3.8 ELECTRICAL POWER SYSTEMS

3.8.1 AC Sources – Operating

LCO 3.8.1 The following AC electrical power sources shall be OPERABLE:

a. Two qualified circuits between the offsite transmission network and the onsite Class 1E AC Electric Power Distribution System; and

b. Three diesel generators (DGs).

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One of two offsite AC power sources to one ESF bus inoperable.	A.1	Verify affected ESF bus is powered from the other operable offsite AC circuit.	72 hours AND once per 8 hours thereafter
	AND		
	A.2	Verify the CTG is functional by verifying the CTG starts and achieves steady state voltage and frequency within 10 minutes.	72 hours AND once per 7 days thereafter
	AND		
	A.3	Verify the CTG circuit breakers are aligned to the affected ESF bus.	72 hours AND once per 8 hours thereafter

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. (continued)	AND		
	A.4	Restore inoperable offsite AC power to affected ESF bus.	30 days
B. One required offsite circuit inoperable.	B.1	Perform SR 3.8.1.1 for OPERABLE required offsite circuit.	1 hour AND Once per 8 hours thereafter
	AND		
	B.2	Declare required feature(s) with no power available from an OPERABLE offsite circuit inoperable when the redundant required feature(s) are inoperable.	24 hours from discovery of no power available from an OPERABLE offsite circuit to one division concurrent with inoperability of redundant required feature(s)
	AND		
	B.3	Verify the combustion turbine generator (CTG) is functional by verifying the CTG starts and achieves steady state voltage and frequency within 10 minutes.	72 hours
	AND		(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
B. (continued)	B.4	Verify the CTG circuit breakers are capable of being aligned to each of three 6.9 kV essential AC buses.	72 hours AND once per 8 hours thereafter
	AND		
	B.5	Restore required offsite circuit to OPERABLE status.	14 days AND 1 day from discovery of two divisions with no power available from an OPERABLE offsite circuit AND 15 days from discovery of failure to meet the LCO

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. ---------NOTE--------- Required Action C.3.1 or C.3.2 shall be completed if this Condition is entered. ---------- One required DG inoperable.	C.1	Perform SR 3.8.1.1 for OPERABLE required offsite circuit(s).	1 hour AND Once per 8 hours thereafter
	AND		
	C.2	Declare required feature(s), supported by the inoperable DG, inoperable when the redundant required feature(s) are inoperable.	4 hours from discovery of Condition C concurrent with inoperability of redundant required feature(s)
	AND		
	C.3.1	Determine OPERABLE DG(s) are not inoperable due to common cause failure.	24 hours
	OR		
	C.3.2	Perform SR 3.8.1.2 for OPERABLE DG(s).	24 hours
	AND		
	C.4	Verify the combustion turbine generator (CTG) is functional by verifying the CTG starts and achieves steady state voltage and frequency within 10 minutes.	72 hours
	AND		

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
C. (continued)	C.5	Verify the CTG circuit breakers are aligned to the 6.9 kV essential AC bus associated with the inoperable DG.	72 hours AND once per 8 hours thereafter
	AND		
	C.6	Restore required DG to OPERABLE status.	14 days AND 15 days from discovery of failure to meet the LCO
D. Two required offsite circuits inoperable.	D.1	Declare required feature(s) inoperable when the redundant required feature(s) are inoperable.	12 hours from discovery of Condition D concurrent with inoperability of redundant required feature(s)
	AND		
	D.2	Restore one required offsite circuit to OPERABLE status.	24 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. One required offsite circuit inoperable. AND One required DG inoperable.	----------NOTE---------- Enter applicable Conditions and Required Actions of LCO 3.8.9, "Distribution Systems – Operating," when Condition D is entered with no required AC power source to one division. ----------	
	E.1 Verify the combustion turbine generator (CTG) is functional by verifying the CTG starts and achieves steady state voltage and frequency within 10 minutes.	2 hours
	AND	
	E.2 Verify the CTG circuit breakers are capable of being aligned to each of three 6.9 kV essential AC buses.	2 hours AND once per 8 hours thereafter
	AND	
	E.3.1 Restore required offsite circuit to OPERABLE status.	24 hours
	OR	
	E.3.2 Restore required DG to OPERABLE status.	24 hours

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
F. Two required DGs inoperable.	F.1	Verify the combustion turbine generator (CTG) is functional by verifying the CTG starts and achieves steady state voltage and frequency within 10 minutes.	2 hours
	AND		
	F.2	Verify the CTG circuit breakers are capable of being aligned to each of the 6.9 kV essential AC buses associated with the inoperable DGs.	2 hours AND once per 8 hours thereafter
	AND		
	F.3	Restore one required DG to OPERABLE status.	72 hours
G. Required Action and Associated Completion Time of Condition A, B, C, D, E or F not met.	G.1	Be in MODE 3.	12 hours
	AND		
	G.2	Be in MODE 4.	36 hours
H. Three or more required AC sources inoperable.	H.1	Enter LCO 3.0.3.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.1.1	Verify correct breaker alignment and indicated power availability for each required offsite circuit.	7 days
SR 3.8.1.2	----------NOTES---------- 1. Performance of SR 3.8.1.7 satisfies this SR. 2. All DG starts may be preceded by an engine prelube period and followed by a warmup period prior to loading. 3. A modified DG start involving idling and gradual acceleration to synchronous speed may be used for this SR as recommended by the manufacturer. When modified start procedures are not used, the time, voltage, and frequency tolerances of SR 3.8.1.7 must be met. ---------- Verify each DG starts from standby conditions and achieves steady state voltage $\geq$ 6210 V and $\leq$ 7590 V and frequency $\geq$ 58.8 Hz and $\leq$ 61.2 Hz.	As specified in Table 3.8.1-1

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.8.1.3	----------NOTES---------- 1. DG loadings may include gradual loading as recommended by the manufacturer. 2. Momentary transients outside the load range do not invalidate this test. 3. This Surveillance shall be conducted on only one DG at a time. 4. This SR shall be preceded by, and immediately follow, without shutdown, a successful performance of SR 3.8.1.2 or SR 3.8.1.7. ---------- Verify each DG is synchronized and loaded and operates for ≥ 60 minutes at a load ≥ 5000 kW and ≤ [ ] kW.	As specified in Table 3.8.1-1
SR 3.8.1.4	Verify each day tank contains ≥ [ ] liters of fuel oil.	31 days
SR 3.8.1.5	Check for and remove accumulated water from each day tank.	31 days
SR 3.8.1.6	Verify the fuel oil transfer system operates to automatically transfer fuel oil from the storage tank to the day tank.	92 days

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.7	----------NOTE---------- All DG starts may be preceded by an engine prelube period. ---------- Verify each DG starts from standby condition and achieves, in ≤ 20 seconds, voltage ≥ 6210 V and ≤ 7590 V and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.	184 days
SR 3.8.1.8	----------NOTES---------- 1. This Surveillance shall not be performed in MODE 1 or 2. 2. Credit may be taken for unplanned events that satisfy this SR. ---------- Verify manual transfer of the [unit power supply] from the normal offsite circuit to each required alternate offsite circuit.	18 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.8.1.9	----------NOTES---------- 1. This Surveillance shall not be performed in MODE 1 or 2. 2. Credit may be taken for unplanned events that satisfy this SR. ----------	
	Verify each DG operating at a power factor ≤ [ ] rejects a load ≥ 540 kW for Division 1 and ≥ 1400 kW for Divisions 2 and 3, and: a. Following load rejection, the frequency is ≤ [ ] Hz; b. Within 3 seconds following load rejection, the voltage is ≥ 6210 V and ≤ 7590 V; and c. Within 3 seconds following load rejection, the frequency is ≥ 58.8 Hz and ≤ 61.2 Hz.	18 months
SR 3.8.1.10	----------NOTES---------- 1. This Surveillance shall not be performed in MODE 1 or 2. 2. Credit may be taken for unplanned events that satisfy this SR. ----------	
	Verify each DG operating at a power factor ≤ 0.9 does not trip and voltage is maintained ≤ [ ] V during and following a load rejection of a load ≥ [5000] V and ≤ [ ] kW.	18 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.8.1.11	----------NOTES---------- 1. All DG starts may be preceded by an engine prelube period. 2. This Surveillance shall not be performed in MODE 1, 2, or 3. 3. Credit may be taken for unplanned events that satisfy this SR. ---------- Verify on an actual or simulated loss of offsite power signal: a. De-energization of emergency buses; b. Load shedding from emergency buses; and c. DG auto-starts from standby condition and: 1. energizes permanently connected loads in ≤ 20 seconds, 2. sequentially energizes auto-connected shutdown loads, 3. maintains steady state voltage ≥ 6210 V and ≤ 7590 V, 4. maintains steady state frequency ≥ 58.8 Hz and ≤ 61.2 Hz, and 5. supplies permanently connected and auto-connected shutdown loads for ≥ 5 minutes.	18 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE	FREQUENCY
SR 3.8.1.12 ----------NOTES---------- 1. All DG starts may be preceded by an engine prelube period. 2. This Surveillance shall not be performed in MODE 1 or 2. 3. Credit may be taken for unplanned events that satisfy this SR. ---------- Verify on an actual or simulated Emergency Core Cooling System (ECCS) initiation signal each DG auto-starts from standby condition and: a. In ≤ 20 seconds after auto-start and during tests, achieves voltage ≥ 6210 V and ≤ 7590 V; b. In ≤ 20 seconds after auto-start and during tests, achieves frequency ≥ 58.8 Hz and ≤ 61.2 Hz; c. Operates for ≥ 5 minutes; d. Permanently connected loads remain energized from the offsite power system; and e. Emergency loads are sequentially energized from the offsite power system.	18 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.8.1.13	----------NOTES---------- 1. This Surveillance shall not be performed in MODE 1, 2, or 3. 2. Credit may be taken for unplanned events that satisfy this SR. ---------- Verify each DG's automatic trips are bypassed on actual or simulated loss of voltage signal on the emergency bus concurrent with an actual or simulated ECCS initiation signal except: a. Engine overspeed; and b. Generator differential current.	18 months
SR 3.8.1.14	----------NOTES---------- 1. Momentary transients outside the load and power factor ranges do not invalidate this test. 2. This Surveillance shall not be performed in MODE 1 or 2. 3. Credit may be taken for unplanned events that satisfy this SR. ---------- Verify each DG operating at a power factor $\leq$ 0.9, operates for $\geq$ 24 hours: a. For $\geq$ 2 hours loaded, $\geq$ 5225 kW and $\leq$ 5500 kW; and b. For the remaining hours of the test loaded $\geq$ 5000 kW and $\leq$ [ ].	18 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.8.1.15	----------NOTES---------- 1. This Surveillance shall be performed within 5 minutes of shutting down the DG after the DG has operated ≥ 2 hours loaded ≥ 5225 kW and ≤ 5500 kW. Momentary transients outside of load range do not invalidate this test. 2. All DG starts may be preceded by an engine prelube period. ---------- Verify each DG starts and achieves, in ≤ 20 seconds, voltage ≥ 6210 V and ≤ 7590 V and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.	18 months
SR 3.8.1.16	----------NOTES---------- 1. This Surveillance shall not be performed in MODE 1, 2, or 3. 2. Credit may be taken for unplanned events that satisfy this SR. ---------- Verify each DG: a. Synchronizes with offsite power source while loaded with emergency loads upon a simulated restoration of offsite power; b. Transfers loads to offsite power source; and c. Returns to ready-to-load operation.	18 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.8.1.17	----------NOTES---------- 1. This Surveillance shall not be performed in MODE 1, 2, or 3. 2. Credit may be taken for unplanned events that satisfy this SR. ---------- Verify, with a DG operating in test mode and connected to its bus, an actual or simulated ECCS initiation signal overrides the test mode by: a. Returning DG to ready-to-load operation; and b. Automatically energizing the emergency load from offsite power.	18 months
SR 3.8.1.18	----------NOTES---------- 1. This Surveillance shall not be performed in MODE 1, 2, or 3. 2. Credit may be taken for unplanned events that satisfy this SR. ---------- Verify interval between each sequenced load block is within ± 10% of design interval for each load sequencer timer.	18 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.8.1.19	----------NOTES---------- 1. All DG starts may be preceded by an engine prelube period. 2. This Surveillance shall not be performed in MODE 1, 2, or 3. 3. Credit may be taken for unplanned events that satisfy this SR. ---------- Verify, on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated ECCS initiation signal: a. De-energization of emergency buses; b. Load shedding from emergency buses; and c. DG auto-starts from standby condition and: 1. energizes permanently connected loads in ≤ 20 seconds, 2. sequentially energizes auto-connected emergency loads, 3. achieves steady state voltage ≥ 6210 V and ≤ 7590 V, 4. achieves steady state frequency ≥ 58.8 Hz and ≤ 61.2 Hz, and 5. supplies permanently connected and auto-connected emergency loads for ≥ 5 minutes.	18 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.20	----------NOTE---------- All DG starts may be preceded by an engine prelube period. ---------- Verify, when started simultaneously from standby condition, each Division 1, 2, and 3 DG achieves, in ≤ 20 seconds, voltage ≥ 6210 V and ≤ 7590 V and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.	10 years during shutdown

Table 3.8.1-1 (page 1 of 1)
Diesel Generator Test Schedule

NUMBER OF FAILURES IN LAST 25 VALID TESTS[a]	FREQUENCY
≤ 3	31 days
≥ 4	7 days[b] (but ≥ 24 hours)

(a) Criteria for determining number of failures and valid tests shall be in accordance with Regulatory Position C.2.1 of Regulatory Guide 1.9, Revision 3, where the number of tests and failures is determined on a per DG basis.

