B 3.7 PLANT SYSTEMS

B 3.7.7 Component Cooling Water (CC) System

BASES

BACKGROUND

The CC System provides a heat sink for the removal of process and operating heat from safety related components during a Design Basis Accident (DBA) or transient. During normal operation, the CC System also provides this function for various nonessential components. The CC System serves as a barrier to the release of radioactive byproducts between potentially radioactive systems and the Service Water System, and thus to the environment.

The Unit 1 and Unit 2 CC systems consist of four pumps, four heat exchangers, two surge tanks and the piping, valves, and controls necessary to provide for both normal and accident heat removal. Each CC system consists of; two pumps (P-11A&B), two heat exchangers (HX-12A/B in Unit 1 and HX-12C/D in Unit 2), a surge tank (T-12), a supply header, and a return header. Heat exchangers HX-12B&C normally serve as shared standby units and may be used in either unit's CC system as conditions require. Each unit requires an operating and a standby heat exchanger. The same heat exchanger may act as the standby for both units, however, they shall not be in use concurrently between units.

During normal and accident conditions, one component cooling pump and one component cooling heat exchanger accommodate the heat removal loads with the standby pump and a standby heat exchanger providing redundant backup. Two pumps and two heat exchangers can be used to remove the residual and sensible heat during plant shutdowns. If one of the pumps or heat exchangers are not operable, shutdown of the plant is not affected; however, the time for cooldown may be extended.

During the recirculation phase following a loss-of-coolant accident, CC system alignment and operation is accomplished by operator action prior to realigning the RHR pump suction to the containment sump.

The component cooling surge tank accommodates expansion, contraction, make up and in leakage. System overpressure protection is provided by a relief valve and negative pressure protection is provided by a vacuum breaker. Surge tank pressure changes during system operation are controlled manually.

The Unit 2 CC system provides cooling water flow to various non-essential loads (e.g., blowdown evaporator, letdown gas stripper

BASES

BACKGROUND (continued)

condensers, etc.) via piping which is not seismic Class I piping.

Automatic isolation valves are provided which automatically close on a Unit 2 containment isolation signal. This automatic isolation capability is not credited for accident mitigation and is not required for system operability

The normal power supplies for the component cooling water pumps P-11A and P-11B are safety-related 480 volt buses B-03 and B-04 respectively. The CC pumps receive a low discharge pressure automatic start signal, however no credit is assumed for the CC pump low discharge pressure automatic start, therefore this feature is not required for loop OPERABILITY.

In the event of a loss of AC power to bus B-03 or B-04, the CC pump breaker associated with any operating CC pump will not load shed and the pump will restart immediately upon restoration of AC power. The breaker associated with any CC pump which was not in operation may close if discharge pressure drops to below the automatic start setpoint, similarly allowing the pump to restart immediately upon restoration of AC power.

In the event of a loss of off-site power coincident with a safety injection signal, any operating CC pump will be load shed and automatic start of the standby pump is inhibited on the unit with the safety injection signal. Alignment and operation of the CC loop required for recirculation phase is accomplished by operator action.

Additional information on the design and operation of the system, along with a list of the components served, is presented in the FSAR, Section 9.1 (Ref. 1). The principal function of the CC System is the removal of decay heat from the reactor via the Residual Heat Removal (RHR) System. This may be during a normal or post accident cooldown and shutdown.

APPLICABLE SAFETY ANALYSES

The CC System transfer heat from the residual heat removal (RHR) heat exchangers to the Service Water System (SW) during the containment sump recirculation phase in support of the assumptions in the FSAR Chapter 14 containment integrity analysis. During the recirculation phase following a loss-of-coolant accident, one CC pump and one CC heat exchanger (HX) can accommodate the heat removal loads. If either a CC pump or a CC HX fails, the standby pump and one of two standby heat exchangers provide 100% backup. Each of the component cooling inlet lines to the RHR HXs has a normally closed remotely operated valve. If one of the valves fails to open at initiation of

BASES

APPLICABLE SAFETY ANALYSES (continued)

long-term recirculation, the other valve supplies a heat exchanger with sufficient cooling capacity to remove the heat load.

The CC System is designed to perform its function with a single failure of any active component, assuming a loss of offsite power.

The CC System also functions to cool the unit from RHR entry conditions (T_{cold} < 350°F), to MODE 5 (T_{cold} < 200°F), during normal and post accident operations. The time required to cool from 350°F to 200°F is a function of the number of CC and RHR loops operating.

The CC System satisfies Criterion 3 of the NRC Policy Statement.

LCO

Each CC pump is independent of the other to the degree that each has separate controls and power supplies and the operation of one does not depend on the other. Similarly, each CC heat exchanger is independent of the other to the degree that the operation of one does not depend on the other.

The CC System is considered OPERABLE when:

a. Both pumps and two required heat exchangers are OPERABLE;

b. the associated surge tank is OPERABLE; and

c. the associated piping, valves, and controls required to perform the safety related function are OPERABLE.

In the event of a DBA, one CC pump and heat exchanger are required to provide the minimum heat removal capability assumed in the safety analysis for the systems to which it supplies cooling water. To ensure this requirement is met assuming the worst case single active failure occurs coincident with a loss of offsite power, two CC pumps, and two CC heat exchangers must be OPERABLE. With both units in MODES 1, 2, 3, and 4, one of the common heat exchangers (HX-12 B or C) may be shared between the two units. Sharing of a common heat exchanger establishes the number of required heat exchangers for two unit operation at three. This will provide assurance that at least one CC pump and heat exchanger will be available for post accident operation in the unit undergoing an accident, while also providing assurance that at least one CC pump and heat exchanger will be available for shutdown capability of the non-accident unit.

BASES

LCO (continued)

The isolation of CC from other components or systems not required for safety may render those components or systems inoperable but does not affect the OPERABILITY of the CC System.

APPLICABILITY

In MODES 1, 2, 3, and 4, the CC System is a normally operating system, which must be prepared to perform its post accident safety functions, primarily RCS heat removal, which is achieved by cooling the RHR heat exchanger.

In MODE 5 or 6, the OPERABILITY requirements of the CC System are determined by the systems it supports.

ACTIONS

The Required Actions are modified by a Note indicating that the applicable Conditions and Required Actions of LCO 3.4.6, "RCS Loops-MODE 4," are required to be entered if inoperable CC loop components result in the inoperability of an RHR loop. This is an exception to LCO 3.0.6 and ensures the proper actions are taken for these components.

A.1

If one required CC pump is inoperable (including inoperability of any associated piping, valves, and controls required to perform the safety related function that renders the pump inoperable), action must be taken to restore the pump to OPERABLE status within 72 hours. In this Condition, the remaining OPERABLE CC pump is adequate to perform the heat removal function. The 72 hour Completion Time is reasonable, based on the redundant capabilities afforded by the OPERABLE pump, and the low probability of a DBA occurring during this period.

The second Completion Time for Required Action A.1 establishes a limit on the maximum time allowed for any combination of Conditions to be inoperable during any continuous failure to meet this LCO.

The 144 hour Completion Time provides a limitation time allowed in this specified Condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which multiple Conditions are entered concurrently. The AND connector between 72 hour and 144 hour dictates that both Completion Times apply simultaneously, and the more restrictive must be met.

BASES

ACTIONS (continued)

B.1

If one required CC heat exchanger is inoperable (including inoperability of any associated piping, valves, and controls required to perform the safety related function that renders the heat exchanger inoperable), action must be taken to restore the inoperable heat exchanger to OPERABLE status within 72 hours. In this Condition, the remaining OPERABLE CC heat exchanger is adequate to perform the heat removal function. The 72 hour Completion Time is reasonable, based on the redundant capabilities afforded by the OPERABLE heat exchanger, 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 Conditions to be inoperable during any continuous failure to meet this LCO.

The 144 hour Completion Time provides a limitation time allowed in this specified Condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which multiple Conditions are entered concurrently. The AND connector between 72 hour and 144 hour dictates that both Completion Times apply simultaneously, and the more restrictive must be met.

C.1 and C.2

If the Required Actions and associated Completion Times are not met, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours and in MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.7.7.1

This SR is modified by a Note indicating that the isolation of the CC flow to individual components may render those components inoperable but does not affect the OPERABILITY of the CC System.

