Non-RAI Associated Changes to U. S. EPR FSAR Chapter 8, Revision 7 For Discussion Purposes Only April 28, 2014 Public Meeting

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Chapter 8 Non-RAI FSAR Changes

Basis for FSAR Changes

- **Ensure consistency with Design Basis Information**
- **Address 2/4 minor NRC reviewer questions**
  - Page 8.2-6 Wrong Table Reference
  - Page 8.3-3 Add Open Phase Monitoring System discussion
  - Remaining 2 questions will be revised in Ch 16
- **Editorial corrections**
- **No Change to Electrical System Architecture**

Table 2.5.8-1—Lightning Protection and Grounding System ITAAC
Sheet 2 of 2

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.6	Insulation coordination is achieved on surge arrestors on MSUs, NATs, and EATs.	a. An analysis will be performed to determine the insulation ratings for MSU, NAT, and EAT surge arrestors.	a. An analysis concludes: The lightning impulse protective ratio of the chopped wave withstand to the front-of-wave protection level is equal to or greater than ~~1.2~~ 1.15. The lightning impulse protective ratio of the basic lightning impulse insulation level to the lightning impulse protective level is equal to or greater than ~~1.2~~ 1.15. The switching impulse protective ratio of the basic switching impulse insulation level to the switching impulse protective level is equal to or greater than ~~1.15~~ 1.2.
		b. An inspection will be performed to verify that the as-built insulation ratings for MSU, NAT, and EAT surge arrestors meet the approved design criteria.	b. The insulation ratings for MSU, NAT, and EAT surge arrestors meet the approved design criteria.

Next File

The physical separation that is provided among the MSUs, NATs and EATs power feeds and control circuits includes these:

- A separate takeoff structure is provided for each preferred power circuit overhead line from the switchyard to the EAT to reduce the likelihood of simultaneous failure of both circuits.
- Power cables between the EATs and 6.9 kV Class 1E switchgear buses are physically independent (to the extent practical) to minimize the likelihood of simultaneous failure.
- Control power to each EAT is separated from each other and the PPS power circuits.
- Each phase of the main generator output is routed to the MSU in an isolated phase bus.
- MSUs and auxiliary transformers are separated from plant buildings in accordance with the guidance provided by RG 1.189.
- EATs are separated from each other and the NATs and MSUs by at least 50 feet or by a one hour rated fire barrier.

The station auxiliary transformer distribution to the EPSS and NPSS is illustrated in Figure 8.3-2—Emergency Power Supply System Single Line Drawing and Figure 8.3-3—Normal Power Supply System Single Line Drawing. Transformer ratings are included in Table 8.3-1—Onsite AC Power System Component Data Nominal Values.

[[The MSU and auxiliary transformers have a deluge fire protection system that provides a distribution spray pattern over the respective transformer for fire suppression. The deluge system is automatically actuated by a heat-sensing device located around the perimeter of the respective transformer or manually activated from the transformer valve station. Additionally, each transformer has an oil retention pit.]]

8.2.2 Analysis

Offsite power meets the acceptance criteria established in 10 CFR 50, Appendix A. Additionally, conformance with the regulations and the recommendations of RGs, BTPs, as well as industry codes and standards adopted by the RGs, is described in Section 8.2.2.1 through Section ~~8.2.2.7~~.

Editorial Change: 8.2.2.10

8.2.2.1 Compliance with GDC 2

Offsite power system components are designed in accordance with GDC 2 to withstand effects of natural phenomena (excluding seismic, hurricane, tornado, and flood) without loss of capability to perform their intended functions within the

A COL applicant that references the U.S. EPR design certification will provide a site-specific grid stability analysis. The results of the analysis will demonstrate that:

- The PPS is not degraded below a level that will activate EPSS degraded grid protection actions after any of the following single contingencies:
  - U.S. EPR turbine-generator trip.
  - Loss of the largest unit supplying the grid.
  - Loss of the largest transmission circuit or inter-tie.
  - Loss of the largest load on the grid.
- The transmission system will not subject the reactor coolant pumps to a sustained frequency decay of greater than 3.5 Hz/s as bounded by the decrease in reactor coolant system flow rate transient and accident analysis described in Section 15.3.2.

Editorial change: 3.3.8, Table 3.3.8-1

The U.S. EPR is designed to operate within a transmission system operating voltage of ± 10 percent and not initiate the degraded voltage protection actions as described in Section 8.3.1.1.3. Degraded grid setpoints are provided in Chapter 16, Specification ~~3.3.1, Table 3.3.1-2~~. Regulation of the transmission system by the transmission system operator within these limits during normal operation and single contingencies provides sufficient voltage to safety-related loads during design basis events.

The PPS provides two circuits from the transmission system to the Class 1E distribution system through the station switchyard that are sized to supply the maximum expected coincident safety-related and non-safety-related loads during normal and abnormal operations as indicated in IEEE Std 308-2001 (Reference 2) and endorsed by RG 1.32.

A COL applicant that references the U.S. EPR design certification will describe essential elements of a program for the operation, setpoint determination, and surveillance testing of the Phase Monitoring System for the GDC 17 off-site power feeds to address NRC Bulletin 2012-01 (Reference 5).

8.2.2.5 Compliance with GDC 18

Offsite power complies with GDC 18. The offsite power system is designed to permit periodic testing and inspection of the system and components to assess its performance. A COL applicant that references the U.S. EPR design certification will provide site-specific information for the station switchyard equipment inspection and testing plan.

Surge arresters and the lightning protection system are capable of periodic inspection and testing as described in RG 1.204, Section C.2.

largest motor starting inrush current and to allow a fault to clear. If the degraded voltage condition exists at the end of the first time delay, an alarm will alert the operator to the condition so that corrective action can be taken. The second time delay is sufficient to allow bus voltage to be restored by the EAT on-load tap changer. If a safety injection (SI) signal is received following the first time delay, the PS initiates a signal to separate the Class 1E switchgear from the preferred power source and start the respective division EDG. If the degraded voltage condition still exists at the completion of the second time delay, the PS separates the switchgear from the preferred power source and the respective division EDG is started and connected to the switchgear regardless of SI signal condition. Load shedding is described in Section 8.3.1.1.5. Sequencing of loads onto the EPSS following a loss of voltage is shown in Table 8.3-4—Division 1 Emergency Diesel Generator Nominal Loads, Table 8.3-5—Division 2 Emergency Diesel Generator Nominal Loads, Table 8.3-6—Division 3 Emergency Diesel Generator Nominal Loads, and Table 8.3-7—Division 4 Emergency Diesel Generator Nominal Loads for each EPSS division.

- An alarm is initiated for a degraded voltage condition related to bus high voltage.
- The EPSS undervoltage and degraded voltage protection is periodically tested to verify operation per the surveillance requirements detailed in Chapter 16. PS testing capability is described in Section 7.3.2.3.6.

~~The NPSS undervoltage scheme is used to detect a loss of voltage on the individual non-Class 1E 13.8 kV buses 31BBA, 32BBA, 33BBA, and 34BBA. At each bus, all three phases are monitored to develop respective voltage signals. Voltage on NAT secondary windings is also monitored to verify there is an adequate transfer source available. Two-out-of-three logic (which prevents a single phase fault from initiating the system or preventing its operation) is used to initiate protection features as follows:~~

- ~~Once the loss of voltage setpoint is reached and a time delay is satisfied, the respective bus load feeder breakers are tripped. The NAT secondary winding voltage monitoring verifies there is voltage on the NAT secondary and initiates a transfer of the bus to the alternate source. The undervoltage setpoint and time delay setting permits ride-through of momentary voltage transients to prevent unnecessary bus transfers.~~
- ~~An alarm is initiated for a degraded voltage condition related to high voltages.~~

Load Center Protection – 480 Vac

Incoming source breakers have inverse time overcurrent (51) and ground fault protection (51G) that trip and lockout the affected source breaker.

Each motor feeder breaker in the 480 Vac load center is equipped with a trip unit that has long time (51), instantaneous (50), ground fault (51G) detection and tripping features.

Replace with insert 1

locally on an alarm display on the EDG local panel. Table 8.3-8—Emergency Diesel Generator Indications and Alarms, provides a list of local and remote alarms and indications for the EDGs.

The EDG bypass or deliberately induced inoperable conditions are automatically alarmed in the MCR. The bypass and inoperable status indicators provide operators with accurate information about the status of each EDG. Disabling or bypass indicators are separated from non-disabling indicators in accordance with BTP 8-7 (Reference 28), which allows operators to clearly determine the ability of the respective EDG to respond to emergency demand.

Performance – Emergency Diesel Generators

Delete

During normal plant operation, the EDGs remain in standby mode with the engines pre-lubricated and cooling water pre-heated for the EDG to be ready to start and accept load. The I&C PS EDG start signal is based on EPSS bus voltage, as described in Section 8.3.1.1.3, or an SI signal.

The EDGs are designed to start and accelerate to rated speed, then start and carry the loads listed on Table 8.3-4, Table 8.3-5, Table 8.3-6 and Table 8.3-7 in the sequence indicated. The EDG capacity can supply the power requirement of the safety-related and non-safety-related loads assigned to the respective EDG bus, and loads on the division that could be aligned to the EDG via the EPSS alternate feeds. ~~Motor minimum torque values are not less than the criteria specified in Reference 7. The pump torque requirements through the acceleration period are less than the motor starting torque provided while the motor is at minimum specified voltage.~~

If a LOOP occurs during EDG testing, the EPSS bus is separated from the offsite power supply. The other redundant divisional EPSS switchgear separate from the EATs due to their individual bus monitoring circuits and undervoltage protection. The remaining EDGs start and supply power to the respective EPSS divisions.

Once an EDG start signal is initiated, the EDG automatically starts and accelerates to rated speed, adjusts for proper speed and voltage, and is in a ready-to-load condition. The start-up time of an unloaded diesel unit, from the emergency start signal to nominal speed, rated generator frequency and voltage, is less than or equal to 15 seconds. When the EDG output breaker permissive conditions of EDG speed, voltage and respective BDA switchgear normal and alternate source breaker position being open are met, the EDG output breaker is closed. Closure of the EDG output circuit breaker and load sequencing is performed by the PS. The PS controls EDG load sequencing by controlling the placement of loads onto the respective EPSS buses at programmed time intervals. Load shedding is accomplished by individually tripping large horsepower motors that were operating prior to the undervoltage condition. Motors that were shed are then restarted in the appropriate sequence or available for

U.S. EPR design criteria for wind, hurricane, tornado, flood, and earthquakes are described in Section 3.3, Section 3.4, and Section 3.7, respectively.

8.3.1.2.2 Compliance with GDC 4

Class 1E onsite AC distribution system components are located in Seismic Category I structures, in rooms constructed in such a manner that any internal hazard only affects the respective division. There are no high energy lines routed through the dedicated electrical rooms containing EPSS equipment such as switchgear, LCs, MCCs and distribution transformers. These rooms are also provided conditioned air that maintains ambient environmental conditions within equipment qualifications during normal operations and DBEs. Details of the design and construction of safety-related structures are included in Chapter 3.

The environmental qualification program for electrical equipment provides reasonable assurance that equipment remains operable during and following exposure to harsh environmental conditions as a result of a design basis event. An evaluation of equipment locations will be performed to determine if any electrical equipment will have to be qualified for submerged operation. Environmental qualification is described in Section 3.11. Safety-related electrical equipment located in an environmental harsh or radiation harsh environment that require qualification are listed in ~~Section 3.11,~~ Table 3.11-1—List of Environmentally Qualified Electrical/I&C Equipment.

Editorial change: delete

8.3.1.2.3 Compliance with GDC 5

GDC 5 is satisfied with the U.S. EPR designed as a single-unit station.

8.3.1.2.4 Compliance with GDC 17

Compliance with GDC 17 is accomplished through the design of the onsite power AC distribution system capacity, capability, independence, redundancy, and meeting the application of the single failure criteria.

Offsite power compliance with GDC 17 is described in Section 8.2.2.4.

The four EPSS divisions, including the EDGs, have the independence, redundancy, and testability to perform their safety-related functions in the presence of a single failure.

The EPSS has been designed to minimize the probability of losing electric power from any of the remaining supplies as a result of, or coincident with, the loss of power generated from the plant, transmission network, or onsite electric power supplies. Meeting GDC 17 is further accomplished through incorporating the following guidance and standards in the onsite AC system design.

Conformance with RG 1.6

The EPSS is designed in accordance with RG 1.6 to provide independence between the redundant standby power sources that supply the safety-related loads.

The EPSS has four divisions, normally powered from the preferred power source, each with an independent and redundant EDG assigned to their respective switchgear 31BDA, 32BDA, 33BDA, and 34BDA. The EPSS divisions combine to make two divisional pairs. Division 1 and 2 constitute the first divisional pair while divisions 3 and 4 constitute the second divisional pair. The EPSS safety-related loads are separated between the divisional pairs and a loss of one divisional pair will not prevent the minimum safety-related functions from being performed.

