW & ECW PUMPS	0	0	205	0	0	0	0	205	0	0	205	0	0	0	0	0	0	0	205	0	0	0	0	0
5	CONTROL ROD DRIVE PUMPS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	MOTOR-OPERATED VALVES	0	7	0	1	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	EMERGENCY LIGHTING	53	14	22	0	0	0	80	68	53	14	22	0	0	0	80	68	53	14	22	0	0	0	80	68
8	EDG COOLANT & LUBE OIL PUMPS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	EDG FUEL XFER & AFTER CLR PP	3	0	3	0	0	0	0	3	3	0	3	0	0	0	0	3	3	0	3	0	0	0	0	3
10	EDG START AIR COMPRESSOR	7	0	7	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	24 V BATTERY CHARGERS	3	3	3	3	0	0	3	3	3	3	3	3	0	0	3	3	3	3	3	3	0	0	3	3
12	125 V BATTERY CHARGERS	30	30	30	30	0	0	30	30	30	30	30	30	0	0	30	30	30	30	30	30	0	0	30	30
13	INSTRUMENT PNLS & UPS POWER	22	18	7	8	0	0	14	0	22	18	7	8	0	0	14	0	22	18	7	8	0	0	14	0
14	RX BLDG COOL WATER PUMPS	0	62	62	0	0	0	0	0	0	62	62	0	0	0	0	0	0	0	0	0	0	0	0	0
15	DRYWELL COOLER FANS	26	0	4	0	0	0	25	0	26	0	4	0	0	0	25	0	0	0	0	0	0	0	0	0
16	CONTROL ROOM VENT FANS	0	0	10	0	0	0	10	0	0	0	10	0	0	0	10	0	0	0	10	0	0	0	10	0
17	EMER SWGR SUPPLY FANS	0	0	41	0	0	0	41	0	0	0	41	0	0	0	41	0	0	0	41	0	0	0	41	0
18	EMER SWGR EXHAUST FANS	0	0	21	0	0	0	21	0	0	0	21	0	0	0	21	0	0	0	21	0	0	0	21	0
19	BATTERY ROOM EXHAUST FANS	0	0	13	0	0	0	13	0	0	0	13	0	0	0	13	0	0	0	13	0	0	0	13	0
20	EDG VENT & PUMP ROOM FANS	38	0	38	0	0	0	0	35	38	0	38	0	0	0	0	35	38	0	38	0	0	0	0	35
21	RHR ROOM COOLING UNITS	0	13	0	13	0	0	0	13	0	13	0	0	0	0	0	0	13	0	0	0	0	0	0	13
22	HPCI ROOM COOLING UNITS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	RCIC ROOM COOLING UNITS	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
24	CORE SPRAY ROOM COOLING UNITS	0	4	0	4	0	0	0	4	0	4	0	4	0	0	0	0	0	4	0	4	0	0	0	0
25	SGTS EXHAUST FANS	40	0	0	40	0	0	0	0	40	0	0	40	0	0	0	0	40	0	0	40	0	0	0	0
26	SGTS EXHAUST HEATER	46	0	0	0	0	0	0	0	46	0	0	0	0	0	0	0	46	0	0	0	0	0	0	0
27	STANDBY LIQUID CONTROL PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	SLC TANK HEATER & HEAT TRACE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	SERVICE WTR SCRNS & WASH PP	46	0	0	0	0	0	0	0	46	0	0	0	0	0	0	0	46	0	0	0	0	0	0	0
30	120 / 208 V DISTRIBUTION PANELS	36	20	33	18	0	0	34	39	36	20	33	18	0	0	34	39	36	20	33	18	0	0	34	39
31	PLANT STACK DILUTION FANS	17	0	17	0	0	0	17	0	17	0	17	0	0	0	17	0	17	0	17	0	0	0	17	0
32	RX AREA RFL. FLR. & COMP RM AC	0	0	8	0	0	0	8	0	0	0	8	0	0	0	8	0	0	0	8	0	0	0	8	0
33	EDG SKID EQUIPMENT & CRANE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	AIR COMPRESSORS	0	81	81	0	0	0	0	0	0	81	81	0	0	0	0	0	0	0	0	0	0	0	0	0
35	MISC LOADS & SYSTEM LOSSES	85	14	60	18	0	0	49	72	151	79	80	37	0	0	84	106	147	72	40	24	0	0	49	53
	4kv BUS SUBTOTAL (kw)	451	2254	664	2119	0	0	344	2472	509	2216	676	1453	0	0	380	284	1872	674	1292	1440	0	0	318	2418
	DIESEL GENERATOR TOTAL (KW)	2705		2783		0		2816		2725		2131		0		664		2546		2732		0		2738	