Verifying the correct alignment for manual, power operated, and automatic valves in the CC flow path provides assurance that the proper flow paths exist for CC operation. This SR does not apply to

BASES

SURVEILLANCE REQUIREMENTS (continued)	valves that are locked, sealed, or otherwise secured in position, since these valves are verified to be in the correct position prior to locking, sealing, or securing. This SR also does not apply to valves that cannot be inadvertently misaligned, such as check valves. This Surveillance does not require any testing or valve manipulation; rather, it involves verification that those valves capable of being mispositioned are in the correct position. The 31 day Frequency is based on engineering judgment, is consistent with the procedural controls governing valve operation, and ensures correct valve positions.
REFERENCES	1. FSAR. Section 9.1.

B 3.7 PLANT SYSTEMS

B 3.7.8 Service Water (SW) System

BASES

BACKGROUND

The SW System provides a heat sink for the removal of process and operating heat from safety related components during a Design Basis Accident (DBA) or transient. During normal operation, and a normal shutdown, the SW System also provides this function for various safety related and non-safety related components. The safety related function is covered by this LCO.

The SW System is a shared system, consisting of; six motor driven centrifugal pumps and the piping, valves, instruments, and controls necessary to provide cooling water to essential and non-essential components. Two service water pumps are connected to separate 480 volt buses (Unit 2 B03 and Unit 1 B04), one per bus. The four remaining pumps are connected, two per bus, to two separate 480 volt buses (Unit 1 B03 and Unit 2 B04). The SW pumps discharge to a normally cross-tied discharge header located in the circulating water pump house which exits the pump house through two supply headers (North and South) leading to the control building. The North and South supply headers then run to the primary auxiliary building where they connect to the West header, forming a ring supply header.

Essential loads are those loads required for the safe shutdown of the plant and to mitigate the consequences of a design basis accident. The SW System is a required back-up source of water for the Auxiliary Feedwater System. All essential-SW-loads are supplied from the North and South headers with the exception of two containment ventilation coolers in each unit which are supplied from the West header. Cooling water from the essential and non-essential-SW-loads is discharged back to the lake via the circulating water discharge lines.

Isolation of certain non-essential-SW-loads, as identified in the approved SW System analyses, is necessary to meet SW capacity demands under limiting conditions. These limiting conditions include loss of a single train of safeguards equipment, and a Loss of Coolant Accident (LOCA) in one unit with continued operation of the other unit. Non-essential loads, as identified in the approved SW System analyses, are automatically isolated upon receipt of a Safety Injection actuation signal.

Isolation of any SW header will not impact the ability of the SW System to supply cooling water to the required number of essential loads for either unit.

BASES

BACKGROUND (continued)

Additional information about the design and operation of the SW System, along with a list of the components served, is presented in the FSAR, Section 9.6 (Ref. 1).

APPLICABLE SAFETY ANALYSES

The design basis of the SW System is three SW pumps, in conjunction with the CCW System and a 100% capacity containment cooling system, to remove core decay heat following a design basis LOCA as discussed in the FSAR, Section 14.3.4 (Ref. 2). This prevents the containment sump fluid from increasing in temperature during the recirculation phase following a LOCA and provides for a gradual reduction in the temperature of this fluid as it is supplied to the Reactor Coolant System by the ECCS pumps. The SW System is designed to perform its function with a single failure of any active component, assuming the loss of offsite power.

The SW System, in conjunction with the CCW System, also cools the unit from residual heat removal (RHR), as discussed in the FSAR, Section 9.2, (Ref. 3) entry conditions to MODE 5 during normal and post accident operations. The time required for this evolution is a function of the number of CCW and RHR System pumps and heat exchangers that are operating. Heat transferred from the reactor core to the SW System during accidents and anticipated operational occurrences in which the unit is cooled down and placed on residual heat removal (RHR) operation is removed by Lake Michigan. Operating limits for the SW System are based on the approved SW System analyses as stated in Appendix C, Additional Conditions, Operating Licenses DPR-24 and DPR-27.

The SW System satisfies Criterion 3 of the NRC Policy Statement.

LCO

The SW System is required to be OPERABLE to provide the required redundancy to ensure that the system will function to remove post accident heat loads, assuming the worst case single active failure. The SW System is OPERABLE during MODES 1, 2, 3, and 4 when:

a. six SW pumps are OPERABLE;

b. the SW ring header continuous flowpath is not interrupted;

c. the required non-essential-SW-load isolation valves are OPERABLE or the affected non-essential flowpath is isolated;

d. the opposite unit's containment fan cooler SW outlet motor operated valves are closed or the SW flowpath is isolated; and

BASES

LCO (continued)

e. the instrumentation and controls required to perform the safety related function are OPERABLE.

APPLICABILITY

In MODES 1, 2, 3, and 4, the SW System is a normally operating system that is required to support the OPERABILITY of the equipment serviced by the SW System and required to be OPERABLE in these MODES.

In MODES 5 and 6, the OPERABILITY requirements of the SW System are determined by the systems it supports.

ACTIONS

The Actions Table is modified by a Note which requires the applicable Conditions and Required Actions to be entered for the system made inoperable as a result of any SW System inoperability. This is an exception to LCO 3.0.6 and ensures the proper actions are taken for these components.

A.1

If one SW pump is inoperable, action must be taken to restore the pump to OPERABLE status within 7 days. In this Condition, the remaining OPERABLE SW pumps assure adequate system flow capability. However, the overall reliability is reduced because a single failure could result in less than the required number of pumps to assure this flow. The 7 day Completion Time is based on the redundant capabilities afforded by the remaining OPERABLE pumps, and the low probability of a DBA occurring during this time period.

The second Completion Time for Required Action A.1 establishes a limit on the maximum time allowed for any combination of Conditions to be inoperable during any continuous failure to meet this LCO. The 14 day Completion Time provides a limitation on the time allowed in this specified Condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which multiple Conditions are entered concurrently. The AND connector between 7 days and 14 days dictates that both Completion Times apply simultaneously, and the more restrictive must be met.

B.1

If two or three SW pumps are inoperable, action must be taken to restore at least the minimum number of pumps to OPERABLE status required to exit this Condition within 72 hours. In this Condition, the remaining OPERABLE SW pumps are capable of providing the

BASES

ACTIONS (continued)

required system flow capability provided the requirements of the LCO are met (e.g., SW ring header continuous flowpath, non-essential SW isolation valves and the opposite Unit's containment fan cooler service water outlet valves). With four or more SW pumps inoperable, Condition G must be entered.

The 72 hour Completion Time is based on the redundant capabilities afforded by the remaining OPERABLE pumps, the probability for an additional active or passive failure, and the low probability of a DBA occurring during this time period.

C.1 and C.2

If the SW ring header continuous flowpath is interrupted, the ability of the System to provide required cooling water flow to required equipment must be verified within 1 hour. The 1 hour Completion Time for Required Action C.1 effectively limits the allowed system configuration to alignments previously evaluated and found acceptable (Reference 4). Evaluated alignments with the continuous flowpath interrupted include a minimum required number of OPERABLE SW pumps with each OPERABLE SW pump aligned to all required portions of the SW header. Acceptable alignments must comport to the SW system analyses. Additionally, the 1 hour Completion Time provides sufficient time to accommodate transitory operations (e.g. additional equipment inoperabilities, operations required to realign systems and equipment, etc;) without requiring initiation of a unit shutdown. The 1 hour Completion Time is commensurate with the importance of maintaining the SW System in an OPERABLE configuration.

Additionally, Required Action C.2 directs that the SW ring header continuous flowpath must be restored within 7 days. Since acceptable alignments during this period may include less than five OPERABLE SW pumps, Required Action B.1 may limit operation in Condition C to less than 7 days.

With one or more ring header isolation valves incapable of being closed, the SW System will continue to be capable of providing the required cooling water flow to required equipment. However, the ability to isolate a break in the system while continuing to provide cooling water to required equipment may be impaired.

With one or more ring header isolation valves closed, the SW System may remain capable of providing the required cooling water flow to the minimum required number of components depending on system alignment and the OPERABILITY of other SW System components.

BASES

ACTIONS (continued)

Multiple closed ring header isolation valves could result in loss of cooling water to required equipment (e.g. closure of valves SW-2869 and SW-2870 will render two of the four containment fan coolers inoperable on each Unit). If multiple closed ring header isolation valves result in required equipment being inoperable, the Note to the ACTIONS Table requires entry into the applicable conditions and required actions for the systems made inoperable.