(b) This test frequency shall be maintained until seven consecutive failure free starts from standby conditions and load and run tests have been performed. This is consistent with Regulatory Position [ ], of Regulatory Guide 1.9, Revision 3. If, subsequent to the 7 failure free tests, 1 or more additional failures occur such that there are again 4 or more failures in the last 25 tests, the testing interval shall again be reduced as noted above and maintained until 7 consecutive failure free tests have been performed.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.1 AC Sources – Operating

BASES

BACKGROUND

The unit Class 1E AC Electrical Power Distribution System AC sources consist of the offsite power sources (normal preferred and alternate preferred) and the onsite standby power sources (Division I diesel generator (DG), Division II DG, and Division III DG). As required by 10 CFR 50, Appendix A, GDC 17 (Ref. 1), the design of the AC electrical power system provides independence and redundancy to ensure an available source of power to the Engineered Safety Feature (ESF) systems.

The Class 1E AC distribution system supplies electrical power to three divisional load groups, with each division powered by an independent Class 1E 6.9 kV ESF bus (refer to LCO 3.8.9, "Distribution Systems – Operating"). Each ESF bus has two separate and independent preferred (offsite) sources of power and a dedicated onsite DG. Each ESF bus is also connectable to a combustion turbine generator (CTG). The ESF systems of any two of the three divisions provide for the minimum safety functions necessary to shut down the unit and maintain it in a safe shutdown condition.

Offsite power is supplied to each of the 6.9 kV ESF buses from the transmission network via two electrically and physically separated circuits. In addition, offsite power may be supplied to any one ESF bus from the CTG (for a limited duration) when the ESF bus is being fed from the reserve suxiliary transformer while the unit auxiliary transformer associated with the ESF bus is out of service. These offsite AC electrical power circuits are designed and located so as to minimize to the extent practicable the likelihood of their simultaneous failure under operating and postulated accident and environmental conditions. A detailed description of the offsite power system and circuits to the onsite Class 1E ESF buses is found in SSAR, Chapter 8 (Ref. 2).

An offsite circuit consists of all breakers, transformers, switches, interrupting devices, cabling, controls, and control power supplies required to transmit power from the offsite transmission network to the onsite Class 1E ESF bus(es). Certain required plant loads are returned to

(continued)

BASES

BACKGROUND (continued)

service in a predetermined sequence in order to prevent overloading the transformer supplying offsite power to the onsite Class 1E Distribution System. Initiating signals (i.e., load shedding and buses-ready-to-load) for returning certain plant loads to service are generated by the control system for the electrical power distribution system. Individual timers for each major load are reset and started by their electrical power distribution system signals and/or LOCA signals. After the initiating signals are received, all automatic and permanently connected loads needed to recover the unit or maintain it in a safe condition are returned to service in a preset sequence via timer delays on each load.

The onsite standby power source for each 6.9 kV ESF bus is a dedicated DG. A DG starts automatically on loss of coolant accident (LOCA) signal (i.e., signal generated from low reactor water level and high drywell pressure that are arranged in two-out-of four logic combinations) or on an ESF bus undervoltage signal (refer to LCO 3.3.1.4, "ESF Actuation Instrumentation"). ~~In addition, the CTG provides another independent source of AC power that can be manually aligned to any ESF bus. The CTG provides an extra level of redundancy that can be utilized under certain conditions.~~ In addition, power can be supplied to any one ESF from the CTG (for a limited duration) when a DG is inoperable.

In the event of a loss of preferred power, the ESF electrical loads are automatically connected to the DGs in sufficient time to provide for safe reactor shutdown and to mitigate the consequences of a Design Basis Accident (DBA) such as a LOCA.

Ratings for DGs satisfy the requirements of Regulatory Guide 1.9 (Ref. 3). The continuous service rating for each DG is 5000 kW, with 10% overload permissible for up to 2 hours in any 24 hour period.

APPLICABLE SAFETY ANALYSES

The initial conditions of DBA and transient analyses in the SSAR, Chapter 6 (Ref. 4) and Chapter 15 (Ref. 5), assume ESF systems are OPERABLE. The AC electrical power sources are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of

(continued)

BASES

APPLICABLE SAFETY ANALYSES

necessary power to ESF systems so that the fuel, Reactor Coolant System (RCS), and containment design limits are not exceeded. These limits are discussed in more detail in the Bases for Section 3.2, Power Distribution Limits; Section 3.4, Reactor Coolant System (RCS); and Section 3.6, Containment Systems.

The OPERABILITY of the AC electrical power sources (not including the CTG) is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining the onsite or offsite AC sources OPERABLE during accident conditions in the event of:

a. An assumed loss of all offsite power or all onsite AC power; and

b. A worst case single failure.

AC sources satisfy the requirements of Criterion 3 of the NRC Policy Statement.

In addition, the CTG may be substituted for the second (delay access) offsite source to any one ESF bus when the first (immediate access) offsite source is from the reserve auxiliary transformer while the unit auxiliary transformer associated with the ESF bus is out of service. The CTG may also be used to substitute (for a limited time) for an inoperable DG. With this substitution, the AC electrical power sources are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that the fuel, Reactor Coolant System (RCS), and containment design limits are not exceeded.

LCO

Two qualified offsite circuits between the offsite transmission network and the onsite Class 1E Distribution System that consists of three separate and independent divisions (Divisions I, II, and III) each backed by its own dedicated and independent DG, ensure availability of the required power to shut down the reactor and maintain it in a safe shutdown condition after an anticipated operational occurrence (AOO) or a postulated DBA. ~~In addition, the CTG~~

(continued)

BASES

LCO
(continued) ~~may be utilized as a temporary replacement for the required offsite or onsite sources to any one ESF bus under certain conditions.~~ In addition, the CTG may be utilized as a temporary substitution for the second (delayed access) qualified offsite circuit when the first (immediate access) qualified offsite circuit to any one ESF bus (immediate access) offsite source is from the reserve auxiliary transformer while the unit auxiliary trnsformer associated with the ESF bus is out of service. With this temporary substitution, the two qualified offsite circuits between the offsite transmission network and the onsite Class 1E Distribution System that consists of three separate and independent divisions (Divisions I, II, and III) each backed by its own dedicated and independent DG, also ensure availability of the the required power to shutdown the reactor and maintain it in a safe condition after an anticipated operational occurrence (AOO) or a postulated DBA.

Qualified offsite circuits are the normal and alternate preferred power circuits that are described in the SSAR and are part of the licensing basis for the unit. In addition, the temporary substitution of the CTG is described in the SSAR and is part of the licensing basis for the unit.

Each offsite circuit must be capable of maintaining rated frequency and voltage, and accepting required loads within the assumed load sequence intervals during an accident, while connected to the ESF buses. The normal preferred circuit consists of the switching station breaker to the main transformer, the generator breaker, the disconnect links to the unit auxiliary transformers, and the circuit path from the offsite transmission network to all of the 6.9 kV ESF buses including feeder breakers at the 6.9 kV ESF buses. The alternate preferred circuit consists of the switching station breaker to the reserve auxiliary transformer and the circuit path from the offsite transmission network to all of the 6.9 kV ESF buses including feeder breakers at the 6.9 kV ESF buses.

Each DG must be capable of starting, accelerating to rated speed and voltage, and connecting to its respective ESF bus on detection of bus undervoltage. This sequence must be accomplished within 20 seconds. Each DG must also be capable of accepting required loads within the assumed

(continued)

BASES

LCO
(continued)

loading sequence intervals, and must continue to operate until offsite power can be restored to the ESF buses. These capabilities are required to be met from a variety of initial conditions such as DG in standby with engine hot, DG in standby with engine at ambient conditions, and DG operating in parallel test mode.

The CTG, when used as a temporary substitute for the second offsite source or for an inoperable DG to any one ESF bus, must be capable of starting, accelerating to rated speed and voltage, and of being manually configured to provide power to the ESF bus. This sequence must be accomplished within 10 minutes. The CTG must also be capable of accepting required loads, must be capable of maintaining rated frequency and voltage, and accepting required loads when connected to the ESF bus.

Proper sequencing of loads is a required function for both DG and offsite circuit OPERABILITY.

The AC sources are separate and independent. For the DG AC sources, the separation and independence are complete. For the offsite AC sources (including the CTG as an offsite source), the separation and independence are to the extent practicable. For the offsite (including the CTG) to DG AC sources, the separation and independence are to the extent practicable.

Offsite circuit OPERABILITY includes the normal offsite source supplying two of three AC divisions and the alternate offsite source supplying the third AC division. Other configurations make an offsite circuit inoperable.

The AC sources are required to be OPERABLE in MODES 1, 2, and 3 to ensure that:

a. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of AOOs or abnormal transients; and

b. Adequate core cooling is provided and containment OPERABILITY and other vital functions are maintained in the event of a postulated DBA.

(continued)

BASES

LCO (continued)

AC power requirements for MODES 4 and 5 are covered in LCO 3.8.2, "AC Sources – Refueling", and LCO 3.8.11, "AC Sources-Shutdown(Low Water Level)."

ACTIONS

A.1, A.2, A.3, and A.4

If Condition A is entered, Required Action A.4 allows 30 days to restore the inoperable offsite power source to one ESF bus to OPERABLE status provided:

a. The ESF bus with its associated unit auxiliary transformer inoperable is verified to be energized from the offsite transmission network through the reserve auxiliary transformer initially within 72 hours, and once per 8 hours thereafter,

b. The CTG is verified functional through testing within 72 hours and once per 7 days thereafter,

c. The CTG is verified to be aligned with the ESF bus that has its associated unit auxiliary transformer inoperable within 72 hours, and once per 8 hours thereafter.

The 30 day Completion Time is reasonable because it accounts for the reliability and convenience of the CTG. Since the CTG can be aligned as a temporary backup offsite source, there are sufficient offsite sources available if Required Actions A.2 and A.3 are completed. The LCO is satisfied at this point. However, given the primary function of the CTG as the alternate AC power source during the station blackout event and a a standby non-safety related power source located onsite to energize non-safety related plant investment protection loads, the Completion Time has been limited to 30 days.

If the CTG cannot be made available to function as a temporary backup offsite circuit within 72 hours, the configuration of the AC sources is described in Regulatory

(continued)

BASES

ACTIONS (continued)

A.1, A.2, A.3, and A.4 (continued)

Guide 1.93 (Ref. 6), which states that operation in the applicable modes may continue as described by Condition A for a period that should not exceed 72 hours. Therefore, if Required Actions A.2 and A.3 cannot be completed within 72 hours of entering Condition A, then Required Actions G.1 and G.2 must be followed. Upon restoring the offsite circuit to OPERABLE status, the LCO is met, Conditions A and F are exited, and operation may continue.

