

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 and the onsite standby power sources (diesel generators (DGs)). 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, Divisions 1, 2, and 3, with each division powered by an independent Class 1E 4.16 kV emergency bus (refer to LCO 3.8.8, "Distribution Systems – Operating"). The Division 1 and 2 4.16 kV emergency buses each have one separate and independent offsite source of power. The Division 3 4.16 kV emergency bus can be supplied by either offsite source. Each 4.16 kV emergency bus has a dedicated onsite DG. 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 the switchyard from the transmission network. From the switchyard three qualified, electrically and physically separated circuits provide AC power to the Division 1, 2, and 3 4.16 kV emergency buses. Offsite power source A, Reserve Station Service Transformer 2RTX-XSR1A (115 kV/13.8 kV/4.16 kV), provides power to the Division 1 4.16 kV emergency bus and also is normally lined up to provide power to the Division 3 4.16 kV emergency bus. Offsite power source B, Reserve Station Service Transformer 2RTX-XSR1B (115 kV/13.8 kV/4.16 kV), provides power to the Division 2 4.16 kV emergency bus and, when aligned, is capable of providing power to the Division 3 4.16 kV emergency bus. In addition, either Division 1 or Division 2 4.16 kV emergency bus can be powered from a third qualified source, the Auxiliary Boiler Transformer 2ABS-X1. The offsite AC electrical power sources are designed and located so as to minimize to the extent practical the likelihood of their simultaneous failure under operating and postulated accident and environmental conditions. A

(continued)

BASES

BACKGROUND
(continued)

detailed description of the offsite power network and circuits to the onsite Class 1E 4.16 kV emergency buses is found in USAR, Chapter 8 (Ref. 2).

A qualified offsite circuit consists of all breakers, transformers, switches, interrupting devices, cabling, and controls required to transmit power from the offsite transmission network to the onsite Class 1E 4.16 kV emergency bus(es).

Following an accident signal, certain required Division 1 and 2 plant loads are started in a predetermined sequence in order to prevent overloading the reserve station service transformer supplying offsite power to the onsite Class 1E Distribution System. The starting sequence of all automatically connected loads needed to recover the unit or maintain it in a safe condition is provided in Reference 3.

The onsite standby power source for each 4.16 kV emergency bus is a dedicated DG. A DG starts automatically on loss of coolant accident (LOCA) signal (i.e., low reactor water level signal; Level 1 for Division 1 and 2 DGs, Level 2 for Division 3 DG, or high drywell pressure signal) or on an emergency bus degraded voltage or undervoltage signal (refer to LCO 3.3.8.1, "Loss of Power (LOP) Instrumentation"). After the DG has started, it automatically ties to its respective 4.16 kV emergency bus after offsite power is tripped as a consequence of emergency bus undervoltage or degraded voltage, independent of or coincident with a LOCA signal. The DGs also start and operate in the standby mode without tying to the 4.16 kV emergency bus on a LOCA signal alone.

In the event of a loss of offsite 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.

Certain required plant loads are returned to service in a predetermined sequence in order to prevent overloading the DG. For Divisions 1 and 2, if a loss of offsite power signal or a loss of offsite power signal concurrent with a LOCA signal is received, all loads on the respective 4.16 kV emergency bus, including the stub bus, are shed (except the

(continued)

BASES

BACKGROUND
(continued)

600 V load centers), and the emergency loads are sequentially started once power is restored. The Division 3 bus has no shedding or sequencing.

Division 1 and 2 DGs (EDG1 and EDG3) satisfy the following Regulatory Guide 1.9 (Ref. 4) ratings:

- a. 4400 kW - continuous;
- b. 4750 kW - 2000 hours; and
- c. 4840 kW - 2 hours.

Division 3 DG (EDG2) satisfies the following Regulatory Guide 1.9 (Ref. 4) ratings:

- a. 2600 kW - continuous;
- b. 2850 kW - 2000 hours;
- c. 2950 kW - 200 hours;
- d. 2860 kW - 2 hours; and
- e. 3050 kW - 30 minutes.

APPLICABLE
SAFETY ANALYSES

The initial conditions of DBA and transient analyses in the USAR, Chapter 6 (Ref. 5) and Chapter 15 (Ref. 6), 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 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 3.5, Emergency Core Cooling Systems (ECCS) and Reactor Core Isolation Cooling (RCIC) System; and Section 3.6, Containment Systems.

The OPERABILITY of the AC electrical power sources 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:

(continued)

BASES

APPLICABLE
SAFETY ANALYSES
(continued)

- 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 Reference 7.

LCO

Two qualified circuits between the offsite transmission network and the onsite Class 1E Distribution System, and three separate and independent DGs, 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.

Qualified offsite circuits are those that are described in the USAR and are part of the licensing basis for the unit.

Each offsite circuit from the 345 kV/115 kV Scriba Substation must be capable of maintaining rated frequency and voltage, and accepting required loads during an accident, while connected to the 4.16 kV emergency buses. Each offsite circuit consists of the incoming breaker and disconnect to the respective reserve station service transformers 2RTX-XSR1A and 2RTX-XSR1B and auxiliary boiler transformer 2ABS-X1, the respective 2RTX-XSR1A, 2RTX-XSR1B, and 2ABS-X1 transformers, and the respective circuit path including feeder breakers to the 4.16 kV emergency buses. In addition, proper sequencing of loads is a required function for offsite circuit OPERABILITY.

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 13.20 seconds. The 13.20 second start time includes the Loss of Voltage – Time Delay Function Allowable Value specified in LCO 3.3.8.1. Each DG must also be capable of accepting required loads within the assumed loading sequence intervals, and must continue to operate until offsite power can be restored to the 4.16 kV emergency buses. These capabilities are required to be met from a variety of initial conditions such as DG in standby with engine hot and DG in standby with engine at ambient conditions. Additional DG capabilities must be demonstrated to meet required Surveillances, e.g., capability of the DG to revert to standby status on an ECCS signal while

(continued)

BASES

LCO
(continued) operating in parallel test mode. Proper sequencing of loads, including tripping of nonessential loads, is a required function for DG OPERABILITY.

The AC sources in one division must be separate and independent (to the extent possible) of the AC sources in the other division(s). For the DGs, the separation and independence are complete. For the offsite AC sources, the separation and independence are to the extent practical.

APPLICABILITY 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.

A Note has been added taking exception to the Applicability requirements for Division 3 sources, provided the HPCS System is declared inoperable. This exception is intended to allow declaring of the Division 3 inoperable either in lieu of declaring the Division 3 source inoperable, or at any time subsequent to entering ACTIONS for an inoperable Division 3 source. This exception is acceptable since, with the Division 3 inoperable and the associated ACTIONS entered, the Division 3 AC sources provide no additional assurance of meeting the above criteria.

AC power requirements for MODES 4 and 5 and other conditions in which AC sources are required are covered in LCO 3.8.2, "AC Sources – Shutdown."

ACTIONS A Note prohibits the application of LCO 3.0.4.b to an inoperable DG. There is an increased risk associated with entering a MODE or other specified condition in the Applicability with an inoperable DG and the provisions of LCO 3.0.4.b, which allow entry into a MODE or other specified condition in the Applicability with the LCO not met after performance of a risk assessment addressing inoperable systems and components, should not be applied in this circumstance.

A.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

(continued)

BASES

ACTIONS

A.1 (continued)

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 the second required circuit fails SR 3.8.1.1, the second offsite circuit is inoperable, and Condition C, for two offsite circuits inoperable, is entered.

A.2

Required Action A.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 (i.e., single division systems are not included, although, for this Required Action, Division 3 (HPCS System) is considered redundant to Division 1 and 2 Emergency Core Cooling Systems (ECCS)). Redundant required features failures consist of inoperable features associated with a division redundant to the division that has no offsite power.

The Completion Time for Required Action A.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 redundant required feature on another division is inoperable.

If, at any time during the existence of this Condition (one offsite circuit inoperable), a redundant 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 redundant required support or supported features, or both, that are associated with the other division that has offsite power, results in starting the

(continued)

BASES

ACTIONS

A.2 (continued)

Completion Time 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.

A.3

According to Regulatory Guide 1.93 (Ref. 8), operation may continue in Condition A for a period that should not exceed 72 hours.

This Completion Time assumes sufficient offsite power remains to power the minimum loads needed to respond to analyzed events. In the event both the HPCS and Low Pressure Core Spray (LPCS) Systems are without offsite power, this assumption is not met. Therefore, the optional Completion Time is specified. Should the HPCS and LPCS Systems be affected, the 24 hour Completion Time is conservative with respect to the Regulatory Guide assumptions supporting a 24 hour Completion Time for both offsite circuits inoperable. With one offsite circuit inoperable, 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 this condition, however, the remaining OPERABLE offsite circuit and DGs are adequate to supply electrical power to the onsite Class 1E distribution system.

(continued)

BASES

ACTIONS

A.3 (continued)

The 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 A.3 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 A is entered while, for instance, a DG is inoperable and that DG is subsequently returned OPERABLE, the LCO may already have been not met for up to 14 days. This situation could lead to a total of 17 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 OPERABLE, and an additional 14 days (for a total of 31 days) allowed prior to complete restoration of the LCO. The 17 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 A and B are entered concurrently. The "AND" connector between the 72 hour and 17 day Completion Times means that both Completion Times apply simultaneously, and the more restrictive must be met.

Similar to Required Action A.2, the Completion Time of Required Action A.3 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 A was entered.

B.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.

(continued)

BASES

ACTIONS
(continued)

B.2

Required Action B.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, although, for this Required Action, Division 3 (HPCS System) is considered redundant to Division 1 and 2 ECCS). 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." In this Required Action, the Completion Time only begins on discovery that both:

- a. An inoperable DG exists; and
- b. A redundant required feature on another division is inoperable.

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

Discovering one required DG inoperable coincident with one or more redundant required support or supported features, or both, that are associated with the OPERABLE DG(s), 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

(continued)

BASES

ACTIONS

B.2 (continued)

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.

B.3.1 and B.3.2

Required Action B.3.1 provides an allowance to avoid unnecessary testing of OPERABLE DGs. If it can be determined that the cause of the inoperable DG does not exist on the OPERABLE DG(s), 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 E or G of LCO 3.8.1 is entered, as applicable. Once the failure is repaired, and the common cause failure no longer exists, Required Action B.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 DG(s).

In the event the inoperable DG is restored to OPERABLE status prior to completing either B.3.1 or B.3.2, the Deficiency Event Report Program will continue to evaluate the common cause possibility. This continued evaluation, however, is no longer under the 24 hour constraint imposed while in Condition B.

According to Generic Letter 84-15 (Ref. 9), 24 hours is reasonable time to confirm that the OPERABLE DG(s) are not affected by the same problem as the inoperable DG.

B.4

In Condition B, the remaining OPERABLE DGs and offsite circuits are adequate to supply electrical power to the onsite Class 1E distribution system. Although Condition B applies to a single inoperable DG, several Completion Times are specified for this Condition.

The first Completion Time applies to an inoperable Division 3 DG. The 72 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

B.4 (continued)

This Completion Time begins only “upon discovery of an inoperable Division 3 DG” and, as such, provides an exception to the normal “time zero” for beginning the allowed outage time “clock” (i.e., for beginning the clock for an inoperable Division 3 DG when Condition B may have already been entered for another equipment inoperability and is still in effect).

The second Completion Time (14 days) applies to an inoperable Division 1 or Division 2 DG and is a risk-informed Completion Time based on a plant-specific risk analysis. The extended Completion Time would typically be used for voluntary planned maintenance or inspections but can also be used for corrective maintenance. However, use of the extended Completion Time for voluntary planned maintenance should be limited to once within an operating cycle (24 months) for each DG (Division 1 and Division 2). When utilizing an extended DG Completion Time (greater than 72 hours and up to 14 days), the compensatory measures and configuration risk management controls listed below shall be implemented. For planned maintenance utilizing an extended Completion Time, these measures and controls shall be implemented prior to entering Condition B. For an unplanned entry into an extended Completion Time, these measures and controls shall be implemented without delay.

- a. The other two DGs are operable and no planned maintenance or testing activities are scheduled on those two DGs.
- b. No planned maintenance or testing activities are scheduled in Scriba Substation, the NMP2 115 kV switchyard, or on the 115 kV power supply lines and transformers which could cause a line outage or challenge offsite power availability.
- c. The HPCS system is operable and no planned maintenance or testing activities are scheduled.
- d. The RCIC system is operable and no planned maintenance or testing activities are scheduled.
- e. The NMP2 and Nine Mile Point Unit 1 (NMP1) diesel-driven fire pumps and the cross-tie between the NMP2 and NMP1 fire protection water supply systems are available to provide a backup cooling water supply to the Division 3 DG and no planned maintenance or testing activities are scheduled.

(continued)

BASES

ACTIONS

B.4 (continued)

- f. The Division 1 and Division 2 Residual Heat Removal (RHR) pumps and the LPCS pump are operable and no planned maintenance or testing activities are scheduled.
- g. Both divisions of the redundant reactivity control system and the standby liquid control system (equipment required for mitigation of Anticipated Transients Without Scram (ATWS) events) are operable and no planned maintenance or testing activities are scheduled.
- h. The stability of existing and projected grid conditions will be confirmed prior to planned entry into the extended DG Completion Time by contacting the Transmission System Operator (TSO).
- i. Operating crews will be briefed on the DG work plan. As a minimum, the briefing will include the important procedural actions that could be required in the event a loss of offsite power, station blackout, or fire condition occurs.
- j. The extended DG Completion Time will not be entered for planned maintenance if severe weather conditions (high winds, tornado, or heavy snow/ice) with the potential to degrade or limit offsite power availability are present, or if official weather forecasts are predicting such conditions to occur.
- k. Except for the room housing the inoperable DG, no hot work permits will be active for the control building or the normal switchgear rooms.
- l. A portable generator is available as a temporary backup source of AC power to one of the Division 1 or Division 2 battery chargers and is pre-staged within the protected area near the NMP2 control building.
- m. Four portable power supplies are available for use to facilitate operation of safety relief valves to maintain reactor coolant system pressure control for an extended station blackout condition and are verified to be functional.