Note: Bus SubTotals and DG Totals are summed prior to individual load rounding, and may not reflect the sum of the indicated rounded loads on the table due to rounding erro

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PBAPS TABLE 8.5.2.K PAGE : 1 of 1

DIESEL GENERATOR & EMERGENCY BUS LOADING
DIESEL GENERATOR E3 OUT OF SERVICE
UNIT 2 - EMERGENCY SHUTDOWN
UNIT 3 - DESIGN BASIS ACCIDENT

		0 - 10 MINUTES								10 - 60 MINUTES								1 HOUR AND LONGER							
		DIVISION I				DIVISION II				DIVISION I				DIVISION II				DIVISION I				DIVISION II			
		EDG E1		EDG E3		EDG E2		EDG E4		EDG E1		EDG E3		EDG E2		EDG E4		EDG E1		EDG E3		EDG E2		EDG E4	
ITEM	LOAD DESCRIPTION	E12	E13	E32	E33	E22	E23	E42	E43	E12	E13	E32	E33	E22	E23	E42	E43	E12	E13	E32	E33	E22	E23	E42	E43
1	RHR PUMPS	0	1475	0	0	0	1475	0	1475	0	0	0	0	0	0	0	1380	0	1380	0	0	0	0	1380	0
2	CORE SPRAY PUMPS	0	511	0	0	0	511	0	511	0	0	0	0	0	511	0	511	0	0	0	0	0	511	0	511
3	HP SERVICE WATER PUMPS	0	0	0	0	0	0	0	0	0	0	0	0	0	802	0	0	0	802	0	0	802	802	0	0
4	ESW & ECW PUMPS	0	0	0	0	205	0	0	205	0	0	0	0	205	0	0	0	0	0	0	0	205	0	0	0
5	CONTROL ROD DRIVE PUMPS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	MOTOR-OPERATED VALVES	0	7	0	0	0	1	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	EMERGENCY LIGHTING	53	14	0	0	20	39	80	68	53	14	0	0	20	39	80	68	53	14	0	0	20	39	80	68
8	EDG COOLANT & LUBE OIL PUMPS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	EDG FUEL XFER & AFTER CLR PP	3	0	0	0	0	3	0	3	3	0	0	0	0	3	0	3	3	0	0	0	0	3	0	3
10	EDG START AIR COMPRESSOR	7	0	0	0	0	7	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	24 V BATTERY CHARGERS	3	3	0	0	3	3	3	3	3	3	0	0	3	3	3	3	3	3	0	0	3	3	3	3
12	125 V BATTERY CHARGERS	30	30	0	0	30	30	30	30	30	30	0	0	30	30	30	30	30	30	0	0	30	30	30	30
13	INSTRUMENT PNLS & UPS POWER	22	18	0	0	11	19	14	0	22	18	0	0	11	19	14	0	22	18	0	0	11	19	14	0
14	RX BLDG COOL WATER PUMPS	0	62	0	0	62	62	0	0	0	62	0	0	62	62	0	0	0	0	0	0	0	0	0	0
15	DRYWELL COOLER FANS	22	0	0	0	4	0	29	0	22	0	0	0	4	0	29	0	0	0	0	0	0	0	0	0
16	CONTROL ROOM VENT FANS	0	0	0	0	0	0	10	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	10	0
17	EMER SWGR SUPPLY FANS	0	0	0	0	0	0	41	0	0	0	0	0	0	0	41	0	0	0	0	0	0	0	41	0
18	EMER SWGR EXHAUST FANS	0	0	0	0	0	0	21	0	0	0	0	0	0	0	21	0	0	0	0	0	0	0	21	0
19	BATTERY ROOM EXHAUST FANS	0	0	0	0	0	0	13	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	13	0
20	EDG VENT & PUMP ROOM FANS	38	0	0	0	0	42	0	35	38	0	0	0	0	42	0	35	38	0	0	0	0	42	0	35
21	RHR ROOM COOLING UNITS	0	13	0	0	0	13	0	13	0	0	0	0	0	0	0	13	0	13	0	0	0	0	13	0
22	HPCI ROOM COOLING UNITS	0	0	0	0	4	4	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4	0	0
23	RCIC ROOM COOLING UNITS	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
24	CORE SPRAY ROOM COOLING UNITS	0	4	0	0	0	4	0	4	0	0	0	0	0	4	0	4	0	0	0	0	0	4	0	4
25	SGTS EXHAUST FANS	40	0	0	0	40	0	0	0	40	0	0	0	40	0	0	0	40	0	0	0	40	0	0	0
26	SGTS EXHAUST HEATER	46	0	0	0	0	46	0	0	46	0	0	0	0	46	0	0	46	0	0	0	0	46	0	0
27	STANDBY LIQUID CONTROL PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	SLC TANK HEATER & HEAT TRACE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	SERVICE WTR SCRNS & WASH PP	46	0	0	0	46	0	0	0	46	0	0	0	46	0	0	0	46	0	0	0	46	0	0	0
30	120 / 208 V DISTRIBUTION PANELS	38	20	0	0	32	30	34	39	38	20	0	0	32	30	34	39	38	20	0	0	32	30	34	39
31	PLANT STACK DILUTION FANS	17	0	0	0	0	0	17	0	17	0	0	0	0	0	17	0	17	0	0	0	0	0	17	0
32	RX AREA RFL FLR. & COMP RM AC	0	0	0	0	0	0	8	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	8	0
33	EDG SKID EQUIPMENT & CRANE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	AIR COMPRESSORS	0	81	0	0	0	0	0	0	0	81	0	0	0	0	0	0	0	0	0	0	0	0	0	0
35	MISC LOADS & SYSTEM LOSSES	85	14	0	0	125	18	49	72	151	79	0	0	226	117	85	106	147	72	0	0	120	62	49	53
4kv	BUS SUBTOTAL (kw)	446	2254	0	0	582	2308	349	2472	504	308	0	0	679	1713	384	2193	479	2353	0	0	1309	1596	1712	747
	DIESEL GENERATOR TOTAL (KW)	2700		0		2890		2821		812		0		2392		2577		2832		0		2905		2459	