Should the CTG no longer be functional or capable of being aligned to the ESF bus subsequent to the 72-hour period following initial entry into Condition A, Condition F again applies and Required Actions G.1 and G.2 must be followed. Anytime the 8-hours Completion Time of Required Action A.3 is not met during this extension period, Condition F must be entered. Condition F can then only be exited by restoring the offsite circuit to OPERABLE status.

B.1

To ensure a highly reliable power source remains, it is necessary to verify the availability of the remaining required offsite circuits on a more frequent basis. Since the Required Action only specifies "perform," a failure of SR 3.8.1.1 acceptance criteria does not result in the Required Action not met. However, if a second required circuit fails SR 3.8.1.1, the second offsite circuit is inoperable, and Condition D, for two offsite circuits inoperable, is entered.

B.2

Required Action B.2, which only applies if the division cannot be powered from an offsite source, is intended to provide assurance that an event with a coincident single failure of the associated DG does not result in a complete loss of safety function of critical systems. These features are designed with redundant safety related divisions. Redundant required features failures consist of inoperable features associated with a division redundant to the division that has no offsite power.

(continued)

BASES

ACTIONS (continued)

B.2 (continued)

The Completion Time for Required Action B.2 is intended to allow time for the operator to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." In this Required Action, the Completion Time only begins on discovery that both:

a. The division has no offsite power supplying its loads; and

b. A required feature on the other division is inoperable.

If, at any time during the existence of this Condition (one offsite circuit inoperable), a required feature subsequently becomes inoperable, this Completion Time begins to be tracked.

Discovering no offsite power to one division of the onsite Class 1E Power Distribution System coincident with one or more inoperable required support or supported features, or both, that are associated with the other division that has offsite power, results in starting the Completion Times for the Required Action. Twenty-four hours is acceptable because it minimizes risk while allowing time for restoration before the unit is subjected to transients associated with shutdown.

The remaining OPERABLE offsite circuit and DGs are adequate to supply electrical power to the onsite Class 1E Distribution System. Thus, on a component basis, single failure protection may have been lost for the required feature's function; however, function is not lost. The 24 hour Completion Time takes into account the component OPERABILITY of the redundant counterpart to the inoperable required feature. Additionally, the 24 hour Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

(continued)

BASES

ACTIONS (continued)

B.3, B.4, and B.5

If Condition B is entered, Required Action B.5 allows 14 days to restore the inoperable offsite circuit to OPERABLE status, provided the combustion turbine generator (CTG) is verified functional through testing within 72 hours and its capability of being aligned to any of the three 6.9 kV essential AC buses is verified, initially within 72 hours, and once per 8 hours thereafter. This 14-day Completion Time is reasonable because it accounts for the reliability and convenience of the CTG. Since the CTG can be aligned as a temporary backup offsite source, there are sufficient offsite sources available if Required Actions B.3 and B.4 are completed. The LCO is not completely satisfied at this point, but the AC electrical power system is verified to be sufficiently reliable to allow for the 14-day Completion Time of Required Action A.5. The 14-day Completion Time is also reasonable because the capabilities of the remaining AC sources are adequate for this time period, and because of the low probability of a DBA occurring during this time period. See the discussion for Required Action C.6 for additional justification of this Completion Time.

If the CTG cannot be made available to function as a temporary backup offsite circuit within 72 hours, the configuration of the AC sources is as described in Regulatory Guide 1.93 (Ref. 6), which states that operation in the applicable modes may continue as described by Condition B for a period that should not exceed 72 hours. Therefore, if Required Actions B.3 and B.4 cannot be completed within 72 hours of entering Condition B, then Required Actions G.1 and G.2 must be followed. Upon restoring the offsite circuit to OPERABLE status, the LCO is met, Conditions B and G are exited, and operation may continue.

Should the CTG no longer be functional or capable of being aligned to a 6.9 kV AC ESF bus subsequent to the 72-hour period following initial entry into Condition B, Condition G again applies and Required Actions G.1 and G.2 must be followed. Anytime the 8-hour Completion Time of Required Action B.4 is not met during this extension period, Condition G must be entered. Condition G can then only be exited by restoring the offsite circuit to OPERABLE status.

(continued)

BASES

ACTIONS (continued)

B.3, B.4, and B.5 (continued)

The CTG is considered functional when the requirements of Section 9.5.13.19 of the SSAR are satisfied and the CTG is verified to start ~~from standby conditions~~ and achieves steady state voltage ≥ 6210 V and ≤ 7590 V, and frequency ≥ 58.8 Hz and ≤ 61.2 Hz within 2 minutes.

The 14-day Completion Time of Required Action B.5 assumes sufficient offsite power remains to power the minimum loads needed to respond to analyzed events. It also assumes that the CTG may be utilized if needed. Should two divisions be affected, the 1-day Completion Time of Required Action B.5 is conservative with respect to the Regulatory Guide assumptions supporting a 1 day Completion Time for both offsite circuits inoperable (addressed by Condition D). With only one offsite circuit, the reliability of the offsite system is degraded, and the potential for a loss of offsite power is increased, with attendant potential for a challenge to the plant safety systems. In Condition B, however, the remaining OPERABLE offsite circuit, DGs, and the CTG are adequate to supply electrical power to the onsite Class 1E distribution system.

The 14-day Completion Time takes into account the capacity and capability of the remaining AC sources, reasonable time for repairs, and the low probability of a DBA occurring during this period.

The third Completion Time for Required Action B.5 establishes a limit on the maximum time allowed for any combination of required AC power sources to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition B is entered while, for instance, a DG is inoperable and that DG is subsequently returned to OPERABLE status, the LCO may already have been not met for up to 14 days. This situation could lead to a total of 28 days, since initial failure to meet the LCO, to restore the offsite circuit. At this time, a DG could again become inoperable, the circuit restored to OPERABLE status, and an additional 14 days (for a total of 42 days) allowed prior to complete restoration of the LCO. The 15-day Completion Time provides a limit on the time allowed in a specified Condition after discovery of failure to meet the LCO.

(continued)

BASES

ACTIONS (continued)

B.3, B.4, and B.5 (continued)

This limit is considered reasonable for situations in which Conditions B and C are entered concurrently. The "AND" connector between the 14-day and 15-day Completion Times means that both Completion Times apply simultaneously, and the more restrictive must be met.

As in Required Action B.2, the Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This exception results in establishing the "time zero" at the time the LCO was initially not met, instead of at the time that Condition B was entered.

C.1

To ensure a highly reliable power source remains, it is necessary to verify the availability of the remaining required offsite circuit on a more frequent basis. Since the Required Action only specifies "perform," a failure of SR 3.8.1.1 acceptance criteria does not result in a Required Action being not met. However, if a circuit fails to pass SR 3.8.1.1, it is inoperable. Upon offsite circuit inoperability, additional Conditions must then be entered.

C.2

Required Action C.2 is intended to provide assurance that a loss of offsite power, during the period that a DG is inoperable, does not result in a complete loss of safety function of critical systems. These features are designed with redundant safety related divisions (i.e., single division systems are not included). Redundant required features failures consist of inoperable features associated with a division redundant to the division that has an inoperable DG.

The Completion Time is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock."

(continued)

BASES

ACTIONS (continued)

C.2 (continued)

In this Required Action, the Completion Time only begins on discovery that both:

a. An inoperable DG exists; and

b. A required feature on the other division is inoperable.

If, at any time during the existence of this Condition (one DG inoperable), a required feature subsequently becomes inoperable, this Completion Time begins to be tracked.

Discovering one required DG inoperable coincident with one or more required support or supported features, or both, that are associated with the OPERABLE DGs, results in starting the Completion Time for the Required Action. Four hours from the discovery of these events existing concurrently is acceptable because it minimizes risk while allowing time for restoration before subjecting the unit to transients associated with shutdown.

The remaining OPERABLE DGs and offsite circuits are adequate to supply electrical power to the onsite Class 1E Distribution System. Thus, on a component basis, single failure protection for the required feature's function may have been lost; however, function has not been lost. The 4 hour Completion Time takes into account the component OPERABILITY of the redundant counterpart to the inoperable required feature. Additionally, the 4 hour Completion Time takes into account the capacity and capability of the remaining AC sources, reasonable time for repairs, and low probability of a DBA occurring during this period.

C.3.1 and C.3.2

The Note in Condition C requires that Required Action C.3.1 or C.3.2 must be completed if Condition C is entered. The intent is that all DG inoperabilities must be investigated for common cause failures regardless of how long the DG inoperability persists.

Required Action C.3.1 provides an allowance to avoid unnecessary testing of OPERABLE DGs. If it can be

(continued)

BASES

ACTIONS (continued)

C.3.1 and C.3.2 (continued)

determined that the cause of the inoperable DG does not exist on the OPERABLE DG, SR 3.8.1.2 does not have to be performed. If the cause of inoperability exists on other DGs, the other DGs are declared inoperable upon discovery, and Condition F of LCO 3.8.1 is entered. Once the failure is repaired, and the common cause failure no longer exists, Required Action C.3.1 is satisfied. If the cause of the initial inoperable DG cannot be confirmed not to exist on the remaining DG(s), performance of SR 3.8.1.2 suffices to provide assurance of continued OPERABILITY of those DGs. According to Generic Letter 84-15 (Ref. 7), 24 hours is reasonable time to confirm that the OPERABLE DGs are not affected by the same problem as the inoperable DG.

C.4, C.5, and C.6

If Condition C is entered, Required Action C.6 allows 14 days to restore the inoperable DG to OPERABLE status provided the CTG is verified functional through testing within 72 hours, and its circuit breakers are verified to be aligned to the affected 6.9 kV essential AC bus initially within 72 hours and once per 8 hours thereafter. This 14-day Completion Time is reasonable because of the reliability and convenience of the CTG, the low probability of a DBA occurring during this time period.

The CTG is considered functional when the requirements of Section 9.5.13.19 of the SSAR are satisfied and the CTG is verified to start from standby conditions and achieves steady state voltage $\geq$ 6210 V and $\leq$ 7590 V, and frequency $\geq$ 58.8 Hz and $\leq$ 61.2 Hz within 2 minutes.

If the CTG can not be made available to function as a temporary onsite divisional backup to preferred offsite power, the configuration of the AC sources is as described in Regulatory Guide 1.93 (Ref. 6), which states that operation may continue as described in Condition C for a period that should not exceed 72 hours. Therefore, if Required Actions C.4 and C.5 cannot be completed within 72 hours of entering Condition B, then Required Actions G.1 and G.2 must be followed. Upon restoring the inoperable DG to OPERABLE status, the LCO is met, Conditions C and G are exited, and operation may continue.

(continued)

BASES

ACTIONS (continued)

C.4, C.5, and C.6 (continued)

In Condition C, if the CTG is not functional, the remaining OPERABLE DGs and offsite circuits are adequate to supply electrical power to the onsite Class 1E distribution system for 72 hours. The 72 hour Completion Time takes into account the capacity and capability of the remaining AC sources, reasonable time for repairs, and low probability of a DBA occurring during this period.

Should the CTG no longer be functional or capable of being aligned to a 6.9 kV essential AC bus subsequent to the 72-hour period following initial entry into Condition C, Condition G again applies and Required Actions G.1 and G.2 must be followed. Anytime the 8-hour Completion Time of Required Action C.5 is not met during this extension period, Condition F must be entered. Condition G can then only be exited by restoring the DG to OPERABLE status.

The once-per-8-hour Completion Time of Required Action C.5 is necessary to keep a check on the proper alignment of the CTG's circuit breakers and thus the capability of supplying power from the CTG to the 6.9 kV essential AC bus associated with the inoperable DG.