If one or more of the above measures and controls are not met while in the extended Completion Time, enter the condition into the corrective action program, follow applicable Required Actions, manage the risk in accordance with the configuration risk management program, and initiate actions to restore the measure(s) or control(s) without delay.

(continued)

BASES

ACTIONS

B.4 (continued)

The third Completion Time for Required Action B.4 established 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, an offsite circuit is inoperable and that circuit is subsequently restored OPERABLE, the LCO may already have been not met for up to 72 hours. This situation could lead to a total of 17 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 72 hours (for a total of 20 days) allowed prior to complete restoration of the LCO. The 17 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 A and B are entered concurrently. The "AND" connector between the Completion Times means that the three Completion Times apply simultaneously, and the most restrictive Completion Time must be met.

Similar to Required Action B.2, the Completion Time of Required Action B.4 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 B was entered.

C.1 and C.2

Required Action C.1 addresses actions to be taken in the event of concurrent failure of redundant required features. Required Action C.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 A.2). The rationale for the reduction to 12 hours is that Regulatory Guide 1.93 (Ref. 8) allows a Completion Time of 24 hours for two required offsite circuits inoperable, based upon the assumption that two complete 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.,

(continued)

BASES

ACTIONS

C.1 and C.2 (continued)

single division systems are not included in the list, although, for this Required Action, Division 3 (HPCS System) is considered redundant to Division 1 and 2 ECCS). 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 C.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 redundant required feature is inoperable.

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

According to Regulatory Guide 1.93 (Ref. 8), operation may continue in Condition C 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

(continued)

BASES

ACTIONS

C.1 and C.2 (continued)

- 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. 8), with the available offsite AC sources two less than required by the LCO, operation may continue for 24 hours. If two offsite 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 A.

D.1 and D.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 D are modified by a Note to indicate that when Condition D is entered with no AC source to any division (i.e., the division is de-energized), Actions for LCO 3.8.8, "Distribution Systems – Operating," must be immediately entered. This allows Condition D to provide requirements for the loss of the offsite circuit and one DG without regard to whether a division is de-energized. LCO 3.8.8 provides the appropriate restrictions for a de-energized division.

According to Regulatory Guide 1.93 (Ref. 8), operation may continue in Condition D for a period that should not exceed 12 hours. In Condition D, individual redundancy is lost in both the offsite electrical power system and the onsite

(continued)

BASES

ACTIONS

D.1 and D.2 (continued)

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 C (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.

E.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. 8), with two required 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. In the event Division 3 DG in conjunction with Division 1 or 2 DG is inoperable, with the other Division 1 or 2 DG remaining, a significant spectrum of breaks would be capable of being responded to with onsite power. Even the worst case event would be mitigated to some extent – an extent greater than a typical two division design in which this condition represents complete loss of onsite power function. Given the remaining function, a 24 hour Completion Time is

(continued)

BASES

ACTIONS

E.1 (continued)

appropriate. At the end of this 24 hour period, the Division 3 system (HPCS System) could be declared inoperable (see Applicability Note) and this Condition could be exited with only one required DG remaining inoperable. However, with a Division 1 or 2 DG remaining inoperable and the HPCS declared inoperable, a redundant required feature failure exists, according to Required Action B.2.

F.1 and F.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.

G.1

Condition G 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 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. 10). 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 consistent with the recommendations of Regulatory Guide 1.9 (Ref. 11), Regulatory Guide 1.108 (Ref. 12), and Regulatory Guide 1.137 (Ref. 13).

(continued)

BASES

SURVEILLANCE
REQUIREMENTS
(continued)

Where the SRs discussed herein specify voltage and frequency tolerances, the following summary is applicable. The minimum steady state output voltage of 3950 V is approximately 95% of the nominal 4160 V output voltage. This value, which is specified in ANSI C84.1 (Ref. 14), allows for voltage drop to the terminals of 4000 V motors whose minimum operating voltage is specified as 90%, or 3600 V. It also allows for voltage drops to motors and other equipment down through the 120 V level where minimum operating voltage is also usually specified as 90% of name plate rating. The specified maximum steady state output voltage of 4370 V is equal to the maximum operating voltage specified for 4000 V motors. It ensures that for a lightly loaded distribution system, the voltage at the terminals of 4000 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 $\pm 2\%$ of the 60 Hz nominal frequency and are derived from the recommendations given in Regulatory Guide 1.9 (Ref. 11).

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 connected to their preferred power source and that appropriate independence of offsite circuits is maintained. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.8.1.2

This SR helps 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, this SR has been modified by a Note to indicate that all DG starts for this Surveillance may be preceded by an engine prelube period. In addition, to minimize wear and tear on the DG, the Note

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.8.1.2 (continued)

also allows all DG starts to be 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 (Division 1 and 2 DGs only) and lube oil are being continuously circulated and temperature is being maintained consistent with manufacturer recommendations.

SR 3.8.1.2 requires that the DG starts from standby conditions and achieves required voltage and frequency within 10 seconds. The 10 second start requirement supports the assumptions in the design basis LOCA analysis (Ref. 15). In addition, the DG is required to maintain proper voltage and frequency limits after steady state is achieved. The voltage and frequency limits are normally achieved within 13 seconds for the Division 1 and 2 DGs and within 15 seconds for the Division 3 DG. The time for the DG to reach steady state operation is periodically monitored and the trend evaluated to identify degradation of governor and voltage regulator performance.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.8.1.3

This Surveillance demonstrates that the DGs are capable of synchronizing and accepting a load approximately equivalent to that corresponding to the continuous rating. 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.

Although no power factor requirements are established by this SR, the DG is normally operated at a power factor between 0.8 lagging and 1.0 when running synchronized with the grid. The 0.8 power factor value is the design rating of the machine at a particular KVA. The 1.0 power factor value is an operational condition where the reactive power component is zero, which minimizes the reactive heating of

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.8.1.3 (continued)

the generator. Operating the generator at a power factor between 0.8 lagging and 1.0 avoids adverse conditions associated with underexciting the generator and more closely represents the generator operating requirements when performing its safety function (running isolated on its associated 4.16 kV emergency bus). The load band is provided to avoid routine overloading of the DG. Routine overloading may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain DG OPERABILITY.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

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.

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 must 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.

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 the low-low level alarm is annunciated. The level is expressed as an equivalent volume in gallons, and is selected to ensure adequate fuel oil for a minimum of 1 hour of DG operation at full load plus 10%.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

(continued)

BASES

SURVEILLANCE
REQUIREMENTS
(continued)

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 periodically 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 of accumulated water minimizes fouling and provides data regarding the watertight integrity of the fuel oil system. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.8.1.6

This Surveillance demonstrates that each fuel oil transfer pump (two per DG) operates and automatically 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 each 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. Two fuel oil transfer pumps per DG are required since each pump only has a simplex strainer.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

(continued)

BASES

SURVEILLANCE
REQUIREMENTS
(continued)

SR 3.8.1.7

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 frequency and while maintaining a specified margin to the overspeed trip. The load referenced for Division 1 DG is the 1125 kW low pressure core spray pump; for Division 2 DG, the 750 kW residual heat removal (RHR) pump; and for Division 3 DG the 2435 kW HPCS pump. The specified load values conservatively bound the expected kW rating of the single largest loads under accident conditions. This Surveillance may be accomplished by:

- a. Tripping the DG output breaker with the DG carrying greater than or equal to its associated single largest post-accident load while paralleled to offsite power, or while solely supplying the bus; or
- b. Tripping its associated single largest post-accident load with the DG solely supplying the bus.

Consistent with Regulatory Guide 1.9 (Ref. 11), the load rejection test is acceptable if the diesel speed does not exceed the nominal (synchronous) speed plus 75% of the difference between nominal speed and the overspeed trip setpoint, or 115% of nominal speed, whichever is lower. This corresponds to ≤ 64.5 Hz for the Division 1 and 2 DGs and ≤ 66.75 Hz for the Division 3 DG, which is the nominal speed plus 75% of the difference between nominal speed and the overspeed trip setpoint.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

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 (this portion of Note 1 is not applicable to the Division 3 DG). Credit may be taken for unplanned events that satisfy this SR. In order to ensure that the DG is

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.8.1.7 (continued)

tested under load conditions that are as close to design basis conditions as possible, Note 2 requires that, if synchronized to offsite power, testing must be performed at a power factor as close to the power factor of the single largest post-accident load as practicable. The power factor limit is ≤ 0.92 for Division 1 and 2 DGs and ≤ 0.93 for Division 3 DG. This power factor is representative of the actual design basis inductive loading that the DG could experience. However, since the offsite electrical power transmission network is not balanced, it may not be possible to raise DG voltage sufficiently to meet the power factor limit without one phase of the DG exceeding the current limit. Therefore, to ensure the DG is not placed in an unsafe condition during this test, the power factor limit does not have to be met if the offsite grid phase imbalance does not permit the power factor limit to be met when the DG is tied to the grid. When this occurs, the power factor should be maintained as close to the limit as practicable.

SR 3.8.1.8

Consistent with Regulatory Guide 1.9 (Ref. 11), paragraph C.2.2.8, 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 at a power factor as close to the accident load power factor as practicable. The power factor limit is ≤ 0.91 for Division 1 and 2 DGs and ≤ 0.93 for Division 3 DG. This power factor is

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.8.1.8 (continued)

representative of the actual design basis inductive loading that the DG would experience.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

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 (this portion of Note 1 is not applicable to the Division 3 DG). Credit may be taken for unplanned events that satisfy this SR. Note 2 is provided in recognition that since the offsite electrical power transmission network is not balanced, it may not be possible to raise DG voltage sufficiently to meet the power factor limit without one phase of the DG exceeding the current limit. Therefore, to ensure the DG is not placed in an unsafe condition during this test, the power factor limit does not have to be met if the offsite grid phase imbalance does not permit the power factor limit to be met when the DG is tied to the grid. When this occurs, the power factor should be maintained as close to the limit as practicable.

SR 3.8.1.9

Consistent with Regulatory Guide 1.9 (Ref. 11), paragraph C.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 shedding of the nonessential loads (Divisions 1 and 2 only) and 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 and energization of permanently connected loads time of 13.20 seconds is derived from the 3.20 second Loss of Voltage – Time Delay Function Allowable Value (LCO 3.3.8.1) and the requirements of the accident analysis for responding to a design basis large break LOCA (Ref. 14). The Surveillance should be continued for a minimum of

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.8.1.9 (continued)

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 permanently connected loads and auto-connected loads (Division 1 and 2 only) is intended to satisfactorily show the relationship of these loads to the 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, 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 Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This SR is modified by two 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 (Division 1 and 2 DGs only) and lube 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 (this portion of Note 2 is not applicable to the Division 3 DG). Credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.10

Consistent with Regulatory Guide 1.9 (Ref. 11), paragraph C.2.2.5, this Surveillance demonstrates that the DG automatically starts and achieves the required voltage and frequency within the specified time (10 seconds) from the design basis actuation signal (LOCA signal). In addition,

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.8.1.10 (continued)

the DG is required to maintain proper voltage and frequency limits after steady state is achieved. The voltage and frequency limits are normally achieved within 13 seconds for the Division 1 and 2 DGs and within 15 seconds for the Division 3 DG. The DG is required to operate for ≥ 5 minutes. The 5 minute period provides sufficient time to demonstrate stability. SR 3.8.1.10.d and SR 3.8.1.10.e ensure that permanently connected loads and emergency loads are energized from the offsite electrical power system on an ECCS signal without loss of offsite power (for Divisions 1 and 2 only).

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. This is only required for Divisions 1 and 2 because the loading logic is different based on the power source. 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, 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 AC electrical power 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 Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This SR is modified by two Notes. The reason for the 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 (Division 1 and 2 DGs only) and lube 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

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.8.1.10 (continued)

this SR could cause perturbations to the electrical distribution systems that could challenge continued steady state operation and, as a result, plant safety systems (this portion of Note 2 is not applicable to the Division 3 DG). Credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.11

Consistent with Regulatory Guide 1.9 (Ref. 11), paragraph C.2.2.12, 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 Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

The SR is modified by a Note. The reason for the Note is that performing the Surveillance removes a required DG from service (this portion of the Note is not applicable to the Division 3 DG). Credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.12

Consistent with Regulatory Guide 1.9 (Ref. 11), paragraph C.2.2.9, this Surveillance requires demonstration 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 rating of the DG. The DG starts for this Surveillance can be performed

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.8.1.12 (continued)

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 at a power factor as close to the accident load power factor as practicable. The power factor limit is ≤ 0.91 for Division 1 and 2 DGs and ≤ 0.93 for Division 3 DG. This power factor is representative of the actual design basis inductive loading that the DG could experience.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

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 teardown 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 safety systems. However, it is acceptable to perform this SR in MODES 1 and 2 provided the other two DGs are OPERABLE, since a perturbation can only affect one divisional DG. If during performance of this Surveillance one of the other DGs becomes inoperable, this Surveillance is to be suspended. Credit may be taken for unplanned events that satisfy this SR. Note 3 is provided in recognition that since the offsite electrical power transmission network is not balanced, it may not be possible to raise DG voltage sufficiently to meet the power factor limit without one phase of the DG exceeding the current limit. Therefore, to ensure the DG is not placed in an unsafe condition during this test, the power factor limit does not have to be met if the offsite grid phase imbalance does not permit the power factor limit to be met when the DG is tied to the grid.