Note: Bus SubTotals and DG Totals are summed prior to individual load rounding, and may not reflect the sum of the indicated rounded loads on the table due to rounding erro

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PBAPS TABLE 8.5.2.L

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DIESEL GENERATOR & EMERGENCY BUS LOADING
DIESEL GENERATOR E4 OUT OF SERVICE
UNIT 2 - EMERGENCY SHUTDOWN
UNIT 3 - DESIGN BASIS ACCIDENT

		0 - 10 MINUTES								10 - 60 MINUTES								1 HOUR AND LONGER							
		DIVISION I				DIVISION II				DIVISION I				DIVISION II				DIVISION I				DIVISION II			
		EDG E1		EDG E3		EDG E2		EDG E4		EDG E1		EDG E3		EDG E2		EDG E4		EDG E1		EDG E3		EDG E2		EDG E4	
ITEM	LOAD DESCRIPTION	E12	E13	E32	E33	E22	E23	E42	E43	E12	E13	E32	E33	E22	E23	E42	E43	E12	E13	E32	E33	E22	E23	E42	E43
1	RHR PUMPS	0	1475	0	1475	0	1475	0	0	0	0	0	1380	0	0	0	0	0	0	1380	0	0	1380	0	0
2	CORE SPRAY PUMPS	0	511	0	511	0	511	0	0	0	511	0	511	0	0	0	0	0	511	0	511	0	0	0	0
3	HP SERVICE WATER PUMPS	0	0	0	0	0	0	0	0	0	802	0	0	0	0	0	0	802	802	0	0	0	802	0	0
4	ESW & ECW PUMPS	0	0	205	0	205	0	0	0	0	0	205	0	0	0	0	0	0	0	205	0	0	0	0	0
5	CONTROL ROD DRIVE PUMPS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	MOTOR-OPERATED VALVES	0	7	0	1	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	EMERGENCY LIGHTING	53	14	22	0	20	39	0	0	53	14	22	0	20	39	0	0	53	14	22	0	20	39	0	0
8	EDG COOLANT & LUBE OIL PUMPS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	EDG FUEL XFER & AFTER CLR PP	3	0	3	0	0	3	0	0	3	0	3	0	0	3	0	0	3	0	3	0	0	3	0	0
10	EDG START AIR COMPRESSOR	7	0	7	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	24 V BATTERY CHARGERS	3	3	3	3	3	3	0	0	3	3	3	3	3	3	0	0	3	3	3	3	3	3	0	0
12	125 V BATTERY CHARGERS	30	30	30	30	30	30	0	0	30	30	30	30	30	30	0	0	30	30	30	30	30	30	0	0
13	INSTRUMENT PNLS & UPS POWER	22	18	7	8	11	19	0	0	22	18	7	8	11	19	0	0	22	18	7	8	11	19	0	0
14	RX BLDG COOL WATER PUMPS	0	62	62	0	62	62	0	0	0	62	62	0	62	62	0	0	0	0	0	0	0	0	0	0
15	DRYWELL COOLER FANS	39	39	13	13	4	4	0	0	39	39	13	13	4	4	0	0	0	0	0	0	0	0	0	0
16	CONTROL ROOM VENT FANS	0	0	10	0	0	0	0	0	0	0	10	0	0	0	0	0	0	0	10	0	0	0	0	0
17	EMER SWGR SUPPLY FANS	0	0	41	0	0	0	0	0	0	0	41	0	0	0	0	0	0	0	41	0	0	0	0	0
18	EMER SWGR EXHAUST FANS	0	0	21	0	0	0	0	0	0	0	21	0	0	0	0	0	0	0	21	0	0	0	0	0
19	BATTERY ROOM EXHAUST FANS	0	0	13	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	13	0	0	0	0	0
20	EDG VENT & PUMP ROOM FANS	38	0	38	0	0	42	0	0	38	0	38	0	0	42	0	0	38	0	38	0	0	42	0	0