The second Completion Time for Required Action C.6 establishes a 8-day limit on the maximum time allowed for any combination of required AC power sources to be inoperable during any single contiguous occurrence of failing to meet the LCO. If Condition C is entered while, for instance, an offsite circuit is inoperable and that circuit is subsequently restored OPERABLE, the LCO may already have been not met for up to 7 days. This situation could lead to a total of 14 days, since initial failure to meet the LCO, to restore the DG. At this time, an offsite circuit could again become inoperable, the DG restored OPERABLE, and an additional 7 days (for a total of 21 days) would be allowed prior to complete restoration of the LCO.

The 8-day Completion Time provides a limit on the time allowed in a specified condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which Conditions B and C are entered concurrently. The "AND" connector between the 7-day and 8-day Completion Times means that both Completion Times apply simultaneously, and the more restrictive must be met.

(continued)

BASES

ACTIONS (continued)

C.4, C.5, and C.6 (continued)

As in Required Action C.2, the 8-day Completion Time of Required Action C.5 allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This exception results in establishing the "time zero" at the time the LCO was initially not met, instead of the time Condition C was entered.

D.1 and D.2

Required Action D.1 addresses actions to be taken in the event of concurrent failure of redundant required features. Required Action D.1 reduces the vulnerability to a loss of function. The Completion Time for taking these actions is reduced to 12 hours from that allowed with only one division without offsite power (Required Action B.2). The rationale for the reduction to 12 hours is that Regulatory Guide 1.93 (Ref. 6) allows a Completion Time of 24 hours for two required offsite circuits inoperable, based upon the assumption that all three safety divisions are OPERABLE. When a concurrent redundant required feature failure exists, this assumption is not the case, and a shorter Completion Time of 12 hours is appropriate. These features are designed with redundant safety related divisions (i.e., single division systems are not included in the list). Redundant required features failures consist of any of these features that are inoperable, because any inoperability is on a division redundant to a division with inoperable offsite circuits.

The Completion Time for Required Action D.1 is intended to allow the operator time to evaluate and repair any discovered inoperabilities. This Completion Time also allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." In this Required Action, the Completion Time only begins on discovery that both:

a. All required offsite circuits are inoperable; and

b. A required feature is inoperable.

If, at any time during the existence of this Condition (two offsite circuits inoperable), a required feature

(continued)

BASES

ACTIONS (continued)

D.1 and D.2 (continued)

subsequently becomes inoperable, this Completion Time begins to be tracked.

According to Regulatory Guide 1.93 (Ref. 6), operation may continue in Condition D for a period that should not exceed 24 hours. This level of degradation means that the offsite electrical power system does not have the capability to effect a safe shutdown and to mitigate the effects of an accident; however, the onsite AC sources have not been degraded. This level of degradation generally corresponds to a total loss of the immediately accessible offsite power sources.

Because of the normally high availability of the offsite sources, this level of degradation may appear to be more severe than other combinations of two AC sources inoperable that involve one or more DGs inoperable. However, two factors tend to decrease the severity of this degradation level:

a. The configuration of the redundant AC electrical power system that remains available is not susceptible to a single bus or switching failure; and

b. The time required to detect and restore an unavailable offsite power source is generally much less than that required to detect and restore an unavailable onsite AC source.

With both of the required offsite circuits inoperable, sufficient onsite AC sources are available to maintain the unit in a safe shutdown condition in the event of a DBA or transient. In fact, a simultaneous loss of offsite AC sources, a LOCA, and a worst case single failure were postulated as a part of the design basis in the safety analysis. Thus, the 24 hour Completion Time provides a period of time to effect restoration of one of the offsite circuits commensurate with the importance of maintaining an AC electrical power system capable of meeting its design criteria.

According to Regulatory Guide 1.93 (Ref. 6), with the available offsite AC sources two less than required by the LCO, operation may continue for 24 hours. If two offsite

(continued)

BASES

ACTIONS (continued)

D.1 and D.2 (continued)

sources are restored within 24 hours, unrestricted operation may continue. If only one offsite source is restored within 24 hours, power operation continues in accordance with Condition B.

The status of the CTG was not a consideration in establishing the appropriate Completion Times for Required Actions D.1 AND D.2.

E.1 and E.2

Pursuant to LCO 3.0.6, the Distribution System ACTIONS would not be entered even if all AC sources to it were inoperable, resulting in de-energization. Therefore, the Required Actions of Condition E are modified by a Note to indicate that when Condition E is entered with no required AC source to one division, Actions for LCO 3.8.9, "Distribution Systems – Operating," must be immediately entered. This allows Condition E to provide requirements for the loss of the offsite circuit and one DG without regard to whether a division is de-energized. LCO 3.8.9 provides the appropriate restrictions for a de-energized division.

According to Regulatory Guide 1.93 (Ref. 6), operation may continue in Condition E for a period that should not exceed 12 hours. In Condition E, individual redundancy is lost in both the offsite electrical power system and the onsite AC electrical power system. Since power system redundancy is provided by two diverse sources of power, however, the reliability of the power systems in this Condition may appear higher than that in Condition D (loss of both required offsite circuits). This difference in reliability is offset by the susceptibility of this power system configuration to a single bus or switching failure. The 12 hour Completion Time takes into account the capacity and capability of the remaining AC sources, reasonable time for repairs, and low probability of a DBA occurring during this period.

(continued)

BASES

F.1

With two DGs inoperable, there is one remaining standby AC source. Thus, with an assumed loss of offsite electrical power, insufficient standby AC sources are available to power the minimum required ESF functions. Since the offsite electrical power system is the only source of AC power for the majority of ESF equipment at this level of degradation, the risk associated with continued operation for a very short time could be less than that associated with an immediate controlled shutdown (the immediate shutdown could cause grid instability, which could result in a total loss of AC power). ~~Since any inadvertent generator trip could also result in a total loss of offsite AC power, however, the time allowed for continued operation is severely restricted.~~ The intent here is to avoid the risk associated with an immediate controlled shutdown and to minimize the risk associated with this level of degradation.

According to Regulatory Guide 1.93 (Ref. 6), with both DGs inoperable, operation may continue for a period that should not exceed 2 hours. This Completion Time assumes complete loss of onsite (DG) AC capability to power the minimum loads needed to respond to analyzed events.

G.1 and G.2

If the inoperable AC electrical power sources cannot be restored to OPERABLE status within the associated Completion Time, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be brought to MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

H.1

Condition H corresponds to a level of degradation in which all redundancy in the AC electrical power supplies has been lost. At this severely degraded level, any further losses in the AC electrical power system will cause a loss of function. Therefore, no additional time is justified for

(continued)

BASES

ACTIONS (continued)

H.1 (continued)

continued operation. The unit is required by LCO 3.0.3 to commence a controlled shutdown.

SURVEILLANCE REQUIREMENTS

The AC sources are designed to permit inspection and testing of all important areas and features, especially those that have a standby function, in accordance with 10 CFR 50, GDC 18 (Ref. 8). Periodic component tests are supplemented by extensive functional tests during refueling outages under simulated accident conditions. The SRs for demonstrating the OPERABILITY of the DGs are in accordance with the recommendations of Regulatory Guide 1.9 (Ref. 3), Regulatory Guide 1.9 (Ref. 3), and Regulatory Guide 1.137 (Ref. 9).

Where the SRs discussed herein specify voltage and frequency tolerances, the following summary is applicable. The minimum steady state output voltage of 6210 V is 90% of the nominal 6.9 kV output voltage. This value, which is specified in ANSI C84.1 (Ref. 10), allows for voltage drop to the terminals of 6600 V motors whose minimum operating voltage is specified as 90%, or 5980 V. It also allows for voltage drops to motors and other equipment down through the 200 V level where minimum operating voltage is also usually specified as 90% of name plate rating. The specified maximum steady state output voltage of 6674 V is equal to the maximum operating voltage specified for 6600 V motors. It ensures that for a lightly loaded distribution system, the voltage at the terminals of 6600 V motors is no more than the maximum rated operating voltages. The specified minimum and maximum frequencies of the DG are 58.8 Hz and 61.2 Hz, respectively. These values are equal to ± 2% of the 60 Hz nominal frequency and are derived from the recommendations given in Regulatory Guide 1.9 (Ref. 3).

SR 3.8.1.1

This SR ensures proper circuit continuity for the offsite AC electrical power supply to the onsite distribution network and availability of offsite AC electrical power. The breaker alignment verifies that each breaker is in its correct position to ensure that distribution buses and loads are

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.1 (continued)

connected to their preferred power source and that appropriate independence of offsite circuits is maintained. The 7 day Frequency is adequate since breaker position is not likely to change without the operator being aware of it and because its status is displayed in the control room.

SR 3.8.1.2 and SR 3.8.1.7

These SRs help to ensure the availability of the standby electrical power supply to mitigate DBAs and transients and maintain the unit in a safe shutdown condition.

To minimize the wear on moving parts that do not get lubricated when the engine is not running, these SRs have been modified by Notes (Note 1 for SR 3.8.1.7 and Note 2 for SR 3.8.1.2) to indicate that all DG starts for these Surveillances may be preceded by an engine prelube period and followed by a warmup period prior to loading.

For the purposes of this testing, the DGs are started from standby conditions. Standby conditions for a DG mean that the diesel engine coolant and oil are being continuously circulated and temperature is being maintained consistent with manufacturer recommendations.

In order to reduce stress and wear on diesel engines, some manufacturers recommend that the starting speed of DGs be limited, that warmup be limited to this lower speed, and that DGs be gradually accelerated to synchronous speed prior to loading. These start procedures are the intent of Note 3, which is only applicable when such procedures are recommended by the manufacturer.

SR 3.8.1.7 requires that, at a 184 day Frequency, the DG starts from standby conditions and achieves required voltage and frequency within 20 seconds. The 20 second start requirement supports the requirements set forth in the SSAR Chapter 8 (Ref. 2). The 20 second start requirement may not be applicable to SR 3.8.1.2 (see Note 3 of SR 3.8.1.2), when a modified start procedure as described above is used. If a modified start is not used, the 20 second start requirement of SR 3.8.1.7 applies. Since SR 3.8.1.7 does require a 20 second start, it is more restrictive than SR 3.8.1.2, and

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BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.2 and SR 3.8.1.7 (continued)

it may be performed in lieu of SR 3.8.1.2. This procedure is the intent of Note 1 of SR 3.8.1.2.

The normal 31 day Frequency for SR 3.8.1.2 (see Table 3.8.1-1, "Diesel Generator Test Schedule") is consistent with Regulatory Guide 1.9 (Ref. 9). The 184 day Frequency for SR 3.8.1.7 is a reduction in cold testing consistent with Generic Letter 84-15 (Ref. 7). These Frequencies provide adequate assurance of DG OPERABILITY, while minimizing degradation resulting from testing.

SR 3.8.1.3

This Surveillance demonstrates that the DGs are capable of synchronizing and accepting greater than or equal to th equivalent of the maximum expected accident loads. A minimum run time of 60 minutes is required to stabilize engine temperatures, while minimizing the time that the DG is connected to the offsite source.

In order to ensure that the DG is tested under load conditions that are as close to design basis conditions as possible, testing shall be performed using a power factor less than or equal to 0.9. This power factor is chosen to be representative of the actual design basis inductive loading that the DG would experience. The load band is provided to avoid routine overloading of the DG. Routine overloading may result in more frequent tear down inspections in accordance with vendor recommendations in order to maintain DG OPERABILITY.

The normal 31 day Frequency for this Surveillance (see Table 3.8.1-1) is consistent with Regulatory Guide 1.9 (Ref. 9).

Note 1 modifies this Surveillance to indicate that diesel engine runs for this Surveillance may include gradual loading, as recommended by the manufacturer, so that mechanical stress and wear on the diesel engine are minimized.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.3 (continued)

Note 2 modifies this Surveillance by stating that momentary transients because of changing bus loads do not invalidate this test.

Note 3 indicates that this Surveillance should be conducted on only one DG at a time in order to avoid common cause failures that might result from offsite circuit or grid perturbations. Similarly, momentary power factor transients above the limit do not invalidate the test.

Note 4 stipulates a prerequisite requirement for performance of this SR. A successful DG start must precede this test to credit satisfactory performance.