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.8.1.12 (continued)

When this occurs, the power factor should be maintained as close to the limit as practicable.

SR 3.8.1.13

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 10 seconds. The 10 second time is derived from the requirements of the accident analysis for responding to a design basis large break LOCA (Ref. 15). In addition, the DG is required to maintain proper voltage and frequency limits after steady state is achieved. The voltage and frequency limits are normally achieved within 13 seconds for the Division 1 and 2 DGs and within 15 seconds for the Division 3 DG.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

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 approximately full load conditions prior to performance of this Surveillance is based on manufacturer recommendations for achieving hot conditions. 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 3.8.1.14

Consistent with Regulatory Guide 1.9 (Ref. 11), paragraph C.2.2.11, this Surveillance ensures that the manual synchronization and 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

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.8.1.14 (continued)

and can receive an auto-close signal on bus undervoltage, and the individual load timers are reset.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This SR is modified by a Note. The reason for the Note is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems (this portion of the Note is not applicable to the Division 3 DG). Credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.15

Consistent with Regulatory Guide 1.9 (Ref. 11), paragraph C.2.2.13, demonstration of the parallel 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 if 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. 17), paragraph 6.2.6(2).

The requirement to automatically energize the emergency loads with offsite power is essentially identical to that of SR 3.8.1.10. The intent in the requirement associated with SR 3.8.1.15.b is to show that the emergency loading is not affected by the DG operation in parallel 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 Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.8.1.15 (continued)

This SR has been modified by a Note. The reason for the Note is that performing the Surveillance would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge safety systems (this portion of the Note is not applicable to the Division 3 DG). Credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.16

Under accident conditions loads are sequentially connected to the bus by the automatic load sequence time delay relays. The sequencing logic controls the permissive and starting signals to motor breakers to prevent overloading of the DGs due to high motor starting currents. The -10% load sequence time interval limit ensures that a sufficient time interval exists for the DG to restore frequency and voltage prior to applying the next load. There is no upper limit for the load sequence time interval since, for a single load interval (i.e., the time between two load blocks), the capability of the DG to restore frequency and voltage prior to applying the second load is not negatively affected by a longer than designed load interval, and if there are additional load blocks (i.e., the design includes multiple load intervals), then the lower limit requirements (-10%) will ensure that sufficient time exists for the DG to restore frequency and voltage prior to applying the remaining load blocks (i.e., all load intervals must be $\geq 90\%$ of the design interval). Reference 2 provides a summary of the automatic loading of emergency buses. Since only the Division 1 and 2 DGs have more than one load block, this SR is only applicable to these DGs.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This SR is modified by a Note. The reason for the Note is that performing the Surveillance during these MODES would remove a required offsite circuit from service, perturb the electrical distribution system, and challenge plant safety systems. Credit may be taken for unplanned events that satisfy this SR.

(continued)

BASES

SURVEILLANCE
REQUIREMENTS
(continued)

SR 3.8.1.17

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 3.8.1.9, during a loss of offsite power actuation test signal in conjunction with an ECCS initiation signal. Since the Loss of Voltage – Time Delay Functions are bypassed during an ECCS initiation signal, a 10 second DG start time applies. 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 Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This SR is modified by two 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 (Division 1 and 2 DGs only) and lube 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 (this portion of Note 2 is not applicable to the Division 3 DG). Credit may be taken for unplanned events that satisfy this SR.

SR 3.8.1.18

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

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.8.1.18 (continued)

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

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.

REFERENCES

1. 10 CFR 50, Appendix A, GDC 17.
 2. USAR, Chapter 8.
 3. USAR, Tables 8.3-1, 8.3-2, and 8.3-3.
 4. Regulatory Guide 1.9, Revision 2, December 1979.
 5. USAR, Chapter 6.
 6. USAR, Chapter 15.
 7. 10 CFR 50.36(c)(2)(ii).
 8. Regulatory Guide 1.93, Revision 0, December 1974.
 9. Generic Letter 84-15, July 2, 1984.
 10. 10 CFR 50, Appendix A, GDC 18.
 11. Regulatory Guide 1.9, Revision 3, July 1993.
 12. Regulatory Guide 1.108, Revision 1, August 1977.
 13. Regulatory Guide 1.137, Revision 1, October 1979.
 14. ANSI C84.1, 1982.
 15. USAR, Section 15.6.5.
 16. Deleted.
 17. IEEE Standard 308-1980.
-

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.2 AC Sources – Shutdown

BASES

BACKGROUND

A description of the AC sources is provided in the Bases for LCO 3.8.1, "AC Sources – Operating."

APPLICABLE SAFETY ANALYSES

The OPERABILITY of the minimum AC sources during MODES 4 and 5, and during movement of irradiated fuel assemblies in the secondary containment ensures that:

- a. The unit can be maintained in the shutdown or refueling condition for extended periods;
- b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status; and
- c. Adequate AC electrical power is provided to mitigate events postulated during shutdown, such as an inadvertent draindown of the vessel or a fuel handling accident.

In general, when the unit is shutdown the Technical Specifications (TS) requirements ensure that the unit has the capability to mitigate the consequences of postulated accidents. However, assuming a single failure and concurrent loss of all offsite or loss of all onsite power is not required. The rationale for this is based on the fact that many Design Basis Accidents (DBAs) that are analyzed in MODES 1, 2, and 3 have no specific analyses in MODES 4 and 5. Worst case bounding events are deemed not credible in MODES 4 and 5 because the energy contained within the reactor pressure boundary, reactor coolant temperature and pressure, and the corresponding stresses result in the probabilities of occurrence significantly reduced or eliminated, and minimal consequences. These deviations from DBA analysis assumptions and design requirements during shutdown conditions are allowed by the LCO for required systems.

During MODES 1, 2, and 3, various deviations from the analysis assumptions and design requirements are allowed within the ACTIONS. This allowance is in recognition that

(continued)

BASES

APPLICABLE
SAFETY ANALYSES
(continued)

certain testing and maintenance activities must be conducted provided an acceptable level of risk is not exceeded. During MODES 4 and 5, performance of a significant number of required testing and maintenance activities is also required. In MODES 4 and 5, the activities are generally planned and administratively controlled. Relaxations from typical MODE 1, 2, and 3 LCO requirements are acceptable during shutdown MODES based on:

- a. The fact that time in an outage is limited. This is a risk prudent goal as well as utility economic consideration.
- b. Requiring appropriate compensatory measures for certain conditions. These may include administrative controls, reliance on systems that do not necessarily meet typical design requirements applied to systems credited in operating MODE analyses, or both.
- c. Prudent utility consideration of the risk associated with multiple activities that could affect multiple systems.
- d. Maintaining, to the extent practical, the ability to perform required functions (even if not meeting MODE 1, 2, and 3 OPERABILITY requirements) with systems assumed to function during an event.

In the event of an accident during shutdown, this LCO ensures the capability of supporting systems necessary to avoid immediate difficulty, assuming either a loss of all offsite power or a loss of all onsite (diesel generator (DG)) power.

The AC sources satisfy Criterion 3 of Reference 1.

LCO

One offsite circuit supplying onsite Class 1E power distribution subsystem(s) of LCO 3.8.9, "Distribution Systems – Shutdown," ensures that all required loads are powered from offsite power. An OPERABLE DG, associated with a Division 1 or Division 2 Distribution System emergency bus required OPERABLE by LCO 3.8.9, ensures a diverse power source is available to provide electrical power support, assuming a loss of the offsite circuit. Similarly, when the high pressure core spray (HPCS) is required to be OPERABLE,

(continued)

BASES

LCO
(continued)

a separate offsite circuit to the Division 3 Class 1E onsite electrical power distribution subsystem, or an OPERABLE Division 3 DG, ensures an additional source of power for the HPCS. This additional source for Division 3 is not necessarily required to be connected to be OPERABLE. Either the circuit required by LCO Item a., or a circuit required to meet LCO Item c. may be connected, with the second source available for connection. Together, OPERABILITY of the required offsite circuit(s) and DG(s) ensure the availability of sufficient AC sources to operate the plant in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents, reactor vessel draindown).

The qualified offsite circuit(s) must be capable of maintaining rated frequency and voltage while connected to their respective emergency bus(es), and of accepting required loads during an accident. Qualified offsite circuits are those that are described in the USAR and are part of the licensing basis for the plant. The offsite circuit from the 345 kV/115 kV Scriba Substation consists of the incoming breaker and disconnect to the respective reserve station service transformers 2RTX-XSR1A and 2RTX-XSR1B and auxiliary boiler transformer 2ABS-X1, the respective 2RTX-XSR1A, 2RTX-XSR1B, and 2ABS-X1 transformers, and the respective circuit path including feeder breakers to all 4.16 kV emergency buses required by LCO 3.8.9.

The required DG must be capable of starting, accelerating to rated speed and voltage, and connecting to its respective emergency bus on detection of bus undervoltage, and accepting required loads. This sequence must be accomplished within 13.20 seconds. The start time includes the 3.20 second Loss of Voltage – Time Delay Function Allowable Value specified in LCO 3.3.8.1, "Loss of Power (LOP) Instrumentation." Each DG must also be capable of accepting required loads within the assumed loading sequence intervals, and must continue to operate until offsite power can be restored to the emergency buses. These capabilities are required to be met from a variety of initial conditions such as: DG in standby with the engine hot and DG in standby with the engine at ambient conditions. Additional DG capabilities must be demonstrated to meet required Surveillances, e.g., capability of the DG to revert to standby status on an ECCS signal while operating in parallel test mode.

(continued)

BASES

LCO
(continued)

Proper sequencing of loads, including tripping of nonessential loads, is a required function for DG OPERABILITY. The necessary portions of the Service Water System and Ultimate Heat Sink capable of providing cooling to the required DG(s) are also required. In addition, proper sequencing of loads is a required function for offsite circuit OPERABILITY.

It is acceptable for divisions to be cross tied during shutdown conditions, permitting a single offsite power circuit to supply all required divisions.

APPLICABILITY

The AC sources required to be OPERABLE in MODES 4 and 5 and during movement of irradiated fuel assemblies in the secondary containment provide assurance that:

- a. Systems to provide adequate coolant inventory makeup are available for the irradiated fuel in the core in case of an inadvertent draindown of the reactor vessel;
- b. Systems needed to mitigate a fuel handling accident are available;
- c. Systems necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and
- d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

The AC power requirements for MODES 1, 2, and 3 are covered in LCO 3.8.1.

ACTIONS

LCO 3.0.3 is not applicable while in MODE 4 or 5. However, since irradiated fuel assembly movement can occur in MODE 1, 2, or 3, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Entering LCO 3.0.3 while in MODE 1, 2, or 3 would require the unit to be shutdown, but would not require

(continued)

BASES

ACTIONS
(continued)

immediate suspension of movement of irradiated fuel assemblies. The Note to the ACTIONS, "LCO 3.0.3 is not applicable," ensures that the actions for immediate suspension of irradiated fuel assembly movement are not postponed due to entry into LCO 3.0.3.

A.1

An offsite circuit is considered inoperable if it is not available to one required 4.16 kV emergency bus. If two or more 4.16 kV emergency buses are required per LCO 3.8.9, division(s) with offsite power available may be capable of supporting sufficient required features to allow continuation of CORE ALTERATIONS, fuel movement, and operations with a potential for draining the reactor vessel. By the allowance of the option to declare required features inoperable that are not powered from offsite power, appropriate restrictions can be implemented in accordance with the required feature(s) LCOs' ACTIONS. Required features remaining powered from a qualified offsite circuit, even if that circuit is considered inoperable because it is not powering other required features, are not declared inoperable by this Required Action.

A.2.1, A.2.2, A.2.3, A.2.4, B.1, B.2, B.3, and B.4

With the offsite circuit not available to all required divisions, the option still exists to declare all required features inoperable per Required Action A.1. Since this option may involve undesired administrative efforts, the allowance for sufficiently conservative actions is made. With the required DG inoperable, the minimum required diversity of AC power sources is not available. It is, therefore, required to suspend CORE ALTERATIONS, movement of irradiated fuel assemblies in the secondary containment, and activities that could potentially result in inadvertent draining of the reactor vessel.

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize probability of the occurrence of postulated events. It is further required to initiate action immediately to restore the required AC sources and to

(continued)

BASES

ACTIONS

A.2.1, A.2.2, A.2.3, A.2.4, B.1, B.2, B.3, and B.4 (continued)

continue this action until restoration is accomplished in order to provide the necessary AC power to the plant safety systems.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required AC electrical power sources should be completed as quickly as possible in order to minimize the time during which the plant safety systems may be without sufficient power.

Pursuant to LCO 3.0.6, the Distribution System ACTIONS are not entered even if all AC sources to it are inoperable, resulting in de-energization. Therefore, the Required Actions of Condition A have been modified by a Note to indicate that when Condition A is entered with no AC power to any required emergency bus, ACTIONS for LCO 3.8.9 must be immediately entered. This Note allows Condition A to provide requirements for the loss of the offsite circuit whether or not a division is de-energized. LCO 3.8.9 provides the appropriate restrictions for the situation involving a de-energized division.

C.1

When the HPCS System is required to be OPERABLE, and the additional required Division 3 AC source is inoperable, the required diversity of AC power sources to the HPCS System is not available. Since these sources only affect the HPCS System, the HPCS System is declared inoperable and the Required Actions of LCO 3.5.2, "Emergency Core Cooling Systems – Shutdown" entered.