21	RHR ROOM COOLING UNITS	0	13	0	13	0	13	0	0	0	0	0	13	0	0	0	0	0	0	13	0	0	13	0	0
22	HPCI ROOM COOLING UNITS	0	0	0	0	4	4	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4	0	0
23	RCIC ROOM COOLING UNITS	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
24	CORE SPRAY ROOM COOLING UNITS	0	4	0	4	0	4	0	0	0	4	0	4	0	0	0	0	0	4	0	4	0	0	0	0
25	SGTS EXHAUST FANS	40	0	0	40	40	0	0	0	40	0	0	40	40	0	0	0	40	0	0	40	40	0	0	0
26	SGTS EXHAUST HEATER	46	0	0	0	0	46	0	0	46	0	0	0	0	46	0	0	46	0	0	0	0	46	0	0
27	STANDBY LIQUID CONTROL PUMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28	SLC TANK HEATER & HEAT TRACE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29	SERVICE WTR SCRNS & WASH PP	46	0	0	0	46	0	0	0	46	0	0	0	46	0	0	0	46	0	0	0	46	0	0	0
30	120 / 208 V DISTRIBUTION PANELS	36	20	33	18	32	30	0	0	36	20	33	18	32	30	0	0	36	20	33	18	32	30	0	0
31	PLANT STACK DILUTION FANS	17	0	17	0	0	0	0	0	17	0	17	0	0	0	0	0	17	0	17	0	0	0	0	0
32	RX AREA RFL FLR. & COMP RM AC	0	0	8	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	8	0	0	0	0	0
33	EDG SKID EQUIPMENT & CRANE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34	AIR COMPRESSORS	0	81	81	0	0	0	0	0	0	81	81	0	0	0	0	0	0	0	0	0	0	0	0	0
35	MISC LOADS & SYSTEM LOSSES	85	19	60	17	125	18	0	0	102	89	81	37	226	117	0	0	147	72	40	24	119	63	0	0
4kv BUS SUBTOTAL (kw)		464	2294	673	2132	582	2318	0	0	523	1665	687	2057	473	400	0	0	1281	1476	1883	638	301	2474	0	0
DIESEL GENERATOR TOTAL (KW)		2758		2805		2900		0		2188		2744		873		0		2757		2521		2775		0	

Note: Bus SubTotals and DG Totals are summed prior to individual load rounding, and may not reflect the sum of the indicated rounded loads on the table due to rounding erro

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TABLE 8.5.3

DIESEL GENERATOR DATA

Diesel Engine	
Rated Speed	900 rpm
DEMA Rated Capacity	2,600 kW continuous
Capacity	3,000 kW for 2,000 hr 3,100 kW for 200 hr 3,250 kW for 30 min
Fuel Consumption at DEMA Rated Capacity	.386#/bhph
Generator	
Continuous Rated Capacity	3,875 kVA
Power Factor	0.8
Frequency	60 Hz
Voltage	4,160 V
Phase (connection)	3 (wye)
Exciter	
Size	13.2 kW
Diesel Generator Startup	
Starting time to rated speed and voltage, and ready to accept load	$\leq$ 10 sec
Fuel Oil Storage	
Day Tank	550 gal
Main Storage Tank	39,655 gal

TABLE 8.5.4
SEQUENCE OF EVENTS IN THE AUTOMATIC APPLICATION OF EMERGENCY AC LOADS ON LOSS-OF-COOLANT WITH ONE OFFSITE SOURCE AVAILABLE