SR 3.8.1.4

This SR provides verification that the level of fuel oil in the day tank is at or above the level at which fuel oil is automatically added. The level is expressed as an equivalent volume in liters, and is selected to ensure adequate fuel oil for a minimum of 1 hour of DG operation at full load plus 10%.

The 31 day Frequency is adequate to assure that a sufficient supply of fuel oil is available, since low level alarms are provided and facility operators would be aware of any large uses of fuel oil during this period.

SR 3.8.1.5

Microbiological fouling is a major cause of fuel oil degradation. There are numerous bacteria that can grow in fuel oil and cause fouling, but all must have a water environment in order to survive. Removal of water from the fuel oil day tanks once every 31 days eliminates the necessary environment for bacterial survival. This is most effective means in controlling microbiological fouling. In addition, it eliminates the potential for water entrainment in the fuel oil during DG operation. Water may come from any of several sources, including condensation, ground water, rain water, contaminated fuel oil, and breakdown of the fuel oil by bacteria. Frequent checking for and removal

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BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.5 (continued)

of accumulated water minimizes fouling and provides data regarding the watertight integrity of the fuel oil system. The Surveillance Frequencies are established by Regulatory Guide 1.137 (Ref. 9). This SR is for preventive maintenance. The presence of water does not necessarily represent a failure of this SR provided that accumulated water is removed during performance of this Surveillance.

SR 3.8.1.6

This Surveillance demonstrates that each required fuel oil transfer pump operates and transfers fuel oil from its associated storage tank to its associated day tank. It is required to support the continuous operation of standby power sources. This Surveillance provides assurance that the fuel oil transfer pump is OPERABLE, the fuel oil piping system is intact, the fuel delivery piping is not obstructed, and the controls and control systems for automatic fuel transfer systems are OPERABLE. This test may be performed by a simulated or actual automatic initiation signal.

The Frequency for this SR is variable, depending on individual system design, with up to a 92 day interval. The 92 day Frequency corresponds to the testing requirements for pumps as contained in the ASME Boiler and Pressure Vessel Code, Section XI (Ref. 11); however, the design of fuel transfer systems is such that pumps operate automatically or must be started manually in order to maintain an adequate volume of fuel oil in the day tanks during or following DG testing. In such a case, a 31 day Frequency is appropriate. Since proper operation of fuel transfer systems is an inherent part of DG OPERABILITY, the Frequency of this SR should be modified to reflect individual designs.

SR 3.8.1.7

See SR 3.8.1.2.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.8

Manual transfer of each 6.9 kV ESF bus power supply from the normal offsite circuit to the alternate offsite circuit demonstrates the OPERABILITY of the alternate circuit distribution network to power the shutdown loads. The manual transfer should be performed using the DG to carry the loads (i.e., not a dead bus transfer). The 18 month Frequency of the Surveillance is based on engineering judgment taking into consideration the plant conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths. Operating experience has shown that these components usually pass the SR when performed on the 18 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

This SR is modified by two Notes. The reason for Note 1 is that, during operation with the reactor critical, performance of this SR could cause perturbations to the electrical distribution systems that could challenge entwined steady state operation and, as a result, plant safety systems. Note 2 acknowledges that credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.9

Each DG is provided with an engine overspeed trip to prevent damage to the engine. Recovery from the transient caused by the loss of a large load could cause diesel engine overspeed, which, if excessive, might result in a trip of the engine. This Surveillance demonstrates the DG load response characteristics and capability to reject the largest single load without exceeding predetermined voltage and frequency and while maintaining a specified margin to the overspeed trip. The load referenced for Division 2 and Division 3 DGs is the 1400 kW high pressure core flooder (HPCF) pump; for the Division 1 DG, the 540 kW residual heat removal (RHR) pump. The Reactor Building Cooling Water (RCW) system load was not used. Even though the load to DG 1 is 640 kW, that value consists of 2 RCW pumps of 320 kW each. As required by IEEE-308 (Ref. 12), the load rejection test is acceptable if the increase in diesel speed does not exceed 75% of the difference between synchronous speed and

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.9 (continued)

the overspeed trip setpoint, or 15% above synchronous speed, whichever is lower.

The time, voltage, and frequency tolerances specified in this SR are derived from Regulatory Guide 1.9 (Ref. 3) recommendations for response during load sequence intervals. The 3 seconds specified is equal to 60% of the 5 second load sequence interval associated with sequencing of this largest load. The voltage and frequency specified are consistent with the design range of the equipment powered by the DG. SR 3.8.1.9.a corresponds to the maximum frequency excursion, while SR 3.8.1.9.b and SR 3.8.1.9.c are steady state voltage and frequency values to which the system must recover following load rejection. The [18 month] Frequency is consistent with the recommendation of Regulatory Guide 1.9 (Ref. 3).

In order to ensure that the DG is tested under load conditions that are as close to design basis conditions as possible, testing must be performed using a power factor $\leq$ [ ]. This power factor is chosen to be representative of the actual design basis inductive loading that the DG could experience.

This SR has been modified by two Notes. The reason for Note 1 is that during operation with the reactor critical, performance of this SR could cause perturbations to the electrical distribution systems that could challenge continued steady state operation and, as a result, plant safety systems. Note 2 acknowledges that credit may be taken for unplanned events that satisfy this SR.

Reviewer's Note: The above MODE restrictions may be deleted if it can be demonstrated to the staff, on a plant specific basis, that performing the SR with the reactor in any of the restricted MODES can satisfy the following criteria, as applicable:

a. Performance of the SR will not render any safety system or component inoperable;

b. Performance of the SR will not cause perturbations to any of the electrical distribution systems that could

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.9 (continued)

result in a challenge to steady state operation or to plant safety systems; and

c. Performance of the SR, or failure of the SR, will not cause, or result in, an AOO with attendant challenge to plant safety systems.

SR 3.8.1.10

This Surveillance demonstrates the DG capability to reject a full load without overspeed tripping or exceeding the predetermined voltage limits. The DG full load rejection may occur because of a system fault or inadvertent breaker tripping. This Surveillance ensures proper engine generator load response under the simulated test conditions. This test simulates the loss of the total connected load that the DG experiences following a full load rejection and verifies that the DG does not trip upon loss of the load. These acceptance criteria provide DG damage protection. While the DG is not expected to experience this transient during an event, and continues to be available, this response ensures that the DG is not degraded for future application, including reconnection to the bus if the trip initiator can be corrected or isolated.

In order to ensure that the DG is tested under load conditions that are as close to design basis conditions as possible, testing must be performed using a power factor ≤ 0.9. This power factor is chosen to be representative of the actual design basis inductive loading that the DG would experience.

The [18 month] Frequency is consistent with the recommendation of Regulatory Guide 1.108 (Ref. 9) and is intended to be consistent with expected fuel cycle lengths.

This SR has been modified by two Notes. The reason for Note 1 is that during operation with the reactor critical, performance of this SR could cause perturbation to the electrical distribution systems that could challenge continued steady state operation and, as a result, plant safety systems. Note 2 acknowledges that credit may be taken for unplanned events that satisfy this SR.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.10 (continued)

Reviewer's Note: The above MODE restrictions may be deleted if it can be demonstrated to the staff, on a plant specific basis, that performing the SR with the reactor in any of the restricted MODES can satisfy the following criteria, as applicable:

a. Performance of the SR will not render any safety system or component inoperable;

b. Performance of the SR will not cause perturbations to any of the electrical distribution systems that could result in a challenge to steady state operation or to plant safety systems; and

c. Performance of the SR, or failure of the SR, will not cause, or result in, an AOO with attendant challenge to plant safety systems.

SR 3.8.1.11

As required by Regulatory Guide 1.9 (Ref. 3), paragraph 2.2.4, this Surveillance demonstrates the as designed operation of the standby power sources during loss of the offsite source. This test verifies all actions encountered from the loss of offsite power, including energization of the emergency buses and respective loads from the DG. It further demonstrates the capability of the DG to automatically achieve the required voltage and frequency within the specified time.

The DG auto-start time of 20 seconds is derived from requirements stated in the SSAR Chapter 8 (Ref. 2). The frequency should be restored to within 2% of nominal following a load sequence step. The Surveillance should be continued for a minimum of 5 minutes in order to demonstrate that all starting transients have decayed and stability has been achieved.

The requirement to verify the connection and power supply of permanent and auto-connected loads is intended to satisfactorily show the relationship of these loads to the

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.11 (continued)

DG loading logic. In certain circumstances, many of these loads cannot actually be connected or loaded without undue hardship or potential for undesired operation. For instance, ECCS injection valves are not desired to be stroked open, high pressure injection systems are not capable of being operated at full flow, or RHR systems performing a decay heat removal function are not desired to be realigned to the ECCS mode of operation. In lieu of actual demonstration of the connection and loading of these loads, testing that adequately shows the capability of the DG system to perform these functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire connection and loading sequence is verified.

The Frequency of 18 months is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3), paragraph 2.2.4, takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by three Notes. The reason for Note 1 is to minimize wear and tear on the DGs during testing. For the purpose of this testing, the DGs must be started from standby conditions, that is, with the engine coolant and oil being continuously circulated and temperature maintained consistent with manufacturer recommendations. The reason for Note 2 is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge plant safety systems.

Note 3 acknowledges that credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.12

This Surveillance demonstrates that the DG automatically starts and achieves the required voltage and frequency within the specified time (20 seconds) from the design basis actuation signal (LOCA signal) and operates for $\geq$ 5 minutes. The 5 minute period provides sufficient time to demonstrate stability. SR 3.8.1.12.d and SR 3.8.1.12.e ensure that

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.12 (continued)

permanently connected loads and emergency loads are energized from the offsite electrical power system on an ECCS signal without loss of offsite power.

The requirement to verify the connection and power supply of permanent and autoconnected loads is intended to satisfactorily show the relationship of these loads to the loading logic for loading onto offsite power. In certain circumstances, many of these loads cannot actually be connected or loaded without undue hardship or potential for undesired operation. For instance, ECCS injection valves are not desired to be stroked open, high pressure injection systems are not capable of being operated at full flow, or RHR systems performing a decay heat removal function are not desired to be realigned to the ECCS mode of operation. In lieu of actual demonstration of the connection and loading of these loads, testing that adequately shows the capability of the DG system to perform these functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire connection and loading sequence is verified.

The Frequency of 18 months takes into consideration plant conditions required to perform the Surveillance and is intended to be consistent with the expected fuel cycle lengths. Operating experience has shown that these components usually pass the SR when performed at the 18 month Frequency. Therefore, the Frequency was concluded to be acceptable from a reliability standpoint.

This SR is modified by three Notes. The reason for Note 1 is to minimize wear and tear on the DGs during testing. For the purpose of this testing, the DGs must be started from standby conditions, that is, with the engine coolant and oil being continuously circulated and temperature maintained consistent with manufacturer recommendations. The reason for Note 2 is that during operation with the reactor critical, performance of this SR could cause perturbations to the electrical distribution systems that could challenge continued steady state operation and, as a result, plant safety systems. Note 3 acknowledges that credit may be taken for unplanned events that satisfy this SR.

(continued)

BASES

SR 3.8.1.13

This Surveillance demonstrates that DG non-critical protective functions (e.g., high jacket water temperature) are bypassed on a loss of voltage signal concurrent with an ECCS initiation test signal and critical protective functions (engine overspeed and generator differential current) trip the DG to avert substantial damage to the DG unit. The non-critical trips are bypassed during DBAs and provide an alarm on an abnormal engine condition. This alarm provides the operator with sufficient time to react appropriately. The DG availability to mitigate the DBA is more critical than protecting the engine against minor problems that are not immediately detrimental to emergency operation of the DG.

The 18 month Frequency is based on engineering judgment, taking into consideration plant conditions required to perform the Surveillance, and is intended to be consistent with expected fuel cycle lengths. Operating experience has shown that these components usually pass the SR when performed at the 18 month Frequency. Therefore, the

Frequency was concluded to be acceptable from a reliability standpoint.