The 7 day Completion Time is acceptable based on the redundant capabilities afforded by the remaining OPERABLE equipment, and the low probability of a DBA or SW System line break occurring during this time period. Piping failures are not considered as the single failure for system functionality during an accident.

The second Completion Time for Required Action C.2 establishes a limit on the maximum time allowed for any combination of Conditions to be in effect during any continuous failure to meet this LCO. The 14 day Completion Time provides a limitation on the time allowed in this specified Condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which multiple Conditions are entered concurrently. The AND connector between 7 days and 14 days dictates that both Completion Times apply simultaneously, and the more restrictive must be met.

D.1 and D.2

In the event one required automatic isolation valves in one or more non-essential-SW-load flowpath(s) is inoperable and the affected non-essential flowpath(s) is not isolated, the required redundant automatic isolation valve in the affected non-essential flowpath(s) must be verified OPERABLE within 1 hour. This verification may be performed administratively.

The 1 hour Completion Time for Required Action D.1 provides sufficient time to accommodate transitory operations (e.g. additional equipment inoperabilities, operations required to realign systems and equipment, etc;) without requiring initiation of a unit shutdown. The 1 hour Completion Time is commensurate with the importance of maintaining the SW System in an OPERABLE configuration. Required Action D.1 is modified by a Note stating it is not required to be met if in Condition E. This Note precludes entry into Condition H, when the required redundant automatic isolation valve in the affected non-essential flowpath(s) is inoperable and Required Action D.1 cannot be met.

BASES

ACTIONS (continued)

Additionally, the valve(s) must be restored to OPERABLE status or the flowpath(s) isolated with a seismically qualified isolation valve within 72 hours. In this Condition, the overall reliability is reduced because a single failure could result in system configuration which could not assure adequate flow to required equipment. The 72 hour Completion Time is based on the flow capabilities afforded by the number of OPERABLE pumps, and the low probability of a DBA occurring during this time period.

The second Completion Time for Required Action D.2 establishes a limit on the maximum time allowed for any combination of Conditions to be in effect during any continuous failure to meet this LCO.

The 14 day Completion Time provides a limitation on the time allowed in this specified Condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which multiple Conditions are entered concurrently. The AND connector between 72 hours and 14 days dictates that both Completion Times apply simultaneously, and the more restrictive must be met.

E.1 and E.2

With two required automatic isolation valves in one or more non-essential-SW-load flowpath(s) inoperable, the affected flowpath(s) shall be isolated with a seismically qualified isolation valve within 1 hour. The Completion Time of 1 hour reflects the importance of isolating the non-essential-SW-loads to meet SW capacity demands under limiting conditions.

F.1 and F.2

If one or more opposite unit containment fan cooler service water outlet motor operated valves are open and the opposite unit containment accident fan cooler unit SW flowpath is not isolated, the ability of the SW System to provide required cooling water flow to required equipment must be verified within 1 hour. The 1 hour Completion Time for ACTION F.1 effectively limits the allowed system configuration to a configuration that has been previously evaluated and found acceptable. Additionally, the 1 hour Completion Time provides sufficient time to accommodate transitory operations (e.g. additional equipment inoperabilities, operations required to realign systems and equipment, etc;) without requiring initiation of a unit shutdown. The 1 hour Completion Time is commensurate with the importance of maintaining the SW System in an OPERABLE configuration.

BASES

ACTIONS (continued)

Additionally, the flowpath associated with any opposite unit containment fan cooler service water outlet motor operated valve that is open must be isolated within 72 hours. (The flowpath is considered isolated if total flow would not exceed the expected flowrate during accident conditions.) In this Condition, the overall reliability is reduced because a single failure could result in a system configuration which could not assure adequate flow to required equipment. The 72 hour Completion Time is based on the confirmed ability of the SW pumps to provide required cooling water flow to required components. This time frame is also considered acceptable based on the low probability of a DBA occurring during this time period.

The second Completion Time for Required Action F.2 establishes a limit on the maximum time allowed for any combination of Conditions to be in effect during any continuous failure to meet this LCO. The 14 day Completion Time provides a limitation on the time allowed in this specified Condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which multiple Conditions are entered concurrently. The AND connector between 72 hours and 14 days dictates that both Completion Times apply simultaneously, and the more restrictive must be met.

G.1

If four or more SW pumps are inoperable, action must be taken within 1 hour to restore the SW pump(s) to OPERABLE status. The 1 hour Completion Time provides sufficient time to accommodate transitory operations (e.g. additional equipment inoperabilities, operations required to realign systems and equipment, etc;) to either restore the pump(s) to OPERABLE status or prepare for an orderly shutdown of the plant, and is commensurate with the importance of maintaining the SW System in an OPERABLE configuration.

H.1 and H.2

If the SW System cannot be restored to OPERABLE status within the associated Completion Times, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours and in MODE 5 within 36 hours.

The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.7.8.1

This SR is modified by a Note indicating that the isolation of the SW System components or systems may render those components inoperable, but does not affect the OPERABILITY of the SW System.

Verifying the correct alignment for manual, power operated, and automatic valves in the SW System flow path provides assurance that the proper flow paths exist for SW System operation. Included within the scope of this SR are the containment accident fan cooler isolation valves for the opposite unit. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since they are verified to be in the correct position prior to being locked, sealed, or secured. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves.

The 31 day Frequency is based on engineering judgment, is consistent with the procedural controls governing valve operation, and ensures correct valve positions.

SR 3.7.8.2

This SR verifies proper automatic operation of the SW System non-essential-SW-load isolation valves on an actual or simulated actuation signal. The SW System is a normally operating system that cannot be fully actuated as part of normal testing. This Surveillance is not required for valves that are locked, sealed, or otherwise secured in the required position under administrative controls. The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power. Operating experience has shown that these components usually pass the Surveillance when performed at the 18 month Frequency. Therefore, the Frequency is acceptable from a reliability standpoint.

SR 3.7.8.3

This SR verifies proper automatic operation of the SW System pumps on an actual or simulated actuation signal. The SW System is a normally operating system that cannot be fully actuated as part of normal testing during normal operation. The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a unit outage and the potential for an unplanned transient if the Surveillance were performed with the reactor at power.

BASES

SURVEILLANCE REQUIREMENTS (continued)	Operating experience has shown that these components usually pass the Surveillance when performed at the 18 month Frequency. Therefore, the Frequency is acceptable from a reliability standpoint.
REFERENCES	1. FSAR. Section 9.6. 2. FSAR. Section 14.3.4. 3. FSAR. Section 9.2. 4. Technical Requirements Manual, TLCO 3.7.7, SW System

B 3.7 PLANT SYSTEMS

B 3.7.9 Control Room Emergency Filtration System (CREFS)

BASES

BACKGROUND

The CREFS provides a protected environment from which operators can control the unit following an uncontrolled release of radioactivity.

The CREFS consists of one emergency make-up air filtration unit, two emergency make-up fans, two recirculation fans, and the required ducts and dampers necessary to establish the required flow paths and isolation boundaries. The CREFS is an emergency system, parts of which operate during normal unit operations. The CREFS has four MODES of operation.

- MODE 1 (normal operation) - One of the two recirculation fans (W-13B1 or W-13B2) are in operation. Outside air is supplied from an intake penthouse located on the roof of the auxiliary building at a rate of approximately 1000 cfm (5% of system design flow) via damper VNCR-4849C which is throttled to a predetermined position. The make-up air combines with return air from the control room and computer room then passing through filter (F-43) and cooling units (HX-100 A&B) before entering the recirculation fan. Filtered and cooled air is supplied to the mechanical equipment room and through separate heating coils (HX-92 and HX-91 A&B), and humidifiers (Z-78 and Z-77) to the computer and control rooms respectively. Room thermostats and humidistats control the operation of the heating coils, chilled water system, and humidifiers. The control room heating, cooling, and humidification systems are not required to demonstrate compliance with the control room habitability limits of 10 CFR 50 Appendix A, GDC-19 as required by NUREG-0737, Item III.D.3.4. The computer room is supplied with supplementary cooling during normal operation via supplementary air conditioning units (W-107A/HX-190A/HX-191A or W-107B/HX-190B/HX-191B). Nominally, the control room washroom exhaust fan (W-15) is also in operation. Operation of the Control Room Ventilation System in MODE 1 (normal operation) is not assumed for control room habitability, and is therefore not a Technical Specification required MODE of operation.