In the event all sources of power to Division 3 are lost, Condition A will also be entered and direct that the ACTIONS of LCO 3.8.9 be taken. If only the Division 3 additional required AC source is inoperable, and power is still supplied to HPCS, 72 hours is allowed to restore the additional required AC source to OPERABLE. This is reasonable considering HPCS System will still perform its function, absent an additional single failure.

(continued)

BASES (continued)

SURVEILLANCE
REQUIREMENTS

SR 3.8.2.1

SR 3.8.2.1 requires the SRs from LCO 3.8.1 that are necessary for ensuring the OPERABILITY of the AC sources in other than MODES 1, 2, and 3 to be applicable. SR 3.8.1.15 is not required to be met because the required OPERABLE DG(s) is not required to undergo periods of being synchronized to the offsite circuit. SR 3.8.1.18 is excepted because starting independence is not required with the DG(s) that is not required to be OPERABLE. Refer to the corresponding Bases for LCO 3.8.1 for a discussion of each SR.

This SR is modified by two Notes. The reason for Note 1 is to preclude requiring the OPERABLE DG(s) from being paralleled with the offsite power network or otherwise rendered inoperable during the performance of SRs, and to preclude de-energizing a required 4.16 kV emergency bus or disconnecting a required offsite circuit during performance of SRs. With limited AC sources available, a single event could compromise both the required circuit and the DG. It is the intent that these SRs must still be capable of being met, but actual performance is not required during periods when the DG and offsite circuit are required to be OPERABLE. Note 2 states that SRs 3.8.1.10 and 3.8.1.17 are not required to be met when its associated ECCS subsystem(s) are not required to be OPERABLE. These SRs demonstrate the DG response to an ECCS initiation signal (either alone or in conjunction with a loss of offsite power signal). This is consistent with the ECCS instrumentation requirements that do not require the ECCS initiation signals when the associated ECCS subsystem is not required to be OPERABLE per LCO 3.5.2, "ECCS – Shutdown."

REFERENCES

1. 10 CFR 50.36(c)(2)(ii).
-
-

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.3 Diesel Fuel Oil, Lube Oil, and Starting Air

BASES

BACKGROUND

Each diesel generator (DG) is provided with a storage tank having a fuel oil capacity sufficient to operate that DG for a period of 7 days while the DG is supplying maximum post loss of coolant accident load demand (Ref. 1). The maximum load demand is calculated using the assumption that at least two DGs are available. This onsite fuel oil capacity is sufficient to operate the DGs for longer than the time to replenish the onsite supply from outside sources.

Fuel oil is transferred from each storage tank to its respective day tank by two transfer pumps associated with each storage tank. Redundancy of pumps and piping precludes the failure of one pump, or the rupture of any pipe, valve, or tank to result in the loss of more than one DG. With the exception of certain components (e.g., the fill connections), all outside tanks, pumps, and piping are located underground. The fuel oil level in the storage tank is indicated locally and is provided with high and low level switches which actuate alarm annunciators in the main control room.

For proper operation of the standby DGs, it is necessary to ensure the proper quality of the fuel oil. Regulatory Guide 1.137 (Ref. 2) addresses the recommended fuel oil practices as supplemented by ANSI N195 (Ref. 3). The fuel oil properties governed by these SRs are the water and sediment content, the kinematic viscosity, specific gravity (or API gravity or absolute specific gravity), and impurity level.

The DG lubrication system is designed to provide sufficient lubrication to permit proper operation of its associated DG under all loading conditions. The system is required to circulate the lube oil to the diesel engine working surfaces and to remove excess heat generated by friction during operation. Each engine oil sump is sized to contain an inventory capable of supporting a minimum of 7 days of operation. This supply is sufficient to allow the operator to replenish lube oil from outside sources.

(continued)

BASES

BACKGROUND
(continued)

Each DG has an air start subsystem (that includes two air receivers) with adequate capacity for five successive starts without recharging the air start receivers.

APPLICABLE
SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in USAR, Chapter 6 (Ref. 4) and Chapter 15 and Appendix A (Ref. 5), assume Engineered Safety Feature (ESF) systems are OPERABLE. The DGs are designed to provide sufficient capacity, capability, redundancy, and reliability to ensure the availability of necessary power to ESF systems so that 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 3.5, Emergency Core Cooling Systems (ECCS) and Reactor Core Isolation Cooling (RCIC) System; and Section 3.6, Containment Systems.

Since diesel fuel oil, lube oil, and starting air subsystem support the operation of the standby AC power sources, they satisfy Criterion 3 of Reference 6.

LCO

Stored diesel fuel oil is required to have sufficient supply for 7 days of full load operation. It is also required to meet specific standards for quality. Additionally, sufficient lube oil supply must be available to ensure the capability to operate at full load for 7 days. This requirement, in conjunction with an ability to obtain replacement supplies within 7 days, supports the availability of DGs required to shut down the reactor and to maintain it in a safe condition for an anticipated operational occurrence (AOO) or a postulated DBA with loss of offsite power. DG day tank fuel requirements, as well as transfer capability from the storage tank to the day tank, are addressed in LCO 3.8.1, "AC Sources – Operating," and LCO 3.8.2, "AC Sources – Shutdown."

The starting air system is required to have a minimum capacity for five successive DG starts without recharging the air start receivers. Both air start receivers per DG are required to ensure adequate capacity.

(continued)

BASES (continued)

APPLICABILITY

The AC sources (LCO 3.8.1 and LCO 3.8.2) are required to ensure the availability of the required power to shut down the reactor and maintain it in a safe shutdown condition after an AOO or a postulated DBA. Since stored diesel fuel oil, lube oil, and starting air subsystems support LCO 3.8.1 and LCO 3.8.2, stored diesel fuel oil, lube oil, and starting air are required to be within limits when the associated DG is required to be OPERABLE.

ACTIONS

The ACTIONS Table is modified by a Note indicating that separate Condition entry is allowed for each DG. This is acceptable, since the Required Actions for each Condition provide appropriate compensatory actions for each inoperable DG subsystem. Complying with the Required Actions for one inoperable DG subsystem may allow for continued operation, and subsequent inoperable DG subsystem(s) are governed by separate Condition entry and application of associated Required Actions.

A.1

With fuel oil level < 50,000 gallons in a Division 1 or 2 DG storage tank, or < 35,342 gallons in the Division 3 DG storage tank, the 7 day fuel oil supply for a DG is not available. However, the Condition is restricted to fuel oil level reductions that maintain at least a 6 day supply. These circumstances may be caused by events such as:

- a. Full load operation required after an inadvertent start while at minimum required level; or
- b. Feed and bleed operations that may be necessitated by increasing particulate levels or any number of other oil quality degradations.

This restriction allows sufficient time for obtaining the requisite replacement volume and performing the analyses required prior to addition of the fuel oil to the tank. A period of 48 hours is considered sufficient to complete restoration of the required level prior to declaring the DG inoperable. This period is acceptable based on the remaining capacity (> 6 days), the fact that procedures will be initiated to obtain replenishment, and the low probability of an event during this brief period.

(continued)

BASES

ACTIONS
(continued)

B.1

With lube oil inventory < 99 gallons for a Division 1 or 2 DG or < 168 gallons for the Division 3 DG, sufficient lube oil to support 7 days of continuous DG operation at full load conditions may not be available. However, the Condition is restricted to lube oil volume reductions that maintain at least a 6 day supply. This restriction allows sufficient time for obtaining the requisite replacement volume. A period of 48 hours is considered sufficient to complete restoration of the required volume prior to declaring the DG inoperable. This period is acceptable based on the remaining capacity (> 6 days), the low rate of usage, the fact that procedures will be initiated to obtain replenishment, and the low probability of an event during this brief period.

C.1

This Condition is entered as a result of a failure to meet the acceptance criterion for particulates. Normally, trending of particulate levels allows sufficient time to correct high particulate levels prior to reaching the limit of acceptability. Poor sample procedures (bottom sampling), contaminated sampling equipment, and errors in laboratory analysis can produce failures that do not follow a trend. Since the presence of particulate does not mean failure of the fuel oil to burn properly in the diesel engine, since particulate concentration is unlikely to change significantly between Surveillance Frequency intervals, and since proper engine performance has been recently demonstrated (within 31 days), it is prudent to allow a brief period prior to declaring the associated DG inoperable. The 7 day Completion Time allows for further evaluation, resampling, and re-analysis of the DG fuel oil.

D.1

With the new fuel oil properties defined in the Bases for SR 3.8.3.3 not within the required limits, a period of 30 days is allowed for restoring the stored fuel oil properties. This period provides sufficient time to test the stored fuel oil to determine that the new fuel oil, when mixed with previously stored fuel oil, remains acceptable,

(continued)

BASES

ACTIONS

D.1 (continued)

or to restore the stored fuel oil properties. This restoration may involve feed and bleed procedures, filtering, or a combination of these procedures. Even if a DG start and load was required during this time interval and the fuel oil properties were outside limits, there is high likelihood that the DG would still be capable of performing its intended function.

E.1

With any starting air receiver pressure < 225 psig for a Division 1 or 2 DG or < 190 psig for the Division 3 DG, sufficient capacity for five successive DG starts does not exist. However, as long as the receiver pressure in both receivers is ≥ 175 psig for a Division 1 or 2 DG and ≥ 110 psig for the Division 3 DG, there is adequate capacity for at least one start, and the DG can be considered OPERABLE while the air receiver pressure is restored to the required limit. A period of 48 hours is considered sufficient to complete restoration to the required pressure prior to declaring the DG inoperable. This period is acceptable based on the remaining air start capacity, the fact that most DG starts are accomplished on the first attempt, and the low probability of an event during this brief period.

E.1

With a Required Action and associated Completion Time of Condition A, B, C, D, or E not met, or the stored diesel fuel oil, lube oil, or starting air subsystem not within limits for reasons other than addressed by Conditions A through E, the associated DG may be incapable of performing its intended function and must be immediately declared inoperable.

SURVEILLANCE
REQUIREMENTS

SR 3.8.3.1

This SR provides verification that there is an adequate inventory of fuel oil in the storage tanks to support each DG's operation for 7 days at full load. The 7 day period is

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.8.3.1 (continued)

sufficient time to place the unit in a safe shutdown condition and to bring in replenishment fuel from an offsite location.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.8.3.2

This Surveillance ensures that sufficient lube oil inventory (above the manufacturers minimum recommended level) is available to support at least 7 days of full load operation for each DG. The 99 gallon requirement for the Division 1 and 2 DGs and the 168 gallon requirement for the Division 3 DG are based on the DG manufacturer's consumption values for the run time of the DG. The 7 day inventory can be in the engine oil sump or a combination of the engine oil sump and remote storage location. Implicit in this SR is the requirement to verify the capability to transfer the lube oil from its storage location to the DG when the DG lube oil sumps do not hold adequate inventory for 7 days of full load operation without the level reaching the manufacturer's recommended minimum level.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.8.3.3

The tests of new fuel oil prior to addition to the storage tanks are a means of determining whether new fuel oil is of the appropriate grade and has not been contaminated with substances that would have an immediate detrimental impact on diesel engine combustion and operation. If results from these tests are within acceptable limits, the fuel oil may be added to the storage tanks without concern for contaminating the entire volume of fuel oil in the storage tanks. These tests are to be conducted prior to adding the new fuel to the storage tank(s).

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.8.3.3 (continued)

The tests, limits, and applicable ASTM Standards are as follows:

- a. Sample the new fuel oil in accordance with ASTM D4057-81 (Ref. 7);
- b. Verify in accordance with the tests specified in ASTM D975-81 (Ref. 7) that: (1) the sample has an API gravity of within 0.3° at 60°F or a specific gravity of within 0.0016 at 60/60°F, when compared to the supplier's certificate, or the sample has an absolute specific gravity at 60/60°F of ≥ 0.83 and ≤ 0.89 or an API gravity at 60°F of ≥ 27 and ≤ 39 ; (2) a kinematic viscosity at 40°C of ≥ 1.9 centistokes and ≤ 4.1 centistokes; and (3) a flash point of $\geq 125^\circ\text{F}$; and
- c. Verify that the new fuel oil has a clear and bright appearance when tested in accordance with ASTM D4176-82 (Ref. 7).

Failure to meet any of the above limits is cause for rejecting the new fuel oil, but does not represent a failure to meet the LCO since the fuel oil is not added to the storage tanks.

Following the initial new fuel oil sample, the fuel oil is analyzed within 31 days following addition of the new fuel oil to the fuel oil storage tank(s) to establish that the other properties specified in Table 1 of ASTM D975-81 (Ref. 7) are met for new fuel oil when tested in accordance with ASTM D975-81 (Ref. 7), except that the analysis for sulfur may be performed in accordance with ASTM D1552-79 (Ref. 7) or ASTM D2622-82 (Ref. 7).

The 31 day period is acceptable because the fuel oil properties of interest, even if not within stated limits, would not have an immediate effect on DG operation. This Surveillance ensures the availability of high quality fuel oil for the DGs.

Fuel oil degradation during long term storage shows up as an increase in particulate, mostly due to oxidation. The presence of particulate does not mean that the fuel oil will

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.8.3.3 (continued)

not burn properly in a diesel engine. However, the particulate can cause fouling of filters and fuel oil injection equipment, which can cause engine failure.

Particulate concentrations should be determined in accordance with ASTM D2276-78, Method A (Ref. 7). This method involves a gravimetric determination of total particulate concentration in the fuel oil and has a limit of 10 mg/l. It is acceptable to obtain a field sample for subsequent laboratory testing in lieu of field testing.

The Frequency of this Surveillance takes into consideration fuel oil degradation trends indicating that particulate concentration is unlikely to change between Frequency intervals.