The four EPSS divisions are normally functionally independent and physically separated from each other. During periods a standby power source is out of service, or other similar maintenance activities, alternate feeds are provided between division 1 and division 2 or between divisions 3 and division 4 as appropriate for the out-of-service EDG. The alternate feed configuration, consistent with separating the safety-related loads between divisional pairs, maintains the plant capability to complete safety-related functions coincident with a single failure.

Alternate feeds have these features to provide independence between divisions:

- When required for maintenance or other operating conditions, the alternate feeds are manually implemented and have no automatic connections between divisions.
- The alternate feed incorporates an engineering design feature that prevents having two different divisional power sources supplying power to the same bus simultaneously. This prevents paralleling two EDGs.
- Alternate feed protection and coordination prevents a fault on one division from degrading the other division below an acceptable level.

Conformance with RG 1.9

The EDG mechanical and electrical design properties for starting and loading, including following light load or no load operation, have been incorporated so that they will start, accelerate to rated speed and properly sequence design loads while maintaining nominal frequency and voltage within limits specified in RG 1.9.

The EDGs continuous load rating has been established utilizing the guidance in RG 1.9; specifically it is greater than the sum of the conservatively estimated connected loads that the EDG will power at any one time. In developing EDG load rating, performance characteristics for motors were calculated based on 90 percent efficiency~~, and power factors of 85 percent or less~~. At least ten percent margin exists in each EDG to account for future load growth.

CWW	Chopped wave withstand
FOW	Front-of-wave protection level
BIL	Basic lightning impulse insulation level
LPL	Lightning impulse protective level
BSL	Basic switching impulse insulation level
SPL	Switching impulse protective level

Acceptable coordination is achieved if PR_{L1} and PR_{L2} are equal to or greater than ~~1.2~~ 1.15, and PR_S is equal to or greater than ~~1.15~~ 1.2. An analysis is performed to verify acceptable insulation coordination on surge arresters installed on the as-built MSUs, EATs, and NATs.

8.3.1.3.6 Power Quality Limits

Electrical distribution systems have been designed to provide power to the connected loads such that the effects of total harmonic distortion (THD) in the Class 1E power systems do not degrade safety-related system performance. Equipment that is susceptible to degradation due to THD includes motors, transformers and switchgear due to a combination of copper and stray flux loses, and iron losses which can increase component heating, thereby shortening the life of some insulating components and reducing the steady-state current carrying capacity. Equipment connected to the distribution system that can contribute to THD includes battery chargers and inverters, which have been designed and selected to minimize the harmonics they inject into the distribution system buses. THD is maintained within the acceptance criteria of IEEE 519-1992 (Reference 35).

Medium voltage motor protection is described in Section 8.3.1.1.3. EDG protection is described in Section 8.3.1.1.5. Main generator protection is described in Section 8.3.1.1. Protective device application is consistent with the power quality required for the device to operate. An analysis will be performed to verify the THD present on the Class 1E buses is less than or equal to 5 percent.

8.3.1.3.7 Monitoring and Testing

The MCR and RSS monitoring of distribution system components as described in Section 8.3.1.1.4 is provided by the safety information and control system (SICS) and the process information and control system (PICS). SICS provides safety-related control and monitoring capability in the event that the PICS is not available. PICS is a non-safety-related human machine interface that provides monitoring and control of plant systems during plant operations, including accident conditions. The functional capabilities of SICS and PICS are described in Section 7.1.1.3. Where monitoring of component critical characteristics such as inverter output frequency and voltage is not provided in the MCR or RSS, alarms alert operators of out-of-tolerance equipment characteristics.

Table 8.3-1—Onsite AC Power System Component Data Nominal Values
Sheet 1 of 2

Component		Nominal Ratings
1.	MSUs (30BAT01, 30BAT02, 30BAT03, 30BAT04)	26 kV-(site-specific), single phase, 60 Hz 2100MVA (700MVA each phase) Cooling Class ODAF Temperature Rise 65°C
2.	EATs (30BDT01, 30BDT02)	(site-specific)-6.9 kV-6.9 kV, three phase, 60 Hz Rated Power 25/33.3/41.5 MVA Cooling Class ONAN/ONAF/ONAF Temperature Rise 65°C
3.	NATs (30BBT01, 30BBT02)	(site-specific)-13.8 kV-13.8 kV, three phase, 60 Hz Rated Power 140/186.2/232.4 MVA Cooling Class ONAN/ONAF/ONAF Temperature Rise 65°C
4.	NPSS 13.8 kV Switchgear	Rated Maximum Voltage, 15 kV Maximum Continuous Current, 3000 A Maximum Bus Bracing Current, 164 kA rms
	NPSS 13.8 kV Feeder Breaker	Rate Maximum Voltage, 15 kV Maximum Continuous Current, 3000 A Maximum Rated Interrupting Current, 63 kA Maximum Rated Closing and Latching Current 164 kA (peak value)
5.	EPSS and NPSS 6.9 kV Switchgear	Rated Maximum Voltage, 8.25 kV Maximum Continuous Current, 2000 A Maximum Bus Bracing Current, 104 kA rms
	EPSS and NPSS 6.9 kV Feeder Breaker	Rated Maximum Voltage, 8.25 kV Maximum Continuous Current, 2000 A Maximum Rated Interrupting Current 40 kA rms Maximum Rated Closing and Latching Current 104 kA (peak value)
6.	EPSS and NPSS 480 Vac Load Centers	Rated Maximum Voltage, 508 V Maximum Continuous Current, 4000 A Maximum Bus Bracing Current, 100 kA rms
	EPSS and NPSS 480 Vac Feeder Breaker	Rated Maximum Voltage, 508 V Maximum Continuous Current, 4000 A Maximum Rated Interrupting Current 100 kA rms

Insert 2

Insert 3

Insert 4

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Table 8.3-1—Onsite AC Power System Component Data Nominal Values
Sheet 2 of 2

	Component	Nominal Ratings
7.	EPSS 480 Vac MCCs	Rated Maximum Voltage, 508 V Maximum Continuous Current, 1600 A Maximum Bus Bracing Current, 100 kA rms
	NPSS 480 Vac MCCs	Rated Maximum Voltage, 508 V Maximum Continuous Current, 3200 A Maximum Bus Bracing Current, 100 kA rms
	EPSS 480 Vac MCC Feeder Breaker	Rated Maximum Voltage, 508 V Maximum Continuous Current, 1600 A Maximum Bus Bracing Current, 100 kA rms
	NPSS 480 Vac MCC Feeder Breaker	Rated Maximum Voltage, 508 V Maximum Continuous Current, 3200 A Maximum Bus Bracing Current, 100 kA rms
8.	EPSS Distribution Transformers:	Dry type 60 Hz, three phase, air cooled
	31BMT01, 32BMT01, 33BMT01, 34BMT01, 31BMT02, 34BMT02	6.9 kV to 480 Vac 2500 kVA
	32BMT02, 33BMT02, 31BMT03, 32BMT03, 33BMT03, 34BMT03, 31BMT04, 32BMT04, 33BMT04, 34BMT04	6.9 kV to 480 Vac 1500 kVA
	31BNT01, 32BNT01, 33BNT01, 34BNT01	480 Vac to 480 Vac 500 kVA Rated Input Voltage 460 Vac Rated Output Voltage 480 Vac

Insert 6

Table 8.3-4—Division 1 Emergency Diesel Generator Nominal Loads
Sheet 1 of 6

Time Seq. (s) (13)	Load Description (8) (15) (19)	Volts	Rating (hp/kW) (3)	Alternate Feed Load (kW) (1) (12)	Operating Load LOOP (kW) (1) (12)	Operating Load DBA/ LOOP (kW) (1) (12)
Load Step Group 1						
0	Start Signal					
15	EDG reaches rated speed and voltage/output breaker closes					
15	Emergency power generating building electric room supply fan	480	10 Bhp		8.3	8.3
15	Emergency power generating building fuel oil storage tank room fan	480	~~13.4~~ Bhp		~~11.1~~	~~11.1~~
15	EDG starting air compressor	~~480~~	61 Bhp		50.6	50.6
15	EDG auxiliary loads	~~480~~	9.7 kW		9.7	9.7
15	Vent stack monitoring	~~480~~	13 kW		13	13
15	Division 1 EUPS battery charger (4)	~~480~~	106 kW		106	106
15	Annulus ventilation heating unit	~~480~~	6 kW		4.2 (2)	4.2 (2)
15	Annulus ventilation fan	~~480~~	4.3 Bhp		3.6	3.6
15	KAA/LAR valve room cooling fan	~~480~~	5 Bhp		4.1	4.1
15	Extra boration room cooling fan	~~480~~	~~14~~ Bhp		~~11.6~~	~~11.6~~
15	Fuel pool cooling ~~pump~~ room cooling fan	~~480~~	~~7.75~~ Bhp		~~6.4~~	~~6.4~~
15	Fuel pool cooling ~~pump~~ room cooling fan	~~480~~	~~7.75~~ Bhp		~~6.4~~	~~6.4~~
15	Fuel building ventilation heating unit (7)	~~480~~	~~15~~ kW		0	0
15	Safety chilled water pump (6)	~~480~~	100 Bhp		82.9	82.9
15	Safety chilled water pump (6)	480	100 Bhp		82.9	82.9

Table 8.3-4—Division 1 Emergency Diesel Generator Nominal Loads
Sheet 2 of 6

Time Seq. (s) (13)	Load Description (8) (15) (19)	Volts	Rating (hp/kW) (3)	Alternate Feed Load (kW) (1) (12)	Operating Load LOOP (kW) (1) (12)	Operating Load DBA/ LOOP (kW) (1) (12)
15	Safety chiller condenser fans (22)	480	325 kW		325	325
15	Main control room air conditioning fan	480	27 Bhp		22.4	22.4
15	Main control room air conditioning filtration unit heater (11)	480	10 kW			7 (2)
15	Main control room air conditioning iodine filtration fan (11)	480	10 Bhp			8.3
15	Safeguard building ventilation heaters (7)	480	210 kW		0	0
15	Safeguard building ventilation supply fan	480	78 Bhp		64.7	64.7
15	Safeguard building ventilation return fan	480	43 Bhp		35.6	35.6
15	Main control room air conditioning fan	480	27 Bhp	22.4		
15	Safeguard building battery exhaust fan	480	7 Bhp		5.8	5.8
15	Emergency feed water room ventilation recirculation fan	480	2 Bhp		1.7	1.7
15	Emergency lighting panels (18)	480	165.7 kW		165.7	165.7
15	Component cooling water valve hydraulic pump	480	5 Bhp		4.1	4.1
15	Component cooling valve hydraulic pump	480	5 Bhp		4.1	4.1
15	Component cooling water valve hydraulic pump	480	5 Bhp		4.1	4.1
15	Component cooling water valve hydraulic pump	480	5 Bhp		4.1	4.1
15	Component cooling water valve hydraulic pump	480	5 Bhp		4.1	4.1

Table 8.3-4—Division 1 Emergency Diesel Generator Nominal Loads
Sheet 3 of 6

Time Seq. (s) (13)	Load Description (8) (15) (19)	Volts	Rating (hp/kW) (3)	Alternate Feed Load (kW) (1) (12)	Operating Load LOOP (kW) (1) (12)	Operating Load DBA/ LOOP (kW) (1) (12)
15	Component cooling water valve hydraulic pump	480	5 Bhp		4.1	4.1
15	Division 2 EUPS battery charger	480	106 kW	106		
15	Reactor building ventilation filtration fan	480	10 Bhp	8.3		
15	KAA/LAR valve room cooling fan	480	5 Bhp	4.1		
15	Safeguard building ventilation heaters (7)	480	180 kW	0		
15	Safeguard building ventilation supply fan	480	72 Bhp	59.7		
15	Safeguard building ventilation return fan	480	43 Bhp	35.6		
15	Safeguard building battery exhaust fan	480	6 Bhp	5		
15	Emergency feed water ventilation recirculation fan	480	2 Bhp	1.7		
15	KAA pump room recirculation fan	480	2 Bhp	~~1.7~~		
15	Emergency lighting panels (18)	480	86.7 kW	86.7		
15	Component cooling water valve hydraulic pump	480	5 Bhp	4.1		
15	Component cooling water valve hydraulic pump	480	5 Bhp	4.1		
15	Component cooling water valve hydraulic pump	480	5 Bhp	4.1		
15	Component cooling water valve hydraulic pump	480	5 Bhp	4.1		
15	Component cooling water valve hydraulic pump	480	5 Bhp	4.1		

3

2.5

Table 8.3-4—Division 1 Emergency Diesel Generator Nominal Loads
Sheet 5 of 6

Time Seq. (s) (13)	Load Description (8) (15) (19)	Volts	Rating (hp/kW) (3)	Alternate Feed Load (kW) (1) (12)	Operating Load LOOP (kW) (1) (12)	Operating Load DBA/ LOOP (kW) (1) (12)
15	Emergency power generating building exhaust fan 2	480	75 hp		62.2	62.2
15	Additional connected loads	480	100.9 kW		100.9	100.9
15	Load contribution from transformer and cable losses		160 kW	40	120	120
Subtotal Load Step Group 1				~~469.7~~ (10) 470.5	~~1717.0~~ 1702.2	~~1754.5~~ 1739.6
Load Step Group 2 (17)						
20	MHSI pump	6.9 kV	700 hp			580
Subtotal Load Step Group 2						580
Load Step Group 3 (17)						
25	LHSI pump	6.9 kV	500 hp			414
Subtotal Load Step Group 3						414
Load Step Group 4 (14)						
30	CCW pump	6.9 kV	1250 hp		1036	1036
Subtotal Load Step Group 4					1036	1036
Load Step Group 5 (14)						
35	ESW pump	6.9 kV	1100~~1250~~ hp		1036	1036
Subtotal Load Step Group 5					1036	1036
Load Step Group 6 (14)						
40	EFW pump	6.9 kV	700 hp		(5)	580
Subtotal Load Step Group 6					(5)	580