The SR is modified by two Notes. The reason for Note 1 is that performing the Surveillance removes a required DG from service. Note 2 acknowledges that credit may be taken for unplanned events that satisfy this SR.

Reviewer's Note: The above MODE restrictions may be deleted if it can be demonstrated to the staff, on a plant specific basis, that performing the SR with the reactor in any of the restricted MODES can satisfy the following criteria, as applicable:

a. Performance of the SR will not render any safety system or component inoperable;

b. Performance of the SR will not cause perturbations to any of the electrical distribution systems that could result in a challenge to steady state operation or to plant safety systems; and

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.13 (continued)

c. Performance of the SR, or failure of the SR, will not cause, or result in, an AOO with attendant challenge to plant safety systems.

SR 3.8.1.14

Regulatory Guide 1.9 (Ref. 3), paragraph 2.2.9, requires demonstration once per 18 months that the DGs can start and run continuously at full load capability for an interval of not less than 24 hours – 22 hours of which is at a load equivalent to 90 to 100% of the continuous rating of the DG, and 2 hours of which is at a load equivalent to 105 to 110% of the continuous ~~duty~~ rating of the DG. The DG starts for this Surveillance can be performed either from standby or hot conditions. The provisions for prelube and warmup, discussed in SR 3.8.1.2, and for gradual loading, discussed in SR 3.8.1.3, are applicable to this SR.

In order to ensure that the DG is tested under load conditions that are as close to design conditions as possible, testing must be performed using a power factor ≤ 0.9. This power factor is chosen to be representative f the actual design basis inductive loading that the DG could experience.

The 18 month Frequency is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3), paragraph 2.2.9; takes into consideration plant conditions required to perform the Surveillance; and is intended to be consistent with expected fuel cycle lengths.

This Surveillance is modified by three Notes. Note 1 states that momentary transients due to changing bus loads do not invalidate this test. The load band is provided to avoid routine overloading of the DG. Routine overloading may result in more frequent tear down inspections in accordance with vendor recommendations in order to maintain DG OPERABILITY. Similarly, momentary power factor transients above the limit do not invalidate the test. The reason for Note 2 is that during operation with the reactor critical, performance of this SR could cause perturbations to the electrical distribution systems that would challenge continued steady state operation and, as a result, plant

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.14 (continued)

safety systems. Note 3 acknowledges that credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.15

This Surveillance demonstrates that the diesel engine can restart from a hot condition, such as subsequent to shutdown from normal Surveillances, and achieve the required voltage and frequency within 20 seconds. The 20-second time is derived from the requirements set forth in the SSAR Chapter 8 (Ref. 2).

The 18 month Frequency is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3), paragraph 2.2.10.

This SR has been modified by two Notes. Note 1 ensures that the test is performed with the diesel sufficiently hot. The requirement that the diesel has operated for at least 2 hours at full load conditions prior to performance of this Surveillance is based on manufacturer recommendations for achieving hot conditions. The load band is provided to avoid routine overloading of the DG. Routine overloads may result in more frequent tear down inspections in accordance with vendor recommendations in order to maintain DG OPERABILITY. Momentary transients due to changing bus loads do not invalidate this test. Note 2 allows all DG starts to be preceded by an engine prelube period to minimize wear and tear on the diesel during testing.

SR 3.8.1.16

As required by Regulatory Guide 1.9 (Ref. 3), paragraph 2.2.11, this Surveillance ensures that the manual synchronization and automatic load transfer from the DG to the offsite source can be made and that the DG can be returned to ready-to-load status when offsite power is restored. It also ensures that the auto-start logic is reset to allow the DG to reload if a subsequent loss of offsite power occurs. The DG is considered to be in ready-to-load status when the DG is at rated speed and voltage, the output breaker is open and can receive an

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.16 (continued)

auto-close signal on bus undervoltage, and the load timers are reset.

The Frequency of 18 months is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3), paragraph 2.2.11, and takes into consideration plant conditions required to perform the Surveillance.

This SR is modified by two Notes. The reason for Note 1 is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems. Note 2 acknowledges that credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.17

Demonstration of the test mode override ensures that the DG availability under accident conditions is not compromised as the result of testing. Interlocks to the LOCA sensing circuits cause the DG to automatically reset to ready-to-load operation of an ECCS initiation signal is received during operation in the test mode. Ready-to-load operation is defined as the DG running at rated speed and voltage with the DG output breaker open. These provisions for automatic switchover are required by IEEE-308 (Ref. 12), paragraph 6.2.6(2).

The requirement to automatically energize the emergency loads with offsite power is essentially identical to that of SR 3.8.1.12. The intent in the requirement associated with SR 3.8.1.17.b is to show that the emergency loading is not affected by the DG operation in test mode. In lieu of actual demonstration of connection and loading of loads, testing that adequately shows the capability of the emergency loads to perform these functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire connection and loading sequence is verified.

The 18 month Frequency is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3), paragraph 2.2.13; takes into consideration plant conditions

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.17 (continued)

required to perform the Surveillance; and is intended to be consistent with expected fuel cycle lengths.

This SR has been modified by two Notes. The reason for Note 1 is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems. Note 2 acknowledges that credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.18

As required by Regulatory Guide 1.9 (Ref. 3), paragraph 2.2.6, each DG is required to demonstrate proper operation for the DBA loading sequence to ensure that voltage and frequency are maintained within the required limits. Under accident conditions, prior to connecting the DGs to their respective bus, all loads are shed except load center feeders and those motor control centers that power Class 1E loads (referred to as "permanently connected" loads). Upon reaching 90% rated voltage and frequency, the DGs are then connected to their respective bus. Load shedding and buses-ready-to-load signals are generated by the control systems for the electrical power distribution system. Individual timers for each major load are reset and started by their electrical power distribution systems signals (Ref. 2). The 10% load sequence time interval tolerance ensures that sufficient time exists for the DG to restore frequency and voltage prior to applying the next load and that safety analysis assumptions regarding ESF equipment time delays are not violated. Regulatory Guide 1.9 (Ref. 3) provides a summary of the automatic loading of ESF buses.

The Frequency of 18 months is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3), paragraph 2.2.6; takes into consideration plant conditions required to perform the Surveillance; and is intended to be consistent with expected fuel cycle lengths.

This SR is modified by two Notes. The reason for Note 1 is that performing the Surveillance during these MODES would remove a required offsite circuit from service, perturb the

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.18 (continued)

electrical distribution system, and challenge plant safety systems. Note 2 acknowledges that credit may be taken for unplanned events that satisfy this SR.

Reviewer's Note: The above MODE restrictions may be deleted if it can be demonstrated to the staff. on a plant specific basis, that performing the SR with the reactor in any of the restricted MODES can satisfy the following criteria, as applicable:

a. Performance of the SR will not render any safety system or component inoperable;

b. Performance of the SR will not cause perturbations to any of the electrical distribution systems that could result in a challenge to steady state operation or to plant safety systems; and

c. Performance of the SR, or failure of the SR, will not cause, or result in, an AOO with attendant challenge to plant safety systems.

SR 3.8.1.19

In the event of a DBA coincident with a loss of offsite power, the DGs are required to supply the necessary power to ESF systems so that the fuel, RCS, and containment design limits are not exceeded.

This Surveillance demonstrates the DG operation, as discussed in the Bases for SR 3.8.1.11, during a loss of offsite power actuation test signal in conjunction with an ECCS initiation signal. In lieu of actual demonstration of connection and loading of loads, testing that adequately shows the capability of the DG system to perform these functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire connection and loading sequence is verified.

The Frequency of 18 months takes into consideration plant conditions required to perform the Surveillance and is

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.19 (continued)

intended to be consistent with an expected fuel cycle length of 18 months.

This SR is modified by three Notes. The reason for Note 1 is to minimize wear and tear on the DGs during testing. For the purpose of this testing, the DGs must be started from standby conditions, that is, with the engine coolant and oil being continuously circulated and temperature maintained consistent with manufacturer recommendations. The reason for Note 2 is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge plant safety systems. Note 3 acknowledges that credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.20

This Surveillance demonstrates that the DG starting independence has not been compromised. Also, this Surveillance demonstrates that each engine can achieve proper speed within the specified time when the DGs are started simultaneously.

The 10 year Frequency is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 3), paragraph 2.2.14, and Regulatory Guide 1.137 (Ref. 9), paragraph C.2.f.

This SR is modified by a Note. The reason for the Note is to minimize wear on the DG during testing. For the purpose of this testing, the DGs must be started from standby conditions, that is, with the engine coolant and oil continuously circulated and temperature maintained consistent with manufacturer recommendations.

Diesel Generator Test Schedule

The DG test schedule (Table 3.8.1-1) implements the recommendations of Revision 3 to Regulatory Guide 1.9 (Ref. 3). The purpose of this test schedule is to provide timely test data to establish a confidence level associated with the goal to maintain DG reliability at > 0.95 per test.

(continued)

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.1.20 (continued)

According to Regulatory Guide 1.9 (Ref. 3), Revision 3, each DG unit should be tested at least once every 31 days. Whenever a DG has experienced 4 or more valid failures in the last 25 valid tests, the maximum time between tests is reduced to 7 days. Four failures in 25 valid tests is a failure rate of 0.16, or the threshold of acceptable DG performance, and hence may be an early indication of the degradation of DG reliability. When considered in the light of a long history of tests, however, 4 failures in the last 25 valid tests may only be a statistically probable distribution of random events. Increasing the test Frequency allows a more timely accumulation of additional test data upon which to base judgment of the reliability of the DG. The increased test Frequency must be maintained until seven consecutive failure free tests have been performed.

The Frequency for accelerated testing is 7 days, but no less than 24 hours. Therefore, the interval between tests should be no less than 24 hours, and no more than 7 days. A successful test at an interval of less than 24 hours should be considered an invalid test and not count towards the seven consecutive failure free starts. A test interval in excess of 7 days constitutes a failure to meet SRs.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 17.
2. ABWR SSAR, Chapter 8.
3. Regulatory Guide 1.9, Revision 3.
4. ABWR SSAR, Chapter 6.
5. ABWR SSAR, Chapter 15.
6. Regulatory Guide 1.93.
7. Generic Letter 84-15, July 2, 1984.
8. 10 CFR 50, Appendix A, GDC 18.
9. Regulatory Guide 1.137.