SR 3.8.3.4

This Surveillance ensures that, without the aid of the refill compressor, sufficient air start capacity for each DG is available. The system design requirements provide for a minimum of five engine starts without recharging. The pressure specified in this SR is intended to support the lowest value in both receivers at which the five starts can be accomplished.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.8.3.5

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. Periodic removal of water from the storage tanks eliminates the necessary environment for bacterial survival. This is the most effective means of controlling microbiological fouling. In addition, it eliminates the potential for water entrainment in the fuel oil during DG operation. Water

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.8.3.5 (continued)

may come from any of several sources, including condensation, ground water, rain water, contaminated fuel oil, and from breakdown of the fuel oil by bacteria. Frequent checking for and removal of accumulated water minimizes fouling and provides data regarding the watertight integrity of the fuel oil system. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. USAR, Section 9.5.4.
 2. Regulatory Guide 1.137, Revision 1, October 1979.
 3. ANSI N195, Appendix B, 1976.
 4. USAR, Chapter 6.
 5. USAR, Chapter 15 and Appendix A.
 6. 10 CFR 50.36(c)(2)(ii).
 7. ASTM Standards: D4057-81; D975-81; D4176-82; D1552-79; D2622-82; D2276-78.
-
-

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.4 DC Sources – Operating

BASES

BACKGROUND

The station DC electrical power system provides the AC emergency 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 three independent Class 1E DC electrical power subsystems, Divisions 1, 2, and 3. Each subsystem consists of a battery, two 100% capacity battery chargers, and all the associated control equipment and interconnecting cabling.

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

Each of the Division 1 and 2 electrical power subsystems provides the protection and control power for its associated Class 1E AC power load group, 4.16 kV emergency switchgear, and 600 V load centers. Also, these DC subsystems provide DC electrical power to the associated diesel generator (DG) control panels, DG field flashing, and the emergency uninterruptible power supply (UPS) inverters, which in turn power the 120 VAC uninterruptible panels. In addition, the Division 1 DC electrical power subsystem provides power to the Reactor Core Isolation Cooling System loads. The Division 3 DC electrical power subsystem provides power for High Pressure Core Spray (HPCS) DG field flashing control logic and control and switching function of 4.16 kV Division 3 breakers. It also provides motive and control power for the HPCS System logic, HPCS DG control and protection, and all Division 3 related control.

(continued)

BASES

BACKGROUND
(continued)

The DC power distribution system is described in more detail in the Bases for LCO 3.8.8, "Distribution Systems – Operating," and LCO 3.8.9, "Distribution Systems – Shutdown," while a description of the Division 1 and 2 emergency UPS inverters is provided in the Bases for LCO 3.8.7, "Inverters – Operating."

Each Division 1, 2, and 3 battery has adequate storage capacity to carry the required load continuously for at least 2 hours as discussed in the USAR, Section 8.3.2 (Ref. 4).

Each DC battery subsystem 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 subsystems such as batteries, battery chargers, or distribution panels.

The batteries for a DC electrical power subsystem are sized to produce required capacity at 80% of nameplate rating, corresponding to warranted capacity at end of life cycles and the 100% design demand. The voltage design limit is 1.75 V per cell (Ref. 4).

Each DC electrical power subsystem battery charger has ample power output capacity for the steady state operation of 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 the battery bank from the design minimum charge to its fully charged state within 24 hours while supplying normal steady state loads (Ref. 4).

APPLICABLE
SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the USAR, Chapter 6 (Ref. 5), and Chapter 15 and Appendix A (Ref. 6), assume that ESF systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the DGs, emergency auxiliaries, 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 Reference 7.

LCO

The DC electrical power subsystems, each subsystem consisting of one battery, one battery charger, and the corresponding control equipment and interconnecting cabling supplying power to the associated bus within the divisions, 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).

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 and other conditions in which the DC electrical power sources are required are addressed in LCO 3.8.5, "DC Sources – Shutdown."

(continued)

BASES (continued)

ACTIONS

A.1

Condition A represents one division 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. The 2 hour limit is consistent with the allowed time for an inoperable DC distribution system division.

If one of the required Division 1 or 2 DC electrical power subsystems is inoperable (e.g., inoperable battery, inoperable required battery charger, or inoperable required 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 2 hours. The 2 hour Completion Time is based on Regulatory Guide 1.93 (Ref. 8) and 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.

B.1

With the Division 3 DC electrical power subsystem inoperable, the HPCS System may be incapable of performing its intended function and must be immediately declared inoperable. This declaration also requires entry into applicable Conditions and Required Actions of LCO 3.5.1, "ECCS – Operating."

C.1 and C.2

If the DC electrical power subsystem 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 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

(continued)

BASES

ACTIONS

C.1 and C.2 (continued)

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 specified in Regulatory Guide 1.93 (Ref. 8).

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 and maintain the battery 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 Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.8.4.2

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

The connection resistance limits are $\leq 20\%$ above the resistance as measured during installation (Ref. 9).

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

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

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.8.4.3 (continued)

battery performance. The presence of physical damage or deterioration does not necessarily represent a failure of this SR, provided an evaluation determines that the physical damage or deterioration does not affect the OPERABILITY of the battery (its ability to perform its design function).

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.8.4.4 and SR 3.8.4.5

Visual inspection and resistance measurements of intercell 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 are $\leq 20\%$ above the resistance as measured during installation (Ref. 9).

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

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. 10), the battery charger supply

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.8.4.6 (continued)

is required to be based on the largest combined demands of 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 controlled under the Surveillance Frequency Control Program.

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 is controlled under the Surveillance Frequency Control Program.

This SR is modified by two Notes. Note 1 allows the performance of a modified performance discharge test in lieu of a service test provided the modified performance discharge test completely envelops the service test. This substitution is acceptable because a modified performance discharge test represents a more severe test of battery capacity than SR 3.8.4.7. 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. The Division 3 test may be performed in MODE 1, 2, or 3 in conjunction with HPCS system outages. Credit may be taken for unplanned events that satisfy the Surveillance.

(continued)

BASES

SURVEILLANCE
REQUIREMENTS
(continued)

SR 3.8.4.8

A battery performance discharge 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.

A battery modified performance discharge test is a simulated duty cycle normally consisting of just two rates; the one minute rate published for the battery or the largest current load of the duty cycle, followed by the test rate employed for the performance discharge test, both of which envelope the duty cycle of the service test. (The test can consist of a single rate if the test rate employed for the performance discharge test exceeds the 1 minute rate.) Since the ampere-hours removed by a rated one minute discharge represents a very small portion of the battery capacity, the test rate can be changed to that for the performance test without compromising the results of the performance discharge test. The battery terminal voltage for the modified performance discharge test should remain above the minimum battery terminal voltage specified in the battery performance discharge test for the duration of time equal to that of the performance discharge 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 discharge test should be identical to those specified for a performance discharge test. Either the battery performance discharge test or the modified performance discharge test is acceptable for satisfying SR 3.8.4.8; however, only the modified performance discharge test may be used to satisfy SR 3.8.4.8 while satisfying the requirements of SR 3.8.4.7 at the same time.

The acceptance criteria for this Surveillance is consistent with IEEE-450 (Ref. 9) and IEEE-485 (Ref. 11). These references recommend that the battery be replaced if its capacity is below 80% of the manufacturers rating, since IEEE-485 (Ref. 11) recommends using an aging factor of 125%

(continued)

BASES

SURVEILLANCE

SR 3.8.4.8 (continued)

in the battery size calculation. A capacity of 80% shows that the battery is getting old and capacity will decrease more rapidly, even if there is ample capacity to meet the load requirements.

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. If the battery shows degradation, or if the battery has reached 85% of its expected life and capacity is < 100% of the manufacturer's rating, the Surveillance Frequency is reduced to 12 months. However, if the battery shows no degradation but has reached 85% of its expected life, the Surveillance Frequency is only reduced to 24 months for batteries that retain capacity $\geq 100\%$ of the manufacturer's rating. Degradation is indicated, consistent with IEEE-450 (Ref. 9), when the battery capacity drops by more than 10% of rated capacity in the previous 72 months or when it is below 90% of the manufacturer's rating. The 12 month frequency is consistent with the recommendations in IEEE-450 (Ref. 9). The 24 month Frequency is derived from the recommendations of IEEE-450 (Ref. 9).

This SR is modified by a Note. The reason for the Note is that performing the Surveillance would remove a required DC electrical power subsystem from service, perturb the electrical distribution system, and challenge safety systems. The Division 3 test may be performed in MODE 1, 2, or 3 in conjunction with HPCS system outages. 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, Revision 0, March 10, 1971.
3. IEEE Standard 308, 1974.
4. USAR, Section 8.3.2.
5. USAR, Chapter 6.
6. USAR, Chapter 15 and Appendix A.
7. 10 CFR 50.36(c)(2)(ii).

(continued)

BASES

REFERENCES
(continued)

8. Regulatory Guide 1.93, Revision 0, December 1974.
 9. IEEE Standard 450, 1980.
 10. Regulatory Guide 1.32, Revision 2, February 1977.
 11. IEEE Standard 485, 1978.
-
-

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.5 DC Sources - Shutdown

BASES

BACKGROUND A description of the DC sources is provided in the Bases for LCO 3.8.4, "DC Sources – Operating."

APPLICABLE SAFETY ANALYSES The initial conditions of Design Basis Accident and transient analyses in the USAR, Chapter 6 (Ref. 1) and Chapter 15 and Appendix A (Ref. 2), assume that Engineered Safety Feature systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the diesel generators, emergency auxiliaries, and control and switching during all MODES of operation and during movement of irradiated fuel assemblies in the secondary containment.

The OPERABILITY of the DC subsystems is consistent with the initial assumptions of the accident analyses and the requirements for the supported systems' OPERABILITY.

The OPERABILITY of the minimum DC electrical power sources during MODES 4 and 5 and during movement of irradiated fuel assemblies in the secondary containment ensures that:

- a. The facility can be maintained in the shutdown or refueling condition for extended periods;
- b. Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status; and
- c. Adequate DC electrical power is provided to mitigate events postulated during shutdown, such as an inadvertent draindown of the vessel or a fuel handling accident.

In general, when the unit is shutdown, the Technical Specifications requirements ensure that the unit has the capability to mitigate the consequences of postulated accidents. However, assuming a single failure and concurrent loss of all offsite or all onsite power is not required. The rationale for this is based on the fact that many Design Basis Accidents (DBAs) that are analyzed in MODES 1, 2, and 3 have no specific analyses in MODES 4 and 5. Worst case bounding events are deemed not credible in MODES 4 and 5

(continued)

BASES

APPLICABLE
SAFETY ANALYSES
(continued)

because the energy contained within the reactor pressure boundary, reactor coolant temperature and pressure, and the corresponding stresses result in the probabilities of occurrence being significantly reduced or eliminated, and in minimal consequences. These deviations from DBA analysis assumptions and design requirements during shutdown are allowed by the LCO for required systems.

The shutdown Technical Specification requirements are designed to ensure that the unit has the capability to mitigate the consequences of certain postulated accidents. Worst case Design Basis Accidents which are analyzed for operating MODES are generally viewed not to be a significant concern during shutdown MODES due to the lower energies involved. The Technical Specifications therefore require a lesser complement of electrical equipment to be available during shutdown than is required during operating MODES. More recent work completed on the potential risks associated with shutdown, however, has found significant risk associated with certain shutdown evolutions. As a result, in addition to the requirements established in the Technical Specifications, the industry has adopted NUMARC 91-06, "Guidelines for Industry Actions to Assess Shutdown Management," as an industry initiative to manage shutdown tasks and associated electrical equipment support to maintain risk at an acceptable low level. This may require the availability of additional equipment beyond that required by the shutdown Technical Specifications.

The DC sources satisfy Criterion 3 of Reference 3.

LCO

The DC electrical power subsystems, each required subsystem consisting of one battery, one battery charger, and the corresponding control equipment and interconnecting cabling supplying power to the associated buses within the division, are required to be OPERABLE to support some of the required DC Distribution System divisions required OPERABLE by LCO 3.8.9, "Distribution Systems – Shutdown." This ensures the availability of sufficient DC electrical power sources to operate the unit in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents and inadvertent reactor vessel draindown).

APPLICABILITY

The DC electrical power sources required to be OPERABLE in MODES 4 and 5 and during movement of irradiated fuel assemblies in the secondary containment provide assurance that:

(continued)

BASES

APPLICABILITY
(continued)

- a. Required features to provide adequate coolant inventory makeup are available for the irradiated fuel assemblies in the core in case of an inadvertent draindown of the reactor vessel;
- b. Required features needed to mitigate a fuel handling accident are available;
- c. Required features necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and
- d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

The DC electrical power requirements for MODES 1, 2, and 3 are covered in LCO 3.8.4.

ACTIONS

LCO 3.0.3 is not applicable while in MODE 4 or 5. However, since irradiated fuel assembly movement can occur in MODE 1, 2, or 3, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Entering LCO 3.0.3 while in MODE 1, 2, or 3 would require the unit to be shutdown, but would not require immediate suspension of movement of irradiated fuel assemblies. The Note to the ACTIONS, "LCO 3.0.3 is not applicable," ensures that the actions for immediate suspension of irradiated fuel assembly movement are not postponed due to entry into LCO 3.0.3.

A.1, A.2.1, A.2.2, A.2.3, and A.2.4

By allowing the option to declare required features inoperable with associated DC electrical power subsystems inoperable, appropriate restrictions are implemented in accordance with the affected system LCOs' ACTIONS. However, in many instances this option may involve undesired administrative efforts. Therefore, the allowance for sufficiently conservative actions is made (i.e., to suspend CORE ALTERATIONS, movement of irradiated fuel assemblies in the secondary containment, and any activities that could result in inadvertent draining of the reactor vessel).