Event	Time (sec)
LOCA	0
Initiation of Safety Injection Signal	3
Trip two 9051 hp Reactor Recirc ASDs	3
Trip All Cooling Towers D & E Cooling Towers are Permanently De-energized	3
Trip Reactor Building Area Exhaust and Supply Fans, Refueling Floor Vent Exhaust and Supply Fans, and Reactor Building Equipment Cell Exhaust Fan	3
Trip Cleanup Recirc Pumps	3
Start 4 Diesel Generators and Ventilation Fans	3
Start RHR Pump Compartment Cooler Fans	3
Start Standby Gas Treatment Fan and Heater	3
Start 460 V Miscellaneous Loads	3
Start RHR Pumps A&B	5
Start RHR Pumps C&D	11
Transfer One or Two 13.2 kV Unit Auxiliary Buses of the LOCA Unit Depending on the Boundary Conditions	15
Start Core Spray Pumps A&C as well as Associated Compartment Fans	16
Start Opening RHR and Core Spray Injection Valves	23.5
Start Core Spray Pumps B&D as well as Associated Compartment Fans	26
Start Closing Recirc Line Discharge Valves	30
Start two Emergency Service Water Pumps and one Emergency Cooling Water Pump	39
Trip Emergency Cooling Water Pump	45-55
Trip 3 RHR Pumps and 2 Core Spray Pumps Manually	600 or More
Start 1 High Pressure Service Water Pump Manually	600 or More
Trip Miscellaneous 460 V Loads Manually as Required	600 or More

NOTES:
1. Diesels are started and remain on standby when offsite power is available.
2. Timings are based on +7% on timer setting for combined rated extremes of temperature, voltage, and calibration error.
3. ECCS load sequence is modified if a DG is in test or if any ECCS load is running at time t = 0.

TABLE 8.5.5

SEQUENCE OF EVENTS IN THE AUTOMATIC APPLICATION OF EMERGENCY AC LOADS ON LOSS-OF-COOLANT WITH TWO OFFSITE SOURCES AVAILABLE

Event	Time (sec)
LOCA	0
Initiation of Safety Injection Signal	3
Trip two 9000HP Reactor Recirc M-G Sets (Unit 2 only) and two 9150HP Reactor Recirc ASD (Unit 3 only)	3
Trip All Cooling Towers D & E Cooling Towers are Permanently De-energized	3
Trip Reactor Building Area Exhaust and Supply Fans, Refueling Floor Vent Exhaust and Supply Fans, and Reactor Building Equipment Cell Exhaust Fan	3
Trip Cleanup Recirc Pumps	3
Start 4 Diesel Generators and Ventilation Fans	3
Start RHR Pump Compartment Cooler Fans	3
Start Standby Gas Treatment Fan and Heater	3
Start 460 V Miscellaneous Loads	3
Start 1 RHR Pump from each Offsite Power Source	5
Start 1 RHR Pump from each Offsite Power Source	11
Transfer One 13.2 kV Unit Auxiliary Bus to each Offsite Power Source	15
Start Core Spray Pumps A&C as well as Associated Pump Compartment Cooler Fans from one Offsite Power Source	16
Start Opening RHR and Core Spray Injection Valves	23.5
Start Core Spray Pumps B&D as well as Associated Pump Compartment Cooler Fans from the other Offsite Power Source	26
Start Closing Recirc Line Discharge Valves	30
Start 1 Emergency Service Water Pump and 1 Emergency Cooling Water Pump from one Offsite Power Source	39
Start 1 Emergency Water Pump from the other Offsite Power Source	39
Trip Emergency Cooling Water Pump	45-55
Trip 3 RHR Pumps and 2 Core Spray Pumps Manually	600 or More
Start 1 High Pressure Service Water Pump Manually	600 or More
Trip Miscellaneous 460 V Loads Manually as Required	600 or More

NOTES:
1. Diesels are started and remain on standby when offsite power is available.
2. Timings are based on +7% on their setting for combined rated extremes of temperature, voltage, and calibration error.
3. ECCS load sequence is modified if a DG is in test or if any ECCS load is running at time t=Ø.

8.6 120 V AC POWER SYSTEM

8.6.1 Safety Objective

The safety objective of the 120 V AC power system is to provide reliable power sources for safeguard instruments and inboard and outboard isolation valve relays.

8.6.2 Safety Design Basis

1. The 120 V AC power system design conforms to the intent of "Proposed IEEE Criteria for Class 1E Electrical Systems for Nuclear Power Generating Stations," dated June, 1969.

2. The 120 V AC power system sources, distribution equipment, cabling, and loads are arranged so that failure of a single component does not impair plant safety. Loads important to plant safety are split and diversified among systems.

3. Plant design and circuit layout provides for physical separation of redundant power sources, distribution equipment, cabling, and instrumentation essential to plant safety.