1250

Table 8.3-4—Division 1 Emergency Diesel Generator Nominal Loads
Sheet 6 of 6

Time Seq. (s) (13)	Load Description (8) (15) (19)	Volts	Rating (hp/kW) (3)	Alternate Feed Load (kW) (1) (12)	Operating Load LOOP (kW) (1) (12)	Operating Load DBA/ LOOP (kW) (1) (12)
Load Step Group 7 (14)						
45	Division 1 safety chilled water compressor (23)	6.9 kV	1105 kW		~~1105~~	~~1105~~
Subtotal Load Step Group 7					~~1105~~	~~1105~~
Load Step Group 8 (14)						
50	Essential service water UHS fan 1	480	250 hp		207.2	207.2
50	Essential service water UHS fan 2	480	250 hp		207.2	207.2
Subtotal Load Step Group 8					414.4	414.4
Subtotal Alternate Feed Loads				~~469.7~~		
Total Automatically Sequenced Loads without alternate feed installed					~~5308.7~~	~~6921.0~~
Total Automatically Sequenced Loads with alternate feed installed					~~5778.4~~	~~7390.7~~
Additional Manually Connected Loads						
	Emergency pressurizer heaters (16)	480	144 kW		144	
	Extra boration pump	480	163 Bhp		0 (20)	0 (20)
	Fuel pool cooling pump (21)	480	137 Bhp		113.6	113.6
Total Manually Connected Loads					257.6	113.6
Total Division 1 EDG Loading					~~6035.9~~	~~7504.3~~

1227.8
Please make superscript
7029.0
470.5
5416.6
5887.1
7499.5
6144.7
7613.0

Notes:

1. The kW rating derived from hp rating multiplied by 0.746 conversion factor. Indicated hp is considered rated. Where brake horsepower (Bhp) is indicated, this is from the system mechanical requirements.

Table 8.3-5—Division 2 Emergency Diesel Generator Nominal Loads
Sheet 1 of 6

Time Seq. (s) (13)	Load Description (8) (15) (19)	Volts	Rating (hp/kW) (3)	Alternate Feed Load (kW) (1) (12)	Operating Load LOOP (kW) (1) (12)	Operating Load DBA/ LOOP (kW) (1) (12)
Load Step Group 1						
0	Start Signal					
15	EDG reaches rated speed and voltage/output breaker closes					
15	Emergency power generating building electric room supply fan	480	10 Bhp		8.3	8.3
15	Emergency power generating building fuel oil storage tank room fan	480	~~13.4~~ Bhp		~~11.1~~	~~11.1~~
15	EDG starting air compressor	480	61 Bhp		50.6	50.6
15	EDG auxiliary loads	480	9.7 kW		9.7	9.7
15	Main control room air conditioning fan	480	27 Bhp		22.4	22.4
15	MHSI/LHSI room recirculation fan	480	5 Bhp		4.1	4.1
~~15~~	~~Main control room air conditioning heaters (7)~~	~~480~~	~~21 kW~~		~~0~~	~~0~~
15	Division 2 EUPS battery charger (4)	480	106 kW		106	106
15	Reactor building ventilation filtration fan	480	10 Bhp		8.3	8.3
15	KAA/LAR valve room cooling fan	480	5 Bhp		4.1	4.1
15	Safety chilled water pump (6)	480	100 Bhp		82.9	82.9
15	Safety chilled water pump (6)	480	100 Bhp		82.9	82.9
15	Safeguard building ventilation heaters (7)	480	180 kW		0	0
15	Safeguard building ventilation supply fan	480	72 Bhp		59.7	59.7
15	Safeguard building ventilation return fan	480	43 Bhp		35.6	35.6

10
8.3
Delete

Table 8.3-5—Division 2 Emergency Diesel Generator Nominal Loads
Sheet 2 of 6

Time Seq. (s) (13)	Load Description (8) (15) (19)	Volts	Rating (hp/kW) (3)	Alternate Feed Load (kW) (1) (12)	Operating Load LOOP (kW) (1) (12)	Operating Load DBA/ LOOP (kW) (1) (12)
15	Safeguard building battery exhaust fan	480	6 Bhp		5	5
15	Emergency feed water ventilation recirculation fan	480	2 Bhp		1.7	1.7
15	KAA pump room recirculation fan	480	2 Bhp		1.7	1.7
15	Emergency lighting panels (18)	480	86.7 kW		86.7	86.7
15	Component cooling water valve hydraulic pump	480	5 Bhp		4.1	4.1
15	Component cooling water valve hydraulic pump	480	5 Bhp		4.1	4.1
15	Component cooling water valve hydraulic pump	480	5 Bhp		4.1	4.1
15	Component cooling water valve hydraulic pump	480	5 Bhp		4.1	4.1
15	Component cooling water valve hydraulic pump	480	5 Bhp		4.1	4.1
15	Component cooling water valve hydraulic pump	480	5 Bhp		4.1	4.1
15	Division 1 EUPS battery charger (4)	480	106 kW	106		
15	Annulus ventilation heating unit	480	6 kW	4.2 (2)		4.1
15	Annulus ventilation fan	480	4.3 Bhp	3.6		
15	KAA/LAR valve room cooling fan	480	5 Bhp	4.1		
15	Extra boration room cooling fan	480	~~14~~ Bhp	~~11.6~~		
15	Fuel pool cooling pump room cooling fan	480	~~7.75~~ Bhp	~~6.4~~		

Table 8.3-5—Division 2 Emergency Diesel Generator Nominal Loads
Sheet 3 of 6

Time Seq. (s) (13)	Load Description (8) (15) (19)	Volts	Rating (hp/kW) (3)	Alternate Feed Load (kW) (1) (12)	Operating Load LOOP (kW) (1) (12)	Operating Load DBA/ LOOP (kW) (1) (12)
15	Fuel pool cooling pump room cooling fan	480	~~7.75~~ Bhp	~~6.4~~		
15	Fuel building ventilation heating unit (7)	480	~~15~~ kW	0		
15	Main control room air conditioning fan	480	27 Bhp	22.4		
15	Main control room air conditioning filtration unit heater (11)	480	10 kW	7 (2)		
15	Main control room air conditioning iodine train fan (11)	480	10 Bhp	8.3		
15	Safeguard building ventilation heaters (7)	480	210 kW	0		
15	Safeguard building ventilation supply fan	480	78 Bhp	64.7		
15	Safeguard building ventilation return fan	480	43 Bhp	35.6		
15	Safeguard building battery exhaust fan	480	7 Bhp	5.8		
15	Emergency feed water room ventilation recirculation fan	480	2 Bhp	1.7		
15	Emergency lighting panels (18)	480	165.7 kW	165.7		
15	Component cooling water valve hydraulic pump	480	5 Bhp	4.1		
15	Component cooling valve hydraulic pump	480	5 Bhp	4.1		
15	Component cooling water valve hydraulic pump	480	5 Bhp	4.1		
15	Component cooling water valve hydraulic pump	480	5 Bhp	4.1		

Table 8.3-5—Division 2 Emergency Diesel Generator Nominal Loads
Sheet 5 of 6

Time Seq. (s) (13)	Load Description (8) (15) (19)	Volts	Rating (hp/kW) (3)	Alternate Feed Load (kW) (1) (12)	Operating Load LOOP (kW) (1) (12)	Operating Load DBA/ LOOP (kW) (1) (12)
15	Lighting (18)	480	300 kW		300	300
15	Reserved for special use (18)	480	125 kW		125	125
15	Load contribution from transformer and cable losses		160 kW	40	120	120
Subtotal Load Step Group 1				~~647.2~~ (10)	~~1619.0~~	~~1619.0~~
Load Step Group 2 (17)						
20	MHSI pump	6.9 kV	700 hp			580
Subtotal Load Step Group 2						580
Load Step Group 3 (17)						
25	LHSI pump	6.9 kV	500 hp			414
Subtotal Load Step Group 3						414
Load Step Group 4 (14)						
30	CCW pump	6.9 kV	1250 hp		1036	1036
Subtotal Load Step Group 4					1036	1036
Load Step Group 5 (14)						
35	ESW pump	6.9 kV	1100~~1250~~ hp		1036	1036
Subtotal Load Step Group 5					1036	1036
Load Step Group 6 (14)						
40	EFW pump	6.9 kV	700 hp		(5)	580
Subtotal Load Step Group 6					(5)	580
Load Step Group 7 (14)						

635.2

1616.2

1250

Table 8.3-5—Division 2 Emergency Diesel Generator Nominal Loads
Sheet 6 of 6

Time Seq. (s) (13)	Load Description (8) (15) (19)	Volts	Rating (hp/kW) (3)	Alternate Feed Load (kW) (1) (12)	Operating Load LOOP (kW) (1) (12)	Operating Load DBA/ LOOP (kW) (1) (12)
45	Division 2 safety chilled water compressor (22)	6.9 kV	947 kW		~~947~~	~~947~~
Subtotal Load Step Group 7					~~947~~	~~947~~
Load Step Group 8 (14)						
50	Essential service water UHS fan 1	480	250 hp		207.2	207.2
50	Essential service water UHS fan 2	480	250 hp		207.2	207.2
Subtotal Load Step Group 8					414.4	414.4
Subtotal Alternate Feed Loads				~~647.2~~		
Total Automatically Sequenced Loads without alternate feed installed					~~5052.6~~	~~6627.5~~
Total Automatically Sequenced Loads with alternate feed installed					~~5699.9~~	~~7274.8~~
Additional Manually Connected Loads						
	Extra boration pump	480	163 Bhp	0 (20)		
	Fuel pool cooling pump (21)	480	137 Bhp	113.6		
	Emergency pressurizer heaters (16)	480	144 kW		144	
Total Manually Connected Loads				113.6	144	
Total Division 2 EDG Loading					~~5957.4~~	~~7388.3~~

1052.2
Please make superscript
5155.0
635.2
6729.8
5790.3
7365.1
6047.8
7478.7

Notes:

1. The kW rating derived from hp rating multiplied by 0.746 conversion factor. Indicated hp is considered rated. Where brake horsepower (Bhp) is indicated, this is from the system mechanical requirements.

2. A diversity factor of 0.7 is assumed in load contribution due to cyclical nature of load.

Table 8.3-6—Division 3 Emergency Diesel Generator Nominal Loads
Sheet 1 of 6

Time Seq. (s) (13)	Load Description (8) (15) (19)	Volts	Rating (hp/kW) (3)	Alternate Feed Load (kW) (1) (12)	Operating Load LOOP (kW) (1) (12)	Operating Load DBA/ LOOP (kW) (1) (12)
Load Step Group 1						
0	Start Signal					
15	EDG reaches rated speed and voltage/output breaker closes			10	8.3	
15	Emergency power generating building electric room supply fan	480	10 Bhp		8.3	8.3
15	Emergency power generating building fuel oil storage tank room fan	480	~~13.4~~ Bhp		~~11.1~~	~~11.1~~
15	EDG starting air compressor	480	61 Bhp		50.6	50.6
15	EDG auxiliary loads	480	8.7 kW		8.7	8.7
15	Main control room air conditioning fan	480	27 Bhp		22.4	22.4
15	MHSI/LHSI room recirculation fan	480	5 Bhp		4.1	4.1
~~15~~	~~Main control room air conditioning heaters (7)~~	~~480~~	~~21 kW~~		~~14.7(2)~~	~~14.7(2)~~
15	Division 3 EUPS battery charger (4)	480	106 kW		106	106
15	KAA/LAR valve room cooling fan	480	5 Bhp		4.1	4.1
15	Safety chilled water pump (6)	480	100 Bhp		82.9	82.9
15	Safety chilled water pump (6)	480	100 Bhp		82.9	82.9
15	Safeguard building ventilation heaters	480	180 kW		0	0
15	Safeguard building ventilation supply fan	480	72 Bhp		59.7	59.7
15	Safeguard building ventilation return fan	480	43 Bhp		35.6	35.6
15	Safeguard building battery exhaust fan	480	6 Bhp		5	5