- MODE 2 (recirculation operation) - 100% of the control room and computer room air is recirculated. In this MODE, the outside air damper (VNCR-4849C) is closed and the control room washroom exhaust fan is de-energized. Recirculation can be automatically initiated by a Containment Isolation or Safety Injection signal, or can be manually initiated from the control room. Operation of the

BASES

BACKGROUND (continued)

Control Room Ventilation System in MODE 2 (recirculation) is not assumed for control room habitability, and is therefore not a Technical Specification required MODE of operation.

- MODE 3 (recirculation/charcoal adsorber operation) - One of two control room emergency make-up fans (W-14A or W-14B) is in operation and air is supplied to the emergency make-up charcoal filter unit (F-16) via the computer and control room return air duct (damper VNCR-4851B). The normal outside air supply is secured (damper VNCR-4849C closed) and the control room washroom exhaust fan is de-energized. In this MODE approximately 25% of the return air is being recirculated by the emergency make-up charcoal filter unit back to the suction of the control room recirculation fans. Recirculation/charcoal adsorber MODE is manually initiated from the control room. Operation of the Control Room Ventilation System in MODE 3 (recirculation/charcoal adsorber MODE) is not assumed for control room habitability, and is therefore not a Technical Specification required MODE of operation.

- MODE 4 (emergency make-up) - Operation in this MODE is similar to MODE 3 except return air inlet damper VNCR-4851B to the emergency fans remains closed and outside air supply to the emergency make-up charcoal filter unit opens (damper VNCR-4851A). This allows approximately 4950 cfm (25% of system design flow) of make-up air to pass through the emergency make-up charcoal filter unit to the suction of the control room recirculation fan. This make-up flow rate is sufficient to assure a positive pressure of ≥ 1/8 in. water gage is maintained in the control and computer rooms to prevent excessive unfiltered in-leakage into the control room ventilation boundary. MODE 4 (emergency make-up) is automatically initiated by a high radiation signal from the control room area monitor RE-101, or a high radiation signal from noble gas monitor RE-235 located in the supply duct to the control room. This MODE of operation can also be manually initiated from the control room. Operation of the Control Room Ventilation System in MODE 4 (emergency make-up) is the assumed MODE of operation for the control room habitability analysis, and is therefore the only MODE of operation addressed by this LCO.

The air entering the control room is continuously monitored by noble gas radiation monitors and the control room itself is continuously monitored by an area radiation monitor. One detector output above its setpoint will actuate the emergency make-up MODE of operation (MODE 4) for the CREFS.

The limiting design basis accident for the control room dose analysis is

BASES

BACKGROUND (continued)

the large break LOCA. CREFS does not automatically restart after being load shed following a loss of offsite power; manual action is required to restart CREFS. The control room emergency make-up and recirculation fans have been included in the emergency diesel generator loading profile during the recirculation phase of a loss of coolant accident.

The CREFS will pressurize the control and computer rooms to at least 0.125 inches water gauge in the emergency make-up MODE of operation. The CREFS role in maintaining the control room habitable is discussed in the FSAR, Section 9.8 (Ref. 1).

APPLICABLE SAFETY ANALYSES

The CREFS provides airborne radiological protection for control room personnel, as demonstrated by the limiting control room dose analyses for the design basis large break loss of coolant accident. Control room dose analysis assumptions are presented in the FSAR, Section 14.3.5 (Ref. 2).

The analyses for radiological consequences in the control room are based on operation of CREFS in the emergency make-up MODE (MODE 4). The radiological effects in the control room, of the stopping and subsequent restart of CREFS after a loss of offsite power would not be significantly greater than the doses associated with continuous operation of CREFS post-accident, based on the following:

1. The control room would start from positive pressurization because the system normally runs in a positive pressurization MODE (MODE 1).

2. During the loss of ventilation, the air inside the control room would heat up and expand, which would continue to enhance outflow, minimizing in-leakage.

3. The control room would normally be closed which reduces in-leakage.

4. The control room ventilation system damper positions would automatically reposition to the emergency make-up configuration (MODE 4). Therefore, if any in-leakage through the control room intake occurred, it would be filtered at the same or higher efficiency assumed in the analysis.

5. Noble gases would not be drawn into the control room by the control room charcoal filter fan.

The CREFS satisfies Criterion 3 of the NRC Policy Statement.

BASES

LCO

The CREFS (MODE 4) is required to be OPERABLE to ensure that the control room habitability limits are met following a limiting design basis LOCA. Total system failure could result in exceeding the control room operator thyroid dose limit of 30 rem in the event of a large radioactive release. The CREFS is considered OPERABLE when the individual components necessary to filter and limit control room in-leakage are OPERABLE. CREFS is considered OPERABLE when:

a. Both emergency make-up fans (W-14A and W-14B) are OPERABLE;

b. Both recirculation fans (W-13B1 and W-13B2) are OPERABLE;

c. Emergency make-up filter unit (F-16), HEPA filters and charcoal adsorbers are not excessively restricting flow, and are capable of performing their filtration functions;

d. Control room ventilation envelope is capable of achieving and maintaining a positive pressure of at least 0.125 inches water gauge in the emergency make-up MODE of operation;

e. Ductwork and dampers are OPERABLE, and air circulation can be maintained; and

f. CREFS is capable of being manually initiated in the emergency make-up MODE of operation (MODE 4).

In addition, the control room boundary must be maintained, including the integrity of the walls, floors, ceilings, ductwork, and access doors.

APPLICABILITY

In MODES 1, 2, 3, 4, and during movement of irradiated fuel assemblies and during CORE ALTERATIONS, CREFS must be OPERABLE to control operator exposure during and following a DBA.

During movement of irradiated fuel assemblies and CORE ALTERATIONS, the CREFS must be OPERABLE to cope with the release from a fuel handling accident.

ACTIONS

A.1

When CREFS is inoperable, action must be taken to restore the system to OPERABLE status within 7 days. In this Condition, the remaining OPERABLE CREFS components may be adequate to perform the control room protection function; however, overall reliability may be

BASES

ACTIONS (continued)

reduced because a single active failure could result in loss of CREFS function. The 7 day Completion Time is based on the low probability of a DBA challenging control room habitability occurring during this time period.

B.1, B.2, B.3, and B.4

If CREFS cannot be restored to OPERABLE status within the required Completion Time with CORE ALTERATIONS or movement of irradiated fuel in progress, these activities must be suspended immediately. Immediately suspending these activities places the unit in a condition that minimizes risk from these activities. This does not preclude the movement of fuel to a safe position.

In MODE 1, 2, 3, or 4, if CREFS cannot be restored to OPERABLE status within the required Completion Time, the unit must be placed in a MODE that minimizes accident risk. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours, and in MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.7.9.1

Standby systems should be checked periodically to ensure that they function properly. As the environment and normal operating conditions on this system are not too severe, testing each fan subsystem once every month provides an adequate check of this system. Systems without heaters need only be operated for ≥ 15 minutes to demonstrate the function of the system. The 31 day Frequency is based on the reliability of the equipment.

SR 3.7.9.2

This SR verifies that the required CREFS testing is performed in accordance with the Ventilation Filter Testing Program (VFTP). The Frequency of CREFS filter tests are in accordance with Regulatory Guide 1.52 (Ref. 3). The VFTP includes testing the performance of the HEPA filter, charcoal adsorber efficiency, minimum flow rate, and the physical properties of the activated charcoal. Specific test Frequencies and additional information are discussed in detail in the VFTP.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.9.3

This SR verifies that each CREFS emergency make-up fan starts and operates on an actual or simulated actuation signal. The Frequency of 18 months is specified in Regulatory Guide 1.52 (Ref. 3).

SR 3.7.9.4

This SR verifies that each CREFS automatic damper in the emergency make-up MODE flow path will actuate to its required position on an actuation signal. The Frequency of 18 months is specified in Regulatory Guide 1.52 (Ref. 3).

SR 3.7.9.5

This test verifies manual actuation capability for CREFS. Manual actuation capability is a required for OPERABILITY of the CREFS because CREFS does not automatically restart after being load shed following a loss of offsite power. Manual action is required to restart and align the CREFS after a loss of offsite power, which is verified through performance of this SR. The 18 month Frequency is acceptable based on the inherent reliability of manual actuation circuits.