8.6.3 Power Generation Objective

1. The power generation objective of the 120 V AC instrument subsystem is to provide power to safeguard and non-safeguard instruments, control to safeguard and non-safeguard systems, and power to non-safeguard auxiliaries.

2. The power generation objective of the 120 V uninterruptible AC system is to provide power for necessary services for which power interruption should be avoided but are not vital to plant safety.

8.6.4 Power Generation Design Basis

1. The instrument subsystem distributes adequate power to the core and containment cooling system instruments, reactor and containment cooling and isolation instruments, inboard and outboard isolation valve relays, main control room instruments, and to other loads as shown in Drawings E-28, Sheets 1 and 2, and E-29.

2. The uninterruptible AC system has adequate capacity to supply all loads connected to the uninterruptible bus as shown in Drawings E-28, Sheets 1 and E-29.

8.6.5 Description

1. The instrument subsystem receives power from the auxiliary power systems described in subsection 8.4, or from the standby AC power supply and distribution system described in subsection 8.5. The panels receive power from different standby diesel generators, and they distribute power to safeguard and non-safeguard loads. All other instrumentation panels distribute power to non-safeguard loads. Drawings E-28, Sheets 1 and 2, and E-29 provide single line diagram of the 120 V AC system showing the power supplies to the engineered safety feature systems.

2. The uninterruptible AC bus is supplied from (a) a static inverter connected to the 250 VDC station battery and (b) from a transformer connected to the 480 V AC emergency auxiliary power system. Upon loss of the static inverter output, AC power is automatically supplied from the transformer through a solid state automatic transfer switch. Re-transfer to the static inverter is also automatic. The 120 V uninterruptible AC power distribution panel does not supply any safety system loads. A bypass/isolating switch around the static inverter and static switch is provided to permit the inverter and static switch to be taken completely out of service without interrupting power to the distribution panel.

8.6.6 Safety Evaluation

The instrument subsystem is normally supplied from the auxiliary power systems. Upon loss of offsite power, the instrument subsystem is reenergized from the standby AC power supply and distribution system.

Failure of one diesel generator does not impair the reliability of safeguard instruments and operation of inboard and outboard isolation valves, because the power sources are distributed between two redundant diesel generators serving an independent, redundant distribution system.

The uninterruptible AC system is supplied from the 250 VDC station battery, or from plant auxiliary power sources fed by the plant standby AC power system. The aggregate system is so arranged that the probability of system failure resulting in loss of 120 V AC power is very low. The uninterruptible AC system is a convenience to the operator and loss of loads does not affect the safety of the plant or result in damage to equipment.

8.6.7 Inspection and Testing

Inspection and testing at vendor factories and initial system tests were conducted to ensure that all components are operational within their design ratings. The systems are inspected and tested as required during the life of the plant to demonstrate capability to provide reliable power sources.

8.7 125/250 VDC POWER SUPPLIES AND DISTRIBUTION

8.7.1 Safety Objective

The safety objective of the station batteries is to supply all normal and emergency loads for 125 V and 250 VDC power.

8.7.2 Safety Design Basis

1. Each of the two independent safety-related 125/250 VDC systems per unit are of adequate size to provide control and switching power to safeguard systems and apparatus, DC auxiliaries, and motor operated valves until AC power sources are restored.

2. The safety-related 125/250 VDC power supplies are designed so that no single component failure prevents power from being provided to a sufficient number of vital loads for safe shutdown.

3. The safety-related 125/250 VDC power supplies are provided in accordance with the intent of "Proposed IEEE Criteria for Class 1E Electrical Systems for Nuclear Power Generating Stations," dated June, 1969.

8.7.3 Description

8.7.3.1 Safety-Related DC Systems

There are two independent safety-related 125/250 V, 3-wire, DC systems per unit. Each system is comprised of two 125 V batteries, each with its own charger panel consisting of two - 100% chargers. There are a total of four safety-related 125/250 V batteries in the station, two for Unit 2 and two for Unit 3. Each safety-related 125/250 V battery is in a separate ventilated battery room. The two batteries for each unit are redundant. Loads are diversified between these systems so that each system serves loads which are identical and redundant, which are different but redundant to plant safety, or which back up AC equipment. The DC system for Unit 2 and the loads in each battery are shown in Figure 8.7.1. The system for Unit 3 is shown in Figure 8.7.2.

Power required for the larger loads, such as DCdc motor driven pumps and valves, is supplied at 250 V from the two 125 V sources of each system connected in series, and distributed through 250 VDC motor control centers.