(continued)

BASES

ACTIONS
(continued)

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize the probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required DC electrical power subsystems and to continue this action until restoration is accomplished in order to provide the necessary DC electrical power to the plant safety systems.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required DC electrical power subsystems should be completed as quickly as possible in order to minimize the time during which the plant safety systems may be without sufficient power.

SURVEILLANCE
REQUIREMENTS

SR 3.8.5.1

SR 3.8.5.1 requires all Surveillances required by SR 3.8.4.1 through SR 3.8.4.8 to be applicable. Therefore, see the corresponding Bases for LCO 3.8.4 for a discussion of each SR.

This SR is modified by a Note. The reason for the Note is to preclude requiring the OPERABLE DC sources from being discharged below their capability to provide the required power supply or otherwise rendered inoperable during the performance of SRs. It is the intent that these SRs must still be capable of being met, but actual performance is not required.

REFERENCES

1. USAR, Chapter 6.
 2. USAR, Chapter 15 and Appendix A.
 3. 10 CFR 50.36(c)(2)(ii).
-
-

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.6 Battery Cell Parameters

BASES

BACKGROUND This LCO delineates the limits on electrolyte temperature, level, float voltage, and specific gravity for the DC power source batteries. A discussion of these batteries and their OPERABILITY requirements is provided in the Bases for LCO 3.8.4, "DC Sources – Operating," and LCO 3.8.5, "DC Sources – Shutdown."

APPLICABLE SAFETY ANALYSES The initial conditions of Design Basis Accident (DBA) and transient analyses in USAR, Chapter 6 (Ref. 1) and Chapter 15 and Appendix A (Ref. 2), assume Engineered Safety Feature systems are OPERABLE. The DC electrical power subsystems provide normal and emergency DC electrical power for the diesel generators, emergency auxiliaries, and control and switching during all MODES of operation.

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 as discussed in the Bases for LCO 3.8.4 and LCO 3.8.5.

Since battery cell parameters support the operation of the DC power sources, they satisfy Criterion 3 of Reference 3.

LCO Battery cell parameters must remain within acceptable limits to ensure availability of the required DC power to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence or a postulated DBA. Electrolyte limits are conservatively established, allowing continued DC electrical system function even with limits not met.

APPLICABILITY The battery cell parameters are required solely for the support of the associated DC electrical power subsystem. Therefore, these cell parameters are only required when the associated DC electrical power subsystem is required to be OPERABLE. Refer to the Applicability discussion in Bases for LCO 3.8.4 and LCO 3.8.5.

(continued)

BASES (continued)

ACTIONS

The ACTIONS Table is modified by a Note which indicates that separate Condition entry is allowed for each battery. This is acceptable, since the Required Actions for each Condition provide appropriate compensatory actions for each inoperable DC electrical power subsystem. Complying with the Required Actions for one inoperable DC electrical power subsystem may allow for continued operation, and subsequent inoperable DC electrical power subsystem(s) are governed by separate Condition entry and application of associated Required Actions.

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

With parameters of one or more cells in one or more batteries not within Table 3.8.6-1 limits (i.e., Category A limits not met, Category B limits not met, or Category A and B limits not met) but within the Category C limits specified in Table 3.8.6-1, the battery is degraded but there is still sufficient capacity to perform the intended function. Therefore, the affected battery is not required to be considered inoperable solely as a result of Category A or B limits not met, and continued operation is permitted for a limited period.

The pilot cell(s) electrolyte level and float voltage are required to be verified to meet Category C limits within 1 hour (Required Action A.1). This check provides a quick indication of the status of the remainder of the battery cells. One hour provides time to inspect the electrolyte level and to confirm the float voltage of the pilot cell(s). One hour is considered a reasonable amount of time to perform the required verification.

Verification that the Category C limits are met (Required Action A.2) provides assurance that, during the time needed to restore the parameters to the Category A and B limits, the battery is still capable of performing its intended function. A period of 24 hours is allowed to complete the initial verification because specific gravity measurements must be obtained for each connected cell. Taking into consideration both the time required to perform the required verification and the assurance that the battery cell parameters are not severely degraded, this time is considered reasonable. The verification is repeated at

(continued)

BASES

ACTIONS

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

7 day intervals until the parameters are restored to Category A and B limits. This periodic verification is consistent with the normal Frequency of pilot cell Surveillances.

Continued operation is only permitted for 31 days before battery cell parameters must be restored to within Category A and B limits. Taking into consideration that while battery capacity is degraded, sufficient capacity exists to perform the intended function and to allow time to fully restore the battery cell parameters to normal limits, this time is acceptable for operation prior to declaring the associated DC batteries inoperable.

B.1

When any battery parameter is outside the Table 3.8.6-1 Category C limit for any connected cell, sufficient capacity to supply the maximum expected load requirement is not assured and the corresponding DC electrical power subsystem must be declared inoperable. Additionally, other potentially extreme conditions, such as any Required Action of Condition A and associated Completion Time not met or average electrolyte temperature of representative cells $\leq 65^{\circ}\text{F}$, also are cause for immediately declaring the associated DC electrical power subsystem inoperable.

SURVEILLANCE
REQUIREMENTS

SR 3.8.6.1

The SR verifies that Table 3.8.6-1 Category A battery cell parameters are consistent with IEEE-450 (Ref. 4), which recommends regular battery inspections including voltage, specific gravity, and electrolyte level of pilot cells. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.8.6.2

The Surveillance Frequency is controlled under the Surveillance Frequency Control Program. In addition, within 7 days of a battery discharge $< 107\text{ V}$ or a battery overcharge $> 142\text{ V}$, the battery must be demonstrated to meet Table 3.8.6-1

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.8.6.2 (continued)

Category B limits. Transients, such as motor starting transients, which may momentarily cause battery voltage to drop to < 107 V, do not constitute a battery discharge provided the battery terminal voltage and float current return to pre-transient values. This inspection is also consistent with IEEE-450 (Ref. 4), which recommends special inspections following a severe discharge or overcharge, to ensure that no significant degradation of the battery occurs as a consequence of such discharge or overcharge. The 7 day requirement is based on engineering judgement.

SR 3.8.6.3

This Surveillance verification that the average temperature of representative cells is $\geq 65^{\circ}\text{F}$ is consistent with a recommendation of IEEE-450 (Ref. 4). For this SR, a check of 20% of the connected cells is considered representative. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

Lower than normal temperatures act to inhibit or reduce battery capacity. This SR ensures that the operating temperatures remain within an acceptable operating range. This limit is based on manufacturers recommendations and the battery sizing calculations.

Table 3.8.6-1

This Table delineates the limits on electrolyte level, float voltage, and specific gravity for three different categories. The meaning of each category is discussed below.

Category A defines the normal parameter limit for each designated pilot cell in each battery. The cells selected as pilot cells are those whose temperature, voltage, and electrolyte specific gravity approximate the state of charge of the entire battery.

The Category A limits specified for electrolyte level are based on manufacturers recommendations and are consistent with the guidance in IEEE-450 (Ref. 4), with the extra $\frac{1}{4}$ inch allowance above the high water level indication for

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

Table 3.8.6-1 (continued)

operating margin to account for temperatures and charge effects. In addition to this allowance, footnote a to Table 3.8.6-1 permits the electrolyte level to be temporarily above the specified maximum level during and following an equalizing charge (i.e., for up to 3 days following the completion of an equalize charge), provided it is not overflowing. These limits ensure that the plates suffer no physical damage, and that adequate electron transfer capability is maintained in the event of transient conditions. IEEE-450 (Ref. 4) recommends that electrolyte level readings should be made only after the battery has been at float charge for at least 72 hours.

The Category A limit specified for float voltage is ≥ 2.13 V per cell. This value is based on manufacturers recommendations and on the recommendation of IEEE-450 (Ref. 4), which states that prolonged operation of cells below 2.13 V can reduce the life expectancy of cells.

The Category A limit specified for specific gravity for each pilot cell is ≥ 1.200 (0.015 below the manufacturers fully charged nominal specific gravity or a battery charging current that had stabilized at a low value). This value is characteristic of a charged cell with adequate capacity. According to IEEE-450 (Ref. 4), the specific gravity readings are based on a temperature of 77°F (25°C).

The specific gravity readings are corrected for actual electrolyte temperature and level. For each 3°F (1.67°C) above 77°F (25°C), 1 point (0.001) is added to the reading; 1 point is subtracted for each 3°F below 77°F. The specific gravity of the electrolyte in a cell increases with a loss of water due to electrolysis or evaporation. Level correction will be in accordance with manufacturers recommendations.

Category B defines the normal parameter limits for each connected cell. The term "connected cell" excludes any battery cell that may be jumpered out.

The Category B limits specified for electrolyte level and float voltage are the same as those specified for Category A and have been discussed above. The Category B limit

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

Table 3.8.6-1 (continued)

specified for specific gravity for each connected cell is ≥ 1.195 (0.020 below the manufacturers fully charged, nominal specific gravity) with the average of all connected cells > 1.205 (0.010 below the manufacturers fully charged, nominal specific gravity). These values are based on manufacturers recommendations. The minimum specific gravity value required for each cell ensures that a cell with a marginal or unacceptable specific gravity is not masked by averaging with cells having higher specific gravities.

Category C defines the limit for each connected cell. These values, although reduced, provide assurance that sufficient capacity exists to perform the intended function and maintain a margin of safety. When any battery parameter is outside the Category C limit, the assurance of sufficient capacity described above no longer exists, and the battery must be declared inoperable.

The Category C limit specified for electrolyte level (above the top of the plates and not overflowing) ensures that the plates suffer no physical damage and maintain adequate electron transfer capability. The Category C limit for float voltage is based on IEEE-450, Appendix C (Ref. 4), which states that a cell voltage of 2.07 V or below, under float conditions and not caused by elevated temperature of the cell, indicates internal cell problems and may require cell replacement.

The Category C limit of average specific gravity (≥ 1.195), is based on manufacturers recommendations (0.020 below the manufacturers recommended fully charged, nominal specific gravity). In addition to that limit, it is required that the specific gravity for each connected cell must be no more than 0.020 below the average of all connected cells. This limit ensures that a cell with a marginal or unacceptable specific gravity is not masked by averaging with cells having higher specific gravities.

The footnotes to Table 3.8.6-1 that apply to specific gravity are applicable to Category A, B, and C specific gravity. Footnote b requires the above mentioned correction for electrolyte level and temperature.

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

Table 3.8.6-1 (continued)

Because of specific gravity gradients that are produced during the recharging process, delays of several days may occur while waiting for the specific gravity to stabilize. A stabilized charging current is an acceptable alternative to specific gravity measurement for determining the state of charge. This phenomenon is discussed in IEEE-450 (Ref. 4). Footnote c allows the float charge current to be used as an alternate to specific gravity for up to 7 days following a battery recharge. Within 7 days each connected cell's specific gravity must be measured to confirm the state of charge. Following a minor battery recharge (such as equalizing charge that does not follow a deep discharge) specific gravity gradients are not significant, and confirming measurements may be made in less than 7 days.

REFERENCES

1. USAR, Chapter 6.
 2. USAR, Chapter 15 and Appendix A.
 3. 10 CFR 50.36(c)(2)(ii).
 4. IEEE Standard 450, 1980.
-
-

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.7 Inverters – Operating

BASES

BACKGROUND

The emergency uninterruptible power supply (UPS) inverters are the preferred source of power for the Division 1 and 2 120 VAC uninterruptible electrical power distribution subsystems because of the stability and reliability they achieve. There are two redundant emergency UPS inverters per 120 VAC uninterruptible electrical power distribution subsystem (an in-service unit and a standby unit), making a total of four emergency UPS inverters. The function of the emergency UPS inverters is to provide 120 VAC electrical power to the associated uninterruptible panels. The emergency UPS inverter can be powered from an internal AC source/rectifier or from the divisional battery via the associated DC electrical power distribution subsystem. The divisional battery provides an uninterruptible power source for the instrumentation and controls for the Emergency Core Cooling Systems (ECCS) and the loads specified in the VBS Panel Load List.

Specific details on emergency UPS inverters, such as type, capacity, operating limits, and number of units can be found in the USAR, Section 8.3.1.1.2 (Ref. 1).

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the USAR, Chapter 6 (Ref. 2) and Chapter 15 and Appendix A (Ref. 3), assume Engineered Safety Feature systems are OPERABLE. The emergency UPS inverters are designed to provide the required capacity, capability, redundancy, and reliability to ensure the availability of necessary power to the ECCS instrumentation and controls 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 3.5, Emergency Core Cooling Systems (ECCS) and Reactor Core Isolation Cooling (RCIC) System; and Section 3.6, Containment Systems.

The OPERABILITY of the emergency UPS inverters is consistent with the initial assumptions of the accident analyses and is based on meeting the design basis of the unit. This includes maintaining electrical power sources OPERABLE during accident conditions in the event of:

(continued)

BASES

APPLICABLE
SAFETY ANALYSES
(continued)

- 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 Reference 4.

LCO

The emergency UPS inverters ensure the availability of AC electrical power for the instrumentation for the systems required to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence (AOO) or a postulated DBA.

One of two Division 1 emergency UPS inverters, and one of two Division 2 emergency UPS inverters, are required to be OPERABLE. Maintaining the required emergency UPS inverters OPERABLE ensures that the redundancy incorporated into the design of the ECCS instrumentation and controls is maintained. The two battery powered emergency UPS inverters ensure an uninterruptible supply of 120 VAC electrical power to the 120 VAC uninterruptible panels even if the 4.16 kV emergency buses are de-energized.