SR 3.7.9.6

This SR verifies the integrity of the control room enclosure. The control room positive pressure, with respect to potentially contaminated adjacent areas, is periodically tested to verify proper functioning of the CREFS. During the emergency MODE of operation, the CREFS is designed to pressurize the control room ≥ 0.125 inches water gauge positive pressure with respect to adjacent areas in order to minimize unfiltered inleakage. The CREFS is designed to maintain this positive pressure with one emergency make-up fan in operation at a makeup flow rate of ± 10% of the nominal make-up pressurization flow rate of approximately 4950 cfm. The Frequency of 18 months is consistent with the guidance provided in NUREG-0800 (Ref. 4).

REFERENCES

1. FSAR. Section 9.8.
2. FSAR. Section 14.3.5.
3. Regulatory Guide 1.52, Rev. 2.
4. NUREG-0800, Section 6.4, Rev. 2, July 1981.

B 3.7 PLANT SYSTEMS

B 3.7.10 Fuel Storage Pool Water Level

BASES

BACKGROUND

The minimum water level in the fuel storage pool meets the assumptions of iodine decontamination factors following a fuel handling accident. The specified water level shields and minimizes the general area dose when the storage racks are filled to their maximum capacity. The water also provides shielding during the movement of spent fuel.

A general description of the fuel storage pool design is given in the FSAR, Section 9.4 (Ref. 1). A description of the Spent Fuel Pool Cooling and Cleanup System is given in the FSAR, Section 9.9 (Ref. 2). The assumptions of the fuel handling accident are given in the FSAR, Section 14.2.1 (Ref. 3).

APPLICABLE SAFETY ANALYSES

The minimum water level in the fuel storage pool meets the assumptions of the fuel handling accident described in Regulatory Guide 1.25 (Ref. 4). The resultant 2 hour thyroid dose per person at the exclusion area boundary is a small fraction of the 10 CFR 100 (Ref. 5) limits.

According to Reference 4, there is 23 ft of water between the top of the damaged fuel bundle and the fuel pool surface during a fuel handling accident. With 23 ft of water, the assumptions of Reference 4 can be used directly. In practice, this LCO preserves this assumption for the bulk of the fuel in the storage racks. In the case of a single bundle dropped and lying horizontally on top of the spent fuel racks, however, there may be < 23 ft of water above the top of the fuel bundle and the surface, indicated by the width of the bundle. To offset this small nonconservatism, the analysis assumes that all fuel rods fail, although analysis shows that only the first few rows fail from a hypothetical maximum drop.

The fuel storage pool water level satisfies Criteria 2 and 3 of the NRC Policy.

LCO

The fuel storage pool water level is required to be ≥ 23 ft over the top of irradiated fuel assemblies seated in the storage racks. The specified water level preserves the assumptions of the fuel handling accident analysis (Ref. 3). As such, it is the minimum required for fuel storage and movement within the fuel storage pool.

BASES

APPLICABILITY	This LCO applies during movement of irradiated fuel assemblies in the fuel storage pool, since the potential for a release of fission products exists.
ACTIONS	A.1 Required Action A.1 is modified by a Note indicating that LCO 3.0.3 does not apply. When the initial conditions for prevention of an accident cannot be met, steps should be taken to preclude the accident from occurring. When the fuel storage pool water level is lower than the required level, the movement of irradiated fuel assemblies in the fuel storage pool is immediately suspended to a safe position. This action effectively precludes the occurrence of a fuel handling accident. This does not preclude movement of a fuel assembly to a safe position. If moving irradiated fuel assemblies while in MODE 5 or 6, LCO 3.0.3 would not specify any action. If moving irradiated fuel assemblies while in MODES 1, 2, 3, and 4, the fuel movement is independent of reactor operations. Therefore, inability to suspend movement of irradiated fuel assemblies is not sufficient reason to require a reactor shutdown.
SURVEILLANCE REQUIREMENTS	SR 3.7.10.1 This SR verifies sufficient fuel storage pool water is available in the event of a fuel handling accident. The water level in the fuel storage pool must be checked periodically. The 7 day Frequency is appropriate because the volume in the pool is normally stable. Water level changes are controlled by plant procedures and are acceptable based on operating experience. During refueling operations, the level in the fuel storage pool is in equilibrium with the refueling canal, and the level in the refueling cavity is checked daily in accordance with SR 3.9.6.1.
REFERENCES	1. FSAR, Section 9.4. 2. FSAR, Section 9.9. 3. FSAR, Section 14.2.1. 4. Regulatory Guide 1.25, Rev. 0. 5. 10 CFR 100.11.

B 3.7 PLANT SYSTEMS

B 3.7.11 Fuel Storage Pool Boron Concentration

BASES

BACKGROUND

The spent fuel storage racks are designed to allow unrestricted storage of fuel with a maximum enrichment of 4.6 wt% U-235. Fuel with enrichments > 4.6 wt% may be stored as well, but must contain Integral Fuel Burnable Absorbers (IFBA). These limitation ensure a maximum k_{eff} of 0.95 based on the use of unborated water.

The spent fuel storage pool will accommodate 1502 fuel assemblies. One location in the spent fuel storage pool is provided to allow rotation of a fuel assembly for visual inspection, but this location cannot be used for fuel storage. A general description of the spent fuel storage pool design is given in the FSAR Section 9.4 (Ref. 1).

The water in the spent fuel storage pool contains soluble boron, which results in large subcriticality margins under normal conditions. However, the NRC guidelines, based upon the accident condition in which all soluble poison is assumed to have been lost, specify that the limiting k_{eff} of 0.95 be evaluated in the absence of soluble boron. Hence, the design of the spent fuel storage racks is based on the use of unborated water. However, the spent fuel pool k_{eff} storage limit of 0.95 can be exceeded as a result of an excessive pool cooldown or the inadvertent placement of a highly enriched fuel assembly between a storage rack module and the wall of the spent fuel pool. The spent fuel pool k_{eff} storage limit of 0.95 is maintained during these events by maintaining a minimum boron concentration of 700 ppm (Ref. 2). Simultaneous occurrence of these events is not postulated. The double contingency principle discussed in ANSI N-16.1-1975 and the April 1978 NRC letter (Ref. 3) allows credit for soluble boron under abnormal or accident conditions, since only a single accident need be considered at one time.

APPLICABLE SAFETY ANALYSES

Most accident conditions do not result in an reactivity increase for the fuel stored in the spent fuel pool (e.g., loss of cooling, dropping of a fuel assembly on the top of the rack, etc.). However, accidents are postulated that could result in the spent fuel pool k_{eff} storage limit of 0.95 being exceeded. These accidents are excessive pool cooldown and the inadvertent placement of a highly enriched fuel assembly between a storage rack module and the wall of the spent fuel pool. For these events, the spent fuel pool k_{eff} storage limit of 0.95 is maintained by maintaining a minimum boron concentration of 700 ppm (Ref. 2). Simultaneous occurrence of these events is not postulated. The double

BASES

APPLICABLE SAFETY ANALYSES (continued)	contingency principle discussed in ANSI N-16.1-1975 and the April 1978 NRC letter (Ref. 3) allows credit for soluble boron under abnormal or accident conditions, since only a single accident need be considered at one time. The accident analyses is provided in the FSAR, Section 14.2.1 (Ref. 4). The concentration of dissolved boron in the fuel storage pool satisfies Criterion 2 of the NRC Policy Statement.
LCO	The fuel storage pool boron concentration is required to be ≥ 2100 ppm. The specified concentration of dissolved boron provides significant margin to the boron concentration used in the analyses of the potential critical accident scenarios as described in Reference 4. This concentration is the minimum required concentration for fuel assembly storage and movement within the fuel storage pool.
APPLICABILITY	This LCO applies whenever fuel assemblies are stored in the spent fuel storage pool and encompasses movement of fuel assemblies in the spent fuel storage pool. Postulated accident conditions include the inadvertent placement of a fuel assembly between the pool wall and the storage racks or an excessive cooldown event. This LCO provides assurance that k_{eff} of the spent fuel storage pool will remain < 0.95, even under postulated accident conditions.
ACTIONS	The Required Actions are modified by a Note indicating that LCO 3.0.3 does not apply. If the LCO is not met while moving irradiated fuel assemblies in MODE 5 or 6, LCO 3.0.3 would not be applicable. If moving irradiated fuel assemblies while in MODE 1, 2, 3, or 4, the fuel movement is independent of reactor operation. Therefore, inability to suspend movement of fuel assemblies or restoration of boron concentration is not sufficient reason to require a reactor shutdown. <u>A.1</u> When the concentration of boron in the fuel storage pool is less than required, immediate action must be taken to suspending the movement of fuel assemblies. This does not preclude movement of a fuel assembly to a safe position. By suspending movement of fuel, inadvertent placement of a fuel assembly between a fuel storage rack module and the wall of the spent fuel pool is precluded.