(continued)

BASES

REFERENCES
(continued)

10. ANSI C84.1, 1982.

11. ASME, Boiler and Pressure Vessel Code, Section XI.

12. IEEE Standard 308.

3.8 ELECTRICAL POWER SYSTEMS

3.8.4 DC Sources – Operating

LCO 3.8.4 The Division I, Division II, Division III, and Division IV DC electrical power subsystems shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. One DC electrical power subsystem (either Division I, II, or III) inoperable.	A.1	Determine OPERABLE DC electrical subsystems are not inoperable due to common cause failure.	2 hours
	AND		
	A.2	Declare affected required features inoperable.	2 hours
	AND		
	A.3	Verify the combustion turbine generator (CTG) is functional by verifying the CTG starts and achieves steady state voltage and frequency within 10 minutes.	12 hours
	AND		
	A.4	Verify the CTG circuit breakers are capable of being aligned to each of three 6.9 kV essential AC buses.	12 hours AND once per 8 hours thereafter

(continued)

ACTIONS (continued)

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. (continued)	A.5	Restore inoperable DC electrical power subsystem to OPERABLE status.	72 hours
B. Division IV DC electrical power subsystem inoperable.	B.1	Restore Division 4 DC electrical power subsystem to OPERABLE status.	12 hours
	OR		
	B.2	Declare affected required features inoperable.	12 hours
C. One DC electrical power subsystem (either Division I, II, or III) inoperable.	C.1	Restore inoperable DC electrical power subsystem (other than Division IV) to OPERABLE status.	2 hours
AND	OR		
Division IV DC electrical power subsystem inoperable.	C.2	Restore Division IV DC electrical power subsystem to OPERABLE status.	2 hours
D. Required Action and associated Completion Time not met.	D.1	Be in MODE 3.	12 hours
	AND		
	D.2	Be in MODE 4.	36 hours

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.8.4.1	Verify battery terminal voltage is ≥ [ ] V on float charge.	7 days
SR 3.8.4.2	Verify no visible corrosion at terminals and connectors. OR Verify connection resistance is ≤ [ ] ohms for inter-cell connections, ≤ [ ] ohms for inter-rack connections, ≤ [ ] ohms for inter-tier connections, and ≤ [ ] ohms for terminal connections.	92 days
SR 3.8.4.3	Verify cells, cell plates, and battery racks show no visual indication of physical damage or abnormal deterioration.	12 months
SR 3.8.4.4	Remove visible corrosion, and verify cell to cell and terminal connections are clean and coated with anti-corrosion material.	12 months
SR 3.8.4.5	Verify connection resistance is ≤ [ ] ohms for inter-cell connections, ≤ [ ] ohms for inter-rack connections, ≤ [ ] ohms for inter-tier connections, and ≤ [ ] ohms for terminal connections].	12 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.8.4.6	----------NOTES---------- 1. This Surveillance shall not be performed in MODE 1, 2, or 3. 2. Credit may be taken for unplanned events that satisfy this SR. ---------- Verify each required battery charger supplies ≥ [ ] amps at ≥ 125 V for ≥ 12 hours.	18 months
SR 3.8.4.7	----------NOTES---------- 1. A modified performance discharge test may be performed in lieu of a service test once per 60 months. 2. This Surveillance shall not be performed in MODE 1, 2, or 3. 3. Credit may be taken for unplanned events that satisfy this SR. ---------- Verify battery capacity is adequate to supply, and maintain in OPERABLE status, the required emergency loads for the design duty cycle when subjected to a battery service test.	18 months

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.4.8	----------NOTES---------- 1. This Surveillance shall not be performed in MODE 1, 2, or 3. 2. Credit may be taken for unplanned events that satisfy this SR. ----------	
	Verify battery capacity is ≥ 80% of the manufacturer's rating when subjected to a performance discharge test.	60 months AND -----NOTE----- Only applicable when battery shows degradation or has reached 85% of expected life. ---------- 12 months

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.4 DC Sources – Operating

BASES

BACKGROUND

The station DC electrical power system provides the AC power system with control power. It also provides both motive and control power to selected safety related equipment. As required by 10 CFR 50, Appendix A, GDC 17 (Ref. 1), the DC electrical power system is designed to have sufficient independence, redundancy, and testability to perform its safety functions, assuming a single failure. The DC electrical power system also conforms to the requirements of Regulatory Guide 1.6 (Ref. 2) and IEEE-308 (Ref. 3).

The 125 VDC electrical power system consists of four independent Class 1E DC electrical power subsystems, Divisions I, II, III, and IV. Each subsystem consists of a battery, associated battery charger, and all the associated control equipment and interconnecting cabling. In addition there are two standby backup chargers. One is shared by Divisions I and II, and the other is shared by Divisions III and IV. However, no credit is taken for the backup battery chargers which are not required to be OPERABLE or surveillance tested.

During normal operation, the DC loads are powered from the battery chargers with the batteries floating on the system. In case of loss of AC power to the battery charger, the DC loads are automatically powered from the batteries.

Division I, II, and III DC electrical power subsystems provides the control power for its associated Class 1E AC power system. Each of these three DC electrical power subsystems provides both motive and control power, as necessary, to associated safety related components (Division IV supplies neither motive nor control power). All four DC electrical power subsystems provide DC electrical power to essential instrumentation and logic within their respective divisions as well as to the inverters, which in turn power the AC vital buses. All four subsystems also provide motive and control power for DC emergency lighting systems.

(continued)

BASES

BACKGROUND (continued)

The DC power distribution system is described in more detail in Bases for LCO 3.8.9, "Distribution Systems–Operating," and LCO 3.8.10, "Distribution Systems – Shutdown."

Each battery for Division I, II, III, and IV has adequate storage capacity to carry the required load continuously for at least 2 hours. The battery for Division I, which controls the RCIC system, also has adequate storage capacity for eight hours of operation during station blackout (Ref. 12).

Each DC subsystem battery is separately housed in a ventilated room apart from its charger and distribution centers. Each subsystem is located in an area separated physically and electrically from the other subsystems to ensure that a single failure in one subsystem does not cause a failure in a redundant subsystem. There is no sharing between redundant Class 1E DC subsystems such as batteries, battery chargers, or distribution panels.

The maximum equalizing charge for Class 1E batteries is 140 V. The DC system mimimum discharge voltage at the end of the discharge period is 1.75 V per cell (105 V for the battery). The operating voltage range of the Class 1E DC subsystem loads is 100 to 140 V.

Each of the four battery chargers for Division I, II, III, and IV DC electrical power subsystems has ample power output capacity for the steady state operation of its Division's connected loads required during normal operation, while at the same time maintaining its battery bank fully charged. Each battery charger has sufficient capacity to restore its battery bank from the design minimum charge to within 95% of its fully charged state within 12 hours while supplying the largest combined demand of the various continuous steady state loads (Ref. 4).

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the SSAR, Chapter 6 (Ref. 5) and Chapter 15 (Ref. 6), assume that ESF systems are OPERABLE. The DC electrical power system provides DC electrical power for ESF systems, ESF support systems including the DGs and its support systems, and control and switching during all MODES of operation.

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining DC sources OPERABLE during accident conditions in the event of:

a. An assumed loss of all offsite AC power or of all onsite AC power; and

b. A worst case single failure.

The DC sources satisfy Criterion 3 of the NRC Policy Statement.

LCO

The four DC electrical power subsystems are required to be OPERABLE to ensure the availability of the required power to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence (AOO) or a postulated DBA. Loss of any DC electrical power subsystem does not prevent the minimum safety function from being performed (Ref. 4). Each subsystem (or Division) consists of one battery, one battery charger, and the corresponding control equipment and interconnecting cabling within the subsystem.

APPLICABILITY

The DC electrical power sources are required to be OPERABLE in MODES 1, 2, and 3 to ensure safe unit operation and to ensure that:

a. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of AOOs or abnormal transients; and

b. Adequate core cooling is provided, and containment integrity and other vital functions are maintained in the event of a postulated DBA.

The DC electrical power requirements for MODES 4 and 5 are addressed in the Bases for LCO 3.8.5, "DC Sources – Shutdown."

(continued)

BASES (continued)

ACTIONS

A.1, A.2, A.3, A.4, and A.5

Condition A represents one of the Division I, II, or III DC electrical power subsystems with a loss of ability to completely respond to an event, and a potential loss of ability to remain energized during normal operation. It is, therefore, imperative that the operator's attention focus on stabilizing the unit, minimizing the potential for complete loss of DC power to the affected division.

If Condition A is entered, Required Action A.5 allows 72 hours to restore the inoperable DC electrical power subsystem to OPERABLE status, provided the combustion turbine generator (CTG) is verified functional through testing within 12 hours and its capability of being aligned to any of the three 6.9 kV essential AC buses is verified, initially within 12 hours, and once per 8 hours thereafter. The functional capability of the CTG is verified in this Condition because the DC electrical power subsystem provides control functions to the divisional DGs and the circuit breakers, RCIC(Div. I), and other loads.

If one of the required Division I, II, or III DC electrical power subsystems is inoperable (e.g., inoperable battery, inoperable battery charger, or inoperable battery charger and associated inoperable battery), the remaining DC electrical power subsystems have the capacity to support a safe shutdown and to mitigate an accident condition. Since a subsequent worst case single failure could, however, result in the loss of minimum necessary DC electrical subsystems, continued power operation should not exceed 72 hours. The 72 hour Completion Time reflects a reasonable time to assess unit status as a function of the inoperable DC electrical power subsystem and, if the DC electrical power subsystem is not restored to OPERABLE status, to prepare to effect an orderly and safe unit shutdown. The 72 hour limit is consistent with the allowed time for one DC distribution subsystem (either Division I, II, or III) being inoperable.

Completion of Required Action A.1 within 2 hours provides further assurance that operation in Condition A for 72 hours is acceptable by determining that no common cause failure exist among the OPERABLE DC electrical power subsystems. Because of its potential safety significance, only 2 hours are allowed to verify that no common cause failure exists.

(continued)

BASES (continued)

ACTIONS (continued)

A.1, A.2, A.3, A.4, and A.5 (continued)

Required Action A.2 is specified so that appropriate actions are implemented in accordance with the affected required features of LCO 3.4.7 for RHR Shutdown Cooling in MODE 3.

B.1 and B.2

In Condition B, Division IV DC electrical power subsystem is inoperable. Required Actions B.1 and B.2 allow 12 hours to either restore this subsystem to OPERABLE status or declare affected required features inoperable so that appropriate actions are implemented in accordance with the affected required features of the LCOs' ACTIONS. Division IV is less critical than the other three DC electrical power subsystems because of its limited role in actuating safety related functions(i.e., Essential Multiplex System Div. IV, SSLC Div. IV sensor logic). Division IV does not feed or control any major mechanical components or systems. Therefore, its loss is not as critical as a loss of one of the other divisions, and the less restrictive ACTIONS of other LCOs are appropriate (i.e., LCO 3.3.1.1, LCO 3.3.3.1).

C.1 and C.2

In Condition C, Division IV and one other DC electrical power subsystem are inoperable. Because this condition is more severe than that of Condition A or B, only 2 hours are allowed to restore one of the inoperable subsystems to OPERABLE status. This 2 hour Completion Time reflects a reasonable time to assess unit status as a function of the two inoperable DC electrical power subsystems and, if one of the DC electrical power subsystems is not restored to OPERABLE status, to prepare to effect an orderly and safe unit shutdown.

D.1 and D.2

If all inoperable DC electrical power subsystems cannot be restored to OPERABLE status within the associated Completion Times for Required Actions A.1, B.2, and C.1 or C.2, the unit must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to

(continued)

BASES (continued)

ACTIONS (continued)

D.1 and D.2 (continued)

at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems. The Completion Time to bring the unit to MODE 4 is consistent with the time required in Regulatory Guide 1.93 (Ref. 7).

SURVEILLANCE REQUIREMENTS

SR 3.8.4.1

Verifying battery terminal voltage while on float charge helps to ensure the effectiveness of the charging system and the ability of the batteries to perform their intended function. Float charge is the condition in which the charger is supplying the continuous charge required to overcome the internal losses of a battery (or battery cell) and maintain the battery (or battery cell) in a fully charged state. The voltage requirements are based on the nominal design voltage of the battery and are consistent with the initial voltages assumed in the battery sizing calculations. The 7 day Frequency is consistent with manufacturer's recommendations and IEEE-450 (Ref. 8).

Visual inspection to detect corrosion of the battery cells and connections, or measurement of the resistance of each inter-cell, inter-rack, inter-tier, and terminal connection, provides an indication of physical damage or abnormal deterioration that could potentially degrade battery performance.

The limits established for this SR must be no more than 20% above the resistance as measured during installation, or not above the ceiling value established by the manufacturer.

The Surveillance Frequency for these inspections, which can detect conditions that can cause power losses due to resistance heating, is 92 days. This Frequency is considered acceptable based on operating experience related to detecting corrosion trends.

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SR 3.8.4.3

Visual inspection of the battery cells, cell plates, and battery racks provides an indication of physical damage or abnormal deterioration that could potentially degrade battery performance.

The 12 month Frequency of these SRs is consistent with IEEE-450 (Ref. 8), which recommends detailed visual inspection of cell condition and inspection of cell to cell and terminal connection resistance on a yearly basis.

SR 3.8.4.4 and SR 3.8.4.5

Visual inspection and resistance measurements of inter-cell, inter-rack, inter-tier, and terminal connections provides an indication of physical damage or abnormal deterioration that could indicate degraded battery condition. The anti-corrosion material is used to ensure good electrical connections and to reduce terminal deterioration. The visual inspection for corrosion is not intended to require removal of and inspection under each terminal connection.

The removal of visible corrosion is a preventive maintenance SR. The presence of visible corrosion does not necessarily represent a failure of this SR, provided visible corrosion is removed during performance of this Surveillance.