OPERABLE emergency UPS inverters are required to be aligned to the associated uninterruptible panels, with output voltage and frequency within tolerances, and power input to the emergency UPS inverter from a 125 VDC divisional battery via the associated Class 1E DC bus. Alternatively, power supply may be from an internal AC source/rectifier as long as the divisional battery is available as the uninterruptible power supply.

APPLICABILITY

The emergency UPS 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.

(continued)

BASES

APPLICABILITY
(continued)

In MODES 4 and 5, the emergency UPS inverters are not required to be OPERABLE since, during these MODES, if a loss of offsite power occurred (which could result in loss of power to the uninterruptible panels until the DG starts and energizes the associated emergency buses) coincident with an accident requiring the ECCS instrumentation to perform their function, the response time of the ECCS subsystems (which will be delayed due to the loss of power to the uninterruptible panels) is not as critical.

ACTIONS

A.1

With a required emergency UPS inverter inoperable, its associated 120 VAC uninterruptible panels become inoperable until they are re-energized from their Class 1E regulating transformer (maintenance transformer) or emergency UPS inverter using the internal AC source. LCO 3.8.8 addresses this action; however, pursuant to LCO 3.0.6, these actions would not be entered even if the 120 VAC uninterruptible panels were de-energized. Therefore, the ACTIONS are modified by a Note stating that ACTIONS for LCO 3.8.8 must be entered immediately. This ensures the uninterruptible panels are re-energized within 8 hours.

Required Action A.1 allows 24 hours to fix the inoperable emergency UPS inverter and return it to service or, alternatively, to place into service the standby emergency UPS inverter for the affected division. The 24 hour limit is based upon engineering judgment, taking into consideration the time required to repair an inverter and the additional risk to which the plant is exposed because of the inverter inoperability. This risk has to be balanced against the risk of an immediate shutdown, along with the potential challenges to safety systems that such a shutdown might entail. When the 120 VAC uninterruptible panels are powered from their constant voltage maintenance source (or the internal AC source/rectifier with the DC source inoperable), they are relying upon interruptible AC electrical power sources (offsite and onsite). The uninterruptible inverter source to the 120 VAC uninterruptible panels is the preferred source for powering instrumentation trip setpoint devices.

(continued)

BASES

ACTIONS
(continued)

B.1 and B.2

If a required emergency UPS inverter cannot be restored to OPERABLE status within the associated Completion Time (by either restoring the inoperable emergency UPS inverter to OPERABLE status or, alternatively, by placing the standby divisional emergency UPS inverter into service), 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.

SURVEILLANCE
REQUIREMENTS

SR 3.8.7.1

This Surveillance verifies that the required emergency UPS inverters are functioning properly with all required circuit breakers closed and 120 VAC uninterruptible panels energized from the emergency UPS inverter. The verification of proper voltage and frequency output ensures that the required power is readily available for the instrumentation connected to the 120 VAC uninterruptible panels. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. USAR, Section 8.3.1.1.2.
 2. USAR, Chapter 6.
 3. USAR, Chapter 15 and Appendix A.
 4. 10 CFR 50.36(c)(2)(ii).
-
-

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.8 Distribution Systems – Operating

BASES

BACKGROUND

The onsite Class 1E AC and DC electrical power distribution system is divided by division, for Division 1 and 2, into three independent AC, DC, and 120 VAC uninterruptible electrical power distribution subsystems, and for Division 3, into two independent AC and DC electrical power distribution subsystems.

The primary AC Distribution System consists of three 4.16 kV emergency buses that are supplied from the transmission system by two physically independent circuits. Each 4.16 kV emergency bus also has a dedicated onsite diesel generator (DG) source. The Division 1 and 3 4.16 kV emergency buses are normally supplied by the tertiary winding of reserve station service transformer 2RTX-XSR1A while the Division 2 4.16 kV emergency bus is normally supplied by the tertiary winding of reserve station service transformer 2RTX-XSR1B. Control power for the 4.16 kV breakers is supplied from the Class 1E batteries. Additional description of this system may be found in the Bases for LCO 3.8.1, "AC Sources – Operating," and the Bases for LCO 3.8.4, "DC Sources – Operating."

The secondary plant AC distribution system includes 600 V emergency load centers and associated loads, motor control centers, transformers, and distribution panels.

The Division 1 and 2 120 VAC uninterruptible panels are normally powered from their associated emergency uninterruptible power supply (UPS) inverter. The alternate or maintenance power supply for the uninterruptible panels is a Class 1E regulating transformer powered from the same division as the associated emergency UPS inverter; its use is governed by LCO 3.8.7, "Inverters – Operating." Each regulating transformer is powered from Class 1E AC.

There are three independent 125 VDC electrical power distribution subsystems. The list of required distribution buses is located in Table B 3.8.8-1.

(continued)

BASES (continued)

APPLICABLE
SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the USAR, Chapter 6 (Ref. 1) and Chapter 15 and Appendix A (Ref. 2), assume Engineered Safety Feature (ESF) systems are OPERABLE. The AC, DC, and 120 VAC uninterruptible electrical power distribution systems 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, 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 3.5, Emergency Core Cooling Systems (ECCS) and Reactor Core Isolation Cooling (RCIC) System; and Section 3.6, Containment Systems.

The OPERABILITY of the AC, DC, and 120 VAC uninterruptible electrical power distribution systems is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the plant. This includes maintaining the AC and DC electrical power sources and associated distribution systems OPERABLE during accident conditions in the event of:

- a. An assumed loss of all offsite or onsite AC electrical power; and
- b. A worst case single failure.

The AC, DC, and 120 VAC uninterruptible electrical power distribution systems satisfy Criterion 3 of Reference 3.

LCO

The required AC, DC, and 120 VAC uninterruptible power distribution subsystems listed in Table B 3.8.8-1 ensure the availability of AC, DC, and 120 VAC uninterruptible electrical power for the systems required to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence (AOO) or a postulated DBA. The Division 1, 2, and 3 AC and DC, and Division 1 and 2 120 VAC uninterruptible electrical power primary distribution subsystems are required to be OPERABLE. As noted in Table B 3.8.8-1 (Footnote a), each division of the AC, DC, and 120 VAC uninterruptible electrical power distribution systems is a subsystem.

Maintaining the Division 1, 2, and 3 AC and DC, and Division 1 and 2 120 VAC uninterruptible electrical power

(continued)

BASES

LCO
(continued)

distribution subsystems OPERABLE ensures that the redundancy incorporated into the design of ESF is not defeated. Any two of the three divisions of the distribution system are capable of providing the necessary electrical power to the associated ESF components. Therefore, a single failure within any system or within the electrical power distribution subsystems does not prevent safe shutdown of the reactor.

OPERABLE AC electrical power distribution subsystems require the associated buses to be energized to their proper voltages. OPERABLE DC electrical power distribution subsystems require the associated buses to be energized to their proper voltage from either the associated battery or charger. OPERABLE 120 VAC uninterruptible electrical power distribution subsystems require the associated buses to be energized to their proper voltage from the associated emergency UPS inverter via inverted DC voltage, inverter using internal rectified AC source, or Class 1E regulating transformer.

Based on the number of safety significant electrical loads associated with each bus listed in Table B 3.8.8-1, if one or more of the buses becomes inoperable, entry into the appropriate ACTIONS of LCO 3.8.8 is required. Some buses, such as distribution panels, which help comprise the AC and DC distribution systems are not listed in Table B 3.8.8-1. The loss of electrical loads associated with these buses may not result in a complete loss of a redundant safety function necessary to shut down the reactor and maintain it in a safe condition. Therefore, should one or more of these buses become inoperable due to a failure not affecting the OPERABILITY of a bus listed in Table B 3.8.8-1 (e.g., a breaker supplying a single distribution panel fails open), the individual loads on the bus would be considered inoperable, and the appropriate Conditions and Required Actions of the LCOs governing the individual loads would be entered. However, if one or more of these buses is inoperable due to a failure also affecting the OPERABILITY of a bus listed in Table B 3.8.8-1 (e.g., loss of a 4.16 kV emergency bus, which results in de-energization of all buses powered from the 4.16 kV emergency bus), then although the individual loads are still considered inoperable, the Conditions and Required Actions of the LCO for the individual loads are not required to be entered, since

(continued)

BASES

LCO
(continued)

LCO 3.0.6 allows this exception (i.e., the loads are inoperable due to the inoperability of a support system governed by a Technical Specification; the 4.16 kV emergency bus).

In addition, tie breakers between Division 1 and Division 2 safety related AC power distribution subsystems must be open. This prevents any electrical malfunction in any power distribution subsystem from propagating to the redundant subsystem, which could cause the failure of a redundant subsystem and a loss of essential safety function(s). If any tie breakers are closed, the electrical power distribution subsystems that are not being powered from their normal source (i.e., they are being powered from their redundant electrical power distribution subsystems) are considered inoperable. This applies to the onsite, safety related, redundant electrical power distribution subsystems. It does not, however, preclude redundant Class 1E 4.16 kV emergency buses from being powered from the same offsite circuit.

APPLICABILITY

The electrical power distribution subsystems 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.

Electrical power distribution subsystem requirements for MODES 4 and 5 and other conditions in which AC, DC, and 120 VAC uninterruptible electrical power distribution subsystems are required are covered in the Bases for LCO 3.8.9, "Distribution Systems – Shutdown."

ACTIONS

A.1

With one or more Division 1 and 2 required AC buses, load centers, motor control centers, or distribution panels (except 120 VAC uninterruptible panels) inoperable and a loss of function has not yet occurred, the remaining AC electrical power distribution subsystems are capable of

(continued)

BASES

ACTIONS

A.1 (continued)

supporting the minimum safety functions necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming no single failure. The overall reliability is reduced, however, because a single failure in the remaining power distribution subsystems could result in the minimum required ESF functions not being supported. Therefore, the required AC buses, load centers, motor control centers, and distribution panels must be restored to OPERABLE status within 8 hours.

The Condition A worst scenario is one division without AC power (i.e., no offsite power to the division and the associated DG inoperable). In this situation, the unit is more vulnerable to a complete loss of AC power. It is, therefore, imperative that the unit operators' attention be focused on minimizing the potential for loss of power to the remaining division by stabilizing the unit and restoring power to the affected division. The 8 hour time limit before requiring a unit shutdown in this Condition is acceptable because of:

- a. The potential for decreased safety if the unit operators' attention is diverted from the evaluations and actions necessary to restore power to the affected division to the actions associated with taking the unit to shutdown within this time limit.
- b. The low potential for an event in conjunction with a single failure of a redundant component in the division with AC power. (The redundant component is verified OPERABLE in accordance with Specification 5.5.11, "Safety Function Determination Program (SFDP).")

The second Completion Time for Required Action A.1 establishes a limit on the maximum time allowed for any combination of required distribution subsystems to be inoperable during any single contiguous occurrence of failing to meet LCO 3.8.8.a, b, or c. If Condition A is entered while, for instance, a DC electrical power distribution subsystem is inoperable and subsequently returned OPERABLE, LCO 3.8.8.a, b, or c may already have been not met for up to 2 hours. This situation could lead to a total duration of 10 hours, since initial failure of LCO 3.8.8.a, b, or c, to restore the AC electrical power

(continued)

BASES

ACTIONS

A.1 (continued)

distribution system. At this time, a DC bus could again become inoperable, and the AC electrical power distribution subsystem could be restored OPERABLE. This could continue indefinitely.

This Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This results in establishing the "time zero" at the time LCO 3.8.8.a, b, or c was initially not met, instead of at the time Condition A was entered. The 16 hour Completion Time is an acceptable limitation on this potential to fail to meet LCO 3.8.8.a, b, or c indefinitely.

B.1

With one or more Division 1 and 2 120 VAC uninterruptible panels inoperable and a loss of function has not yet occurred, the remaining 120 VAC uninterruptible panels are capable of supporting the minimum safety functions necessary to shut down and maintain the unit in the safe shutdown condition. Overall reliability is reduced, however, because an additional single failure could result in the minimum required ESF functions not being supported. Therefore, the 120 VAC uninterruptible electrical power distribution subsystem(s) must be restored to OPERABLE status within 8 hours by powering the bus from the associated emergency UPS inverter via inverted DC, inverter using internal AC source/rectifier, or Class 1E regulating transformer.

Condition B worst scenario is one 120 VAC uninterruptible electrical power distribution subsystem without power; potentially both the DC source and the associated AC source nonfunctioning. In this situation, the plant is significantly more vulnerable to a complete loss of all uninterruptible power. It is, therefore, imperative that the operator's attention focus on stabilizing the plant, minimizing the potential for loss of power to the remaining 120 VAC uninterruptible electrical power distribution subsystem, and restoring power to the affected 120 VAC uninterruptible electrical power distribution subsystem(s).

This 8 hour limit is more conservative than Completion Times allowed for the majority of components that are without adequate 120 VAC uninterruptible power. Taking exception to

(continued)

BASES

ACTIONS

B.1 (continued)

LCO 3.0.2 for components without adequate 120 VAC uninterruptible power, that would have Required Action Completion Times shorter than 8 hours if declared inoperable, is acceptable because of:

- a. The potential for decreased safety when requiring a change in plant conditions (i.e., requiring a shutdown) while not allowing stable operations to continue;
- b. The potential for decreased safety when requiring entry into numerous applicable Conditions and Required Actions for components without adequate 120 VAC uninterruptible power, while not providing sufficient time for the operators to perform the necessary evaluations and actions to restore power to the affected division;
- c. The potential for an event in conjunction with a single failure of a redundant component.

The 8 hour Completion Time takes into account the importance to safety of restoring the 120 VAC uninterruptible electrical power distribution subsystems to OPERABLE status, the redundant capability afforded by the remaining 120 VAC uninterruptible electrical power distribution subsystems, and the low probability of a DBA occurring during this period.