Power for all DC control functions, such as that required for the control of the 13 kV and 4 kV circuit breakers, control relays, and annunciators, and power for exit lighting, is supplied at 125 V from each of the two 125 V sources of each system and distributed through 125 VDC power distribution panels.

Each safety related 125 V battery is of the lead-calcium type and consists of 58 shock absorbent, clear plastic cells.

The chargers are full wave, silicon controlled rectifiers. The housings are freestanding, NEMA Type I and are ventilated.

The safety-related chargers are suitable for float charging the lead-calcium battery at 2.25 V per cell, and supplying an equalizing charge at 2.33 V per cell. The safety-related chargers operate from 480 V, 3-phase, 60 Hz sources supplied from separate 480 V motor control centers. Each of these motor control centers is connected to an independent emergency AC bus. The chargers for three Unit 2 and three Unit 3 batteries can be supplied from the other units' emergency AC buses via manual transfer switches. Charger voltage is maintained at (+/-) 1% percent from 0 to 100 percent of charger rating with a supply voltage variation of (+/-) 10% percent. The chargers are in compliance with all applicable NEC, NEMA, and ANSI standards.

The 125 V chargers are capable of carrying the normal DC system load and, at the same time, supplying charging current to keep the batteries in a fully charged condition.

8.7.3.2 Nonsafety-Related DC Systems

A nonsafety-related 125/250 VDC system is used for the turbine-generator emergency bearing oil pump and other nonsafety-related loads. This DC system is comprised of two 125 V batteries, a 125 V battery charger panel consisting of two-100% chargers for each battery, and a 125/250 VDC switchboard. The battery chargers operate from a 480 V 3-phase, 60 Hz power source from a nonsafety-related MCC.

Table 8.7.1 lists the ratings of the 125/250 VDC electrical equipment.

8.7.4 Safety Evaluation

8.7.4.1 General

The chargers are supplied from multiple sources of plant auxiliary power, including the plant standby AC power system. The aggregate system is so arranged that the probability of system failure resulting in loss of DC power is very low. The system vital components are self-alarming on failure, with indication in the main control room, or provisions are made for in-service testing to detect faults. The 125/250 V batteries are located in ventilated battery rooms. Both the control and power battery systems operate ungrounded, with a ground detector alarm in the main control room set to annunciate a ground.

8.7.4.2 Loss of DC Power

The battery systems are so designed that the only reasonable failure that can be postulated is a multiple ground which would interrupt only the grounded circuits. The probability of this occurrence is very small because the first ground would be detected by a ground alarm and would then be located and removed. Battery conditions are observed by regular checking for any deterioration. Low battery voltage is annunciated in the main control room.

Control power to equipment necessary for safe shutdown of the plant is supplied from redundant safety-related 125 V battery sources. The design of the safety-related 125 VDC power source to the four diesel generators provides complete four channel separation. There are a total of four safety-related 125/250 V batteries in the station: two for Unit 2 and two for Unit 3. Each safety-related 125/250 V battery is in a separate room. The two for each unit are redundant. Losing one battery room will not result in failure of any function essential to safety. The four channel separation is obtained by utilizing these four separated sources and by designing the raceway system to maintain separation of wiring as described in paragraph 8.4.5 and shown in Figures 8.7.1 and 8.7.2.

Loss of the 250 VDC safety-related battery sources results in loss of power to DC motor-operated isolation valves. These DC isolation valves have associated AC isolation valves, and the probability of coincident failure of corresponding AC equipment is very low. Losing one battery room does not result in failure of any function essential to safety.

The five automatic depressurization (ADS) relief valves as well as the six non-ADS main steam relief valves are normally fed from the 125 VDC Channel A, along with the ADS logic circuits. On loss of power, individual relays for each valve and logic chain are deenergized and power is received from 125 VDC Channel B. Loss of one supply does not cause loss of the plant's automatic depressurization capability.

8.7.5 Inspection and Testing

The station batteries and other equipment associated with the DC system are accessible for inspection and testing. The system is tested and inspected as required during the life of the plant to demonstrate its capability to provide power to the safety-related loads.

TABLE 8.7.1

RATINGS OF

125/250 VDC ELECTRICAL EQUIPMENT FOR UNIT 2

1. Batteries	
a. Safety Related: 2A, 2B, 2C, and 2D	125 V, 58 cell, 1,712 A-hr at 8-hr rate*
	2A and 2C, 2B and 2D batteries are connected in series to supply 250 V power load.
b. Nonsafety-Related: Two units	125 V, 60 cell 2,088 A-hr at 8-hr rate**
	Two 125 V batteries are connected in series to supply 125/250 V service.
2. Battery Chargers	
a. Safety Related: 2BCA, 2BCB, 2BCC, and 2BCD	125 VDC, 200 A
b. Nonsafety Related: Two units	125 VDC, 200 A
3. Distribution Equipment	
a. Motor Control Centers 2DA, 2DB, 2DC, 2DD	
Buses	250 VDC, 600 A 22,000 A momentary

* Discharge rate is based on a terminal voltage of 1.81 V per cell.