BASES

ACTIONS (continued)

A.2

Immediate action must be taken to restore boron concentration in the fuel storage pool to ≥ 2100 ppm to assure protection from excessive fuel pool cooldown reactivity insertion events. Restoration of boron concentration could take several hours or days depending on the magnitude of change required, which may involve feed and bleed operations. Immediate initiation of action is warranted based on the importance of maintaining k_{eff} of the spent fuel pool ≤ 0.95. As stated in Reference 2, 700 ppm is adequate to prevent the spent fuel pool k_{eff} storage limit of 0.95 from being exceeded as a result of an excessive pool cooldown. Accordingly, for minor deviations, significant margin exists to the analysis limit.

SURVEILLANCE REQUIREMENTS

SR 3.7.11.1

This SR verifies that the concentration of boron in the fuel storage pool is within the required limit. As long as this SR is met, the analyzed accidents are fully addressed. The 7 day Frequency is appropriate because no major replenishment of pool water is expected to take place over such a short period of time.

REFERENCES

1. FSAR. Section 9.4.
2. NRC Safety Evaluation Report, USNRC to WEPCO, dated September 4, 1997.
3. Double contingency principle of ANSI N16.1-1975, as specified in the April 14, 1978 NRC letter (Section 1.2) and implied in the proposed revision to Regulatory Guide 1.13 (Section 1.4, Appendix A).
4. FSAR. Section 14.2.1.

B 3.7 PLANT SYSTEMS

B 3.7.12 Spent Fuel Pool Storage

BASES

BACKGROUND

The spent fuel storage racks are designed to allow unrestricted storage of fuel with a maximum enrichment of 4.6 wt% U-235. Fuel with enrichments > 4.6 wt% may be stored as well, but must contain Integral Fuel Burnable Absorbers (IFBA). These limitations ensure a maximum k_{eff} of 0.95 based on the use of unborated water.

The spent fuel storage pool will accommodate 1502 fuel assemblies. One location in the spent fuel storage pool is provided to allow rotation of a fuel assembly for visual inspection, but this location cannot be used for fuel storage. A general description of the spent fuel storage pool design is given in the FSAR Section 9.4 (Ref. 1).

The water in the spent fuel storage pool contains soluble boron, which results in large subcriticality margins under normal conditions. However, the NRC guidelines, based upon the accident condition in which all soluble poison is assumed to have been lost, specify that the limiting k_{eff} of 0.95 be evaluated in the absence of soluble boron. Hence, the design of the spent fuel storage racks is based on the use of unborated water.

APPLICABLE SAFETY ANALYSES

The spent fuel pool k_{eff} storage limit of 0.95 can be exceeded as a result of an excessive pool cooldown or the inadvertent placement of a highly enriched fuel assembly between a storage rack module and the wall of the spent fuel pool. The spent fuel pool k_{eff} storage limit of 0.95 is maintained during these events by maintaining a minimum boron concentration (controlled by LCO 3.7.11, "Fuel Storage Pool Boron Concentration") of 700 ppm (Ref. 3). Simultaneous occurrence of these events is not postulated. The double contingency principle discussed in ANSI N-16.1-1975 and the April 1978 NRC letter (Ref. 2) allows credit for soluble boron under abnormal or accident conditions, since only a single accident need be considered at one time.

Fuel assembly storage limits for fuel stored in the spent fuel storage pool satisfy Criterion 2 of the NRC Policy Statement.

LCO

The restrictions on the placement of fuel assemblies within the spent fuel pool, in accordance with Figure 3.7.12-1, and the fuel storage limits of the accompanying LCO, ensures the k_{eff} of the spent fuel storage pool will always remain < 0.95, assuming the pool to be flooded with unborated water.

BASES

APPLICABILITY	This LCO applies whenever any fuel assembly is stored in the fuel storage pool.

ACTIONS

A.1

Required Action A.1 is modified by a Note indicating that LCO 3.0.3 does not apply.

When the fuel assembly storage limits specified in LCO 3.7.12 are not met, immediate action must be initiated to restore the spent fuel pool within fuel storage limits.

The spent fuel pool k_{eff} storage limit is required by NRC guidelines to be calculated assuming no credit for soluble boron. However, the water in the spent fuel storage pool contains soluble boron (as addressed by LCO 3.7.11, "Fuel Storage Pool Boron Concentration"), which results in large subcriticality margins under normal conditions. Accordingly, no immediate criticality concern exists for the range of fuel concentrations and IFBA loadings which may exist provided boron concentration is maintained in accordance with LCO 3.7.11.

If unable to move fuel assemblies while in MODE 5 or 6, LCO 3.0.3 would not be applicable. If unable to move irradiated fuel assemblies while in MODE 1, 2, 3, or 4, the action is independent of reactor operation. Therefore, inability to move fuel assemblies is not sufficient reason to require a reactor shutdown.

SURVEILLANCE REQUIREMENTS

SR 3.7.12.1

This SR verifies by administrative means, that fuel assemblies are within acceptable limits for storage in the spent fuel pool. Fuel assemblies meeting at least one of the following storage limits may be stored in the spent fuel storage racks;

1. Fuel assemblies with an initial enrichment of ≤ 4.6 w/o U-235; or

2. Fuel assemblies which contains Integral Fuel Burnable Absorber (IFBA) rods in the "acceptable range" of Figure 3.7.12-1.

BASES

REFERENCES

1. FSAR. Section, 9.4.
2. Double contingency principle of ANSI N16.1-1975, as specified in the April 14, 1978 NRC letter (Section 1.2) and implied in the proposed revision to Regulatory Guide 1.13 (Section 1.4, Appendix A).
3. NRC Safety Evaluation Report, USNRC to WEPCO, dated September 4, 1997.
4. NRC Safety Evaluation Report, USNRC to WEPCO, dated February 23, 1990.

B 3.7 PLANT SYSTEMS

B 3.7.13 Secondary Specific Activity

BASES

BACKGROUND

Activity in the secondary coolant results from steam generator tube outleakage from the Reactor Coolant System (RCS). Under steady state conditions, the activity is primarily iodines with relatively short half lives and, thus, indicates current conditions. During transients, I-131 spikes have been observed as well as increased releases of some noble gases. Other fission product isotopes, as well as activated corrosion products in lesser amounts, may also be found in the secondary coolant.

A limit on secondary coolant specific activity during power operation minimizes releases to the environment because of normal operation, anticipated operational occurrences, and accidents.

The release of secondary system activity is assumed in several accidents to include reactor coolant pump locked rotor, steam generator tube rupture, and Main Steam Line Break. The MSLB is the most limiting relative to secondary activity and is therefore used to establish the secondary coolant activity limit.

The MSLB involves a complete severance of a main steam line outside containment. The affected SG will rapidly depressurize and release to the outside atmosphere all of the radioiodines initially contained in the SG and the radioiodines which are transferred from the primary coolant through SG tube leakage. Iodine and noble gas activity is also released from the intact SG. A portion of the iodine activity initially contained in the intact SG is released, in addition to radioiodines and noble gases from the RCS through SG tube leakage, during plant cooldown to Residual Heat Removal entry conditions.

Operating a unit at the allowable limits could result in a 2 hour EAB exposure of a small fraction of the 10 CFR 100 (Ref. 1) limits.

APPLICABLE SAFETY ANALYSES

The accident analysis of the main steam line break (MSLB), as discussed in the FSAR, Chapter 14.2.5 (Ref. 2) assumes the initial secondary coolant specific activity to have a radioactive isotope concentration of 1.0 μCi/gm DOSE EQUIVALENT I-131. This assumption is used in the analysis for determining the radiological consequences of the MSLB. The MSLB offsite radiological analysis uses the analytical methods and assumptions outlined in the Standard Review Plan (Ref. 3). The result of the radiological analysis for this

BASES

APPLICABLE SAFETY ANALYSES (continued)

event shows that the radiological consequences of an MSLB do not exceed a small fraction of the plant Exclusion Area Boundary limits (Ref. 1) for whole body and thyroid dose rates.