The second Completion Time for Required Action B.1 establishes a limit on the maximum time allowed for any combination of required distribution subsystems to be inoperable during any single contiguous occurrence of failing to meet LCO 3.8.8.a, b, or c. If Condition B is entered while, for instance, an AC electrical power distribution subsystem is inoperable and subsequently returned OPERABLE, LCO 3.8.8.a, b, or c may already have been not met for up to 8 hours. This situation could lead to a total duration of 16 hours, since initial failure of LCO 3.8.8.a, b, or c, for restoring the 120 VAC uninterruptible electrical power distribution subsystems. At this time, an AC electrical power distribution subsystem could again become inoperable, and 120 VAC uninterruptible electrical power distribution subsystem could be restored to OPERABLE. This could continue indefinitely.

(continued)

BASES

ACTIONS

B.1 (continued)

This Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This allowance results in establishing the "time zero" at the time LCO 3.8.8.a, b, or c was initially not met, instead of at the time that Condition B was entered. The 16 hour Completion Time is an acceptable limitation on this potential of failing to meet LCO 3.8.8.a, b, or c indefinitely.

C.1

With one or more Division 1 and 2 DC buses inoperable and a loss of function has not yet occurred, the remaining DC electrical power distribution subsystems are capable of supporting the minimum safety functions necessary to shut down the reactor and maintain it in a safe shutdown condition, assuming no single failure. The overall reliability is reduced, however, because a single failure in the remaining DC electrical power distribution subsystems could result in the minimum required ESF functions not being supported. Therefore, the required DC electrical power distribution subsystem(s) must be restored to OPERABLE status within 2 hours by powering the bus from the associated battery or charger.

Condition C worst scenario is one division without adequate DC power, potentially with both the battery significantly degraded and the associated charger nonfunctioning. In this situation, the plant is significantly more vulnerable to a complete loss of all DC power. It is, therefore, imperative that the operator's attention focus on stabilizing the plant, minimizing the potential for loss of power to the remaining division, and restoring power to the affected division(s).

This 2 hour limit is more conservative than Completion Times allowed for the majority of components that could be without power. Taking exception to LCO 3.0.2 for components without adequate DC power, that would have Required Action Completion Times shorter than 2 hours, is acceptable because of:

(continued)

BASES

ACTIONS

C.1 (continued)

- a. The potential for decreased safety when requiring a change in plant conditions (i.e., requiring a shutdown) while not allowing stable operations to continue;
- b. The potential for decreased safety when requiring entry into numerous applicable Conditions and Required Actions for components without DC power while not providing sufficient time for the operators to perform the necessary evaluations and actions for restoring power to the affected division; and
- c. The potential for an event in conjunction with a single failure of a redundant component.

The 2 hour Completion Time for DC electrical power distribution subsystems is consistent with Regulatory Guide 1.93 (Ref. 4).

The second Completion Time for Required Action C.1 establishes a limit on the maximum time allowed for any combination of required distribution subsystems to be inoperable during any single contiguous occurrence of failing to meet LCO 3.8.8.a, b, or c. If Condition C is entered while, for instance, an AC electrical power distribution subsystem is inoperable and subsequently returned OPERABLE, LCO 3.8.8.a, b, or c may already have been not met for up to 8 hours. This situation could lead to a total duration of 10 hours, since initial failure of LCO 3.8.8.a, b, or c, to restore the DC electrical power distribution system. At this time, an AC electrical power distribution subsystem could again become inoperable, and DC electrical power distribution could be restored OPERABLE. This could continue indefinitely.

This Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This allowance results in establishing the "time zero" at the time LCO 3.8.8.a, b, or c was initially not met, instead of the time Condition C was entered. The 16 hour Completion Time is an acceptable limitation on this potential of failing to meet LCO 3.8.8.a, b, or c indefinitely.

(continued)

BASES

ACTIONS
(continued)

D.1 and D.2

If the inoperable electrical power distribution system cannot be restored to OPERABLE status within the associated Completion Times, 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.

E.1

With the Division 3 electrical power distribution system inoperable (i.e., one or both Division 3 AC and DC electrical power distribution subsystems inoperable), the Division 3 powered systems are not capable of performing their intended functions. Immediately declaring the High Pressure Core Spray System inoperable allows the ACTIONS of LCO 3.5.1, "ECCS – Operating," to apply appropriate limitations on continued reactor operation.

F.1

Condition F corresponds to a level of degradation in the electrical power distribution system that causes a required safety function to be lost (single division systems are not included, although for this ACTION, Division 3 is considered redundant to Division 1 and 2 ECCS). When two or more inoperable electrical power distribution subsystems result in the loss of a required function, the plant is in a condition outside the accident analysis. Therefore, no additional time is justified for continued operation. LCO 3.0.3 must be entered immediately to commence a controlled shutdown.

SURVEILLANCE
REQUIREMENTS

SR 3.8.8.1

This Surveillance verifies that the AC, DC, and 120 VAC uninterruptible electrical power distribution systems are functioning properly, with the correct circuit breaker alignment. The correct breaker alignment ensures the

(continued)

BASES

SURVEILLANCE
REQUIREMENTS

SR 3.8.8.1 (continued)

appropriate separation and independence of the electrical divisions is maintained, and power is available to each required bus. The verification of energization of the buses ensures that the required power is readily available for motive as well as control functions for critical system loads connected to these buses. This is normally performed by verifying correct voltage for the AC and DC switchgear and by verifying that no inoperability status indicator lights (that indicate a loss of power to one or more of the required load centers, motor control centers (MCCs), or distribution panels) are lit in the control room. Alternately, when the normal method is not available, verification that a load powered from the associated bus is energized is also acceptable. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. USAR, Chapter 6.
 2. USAR, Chapter 15 and Appendix A.
 3. Regulatory Guide 1.93, Revision 0, December 1974.
 4. 10 CFR 50.36(c)(2)(ii).
-
-

Table B 3.8.8-1 (page 1 of 1)
AC, DC, and 120 VAC Uninterruptible Electrical Power Distribution Systems

TYPE	VOLTAGE	DIVISION 1 ^(a)	DIVISION 2 ^(a)	DIVISION 3 ^(a)
AC buses	4160 V	Switchgear 2ENS*SWG101	Switchgear 2ENS*SWG103	Switchgear 2ENS*SWG102
	600V	Load Center 2EJS*US1 MCCs 2EHS*MCC101, 2EHS*MCC102, and 2EHS*MCC103 Distribution Panels 2EJS*PNL100A and 2LAC*PNL100A	Load Center 2EJS*US3 MCCs 2EHS*MCC301, 2EHS*MCC302, and 2EHS*MCC303 Distribution Panels 2EJS*PNL300B and 2LAC*PNL300B	MCC 2EHS*MCC201
	240/120 V			Distribution Panel 2SCV*PNL200P
	208/120 V			Distribution Panel 2LAC*PNLE03
DC buses	125 V	Switchgear 2BYS*SWG002A MCC 2DMS*MCCA1 Distribution Panels 2BYS*PNL201A, 2BYS*PNL202A, and 2BYS*PNL204A	Switchgear 2BYS*SWG002B MCC 2DMS*MCCB1 Distribution Panels 2BYS*PNL201B, 2BYS*PNL202B, and 2BYS*PNL204B	Distribution Panel 2CES*IPNL414
120 VAC uninter- ruptible panels	120 V	Distribution Panels 2VBS*PNL101A and 2VBS*PNL102A	Distribution Panels 2VBS*PNL301B and 2VBS*PNL302B	

(a) Each division of the AC, DC, and 120 VAC uninterruptible electrical power distribution system is a subsystem.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.9 Distribution Systems – Shutdown

BASES

BACKGROUND	<p>A description of the AC, DC, and 120 VAC uninterruptible electrical power distribution systems is provided in the Bases for LCO 3.8.8, "Distribution Systems – Operating."</p>
APPLICABLE SAFETY ANALYSES	<p>The initial conditions of Design Basis Accident and transient analyses in the USAR, Chapter 6 (Ref. 1) and Chapter 15 and Appendix A (Ref. 2), assume Engineered Safety Feature (ESF) systems are OPERABLE. The AC, DC, and 120 VAC uninterruptible electrical power distribution systems 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, and containment design limits are not exceeded.</p> <p>The OPERABILITY of the AC, DC, and 120 VAC uninterruptible electrical power distribution system is consistent with the initial assumptions of the accident analyses and the requirements for the supported systems' OPERABILITY.</p> <p>The OPERABILITY of the minimum AC, DC, and 120 VAC uninterruptible electrical power sources and associated power distribution subsystems during MODES 4 and 5, and during movement of irradiated fuel assemblies in the secondary containment ensures that:</p> <ol style="list-style-type: none">The facility can be maintained in the shutdown or refueling condition for extended periods;Sufficient instrumentation and control capability is available for monitoring and maintaining the unit status; andAdequate power is provided to mitigate events postulated during shutdown, such as an inadvertent draindown of the vessel or a fuel handling accident. <p>The AC, DC, and 120 VAC uninterruptible electrical power distribution systems satisfy Criterion 3 of Reference 3.</p>

(continued)

BASES (continued)

LCO Various combinations of subsystems, equipment, and components are required OPERABLE by other LCOs, depending on the specific plant condition. Implicit in those requirements is the required OPERABILITY of necessary support features. This LCO explicitly requires energization of the portions of the electrical distribution system necessary to support OPERABILITY of Technical Specifications' required systems, equipment, and components – both specifically addressed by their own LCOs, and implicitly required by the definition of OPERABILITY.

Maintaining these portions of the distribution system energized ensures the availability of sufficient power to operate the plant in a safe manner to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents and inadvertent reactor vessel draindown).

APPLICABILITY The AC, DC, and 120 VAC uninterruptible electrical power distribution subsystems required to be OPERABLE in MODES 4 and 5 and during movement of irradiated fuel assemblies in the secondary containment provide assurance that:

- a. Systems to provide adequate coolant inventory makeup are available for the irradiated fuel in the core in case of an inadvertent draindown of the reactor vessel;
- b. Systems needed to mitigate a fuel handling accident are available;
- c. Systems necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and
- d. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown or refueling condition.

The AC, DC, and 120 VAC uninterruptible electrical power distribution subsystem requirements for MODES 1, 2, and 3 are covered in LCO 3.8.8.

(continued)

BASES (continued)

ACTIONS

LCO 3.0.3 is not applicable while in MODE 4 or 5. However, since irradiated fuel assembly movement can occur in MODE 1, 2, or 3, the ACTIONS have been modified by a Note stating that LCO 3.0.3 is not applicable. If moving irradiated fuel assemblies while in MODE 4 or 5, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Entering LCO 3.0.3 while in MODE 1, 2, or 3 would require the unit to be shutdown, but would not require immediate suspension of movement of irradiated fuel assemblies. The Note to the ACTIONS, "LCO 3.0.3 is not applicable," ensures that the actions for immediate suspension of irradiated fuel assembly movement are not postponed due to entry into LCO 3.0.3.

A.1, A.2.1, A.2.2, A.2.3, A.2.4, and A.2.5

Although redundant required features may require redundant divisions of electrical power distribution subsystems to be OPERABLE, one OPERABLE distribution subsystem division may be capable of supporting sufficient required features to allow continuation of CORE ALTERATIONS, fuel movement, and operations with a potential for draining the reactor vessel. By allowing the option to declare required features associated with an inoperable distribution subsystem inoperable, appropriate restrictions are implemented in accordance with the affected distribution subsystem LCO's Required Actions. In many instances, this option may involve undesired administrative efforts. Therefore, the allowance for sufficiently conservative actions is made (i.e., to suspend CORE ALTERATIONS, movement of irradiated fuel assemblies in the secondary containment and any activities that could result in inadvertent draining of the reactor vessel).

Suspension of these activities shall not preclude completion of actions to establish a safe conservative condition. These actions minimize the probability of the occurrence of postulated events. It is further required to immediately initiate action to restore the required AC and DC electrical power distribution subsystems and to continue this action until restoration is accomplished in order to provide the necessary power to the plant safety systems.

(continued)

BASES

ACTIONS

A.1, A.2.1, A.2.2, A.2.3, A.2.4, and A.2.5 (continued)
Notwithstanding performance of the above conservative Required Actions, a required residual heat removal – shutdown cooling (RHR-SDC) subsystem may be inoperable. In this case, Required Actions A.2.1 through A.2.4 do not adequately address the concerns relating to coolant circulation and heat removal. Pursuant to LCO 3.0.6, the RHR-SDC ACTIONS would not be entered. Therefore, Required Action A.2.5 is provided to direct declaring RHR-SDC inoperable, which results in taking the appropriate RHR-SDC ACTIONS.

The Completion Time of immediately is consistent with the required times for actions requiring prompt attention. The restoration of the required distribution subsystems should be completed as quickly as possible in order to minimize the time the plant safety systems may be without power.

SURVEILLANCE
REQUIREMENTS

SR 3.8.9.1

This Surveillance verifies that the AC, DC, and 120 VAC uninterruptible electrical power distribution subsystems are functioning properly, with the correct breaker alignment. The correct breaker alignment ensures power is available to each required bus. The verification of energization of the buses ensures that the required power is readily available for motive as well as control functions for critical system loads connected to these buses. This is normally performed by verifying correct voltage for the AC and DC switchgear and by verifying that no inoperability status indicator lights (that indicate a loss of power to one or more of the required load centers, MCCs, or distribution panels) are lit in the control room. Alternately, when the normal method is not available, verification that a load powered from the associated bus is energized is also acceptable. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. USAR, Chapter 6.
 2. USAR, Chapter 15 and Appendix A.
 3. 10 CFR 50.36(c)(2)(ii).
-
-