** Discharge rate is based on a terminal voltage of 1.75 V per cell.

TABLE 8.7.1 (Continued)

3. Distribution Equipment (Cont'd)

   b. Power Distribution Panels
      2PPA, 2PPB, 2PPC, 2PPD

Buses	125 VDC (minimum), 400 A 16,300 A momentary

TABLE 8.7.2

RATINGS OF

125/250 V DC ELECTRICAL EQUIPMENT FOR UNIT 3

1. Batteries

a. Safety Related: 3A, 3B, 3C, and 3D	125 V, 58 cell, 1,712 A-hr at 8-hr rate* 3A and 3C, 3B and 3D batteries are connected in series to supply 250 V power load.
b. Nonsafety-Related: Two units	125 V, 60 cell, 2,088 A-hr at 8-hr rate** Two 125 V batteries are connected in series to supply 125/250 V service.

2. Battery Chargers

a. Safety Related: 3BCA, 3BCB, 3BCC, and 3BCD	125 VDC, 200 A
b. Nonsafety Related: Two Units	125 VDC, 200 A

3. Distribution Equipment

a. Motor Control Centers 3DA, 3DB, 3DC, 3DD	
Buses	250 VDC, 600 A 22,000 A momentary
Switches	250 VDC, 30 A

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* Discharge rates are based on a terminal voltage of 1.81 V per cell.
** Discharge rate is based on a terminal voltage of 1.75 V per cell.

TABLE 8.7.2 (Continued)

3. Distribution Equipment)

b. Power Distribution Panels
3PPA, 3PPB, 3PPC, 3PPD

Buses	125 VDC, 400 A 16,300 A momentary
Switches	125 VDC, 100 A

8.8 24 VDC POWER SUPPLY AND DISTRIBUTION

8.8.1 Power Generation Objective

The power generation objective of the 24 VDC systems is to provide power for neutron monitoring and process radiation monitoring instrumentation. The systems are shown in Drawings E-24.

8.8.2 Power Generation Design Basis

1. The 24 VDC systems provide adequate power for all neutron monitoring and process radiation monitoring instrumentation loads necessary for operation.

2. The systems are arranged so that failure of a single component does not reduce plant safety or impair the operation of essential plant functions. Loads important to plant safety and operation are split and diversified among system components.

8.8.3 Description

A single line diagram of the four 24 VDC power systems is shown in Drawings E-24. Each system has two 24 V batteries and two battery chargers. There are a total of four battery systems: two for Unit 2 and two for Unit 3. Each battery system is in a separate battery room. Each system is insulated from ground at all points, except at the main control room where the system is grounded. The batteries and associated chargers in each system are operated as units. Under normal operation the load requirements are supplied from the battery chargers. Upon failure of the charger, the loads are supplied from the batteries until power from the charger is restored. The battery chargers are supplied from different 440 V emergency motor control centers.

The batteries are of the lead-calcium type with 12 cells each. The batteries have a related capacity of 100 Ah based on a constant discharge rate for 8 hr with a starting voltage of 2 V per cell and a minimum voltage of 1.75 V per cell at the end of the 8-hr period.

Each battery system supplies the following nuclear instrumentation system:

1. Neutron monitoring (wide range neutron monitors) and auxiliaries.

2. Process radiation monitoring and auxiliaries.

8.8.4 Power Generation Evaluation

8.8.4.1 General

The chargers are supplied from multiple sources of plant auxiliary power, including the plant standby AC power system. The aggregate system is so arranged that the probability of system failure resulting in loss of DC power is very low. The system vital components are either self-alarming on failure, or provisions are made for inservice testing to detect faults. The 24 VDC batteries for each system are located in a separate ventilated battery room.

8.8.4.2 Loss of 24 VDC Power Supply

Total loss of power to the 24 VDC instrumentation loads does not affect safe shutdown of the plant because all equipment requiring DC power for safe shutdown is fed from the 125/250 VDC power system. Loss of one of the two 24 VDC systems does not affect plant safety since redundant neutron monitoring instrumentation continues to be supplied by the second system.

8.8.5 Inspection and Testing

The batteries and other equipment associated with the 24 VDC systems are accessible for inspection and testing. The system is inspected and tested as required during the life of the plant to demonstrate its capability to provide power to the safety-related loads.