The connection resistance limits for this SR must be no more than 20% above the resistance as measured during installation, or not above the ceiling value established by battery sizing.

The 12 month Frequency of these SRs is consistent with IEEE-450 (Ref. 8), which recommends detailed visual inspection of cell condition and inspection of cell to cell and terminal connection resistance on a yearly basis.

SR 3.8.4.6

Battery charger capability requirements are based on the design capacity of the chargers (Ref. 4). According to Regulatory Guide 1.32 (Ref. 9), the battery charger supply is required to be based on the largest combined demands of

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BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.4.6 (continued)

the various steady state loads and the charging capacity to restore the battery from the design minimum charge state to the fully charged state, irrespective of the status of the unit during these demand occurrences. The minimum required amperes and duration ensure that these requirements can be satisfied.

The Surveillance Frequency is acceptable, given the unit conditions required to perform the test and the other administrative controls existing to ensure adequate charger performance during these 18 month intervals. In addition, this Frequency is intended to be consistent with expected fuel cycle lengths.

This SR is modified by two Notes. The reason for Note 1 is that performing the Surveillance would remove a required DC electrical power subsystem from service, perturb the electrical distribution system, and challenge safety systems. Note 2 is added to this SR to acknowledge that credit may be taken for unplanned events that satisfy the Surveillance.

SR 3.8.4.7

A battery service test is a special test of the battery's capability, as found, to satisfy the design requirements (battery duty cycle) of the DC electrical power system. The discharge rate and test length correspond to the design duty cycle requirements as specified in Reference 4.

The Surveillance Frequency of 18 months is consistent with the recommendations of Regulatory Guide 1.32 (Ref. 9) and Regulatory Guide 1.129 (Ref. 10), which state that the battery service test should be performed during refueling operations or at some other outage, with intervals between tests not to exceed 18 months.

This SR is modified by three Notes. Note 1 allows a once per 60 months performance of a modified discharge test in lieu of a service test.

Typically, the modified discharge test is a simulated duty cycle consisting of just two rates; the one minute rate

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BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.4.7 (continued)

published for the battery or the largest current load of the duty cycle, followed by the test rate employed for the performance test. Since the ampere-hours removed by a rated one minute discharge represents a very small portion of the battery's capacity, the test rate can be changed to that for the performance test without compromising the results of the performance test.

A modified discharge test is a test of the battery capacity and its ability to provide a high rate, short duration load (usually the highest rate of the duty cycle). This will often confirm the battery's ability to meet the critical period of the load duty cycle, in addition to determining its percentage of rated capacity. Initial conditions for the modified performance test should be identical to those specified for a service test.

The reason for Note 2 is that performing the Surveillance would remove a required DC electrical power subsystem from service, perturb the electrical distribution system, and challenge safety systems. Note 3 is added to this SR to acknowledge that credit may be taken for unplanned events that satisfy the Surveillance.

SR 3.8.4.8

A battery performance test is a test of constant current capacity of a battery, normally done in the as found condition, after having been in service, to detect any change in the capacity determined by the acceptance test. The test is intended to determine overall battery degradation due to age and usage.

The acceptance criteria for this Surveillance is consistent with IEEE-450 (Ref. 8) and IEEE-485 (Ref. 11). These references recommend that the battery be replaced if its capacity is below 80% of the manufacturer's rating. A capacity of 80% shows that the battery rate of deterioration is increasing, even if there is ample capacity to meet the load requirements.

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BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.4.8 (continued)

The Surveillance Frequency for this test is 60 months, or every 12 months if the battery shows degradation or has reached 85% of its expected life. Degradation is indicated, according to IEEE-450 (Ref. 8), when the battery capacity drops by more than 10% relative to its capacity on the previous performance test or when it is ≥ 10% below the manufacturer's rating. All these Frequencies are consistent with the recommendations in IEEE-450 (Ref. 8).

This SR is modified by two Notes. The reason for Note 1 is that performing the Surveillance would remove a required DC electrical power subsystem from service, perturb the electrical distribution system, and challenge safety systems. Note 2 is added to this SR to acknowledge that credit may be taken for unplanned events that satisfy the Surveillance.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 17.
2. Regulatory Guide 1.6, March 10, 1971.
3. IEEE Standard 308, 1978.
4. ABWR SSAR, Section 8.3.2.
5. ABWR SSAR, Chapter 6.
6. ABWR SSAR, Chapter 15.
7. Regulatory Guide 1.93, December 1974.
8. IEEE Standard 450, 1987.
9. Regulatory Guide 1.32, February 1977.
10. Regulatory Guide 1.129, December 1974.
11. IEEE Standard 485, 1983.
12. ABWR SSAR, Section 19E.2.1.2.2.

3.8 ELECTRICAL POWER SYSTEMS

3.8.7 Inverters – Operating

LCO 3.8.7 The Division I, Division II, Division III, and Division IV inverters shall be OPERABLE.

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One inverter inoperable.	----------NOTE---------- Immediately enter applicable Conditions and Required Actions of LCO 3.8.9 "Distribution Systems - Operating," for de-energized AC Vital buses. ----------	
	A.1 Restore inverters to OPERABLE status.	7 days
	AND	
	A.2 Declare affected required features inoperable.	24 hours

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ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. One inverter (either Division I, II, or III) inoperable AND Division IV inverter inoperable.	----------NOTE---------- Immediately enter applicable Conditions and Required Actions of LCO 3.8.9 "Distribution Systems - Operating," for de-energized AC Vital buses. ----------	
	B.1 Restore inoperable inverter (other than Division IV) to OPERABLE status.	2 hours
	OR	
	B.2 Restore Division IV inverter to OPERABLE status.	2 hours
C. Required Action and associated Completion Time of Condition A, or B not met.	C.1 Be in MODE 3.	12 hours
	AND	
	C.2 Be in MODE 4.	36 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.7.1	Verify correct inverter voltage, frequency, and alignment to required AC vital buses.	7 days

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.7 Inverters – Operating

BASES

BACKGROUND

The inverters are the preferred source of power to the four AC vital buses. The inverter for each division is normally supplied power from the divisional 480 V AC motor control center (MCC) via an AC to DC rectifier. Because there are only three divisions of 480 V AC divisional power, the Division IV inverter is powered by the Division II 480 V AC MCC via an AC to DC rectifier. Each of the four divisions has access to its own Class 1E 125 V battery that provides a backup source of 125 V DC power through a transfer switch. The transfer switch automatically switches power from the AC to DC rectified normal power supply to the 125 V DC backup power supply when AC power failure is sensed (Ref. 1). The inverter converts DC electrical power to AC electrical power. The transfer switch and inverter thus provide an uninterruptible AC power supply for Class 1E loads.

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the SSAR, Chapter 6 (Ref. 2) and Chapter 15 (Ref. 3), assume Engineered Safety Feature systems are OPERABLE. The inverters are designed to provide the required capacity, capability, redundancy, and reliability to ensure the availability of necessary power to Class 1E CVCF loads so that the fuel, Reactor Coolant System, and containment design limits are not exceeded. These limits are discussed in more detail in the Bases for Section 3.2, Power Distribution Limits; Section 3.4, Reactor Coolant System (RCS); and Section 3.6, Containment Systems.

The OPERABILITY of the inverters is consistent with the initial assumptions of the accident analyses and is based on meeting the design basis of the unit. This includes

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BASES

APPLICABLE SAFETY ANALYSIS (continued)

maintaining electrical power sources OPERABLE during accident conditions in the event of:

a. An assumed loss of all offsite AC or all onsite AC electrical power; and

b. A worst case single failure.

Inverters are a part of the distribution system and, as such, satisfy Criterion 3 of the NRC Policy Statement.

LCO

The inverters ensure the availability of AC electrical power for the Class 1E CVCF loads required to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence (AOO) or a postulated DBA.

Maintaining the required inverters OPERABLE ensures that the redundancy incorporated into the design of the RPS, MSIV logic and controls, NMS, and PRM, is maintained. Each of the four inverters has a 125 V battery backup power source to ensure an uninterruptible supply of AC electrical power to the AC vital buses even if the 6.9 kV and 480 V safety buses are de-energized.

OPERABLE inverters require that the AC vital bus be powered by the inverter via an inverted DC voltage. This assumes correct DC voltages are applied from the AC to DC rectified and 125 V DC power supplies, a correct AC voltage is at the output, and these voltages are within the design voltage and frequency tolerances. If the vital AC bus is powered from the AC power supply through the 480 V/120 V bypass transformer, or power is available to the inverter from only its AC source, then the inverter is considered inoperable.

(continued)

BASES

APPLICABILITY

The inverters are required to be OPERABLE in MODES 1, 2, and 3 to ensure that:

a. Acceptable fuel design limits and reactor coolant pressure boundary limits are not exceeded as a result of AOOs or abnormal transients; and

b. Adequate core cooling is provided, and containment OPERABILITY and other vital functions are maintained in the event of a postulated DBA.

Inverter requirements for MODES 4 and 5 are covered in the Bases for LCO 3.8.8, "Inverters – Shutdown."

ACTIONS

A.1, A.2, B.1, and B.2

Even with a required inverter inoperable, the corresponding AC vital bus may not be inoperable. This would be the case if the AC vital bus is energized via its Class 1E 480 V/120 V bypass transformer. If the inoperability of an inverter were to make an AC vital bus inoperable, the condition present would be more severe and would need to refer to another LCO for appropriate action. Therefore, the Required Actions of Conditions A are modified by a Note stating that ACTIONS for LCO 3.8.9 must be entered immediately in the event an AC vital bus is de-energized; i.e., inoperable. This ensures the vital bus is returned to OPERABLE status within 72 hours (or appropriate other ACTIONS are followed if an inverter and AC vital bus are inoperable).

Required Action A.1 allows 7 days to fix the inoperable inverter and return it to service. The 7-day limit is based upon a consideration of the loads a particular inverter serves and the Completion Times allowed in supported system LCOs. When the AC vital bus is powered from the AC power supply through its 480 V/120 V bypass transformer, it is relying upon interruptible AC electrical power sources (offsite and onsite). The uninterruptible, battery backed, inverter source to the AC vital buses is the preferred source for powering instrumentation ~~trip setpoint~~ devices. Action A.2 is specified so that appropriate restrictions are implemented in accordance with the affected required feature(s) of the LCOs' ACTIONS.

(continued)

BASES

ACTIONS (continued)

B.1 and B.2

Even with two inverters inoperable, the corresponding AC vital buses may not be inoperable. This would be the case if the AC vital buses are energized via their Class 1E 480 V/120 V bypass transformers. If the inoperability of an inverter were to make an AC vital bus inoperable, the condition present would be more severe and would need to refer to another LCO for appropriate action. Therefore, the Required Actions of Condition B are modified by a Note stating that ACTIONS for LCO 3.8.9 must be entered immediately in the event an AC vital bus is de-energized; i.e., inoperable. This ensures the vital bus is returned to OPERABLE status within 72 hours (or appropriate other ACTIONS are followed if the inverters and AC vital buses are inoperable).

In Condition B, the Division IV inverter and one other inverter are inoperable. Because this condition is more severe than that of Condition A, only 2 hours are allowed to restore one of the inoperable inverters to OPERABLE status. This 2 hour Completion Time reflects a reasonable time to assess unit status as a function of the two inoperable inverters and, if one of the inverters is not restored to OPERABLE status, to prepare to effect an orderly and safe unit shutdown.

C.1 and C.2

If the inoperable devices or components cannot be restored to OPERABLE status within the associated Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

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BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.7.1

This Surveillance verifies that the inverters are functioning properly with all required circuit breakers closed and AC vital buses energized from the inverter. The verification of proper voltage and frequency output ensures that the required power is readily available for the instrumentation connected to the AC vital buses. The 7 day Frequency takes into account the redundant capability of the inverters and other indications available in the control room that alert the operator to inverter malfunctions.

REFERENCES

1. ABWR SSAR, Chapter 8.

2. ABWR SSAR, Chapter 6.

3. ABWR SSAR, Chapter 15.