Delete

Table 8.3-6—Division 3 Emergency Diesel Generator Nominal Loads
Sheet 2 of 6

Time Seq. (s) (13)	Load Description (8) (15) (19)	Volts	Rating (hp/kW) (3)	Alternate Feed Load (kW) (1) (12)	Operating Load LOOP (kW) (1) (12)	Operating Load DBA/ LOOP (kW) (1) (12)
15	Emergency feed water ventilation recirculation fan	480	2 Bhp		1.7	1.7
15	KAA pump room recirculation fan	480	2 Bhp		1.7	1.7
15	Emergency lighting panels (18)	480	155.7 kW		155.7	155.7
15	Component cooling water valve hydraulic pump	480	5 Bhp		4.1	4.1
15	Component cooling water valve hydraulic pump	480	5 Bhp		4.1	4.1
15	Component cooling water valve hydraulic pump	480	5 Bhp		4.1	4.1
15	Component cooling water valve hydraulic pump	480	5 Bhp		4.1	4.1
15	Component cooling water valve hydraulic pump	480	5 Bhp		4.1	4.1
15	Component cooling water valve hydraulic pump	480	5 Bhp		4.1	4.1
15	Division 4 EUPS battery charger (4)	480	106 kW	106		
15	Annulus ventilation heating unit	480	6 kW	4.2 (2)		
15	Annulus ventilation fan	480	4.3 Bhp	3.6		
15	KAA/LAR valve room cooling fan	480	5 Bhp	4.1		
15	Extra boration room cooling fan	480	~~14~~ Bhp	~~11.6~~		
15	Fuel pool cooling pump room cooling fan	480	~~7.75~~ Bhp	~~6.4~~		
15	Fuel pool cooling pump room cooling fan	480	~~7.75~~ Bhp	~~6.4~~		

5

4.1

Table 8.3-6—Division 3 Emergency Diesel Generator Nominal Loads
Sheet 3 of 6

Time Seq. (s) (13)	Load Description (8) (15) (19)	Volts	Rating (hp/kW) (3)	Alternate Feed Load (kW) (1) (12)	Operating Load LOOP (kW) (1) (12)	Operating Load DBA/ LOOP (kW) (1) (12)
15	Fuel building ventilation heating unit (7)	480	~~15~~ kW	0		
15	Main control room air conditioning fan	480	27 Bhp	22.4		
15	Main control room air conditioning filtration unit heater (11)	480	10 kW	7 (2)		
15	Main control room air conditioning iodine train fan (11)	480	10 Bhp	8.3		
15	Safeguard building ventilation heaters (7)	480	210 kW	0		
15	Safeguard building ventilation supply fan	480	78 Bhp	64.6		
15	Safeguard building ventilation return fan	480	43 Bhp	35.6		
15	Safeguard building battery exhaust fan	480	7 Bhp	5.8		
15	Emergency feed water room ventilation recirculation fan	480	2 Bhp	1.7		
15	Emergency lighting panels (18)	480	178.7 kW	178.7		
15	Component cooling water valve hydraulic pump	480	5 Bhp	4.1		
15	Component cooling valve hydraulic pump	480	5 Bhp	4.1		
15	Component cooling water valve hydraulic pump	480	5 Bhp	4.1		
15	Component cooling water valve hydraulic pump	480	5 Bhp	4.1		
15	Component cooling water valve hydraulic pump	480	5 Bhp	4.1		

Table 8.3-6—Division 3 Emergency Diesel Generator Nominal Loads
Sheet 5 of 6

Time Seq. (s) (13)	Load Description (8) (15) (19)	Volts	Rating (hp/kW) (3)	Alternate Feed Load (kW) (1) (12)	Operating Load LOOP (kW) (1) (12)	Operating Load DBA/ LOOP (kW) (1) (12)
15	Load contribution from transformer and cable losses		160 kW	40	120	120
Subtotal Load Step Group 1				~~689.8~~ (10)	~~1644.5~~	~~1644.5~~
Load Step Group 2 (17)						
20	MHSI pump	6.9 kV	700 hp			580
Subtotal Load Step Group 2						580
Load Step Group 3 (17)						
25	LHSI pump	6.9 kV	500 hp			414
Subtotal Load Step Group 3						414
Load Step Group 4 (14)						
30	CCW pump	6.9 kV	1250 hp		1036	1036
Subtotal Load Step Group 4					1036	1036
Load Step Group 5 (14)						
35	ESW pump	6.9 kV	1100~~1250~~ hp		1036	1036
Subtotal Load Step Group 5					1036	1036
Load Step Group 6 (14)						
40	EFW pump	6.9 kV	700 hp		(5)	580
Subtotal Load Step Group 6					(5)	580
Load Step Group 7 (14)						
45	Division 3 safety chilled water compressor (22)	6.9 kV	947 kW		~~947~~	~~947~~

677.8
1641.7
1250
1052.2
superscript

Table 8.3-6—Division 3 Emergency Diesel Generator Nominal Loads
Sheet 6 of 6

Time Seq. (s) (13)	Load Description (8) (15) (19)	Volts	Rating (hp/kW) (3)	Alternate Feed Load (kW) (1) (12)	Operating Load LOOP (kW) (1) (12)	Operating Load DBA/ LOOP (kW) (1) (12)
Subtotal Load Step Group 7					~~947~~	~~947~~
Load Step Group 8 (14)						
50	Essential service water UHS fan 1	480	250 hp		207.2	207.2
50	Essential service water UHS fan 2	480	250 hp		207.2	207.2
Subtotal Load Step Group 8					414.4	414.4
Subtotal Alternate Feed Loads				~~689.8~~		
Total Automatically Sequenced Loads without alternate feed installed					~~5078.1~~	~~6653.0~~
Total Automatically Sequenced Loads with alternate feed installed					~~5768.0~~	~~7342.9~~
Additional Manually Connected Loads						
	Extra boration pump	480	163 Bhp	0 (20)		
	Fuel pool cooling pump (21)	480	137 Bhp	113.6		
	Emergency pressurizer heaters (16)	480	144 kW		144	
Total Manually Connected Loads				113.6	144	
Total Division 3 EDG Loading					~~6025.5~~	~~7456.4~~

1052.2
5180.6
6755.4
677.8
5858.4
7433.3
6115.9
7546.8

Notes:

1. The kW rating derived from hp rating multiplied by 0.746 conversion factor. Indicated hp is considered rated. Where brake horsepower (Bhp) is indicated, this is from the system mechanical requirements.

2. A diversity factor of 0.7 is assumed in load contribution due to cyclical nature of load.

3. Motor efficiencies estimated at 90 percent.

Table 8.3-7—Division 4 Emergency Diesel Generator Nominal Loads
Sheet 1 of 7

Time Seq. (s) (13)	Load Description (8) (15) (19)	Volts	Rating (hp/kW) (3)	Alternate Feed Load (kW) (1) (12)	Operating Load LOOP (kW) (1) (12)	Operating Load DBA/ LOOP (kW) (1) (12)
Load Step Group 1						
0	Start Signal					
15	EDG reaches rated speed and voltage/output breaker closes					
15	Emergency power generating building electric room supply fan	480	10 Bhp		8.3	8.3
15	Emergency power generating building fuel oil storage tank room fan	480	~~13.4~~ Bhp		~~11.1~~	~~11.1~~
15	EDG starting air compressor	480	61 Bhp		50.6	50.6
15	EDG auxiliary loads	480	8.7 kW		8.7	8.7
15	Vent stack monitoring	480	13 kW		13	13
15	Division 4 EUPS battery charger (13)	480	106 kW		106	106
15	Annulus ventilation heating unit	480	6 kW		4.2 (2)	4.2 (2)
15	Annulus ventilation fan	480	4.3 Bhp		3.6	3.6
15	KAA/LAR valve room cooling fan	480	5 Bhp		4.1	4.1
15	Extra boration room cooling fan	480	~~14~~ Bhp		~~11.6~~	~~11.6~~
15	Fuel pool cooling ~~pump~~ room cooling fan	480	~~7.75~~ Bhp		~~6.4~~	~~6.4~~
15	Fuel pool cooling ~~pump~~ room cooling fan	480	~~7.75~~ Bhp		~~6.4~~	~~6.4~~
15	Fuel building ventilation heating unit (7)	480	~~15~~ kW		0	0
15	Safety chilled water pump (6)	480	100 Bhp		82.9	82.9
15	Safety chilled water pump (6)	480	100 Bhp		82.9	82.9

Table 8.3-7—Division 4 Emergency Diesel Generator Nominal Loads
Sheet 2 of 7

Time Seq. (s) (13)	Load Description (8) (15) (19)	Volts	Rating (hp/kW) (3)	Alternate Feed Load (kW) (1) (12)	Operating Load LOOP (kW) (1) (12)	Operating Load DBA/ LOOP (kW) (1) (12)
15	Safety chiller condenser fans (22)	480	325 kW		325	325
15	Main control room air conditioning fan	480	27 Bhp		22.4	22.4
15	Main control room air conditioning filtration unit heater (11)	480	10 kW			7 (2)
15	Main control room air conditioning iodine filtration fan (11)	480	10 Bhp			8.3
15	Safeguard building ventilation heaters (7)	480	210 kW		0	0
15	Safeguard building ventilation supply fan	480	78 Bhp		64.7	64.7
15	Safeguard building ventilation return fan	480	43 Bhp		35.6	35.6
15	Safeguard building battery exhaust fan	480	7 Bhp		5.8	5.8
15	Emergency feed water room ventilation recirculation fan	480	2 Bhp		1.7	1.7
15	Emergency lighting panels (18)	480	178.7 kW		178.7	178.7
15	Component cooling water valve hydraulic pump	480	5 Bhp		4.1	4.1
15	Component cooling valve hydraulic pump	480	5 Bhp		4.1	4.1
15	Component cooling water valve hydraulic pump	480	5 Bhp		4.1	4.1
15	Component cooling water valve hydraulic pump	480	5 Bhp		4.1	4.1
15	Component cooling water valve hydraulic pump	480	5 Bhp		4.1	4.1

Table 8.3-7—Division 4 Emergency Diesel Generator Nominal Loads
Sheet 4 of 7

Time Seq. (s) (13)	Load Description (8) (15) (19)	Volts	Rating (hp/kW) (3)	Alternate Feed Load (kW) (1) (12)	Operating Load LOOP (kW) (1) (12)	Operating Load DBA/ LOOP (kW) (1) (12)
15	Component cooling water valve hydraulic pump	480	5 Bhp	4.1		
15	Component cooling water valve hydraulic pump	480	5 Bhp	4.1		
15	Additional connected alternate feed loads	480	39 kW	39		
15	Reactor building ventilation filtration fan	480	11 Bhp		9.1	9.1
15	Reactor building filtration heating	480	25 kW		25	25
15	Reactor building pit fan (18)	480	14 Bhp		11.6	11.6
15	Reactor building pit fan (18)	480	14 Bhp		11.6	11.6
15	MHSI/LHSI room recirculation fan	480	5 Bhp		4.1	4.1
15	JMU/KUL sample room recirculation fan	480	5 Bhp		4.1	4.1
15	Main control room air conditioning heaters (7)	480	21 kW		0	0
15	Severe accident sampling system	480	28 kW			28
15	~~Safeguard building ventilation recirculation fan~~	480	3 Bhp		2.5	2.5
15	Essential service water building ventilation and auxiliaries	480	110 kW		85.6(2) (12)	85.6(2) (12)
15	Essential service water building recirculation fan	480	10 Bhp		8.3	8.3
15	Safeguard building controlled-area ventilation system heating unit	480	21 kW			14.7 (2)
15	Safeguard building controlled-area fan	480	9 Bhp			7.5

KAA pump room recirculation fan

Table 8.3-7—Division 4 Emergency Diesel Generator Nominal Loads
Sheet 5 of 7

Time Seq. (s) (13)	Load Description (8) (15) (19)	Volts	Rating (hp/kW) (3)	Alternate Feed Load (kW) (1) (12)	Operating Load LOOP (kW) (1) (12)	Operating Load DBA/ LOOP (kW) (1) (12)
15	Emergency power generating building supply fan 1	480	100 hp		82.9	82.9
15	Emergency power generating building supply fan 2	480	100 hp		82.9	82.9
15	Emergency power generating building exhaust fan 1	480	75 hp		62.2	62.2
15	Emergency power generating building exhaust fan 2	480	75 hp		62.2	62.2
15	Additional connected loads	480	189.8 kW		189.8	189.8
15	Load contribution from transformer and cable losses		160 kW	40	120	120
Subtotal Load Step Group 1				495.7 (10)	~~1820.4~~ 1805.6	~~1885.0~~ 1870.2
Load Step Group 2 (17)						
20	MHSI pump	6.9 kV	700 hp			580
Subtotal Load Step Group 2						580
Load Step Group 3 (17)						
25	LHSI pump	6.9 kV	500 hp			414
Subtotal Load Step Group 3						414
Load Step Group 4 (14)						
30	CCW pump	6.9 kV	1250 hp		1036	1036
Subtotal Load Step Group 4					1036	1036