Two offsite dose analyses are performed, one assuming a pre-accident RCS iodine spike, and the second involving an RCS iodine spike as a result of the MSLB. For the pre-accident iodine spike, it is assumed that a reactor transient has occurred prior to the MSLB which has raised the RCS DOSE EQUIVALENT I-131 concentration to the allowed Technical Specification value of 50 μCi/gm. For the accident-initiated iodine spike, the reactor trip associated with the MSLB creates an iodine spike in the RCS which increases the iodine release rate from the fuel to the RCS to a value of 500 times greater than the release rate corresponding to the maximum proposed equilibrium RCS DOSE EQUIVALENT I-131 Technical Specification concentration of 0.8 μCi/gm. The duration of the accident-initiated iodine spike is assumed to be 1.6 hours.

The following is a summary of other major assumptions and parameters used in both the pre and post accident cases outlined above:

1. Primary and secondary system activities are at equilibrium prior to the accidents.
2. The RCS noble gas activity is based on a fuel defect level of 1.0%. This is approximately equal to 100/E-bar μCi/gm for gross radioactivity.
3. The secondary coolant iodine activity is assumed to be 1.0 μCi/gm of DOSE EQUIVALENT I-131.
4. Primary to secondary SG tube leakage in each SGs is assumed to be 0.35 gpm.
5. The atmospheric dispersion factor (χ/Q) at site boundary during the two hours following the accident is 5.0×10^{-4} m^3/sec.
6. Breathing rate used to calculate the thyroid dose for the accidents is 3.47×10^{-4} m^3/sec.
7. The SG connected to the ruptured main steam line is assumed to boil dry within 30 minutes.
8. All of the activity contained in the steam generator connected to the ruptured steam line is assumed to be released directly to the environment. No credit is taken for activity plate out or retention.

BASES

APPLICABLE SAFETY ANALYSES (continued)

9. Iodine carried over to the faulted SG by SG tube leaks is assumed to be released directly to the environment.

10. No credit is taken for iodine removal from steam released to the condenser prior to reactor trip and concurrent loss of offsite power.

11. With the loss of offsite power, the remaining intact steam generator is available for core decay heat removal by venting steam to the atmosphere.

12. The intact steam generator is assumed to discharge entrained activity to the atmosphere. The iodine partition factor for the intact SG is assumed to be 0.01.

13. The Auxiliary Feedwater System supplies makeup to the intact steam generator.

14. Venting of steam from the intact SG continues until the reactor coolant temperature and pressure have decreased sufficiently for the Residual Heat Removal System to be placed into operation to complete the cooldown. Eight hours after the accident, the residual heat removal system is assumed to be placed into operation.

Secondary specific activity limits satisfy Criterion 2 of the NRC Policy Statement.

LCO

As indicated in the Applicable Safety Analyses, the specific activity of the secondary coolant is required to be ≤ 1.0 μCi/gm DOSE EQUIVALENT I-131 to limit the radiological consequences of a Design Basis Accident (DBA) to a small fraction of the required limit (Ref. 1).

Monitoring the specific activity of the secondary coolant ensures that when secondary specific activity limits are exceeded, appropriate actions are taken in a timely manner to place the unit in an operational MODE that would minimize the radiological consequences of a DBA.

APPLICABILITY

In MODES 1, 2, 3, and 4, the limits on secondary specific activity apply due to the potential for secondary steam releases to the atmosphere.

In MODES 5 and 6, the steam generators are not being used for heat removal. Both the RCS and steam generators are depressurized, and primary to secondary LEAKAGE is minimal. Therefore, monitoring of secondary specific activity is not required.

BASES

ACTIONS

A.1 and A.2

DOSE EQUIVALENT I-131 exceeding the allowable secondary coolant, is an indication of a problem in the RCS and contributes to increased post accident doses. If the secondary specific activity cannot be restored to within limits within the associated Completion Time, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours, and in MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

SURVEILLANCE REQUIREMENTS

SR 3.7.13.1

This SR verifies that the secondary specific activity is within the limits of the accident analysis. A gross beta-gamma or gamma isotopic analysis of the secondary coolant, may be used to confirm DOSE EQUIVALENT I-131 is $\leq$ 1.0 μCi/gm. Confirmation of gross activity is a conservative means of determining compliance with the LCO limit. However, if gross activity exceeds the 1.0 μCi/gm limit, an isotopic analysis should be performed to determine DOSE EQUIVALENT I-131, to prevent unnecessary shutdowns. Performance of this SR confirms the validity of the safety analysis assumptions as to the secondary system source terms for post accident releases. It also serves to identify and trend any unusual isotopic concentrations that might indicate changes in reactor coolant activity or LEAKAGE. The 31 day Frequency is based on the detection of increasing trends of the level of DOSE EQUIVALENT I-131, and allows for appropriate action to be taken to maintain levels below the LCO limit.

REFERENCES

1. 10 CFR 100.11.

2. FSAR. Chapter 14.2.5.

3. NUREG 0800, USNRC Standard Review Plan, 15.1.5, Steam Piping Failures Inside and Outside of Containment (PWR), Rev. 2, July 1981.

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 preferred normal offsite power source, and the onsite standby emergency power sources. As required by the Point Beach Design Criteria (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 is divided into two redundant load groups (safeguards buses) so that the loss of any one group does not prevent a safety function from being performed. Each safeguards bus has connections to the normal offsite power source and a standby emergency power source.

Offsite power is supplied to the switchyard from the offsite transmission network by four transmission lines. From the switchyard, two separate circuits provide AC power through high voltage (345/13.8 kV) station auxiliary transformers 1X03 and 2X03 to the 13.8 kV distribution network. The 13.8 kV distribution network is divided into three buses designated; H01, H02, and H03. The high voltage station auxiliary transformers 1X03 and 2X03, are the normal supplies to the 13.8 kV network, directly supplying buses H02 and H03, respectively. A 13.8 kV gas turbine generator (G05) can also supply power to the 13.8 kV distribution network via bus H01. The high voltage station auxiliary transformer 1X03 normally supplies offsite power to the Unit 1 low voltage station auxiliary transformer 1X04 via bus H02. Alternate power supplies to the Unit 1 station auxiliary transformer 1X04 are the gas turbine generator (G05) and the high voltage station transformer 2X03. Similarly the high voltage station auxiliary transformer 2X03 supplies power to the Unit 2 low voltage station auxiliary transformer 2X04 with alternate power supplies from the gas turbine generator (G05) and high voltage station transformer 1X03. The normal 13.8 kV electrical arrangement is to have one of the two bus tie breakers from bus H02 or Bus H03 to bus H01 closed supplying power to bus H01.

The 13.8 kV bus configuration allows a high voltage station auxiliary transformer (1X03 or 2X03) to be removed from service, allowing its associated low voltage auxiliary transformer (1X04 or 2X04) to be supplied from the opposite unit's redundant high voltage station auxiliary transformer (1X03 or 2X03) or the gas turbine generator. If a high voltage station auxiliary transformer lockout occurs, the 13.8 kV bus tie breakers will receive an automatic close signal to supply the

BASES

BACKGROUND (continued)

affected unit's low voltage station auxiliary transformer. The closing of the tie breakers into a common fault is prevented by trip and lockout interlocks in the breaker control circuits.

The 13.8 kV distribution network supplies power to the low voltage (13.8/4.16 kV) station auxiliary transformers, 1X04 and 2X04, which in turn supply power to 4.16 kV distribution buses, A03 and A04. The 4.16 kV distribution buses, A03 and A04, supply power to safeguards buses A05 and A06.

The offsite AC power source consists of all breakers, transformers, switches, interrupting devices, cabling, and controls required to transmit power from the offsite 345 kV transmission network to the 4.16 kV Class 1E safeguards bus(es).

The onsite standby emergency power system is comprised of four diesel generators that directly supply the 4.16 kV safeguards electrical distribution buses (A05 and A06). The two A train standby emergency power sources (G-01 and G-02) are normally aligned; G-01 to the Unit 1 A train 4.16 kV bus (1A05) and G-02 to the Unit 2 A train 4.16 kV bus (2A05). The two Train B standby emergency power sources are normally aligned; G-03 to the Unit 1 B train 4.16 kV bus (1A06) and G-04 to the Unit 2 B train 4.16 kV bus (2A06). Each emergency diesel generator is capable of starting and supplying the power requirement of one complete set of safeguards equipment for one reactor unit, while simultaneously providing sufficient power to allow the other unit to be placed in a safe shutdown condition (no accident is assumed in the second unit).

Normally, all four standby emergency power sources are OPERABLE and aligned to their normal bus; however, the standby emergency power sources can be aligned such that only one diesel generator per safeguards train is required OPERABLE to support one or both units. In addition, either diesel generator may be manually connected to one or both of its respective trains' 4.16 kV safeguards distribution buses.