Table 8.3-7—Division 4 Emergency Diesel Generator Nominal Loads
Sheet 6 of 7

Time Seq. (s) (13)	Load Description (8) (15) (19)	Volts	Rating (hp/kW) (3)	Alternate Feed Load (kW) (1) (12)	Operating Load LOOP (kW) (1) (12)	Operating Load DBA/ LOOP (kW) (1) (12)
Load Step Group 5 (14)						
35	ESW pump	6.9 kV	1100~~1250~~ hp		1036	1036
Subtotal Load Step Group 5					1036	1036
Load Step Group 6 (14)						
40	EFW pump	6.9 kV	700 hp		(5)	580
Subtotal Load Step Group 6					(5)	580
Load Step Group 7 (14)						
45	Division 4 safety chilled water compressor (23)	6.9 kV	1105 kW		~~1105~~	~~1105~~
Subtotal Load Step Group 7					~~1105~~	~~1105~~
Load Step Group 8 (14)						
50	Essential service water UHS fan 1	480	250 hp		207.2	207.2
50	Essential service water UHS fan 2	480	250 hp		207.2	207.2
Subtotal Load Step Group 8					414.4	414.4
Subtotal Alternate Feed Loads				495.7		
Total Automatically Sequenced Loads without alternate feed installed					~~5412.1~~	~~7051.6~~
Total Automatically Sequenced Loads with alternate feed installed					~~5907.8~~	~~7547.3~~
Additional Manually Connected Loads						
	Emergency pressurizer heaters (16)	480	144 kW		144	
	Extra boration pump	480	163 Bhp		0 (20)	0 (20)
	Fuel pool cooling pump (21)	480	137 Bhp		113.6	113.6

1250
1227.8
Superscript
5520.0
7159.5
6015.7
7655.2

Table 8.3-7—Division 4 Emergency Diesel Generator Nominal Loads
Sheet 7 of 7

Time Seq. (s) (13)	Load Description (8) (15) (19)	Volts	Rating (hp/kW) (3)	Alternate Feed Load (kW) (1) (12)	Operating Load LOOP (kW) (1) (12)	Operating Load DBA/ LOOP (kW) (1) (12)
	Severe accident heat removal pump (16)	6.9 kV	400 hp		0 (20)	0 (20)
Total Manually Connected Loads					257.6	113.6
Total Division 4 EDG Loading					~~6165.3~~ 6273.3	~~7660.8~~ 7768.8

Notes:

1. The kW rating derived from hp rating multiplied by 0.746 conversion factor. Indicated hp is considered rated. Where brake horsepower (Bhp) is indicated, this is from the system mechanical requirements.

2. A diversity factor of 0.7 is assumed in load contribution due to cyclical nature of load.

3. Motor efficiencies estimated at 90 percent.

4. One EUPS battery charger is in service with the other battery charger in standby. Contribution to EDG loading is calculated considering only one battery charger.

5. During a LOOP-only EDG loading sequence, the EFW start is prevented until load step group six, which occurs at 30 seconds. At load step six, the start inhibit is removed and the EFW pump start sequence is based on steam generator low level initiation. If a steam generator low level initiation exists, EFW pump start is given priority over subsequent load steps.
   During a LOOP/LOCA condition, the EFW pump is started at the sequence step indicated.

6. The divisional safety chilled water pumps and chiller are assumed operating for EDG loading purposes.

7. Worst case EDG loading occurs during summer operation when safety chilled water loading is highest. Area heater loads are shown, but do not contribute to overall EDG loading since operating conditions where heater operation is expected does not reflect bounding EDG loading scenario.

120 cells
2400 AH at eight hour rate to 1.75 V/cell at 77°F (1)

Table 8.3-11—Onsite DC Power System Component Data Nominal Values
Sheet 1 of 2

Component	Division/Train	Nominal Value
1. EUPS Batteries:	Each EUPS Battery	2.22 V/cell nominal float voltage 2.33 V/cell equalize voltage 1.215 nominal specific gravity at 77°F
	~~Divisions 1 and 4~~	~~240 cells~~ ~~1800 AH at eight hour rate to 1.75 V/cell at 77°F~~ (1)
	~~Divisions 2 and 3~~	~~120 cells~~ ~~2147 AH at eight hour rate to 1.75 V/cell at 77°F~~ (1)
2. EUPS Battery Chargers	Divisions 1 and 4 & Divisions 2 and 3	Rated nominal input voltage 480 Vac, 3 phase Rated maximum input voltage 508 Vac Rated minimum input voltage ~~413~~ Vac Rated nominal AC supply frequency 57 to 63 Hz Rated nominal output voltage 250 Vdc
	Divisions 1 and 4	Required output current ~~382~~ A (2)
	Divisions 2 and 3	Required output current ~~333~~ A (2)
3. EUPS Inverters	Divisions 1 and 4 & Divisions 2 and 3	Rated nominal input voltage 250 Vdc Rated maximum input voltage 280 Vdc Rated minimum input voltage 200 Vdc Rated nominal output voltage 480 Vac 3 phase Rated power regulation ± 2% Rated nominal output frequency 60 Hz ± ½% Total harmonic distortion less than 5% total voltage distortion, less than 3% individual voltage distortion
	Divisions 1 and 4	Rated power ~~450~~ kVA
	Divisions 2 and 3	Rated power ~~300~~ kVA
4. EUPS AC/DC Converters	Divisions 1 and 4 & Divisions 2 and 3	Rated Nominal input voltage 480 Vac Rated nominal output voltage 24 Vdc
5. EUPS DC/DC Converters	Divisions 1 and 4 & Divisions 2 and 3	Rated nominal input voltage 250 Vdc Rated maximum input voltage 280 Vdc Rated minimum input voltage 200 Vdc Rated nominal output voltage 24 Vdc
6. EUPS DC Distribution Switchboard	Divisions 1 and 4	Rated Continuous Current 2500 A Rated Short Circuit Current ~~39~~ kA
	Divisions 2 and 3	Rated Continuous Current 2000 A Rated Short Circuit Current ~~30~~ kA
7. EUPS AC Distribution MCC	Divisions 1 and 4 & Divisions 2 and 3	Rated Maximum Voltage, 508 V Maximum Continuous Current, ~~2000~~ A Maximum Bus Bracing Current, ~~100~~ kA rms

Delete content and separate cells (rows)

424

377

300

300

200

45

34

600

85

Table 8.3-11—Onsite DC Power System Component Data Nominal Values
Sheet 2 of 2

Component	Division/Train	Nominal Value
8. 12UPS Batteries	Trains 1 and 2	120 cells 2.22 V/cell nominal float voltage 2.33 V/cell equalize voltage 2400 AH at 12 hour rate to 1.81 V/cell at 77°F (1) 1.215 nominal specific gravity at 77°F
9. 12UPS Battery Chargers	Trains 1 and 2	Rated nominal input voltage 480 Vac, 3 phase Rated maximum input voltage 508 Vac Rated minimum input voltage 424 Vac Rated nominal AC supply frequency 57 to 63 Hz Rated nominal output voltage 250 Vdc Required output current ~~600~~ 475 A (2)
10. 12UPS System Inverters	Trains 1 and 2	Rated nominal input voltage 250 Vdc Rated maximum input voltage 280 Vdc Rated minimum input voltage 210 Vdc Rated nominal output voltage 480 Vac 3 phase Rated power regulation ± 2% Rated power ~~160~~ 126 kVA Rated nominal output frequency 60 ± ½%
11. 12UPS AC/DC Converters	Trains 1, 2, 3, and 4	Rated Nominal input voltage 480 Vac ± 2% Rated input frequency 60 Hz ± ½% Rated nominal output voltage 24 Vdc
12. 12UPS DC/DC Converters	Trains 1, 2, 3, and 4	Rated nominal input voltage 250 Vdc Rated maximum input voltage 280 Vdc Rated minimum input voltage 210 Vdc Rated nominal output voltage 24 Vdc

Notes:

1. Battery amp-hour rating for different discharge rates are in accordance with vendor specific performance characteristic curves.

2. Battery charger current limiter will limit output current to below 150 percent of the full load output current rating.

Next File

Table 8.3-13—Division 1 Class 1E Uninterruptible Power Supply Nominal Loads

Load Description	Load Requirement (kW)			
	Momentary (1)		Random(2)	Continuous
	0-1 Min	119-120 Min	0-1 Min Duration	0-120 Min
Inverter Load (MCC 31BRA)				
• ~~Motor Operated~~ Valves	~~175.2~~	0	~~138.8~~	~~2.8~~ (5)
• Solenoid Valves	~~0.1~~	~~0.1~~	0	~~3.3~~
• Dampers	~~0~~	0	~~44.8~~	0
• AC/DC Converters	0	0	0	~~31.3~~
• I&C Systems	0	0	0	~~10.5~~
• 31BRA Control Power	~~2~~	0	~~2~~	0.3
Total Inverter Loads	~~177.3~~	~~0.1~~	~~185.6~~	~~48.2~~
250 Vdc Loads (switchgear 31BUC)				
• Control Power	~~18.5~~	0	0	1.2
• DC/DC Converters (3)	0	0	0	0
• Inverter Load (4)	~~203.8~~	~~0.1~~	~~213.3~~	~~55.4~~
• EDG Auxiliaries	~~14.3~~	~~3.3~~	0	0.8
Total Division 1 EUPS Nominal Loads	~~236.6~~	~~3.4~~	~~213.3~~	~~57.4~~

Containment Isolation
39
0
Valves and
2.3
98.6
165.9
0
1.6
31.4
10.2
Insert 8
137.6
167.5
47
17.7
158.2
1.4
1.4
177.3
192.5
54
56

Notes:

1. Maximum load occurring during the one minute momentary load duration is assumed for the entire one minute duration as described in IEEE Std 485-1997.

2. Random load assumed to occur at the most critical time of the duty cycle. Maximum load occurring during the one minute random load duration is assumed for the entire one minute duration.

3. AC/DC and DC/DC converters operate in parallel. Total load contribution from converters is shown as inverter load to include efficiency factor.

4. EUPS Battery load includes inverter efficiency factor of 87 percent.

5. ~~Load contribution from modulating valves in continuous use.~~

Table 8.3-14—Division 2 Class 1E Uninterruptible Power Supply Nominal Loads

Load Description	Load Requirement (kW)			
	Momentary (1)		Random(2)	Continuous
	0-1 Min	119-120 Min	0-1 Min Duration	0-120 Min
Inverter Load (MCC 32BRA)				
• ~~Motor Operated~~ Valves	~~85.6~~	0	~~120.9~~	~~2.8~~ (5)
• Solenoid Valves	~~0.1~~	~~0.1~~	0	2.7
• Dampers	~~0~~	0	~~22.4~~	0
• Special Emergency Lighting	0	0	0	4
• AC/DC Converters	0	0	0	27.5
• I&C Systems	0	0	0	~~7.6~~
• 32BRA Control Power	~~0.6~~	0	~~1.3~~	0.2
Total Inverter Loads	~~86.3~~	~~0.1~~	~~144.6~~	~~44.8~~
250 Vdc Loads (switchgear 32BUC)				
• Control Power	~~12.6~~	~~0~~	0	1
• DC/DC Converters (3)	0	0	0	0
• Inverter Load (4)	~~99.2~~	~~0.1~~	~~166.2~~	~~51.5~~
• EDG Auxiliaries	~~14.3~~	~~3.3~~	0	0.8
Total Division 2 EUPS Nominal Loads	~~126.1~~	~~3.4~~	~~166.2~~	~~53.3~~

Containment Isolation
17.9
0
Valves and
120.9
103.1
0
0.8
6.6
138.8
44.1
Insert 9
1.2
103.9
15
1.4
50.7
159.5
175.9
2.6
119.4
52.5

Notes:

1. Maximum load occurring during the one minute momentary load duration is assumed for the entire one minute duration as described in IEEE Std 485-1997.

2. Random load assumed to occur at the most critical time of the duty cycle. Maximum load occurring during the one minute random load duration is assumed for the entire one minute duration.

3. AC/DC and DC/DC converters operate in parallel. Total load contribution from converters is shown as inverter load to include efficiency factor.

4. EUPS Battery load includes inverter efficiency factor of 87 percent.

5. ~~Load contribution from modulating valves in continuous use.~~

Table 8.3-15—Division 3 Class 1E Uninterruptible Power Supply Nominal Loads

Load Description	Load Requirement (kW)			
	Momentary (1)		Random(2)	Continuous
	0-1 Min	119-120 Min	0-1 Min Duration	0-120 Min
Inverter Load (MCC 33BRA)				
• ~~Motor Operated~~ Valves	~~85.6~~	0	~~120.9~~	~~2.8~~ (5)
• Solenoid Valves	~~0.1~~	~~0.1~~	0	2.7
• Dampers	~~0~~	0	~~22.4~~	0
• Special Emergency Lighting	0	0	0	4
• AC/DC Converters	0	0	0	27.5
• I&C Systems	0	0	0	~~7.6~~
• 33BRA Control Power	~~0.6~~	0	~~1.3~~	0.2
Total Inverter Loads	~~86.3~~	~~0.1~~	~~144.6~~	~~44.8~~
250 Vdc Loads (switchgear 33BUC)				
• Control Power	~~12.6~~	~~0~~	0	1
• DC/DC Converters (3)	0	0	0	0
• Inverter Load (4)	~~99.2~~	~~0.1~~	~~166.2~~	~~51.5~~
• EDG Auxiliaries	~~14.3~~	~~3.3~~	0	0.8
Total Division 3 EUPS Nominal Loads	~~126.1~~	~~3.4~~	~~166.2~~	~~53.3~~

Containment Isolation
17.9
0
Valves and
120.9
103.1
0
0.8
6.6
138.8
44.1
Insert 9
1.2
1.4
15
50.7
52.5
159.5
175.9
2.6
119.4

Notes:

1. Maximum load occurring during the one minute momentary load duration is assumed for the entire one minute duration as described in IEEE Std 485-1997.

2. Random load assumed to occur at the most critical time of the duty cycle. Maximum load occurring during the one minute random load duration is assumed for the entire one minute duration.

3. AC/DC and DC/DC converters operate in parallel. Total load contribution from converters is shown as inverter load to include efficiency factor.

4. EUPS Battery load includes inverter efficiency factor of 87 percent.

5. ~~Load contribution from modulating valves in continuous use.~~

Table 8.3-16—Division 4 Class 1E Uninterruptible Power Supply Nominal Loads

Load Description	Load Requirement (kW)			
	Momentary (1)		Random(2)	Continuous
	0-1 Min	119-120 Min	0-1 Min Duration	0-120 Min
Inverter Load (MCC 34BRA)				
• ~~Motor Operated~~ Valves	~~175.2~~	0	~~138.8~~	~~2.8~~ (5)
• Solenoid Valves	~~0.1~~	~~0.1~~	0	~~3.3~~
• Dampers	~~0~~	0	~~44.8~~	0
• AC/DC Converters	0	0	0	~~31.3~~
• I&C Systems	0	0	0	~~10.5~~
• 34BRA Control Power	~~2~~	0	~~2~~	0.3
Total Inverter Loads	~~177.3~~	~~0.1~~	~~185.6~~	~~48.2~~
250 Vdc Loads (switchgear 34BUC)				
• Control Power	~~18.5~~	~~0~~	0	~~1.2~~
• DC/DC Converters (3)	0	0	0	0
• Inverter Load (4)	~~203.8~~	~~0.1~~	~~213.3~~	~~55.4~~
• EDG Auxiliaries	~~14.3~~	~~3.3~~	0	0.8
Total Division 4 EUPS Nominal Loads	~~236.6~~	~~3.4~~	~~213.3~~	~~57.4~~

Containment Isolation
32.1
0
Valves and
1.4
98.6
166
0
1.6
32.5
12.6
Insert 8
130.7
167.6
49.6
17.7
1.3
150.2
1.4
169.3
1.4
192.6
57
59.1

Notes:

1. Maximum load occurring during the one minute momentary load duration is assumed for the entire one minute duration as described in IEEE Std 485-1997.

2. Random load assumed to occur at the most critical time of the duty cycle. Maximum load occurring during the one minute random load duration is assumed for the entire one minute duration.

3. AC/DC and DC/DC converters operate in parallel. Total load contribution from converters is shown as inverter load to include efficiency factor.

4. EUPS Battery load includes inverter efficiency factor of 87 percent.

5. ~~Load contribution from modulating valves in continuous use.~~

Next File

- Grounding for personnel protection and generator neutral grounding is consistent with the overall plant grounding requirements.

Each SBODG and its power distribution equipment are sized to provide the voltage and frequency needed for proper operation of their connected loads. The highest expected continuous loading was calculated using conservative estimates of load characteristics. Uncertainties associated with SBODG loading are addressed by maintaining a margin of at least five percent.

8.4.1.3 Alternate AC Power System Performance

During normal plant operation each SBODG remains in standby with the diesel engines ready to be started and loaded. Each diesel engine is prelubricated and its cooling water is preheated. The SBODGs are not normally connected to the preferred or the onsite emergency alternating current (EAC) power system and are separated from the assigned Class 1E bus through two normally open circuit breakers. The circuit breaker located at the Class 1E bus is a Class 1E breaker.

Editorial change: Delete hyphen

At the start of an SBO event, two-hour rated safety-related batteries supply DC power to safety-related inverters and their critical loads, including I&C power and DC control power. A combination of two-hour rated and twelve-hour rated non-safety-related batteries supply various non-safety-related 250 Vdc switchboards.

When power is lost to the normal power supply system (NPSS) 6.9 kV switchgear, selected NPSS switchgear load breakers will open on undervoltage. Non-safe shutdown loads are stripped below the machine rating for immediately connected load (typically 25 to 30 percent of the machine continuous rating). The SBODGs will automatically start on a loss of voltage on their associated non-safety-related buses. If the EDGs fail to re-energize the Class 1E buses, the EPSS preferred and emergency power source feeder breakers are opened. Opening these breakers prevents inadvertent paralleling out of phase if the preferred or emergency power supply is restored during SBODG operation. Sufficient controls and indications are available in the MCR and at the local control panel to start the SBODGs from either of those locations. Both SBODGs are started and manually aligned to their respective EPSS buses from the MCR within ten minutes from the beginning of the SBO event. The undervoltage signal causes all loads to be stripped from the associated Class 1E and non-Class 1E buses. Non-Class 1E loads are stripped to the extent that the remaining load is less than the SBODG rating for immediately connected loads. This prepares the SBODG bus for loading by the MCR operators.

In Table 8.4-3—Station Blackout Diesel Generator Indications and Alarms, a list of alarms and indications are provided for the SBODG. Engine trip functions are based on manufacturer recommendations for commercial service.

Insert 1, Section 8.3.1.1.3

A loss of voltage on any of the 13.8 kV NPSS buses 31BBA, 32BBA, 33BBA, or 34BBA is detected by the bus undervoltage scheme and the respective bus load feeder circuit breakers are tripped after a set time delay. A synch check relay is used to perform a residual voltage transfer to the alternate NAT. The load feeders on the bus are then manually re-energized once the power supply from the alternate NAT is restored.

Insert 2, Table 8.3-1 Item 4

4.	NPSS 13.8 kV Switchgear	Rated Maximum Voltage, 15 kV Maximum Bus Bracing Current, 164 kA rms
	Feeder Circuit Breaker	Maximum Rated Interrupting Current, 63 kA Maximum Rated Closing and Latching Current 164 kA (peak value)
	31BBA, 32BBA, 33BBA, 34BBA	Maximum Continuous Current, 3000 A
	31BBC, 32BBC, 33BBC, 34BBC 31BBD, 32BBD, 33BBD, 34BBD 31BDE, 32BDE, 33BDE, 34BDE	Maximum Continuous Current, 1200 A

Insert 3, Table 8.3-1 Item 5

5.	EPSS and NPSS 6.9 kV Switchgear	Rated Maximum Voltage, 8.25 kV Maximum Bus Bracing Current, 104 kA rms
	Feeder Circuit Breaker	Maximum Rated Interrupting Current 40 kA rms Maximum Rated Closing and Latching Current 104 kA (peak value)
	31BBH, 32BBH, 33BBH, 34BBH	Maximum Continuous Current, 2000 A
	31BDA, 32BDA, 33BDA, 34BDA 31BDB, 32BDB, 33BDB, 34BDB 31BDD, 32BDD, 33BDD, 34BDD 31BDC, 34BDC, 33BBG, 34BBG	Maximum Continuous Current, 1200 A

Insert 4, Table 8.3-1 Item 6

6.	EPSS 480 Vac Load Centers	Rated Maximum Voltage, 508V Maximum Bus Bracing Current, 85 kA rms
	31BMB, 32BMB, 33BMB, 34BMB	Maximum Continuous Current, 3000 A
	31BMD, 32BMD, 33BMD, 34MBD 31BMC, 34BMC	Maximum Continuous Current, 2000 A
	NPSS 480 Vac Load Centers	Rated Maximum Voltage, 508V Maximum Bus Bracing Current, 100 kA rms
	31BFD, 32BFD, 33BFD, 34BFD 31BFE, 32BFE, 34BFE 31BFF, 32BFF, 33BFF, 34BFF 31BFG, 32BFG, 33BFG, 34BFG 31BFX, 32BFX	Maximum Continuous Current, 4000 A
	31BFA, 32BFA, 33BFA, 34BFA 31BFB, 32BFB, 31BFC, 32BFC	Maximum Continuous Current, 2000 A
	EPSS and NPSS 480 Vac Feeder Breaker	Rated Maximum Voltage, 508 V Maximum Rated Interrupting Current 100 kA rms
	31BFD, 31BFE	Maximum Continuous Current, 4000 A
	32BFD, 33BFD, 34BFD, 32BFE, 34BFE, 31BFF, 32BFF, 33BFF, 34BFF, 31BFG, 32BFG, 33BFG, 34BFG, 31BFX, 32BFX, 34BMB	Maximum Continuous Current, 3200 A
	31BMB	Maximum Continuous Current, 2000 A
	32BMB, 33BMB, 31BMD, 32BMD, 33BMD, 34MBD, 31BMC, 34BMC, 31BFA, 32BFA, 33BFA, 34BFA 31BFB, 32BFB, 31BFC, 32BFC	Maximum Continuous Current, 1600 A

Insert 5, Table 8.3-1 Item 7

7.	EPSS 480 Vac MCCs	Rated Maximum Voltage, 508V Maximum Bus Bracing Current, 85 kA rms
	32BNA02, 33BNA02	Maximum Continuous Current, 1200 A
	31BNA01, 32BNA01, 33BNA01, 34BNA01	Maximum Continuous Current, 1000 A
	31BNB01, 34BNB01, 31BNC01, 34BNC01	Maximum Continuous Current, 800 A
	32BNB01, 33BNB01, 31BNB02, 32BNB02, 33BNB02, 34BNB02, 31BNB03, 32BNB03, 33BNB03, 34BNB03, 31BND01, 32BND01, 33BND01, 34BND01	Maximum Continuous Current, 600 A
	NPSS 480 Vac MCCs	Rated Maximum Voltage, 508V Maximum Bus Bracing Current, 100 kA rms
	31BHD01, 32BHD01, 31BHE01, 32BHE01	Maximum Continuous Current, 2500 A
	33BHD01, 34BHD01	Maximum Continuous Current, 2000 A
	31BHD02, 32BHD02, 34BHD02, 34BHE01	Maximum Continuous Current, 1200 A
	33BHD02	Maximum Continuous Current, 1000 A
	31BHB01	Maximum Continuous Current, 800 A
	31BHA01, 32BHA01, 33BHA01, 34BHA01, 31BHB02, 32BHB01, 32BHB02, 31BHC01, 32BHC01, 31BHF01, 32BHF01, 31BHX01, 32BHX01, 31BHZ01, 32BHZ01, 31BRC, 32BRC, 31BRJ, 32BRJ, 31BRB, 32BRB, 33BRB, 34BRB	Maximum Continuous Current, 600 A
	EPSS 480 Vac MCC Feeder Breakers	Rated Maximum Voltage, 508V Maximum Interrupting Current, 100 kA rms
	32BNA02, 33BNA02	Maximum Continuous Current, 1200 A
	31BNA01, 32BNA01, 33BNA01, 34BNA01	Maximum Continuous Current, 1000 A
	31BNB01, 34BNB01, 31BNC01, 34BNC01, 32BNB02, 33BNB02, 34BNB02,	Maximum Continuous Current, 800 A
	32BNB01, 33BNB01, 31BNB02, 31BNB03, 32BNB03, 33BNB03, 34BNB03, 31BND01, 32BND01, 33BND01, 34BND01	Maximum Continuous Current, 600 A
	NPSS 480 Vac MCC Feeder Breakers	Rated Maximum Voltage, 508V Maximum Interrupting Current, 100 kA rms
	31BHD01, 32BHD01, 31BHE01, 32BHE01	Maximum Continuous Current, 2500 A
	33BHD01, 34BHD01	Maximum Continuous Current, 2000 A
	31BHD02, 32BHD02, 34BHD02, 34BHE01	Maximum Continuous Current, 1200 A
	33BHD02	Maximum Continuous Current, 1000 A
	31BHB01	Maximum Continuous Current, 800 A
	31BHA01, 32BHA01, 33BHA01, 34BHA01, 31BHB02, 32BHB01, 32BHB02, 31BHC01, 32BHC01, 31BHF01, 32BHF01, 31BHX01, 32BHX01, 31BHZ01, 32BHZ01, 31BRC, 32BRC, 31BRJ, 32BRJ, 31BRB, 32BRB, 33BRB, 34BRB	Maximum Continuous Current, 600 A

Insert 6, Table 8.3-1 Item 8

31BMT02, 34BMT02	6.9 kV TO 480 Vac 2000 kVA
31BMT01, 32BMT01, 33BMT01, 34BMT01, 32BMT02, 33BMT02, 31BMT03, 32BMT03, 33BMT03, 34BMT03, 31BMT04, 32BMT04, 33BMT04, 34BMT04	6.9 kV TO 480 Vac 1500 kVA

Insert 7, Not Used

Insert 8, Table 8.3-13 and Table 8.3-16

Main Steam Relief Control Valve	0	0	0	2.8

Insert 9, Table 8.3-14 and Table 8.3-15

Main Steam Relief Control Valve	0	0	0	2.8
Communications	0	0	0	0.3

percent voltage. The bus voltage is maintained at the nominal 100 percent following a ± ten percent deviation in the switchyard voltage combined with bus voltage changes as a result of changes in bus loading. The EPSS connection with offsite power utilizes no intervening non-Class 1E buses and does not share a common winding from the preferred power EATs with the non-Class 1E switchgear. This minimizes the probability that transients of non-safety-related loads will adversely affect the Class 1E equipment and eliminates additional failure points between the offsite source and the Class 1E equipment.

The EAT protection detects faults and initiates protection actions to minimize any potential damage to an EAT, while minimizing impact to the electrical distribution system by isolating the affected transformer in the event of a transformer fault. Protection devices installed for EAT protection include transformer differential, ground fault overcurrent, phase overcurrent and sudden pressure relays. An EAT related fault initiates an automatic fast transfer of the offsite power source, maintaining offsite power to all four divisions by switching the affected bus power supply to the unaffected EAT. The combined four EPSS divisions load under postulated conditions are within the ratings of each of the EATs. The fast transfer minimizes volta[illegible] transfer, thus m[illegible]

The integrity of the electrical ties between the onsite and offsite power systems is constantly monitored. The capability of the preferred power circuits to deliver power to the safety-related buses is sensed by an open phase monitoring system on the high voltage side connection to the offsite power supply as described in 8.2.2.4. Undervoltage and degraded voltage protection of the Class 1E buses is described in Section 8.3.1.1.3.

The EPSS distri[illegible]
Table 8.3-2—E[illegible]
Control Center Numbering and Nominal Voltage.

EPSS divisions are functionally independent and physically separated from the others during normal bus alignments. An alternate feed is provided between EPSS divisions 1 and 2 (first divisional pair) to provide the normal and standby source of power to required safety-related systems, safety-related support systems, or components that do not have the required redundancy when certain electrical components, including the division 1 emergency diesel generator (EDG), are out of service. A similar alternate feed provides standby power to EPSS division 2, from division 1 when certain electrical components, including the division 2 EDG are out of service. Similar alternate feeds are used between divisions 3 and 4 (second divisional pair).

The divisional pair functional independence and physical separation are in accordance with IEEE Std 603-1998 (Reference 1) for safety-related system independence. This is accomplished by the separation of safety-related components between divisional pairs. A single failure or internal hazard, or both, in one divisional pair can only affect that one divisional pair. Therefore, during design basis accidents coincident with a single failure to any electrical component in a divisional pair, the second divisional pair supports safety-related function completion in accordance with single failure criteria IEEE Std 379-2000 (Reference 2), as endorsed by RG 1.53.

Figure 8.3-3—Normal Power Supply System Single Line Drawing
Sheet 1 of 5

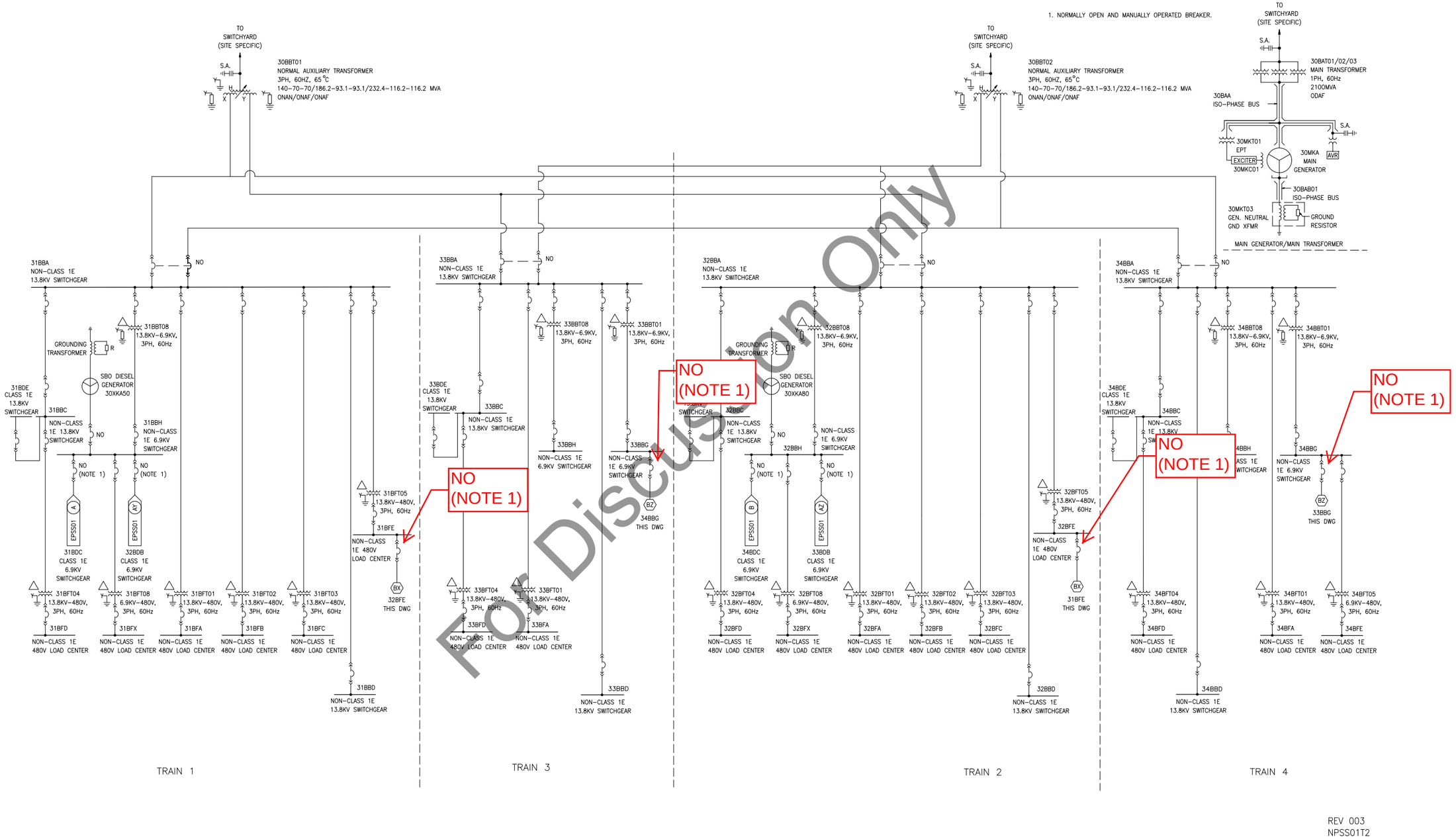
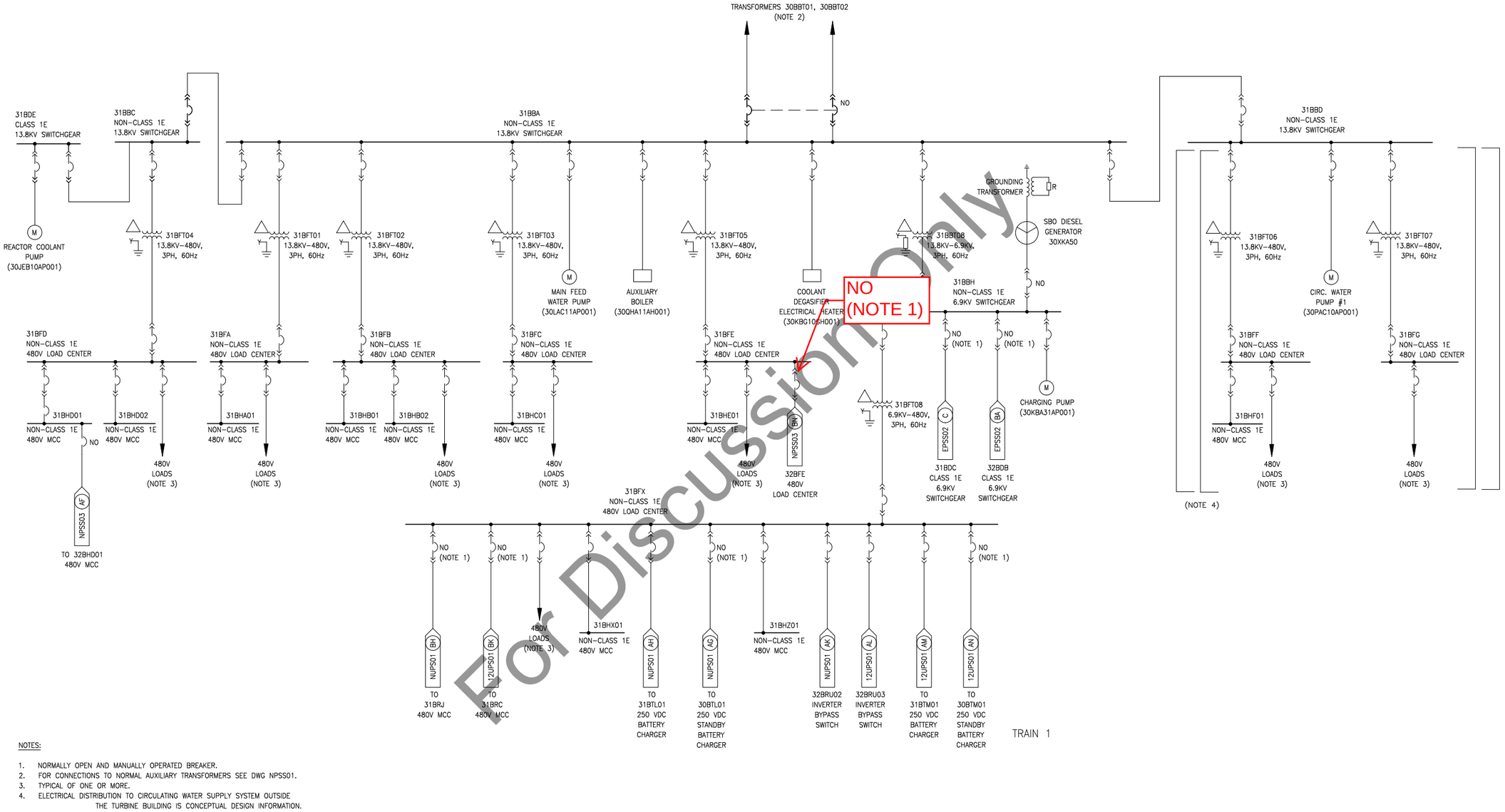


Figure 8.3-3—Normal Power Supply System Single Line Drawing
Sheet 2 of 5



NOTES:

1. NORMALLY OPEN AND MANUALLY OPERATED BREAKER.
2. FOR CONNECTIONS TO NORMAL AUXILIARY TRANSFORMERS SEE DWG NPSS01.
3. TYPICAL OF ONE OR MORE.
4. ELECTRICAL DISTRIBUTION TO CIRCULATING WATER SUPPLY SYSTEM OUTSIDE THE TURBINE BUILDING IS CONCEPTUAL DESIGN INFORMATION.

REV 002
NPSS02T2

Figure 8.3-3—Normal Power Supply System Single Line Drawing
Sheet 3 of 5

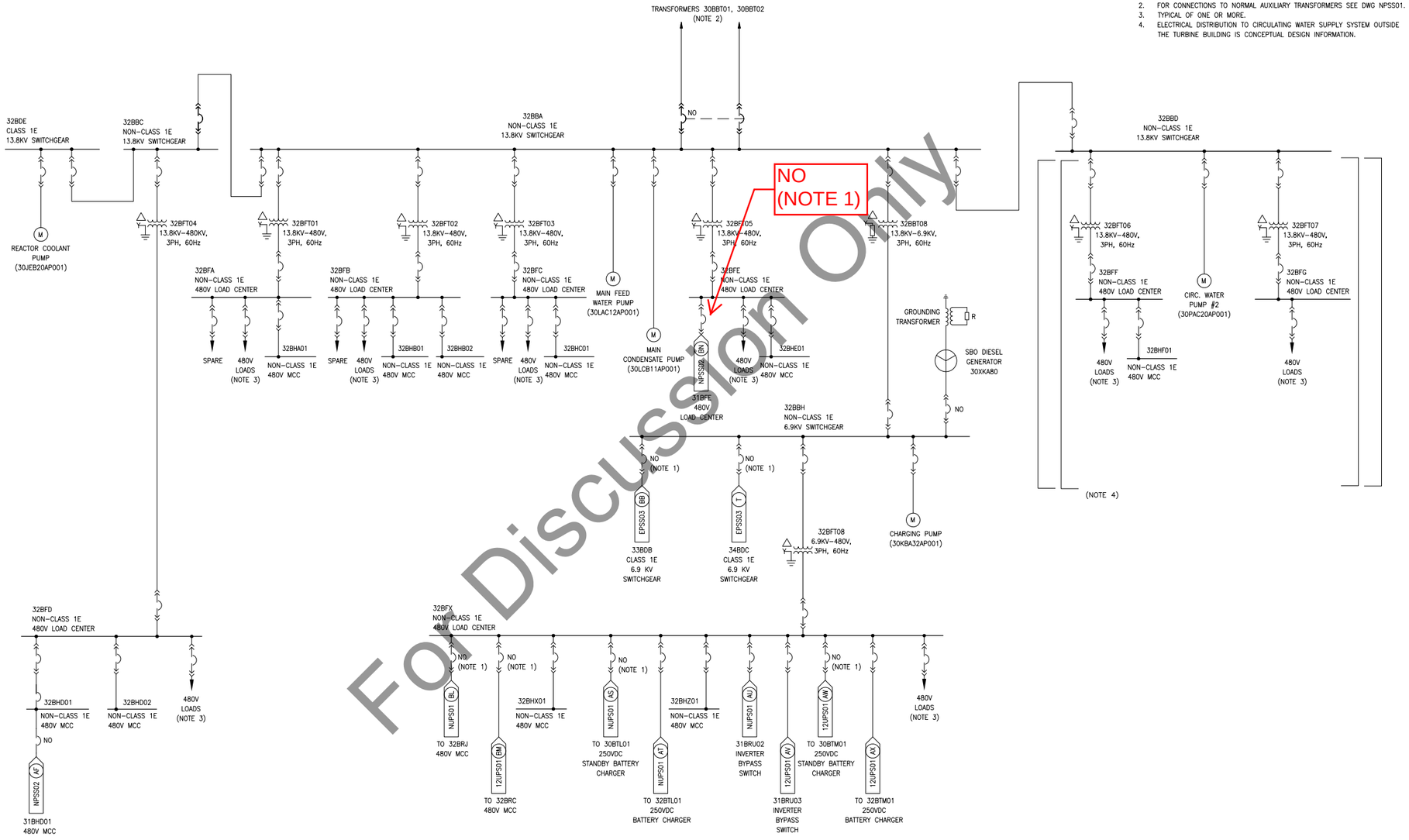
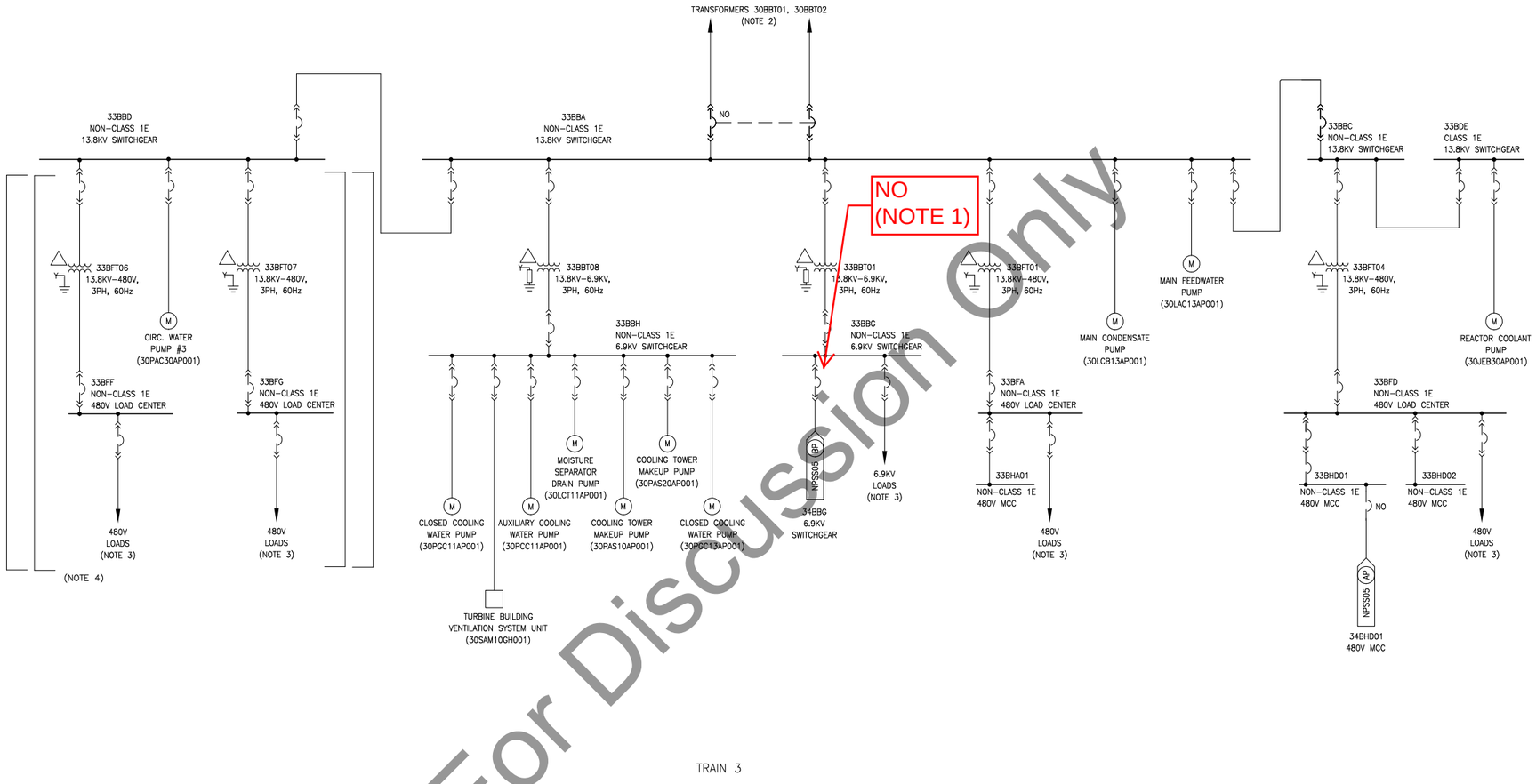


Figure 8.3-3—Normal Power Supply System Single Line Drawing
Sheet 4 of 5



NOTES:

1. NORMALLY OPEN AND MANUALLY OPERATED BREAKER.
2. FOR CONNECTIONS TO NORMAL AUXILIARY TRANSFORMERS SEE DWG NPSS01.
3. TYPICAL OF ONE OR MORE.
4. ELECTRICAL DISTRIBUTION TO CIRCULATING WATER SUPPLY SYSTEM OUTSIDE THE TURBINE BUILDING IS CONCEPTUAL DESIGN INFORMATION.

REV 002
NPSS04T2

Figure 8.3-3—Normal Power Supply System Single Line Drawing
Sheet 5 of 5

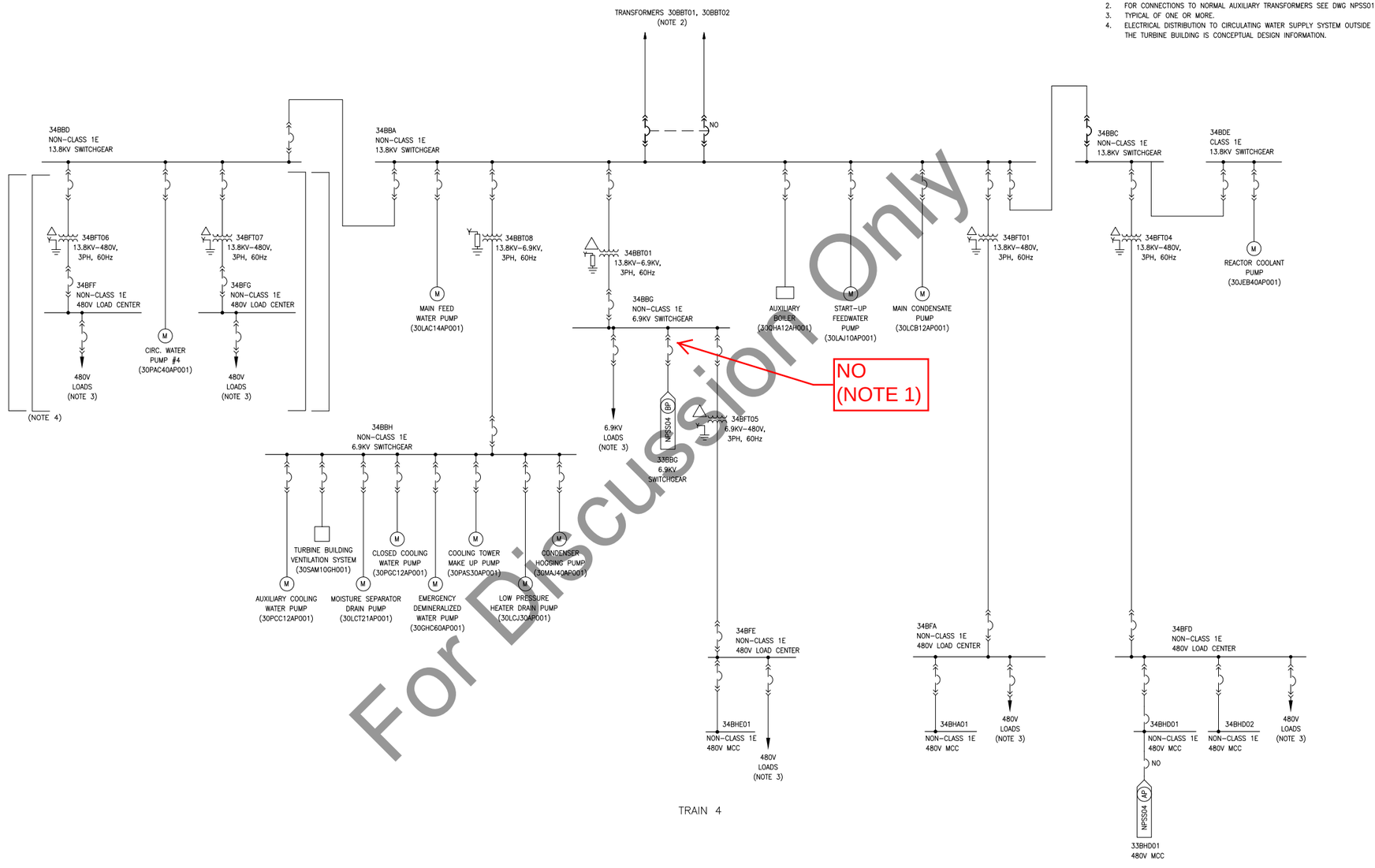


Table 8.4-1—Station Blackout Continuous Loading – Train 1 Estimated

Function	Power	Notes
Safety Chilled Water Compressor - Division 1	715 kW	Division 1 is air cooled, which consists of four 25 percent compressors and eight 12.5 percent condenser fans; contribution to SBODG loading is calculated considering 50 percent of the rated capacity running continuously.
Emergency Feedwater Pump	580 kW	Nominal load adjusted higher for possible efficiency losses. No credit has been taken for the reduced flow rate and hydraulic load expected during SBO. The value listed is conservative.
Class 1E Battery Chargers	~~200~~ kW	Includes Division 1 and Division 2.
Class 1E 480 V Loads Except Battery Chargers -Division 1	~~820~~ kW	Includes 480 V loads powered from load centers 31BMB and 31BMC and MCCs 31BNB01, 31BNB02, 31BNB03, and 31BNC01.
Class 1E 480 V Loads Except Battery Chargers - Division 2	~~520~~ kW	Includes 480 V loads powered from load center 32BMB and MCCs 32BNB01, 32BNB02, and 32BNB03.
SBO DG Auxiliaries	~~230~~ kW	
Non-Class 1E Battery Chargers	~~320~~ kW	Non-Class 1E chargers may be turned off during SBO as needed to maintain load below SBODG continuous rating.
Provision for Site-Specific Non-Class 1E Loads	450 kW	
Total SBO Load	~~3835~~ kW	
Asset Protection	940 kW	Load present during LOOP without SBO. Individual loads removed during SBO as needed to maintain load below SBODG continuous rating

223
527
248
499
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3893

Table 8.4-2—Station Blackout Loading – Train 2 Estimated

Function	Power	Notes
Safety Chilled Water Compressor - Division 4	715 kW	Division 4 is air cooled, which consists of four 25 percent compressors and eight 12.5 percent condenser fans; contribution to SBODG loading is calculated considering 50 percent of the rated capacity running continuously.
Emergency Feedwater Pump	580 kW	Nominal load adjusted higher for possible efficiency losses. No credit has been taken for the reduced flow rate and hydraulic load expected during SBO. The value listed is conservative.
Class 1E Battery Chargers	~~200~~ kW	Includes Division 3 and Division 4.
Class 1E 480 V Loads Except Battery Chargers - Division 4	~~1000~~ kW	Includes 480 V loads powered from load centers 34BMB and 34BMC and MCCs 34BNB01, 34BNB02, 34BNB03, and 34BNC01.
Class 1E 480 V Loads Except Battery Chargers - Division 3	~~550~~ kW	Includes 480 V loads powered from load center 33BMB and MCCs 33BNB01, 33BNB02, and 33BNB03.
SBO DG Auxiliaries	~~210~~ kW	Differs slightly from train 1 due to consideration of loads from the associated 480 V buses.
Non-Class 1E Battery Chargers	~~320~~ kW	Non-Class 1E chargers may be turned off during SBO as needed to maintain load below SBODG continuous rating.
Provision for Site-Specific Non-Class 1E Loads	450 kW	
Total SBO Load	~~4025~~ kW	
Asset Protection	30 kW	Differs from train 1 because most turbine-generator loads are on train 1. Load present during LOOP without SBO. Individual loads removed during SBO as needed to maintain load below SBODG continuous rating.

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4006