Each diesel generator will automatically start on an undervoltage signal from its associated 4.16 kV train in either unit, and will restore power on the bus(es) to which it is aligned (refer to LCO 3.3.5, "Loss of Power (LOP) Diesel Generator (standby emergency power source) Start Instrumentation"). All four diesel generators will automatically start on a safety injection (SI) signal from either unit.

A logic circuit controls the permissive and sequential start signals to various loads to prevent overloading the diesel generator by automatic load application. Sequence and permissives differ based on the

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initiation signal(s) which are received. The standby emergency power sources will start and operate in the standby mode without tying to its respective 4.16 kV ESF bus(es) on an SI signal alone.

Response to a undervoltage condition alone is as follows:

a. The standby emergency power source(s) auto starts.

b. Trip of the 4.16 kV bus supply breaker(s).

c. All feeder and bus tie breakers on the 480 V safeguards bus, except for the component cooling pump motor, auxiliary feedwater pump motor, and the safeguards motor control centers, are tripped. For the A train 480 V buses, this load shedding function is blocked after the bus emergency diesel generator output circuit breaker closes. This is necessary to prevent inadvertent load shedding during load sequencing. For the train B buses, this load shedding function is not blocked. The train B emergency diesel generator transient voltage response is sufficient to maintain bus voltage above the 480 VAC Loss of Voltage Relay setpoint during load sequencing.

d. After the standby emergency power source comes up to speed (as sensed by diesel generator speed switches) and voltage (as determined by generator field being present), the associated standby emergency power source breaker closes, re-energizing the safeguards buses.

e. Manually start any auxiliary as required for safe plant operation.

Response to a Safety Injection signal, coincident with an undervoltage condition, is as follows:

a. The standby emergency power source(s) auto starts.

b. Trip of the 4.16 kV bus supply breaker(s) in response to the undervoltage condition.

c. All feeder and bus tie breakers on the 480 V safeguards bus, except for auxiliary feedwater pump motor, and the safeguards motor control centers, are tripped. For the A train 480 V buses, this load shedding function is blocked after the bus emergency diesel generator output circuit breaker closes. This is necessary to prevent inadvertent load shedding during load sequencing. For the train B buses, this load shedding function is not blocked. The train B emergency diesel generator transient voltage response is

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sufficient to maintain bus voltage above the 480 VAC Loss of Voltage Relay setpoint during load sequencing.

d. Automatic start of the component cooling pump motor is blocked, and the battery charger input contactors are tripped open.

e. After the standby emergency power source comes up to speed (as sensed by diesel generator speed switches) and voltage (as determined by generator field being present), the associated standby emergency power source breaker closes, re-energizing the safeguards buses.

f. Loading sequence of ESF equipment is initiated (refer to FSAR Section 8.8 for sequencer times).

g. Starting of containment spray pumps is independent of the ESF starting sequence. Containment spray start occurs within 10 seconds after a containment high pressure signal with the safeguards bus energized and may occur simultaneously with the start of other equipment.

The emergency generator automatic loading sequence, including engine starting, will be accomplished in approximately 60 seconds. The time between when the emergency diesel generator receives a start signal (i.e., after actuation of the 4.16 kV Loss of Voltage relay), until the emergency diesel generator is ready to accept load, shall not exceed 10 seconds.

The Train A standby emergency power sources (G01 and G02) are rated at 2,850 kW for 2000 hours, 0.8 power factor. Additional ratings for the Train A units include 2963 kW for 200 hours, 3000 kW for 4 hours and 3053 kW for a 30-minute period. The Train B standby emergency power sources are rated at 2848 kW for 2000 hours. Additional ratings for the Train B units include 2951 kW for 200 hours, and 2987 kW for 4 hours. The ESF loads that are powered from the 4.16 kV ESF buses are listed in Reference 2.

The two Train A emergency diesel-generator sets are located in separate rooms in the seismic Class I section of the turbine building. The two Train B emergency diesel-generator sets are located in separate rooms in the seismic Class I Emergency Diesel Generator building.

The emergency diesel generators have several auxiliary support systems that must function in order to perform their safety related functions, including; the diesel starting air system, engine fuel oil

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system, engine cooling system, engine lubricating system, and room ventilation system.

A diesel generator is OPERABLE when diesel room temperature can be maintained ≤ 120°F with the diesel engine operating at full load. Temperature will be maintained ≤ 120°F when: 1) all gravity-operated louvers are OPERABLE, and 2) both diesel room exhaust fans are OPERABLE.

In lieu of both diesel room exhaust fans being OPERABLE for G-01 and G-02; only one diesel room exhaust fan is required to be OPERABLE when outside air temperature is ≤ 80°F.

In lieu of both diesel room exhaust fans being OPERABLE for G-03 and G-04, only the large capacity fan (W-183C for G-03, W-184B for G-04) is required to be OPERABLE when outside air temperature is < 84°F, or only the small capacity fan (W-183B for G-03, W-184C for G-04) is required to be OPERABLE when outside air temperature is ≤ 36°F.

A detailed description of the AC power distribution network is contained in FSAR, Chapter 8 (Ref. 2).

APPLICABLE SAFETY ANALYSES

The initial conditions of DBA and transient analyses in the FSAR, Chapter 14 (Ref. 3), 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; 3.4, Reactor Coolant System (RCS); 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 results in maintaining at least the minimum number of safeguard buses required in support of equipment required to mitigate the consequences of design basis accidents and anticipated operational occurrences in the event of:

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

b. A worst case single failure.

The AC sources satisfy Criterion 3 of NRC Policy Statement.

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LCO

Qualified sources of power between the offsite transmission network, the onsite Class 1E electrical power distribution system, and separate and independent standby emergency power sources for each safeguards train ensures the availability of 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.

The following AC electrical power sources are required to be OPERABLE:

a. One circuit between the offsite transmission network and the associated unit's 4.16 kV Class 1E safeguards buses, A05 and A06, utilizing the associated unit's X03 transformer or the opposite unit's X03 transformer with the gas turbine in operation, and associated unit's X04 transformer; and

b. One circuit between the offsite transmission network and the opposite unit's 4.16 kV Class 1E safeguards buses, A05 and A06; and

c. One standby emergency power source capable of supplying each 4.16 kV/480 V Class 1E safeguards bus, A05/B03 and A06/B04.

Each of the above required offsite sources is described in detail as follows:

The source of offsite AC power between the offsite transmission network and the associated unit's 4.16 kV Class 1E safeguards buses, A05 and A06, consists of:

a. The associated unit's high voltage system auxiliary transformer, X03, supplied from 345 kV Switchyard; or, the opposite unit's X03 with the gas turbine in operation;

b. The associated unit's low voltage station auxiliary transformer, X04;

c. The associated unit's 4.16 kV distribution buses, A03 and A04; and

d. All associated breakers, switches, interrupting devices, cabling, and controls required to transmit power from the Offsite 345 kV Distribution System to its respective unit's 4.16 kV safeguards buses A05 and A06.

The offsite AC power circuit between the offsite transmission network and the opposite unit's 4.16 kV Class 1E safeguards buses, A05 and A06, consists of:

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LCO (continued)

a. Either high voltage system auxiliary transformer, X03, supplied from the 345 kV Switchyard, supplying power to either unit's low voltage station auxiliary transformer, X04, the opposite unit's 4.16 kV distribution buses, A03 and A04, the associated unit's 4.16 kV distribution buses, A03 and A04 (when power is being supplied by the associated unit's low voltage station auxiliary X04 transformer); and

b. All associated breakers, switches, interrupting devices, cabling, and controls required to transmit power from the Offsite 345 kV Distribution System to the opposite unit's 4.16 kV safeguards buses, A05 and A06.

Each of the required offsite sources must be capable of maintaining rated frequency and voltage, and accepting required loads during an accident, while connected to the ESF buses. For the offsite AC sources, separation and independence are to the extent practical. A circuit may be connected to more than one ESF bus. Additionally, fast transfer capability of offsite power to the opposite 13.8 kV AC Power Distribution Circuit or Gas Turbine Generator does not violate separation criteria. The closing of the tie breakers into a common fault is prevented by trip and lockout interlocks in the breaker control circuits.

Each Onsite Class 1E Safeguards AC Power Distribution System must be capable of being powered from an OPERABLE standby emergency power source. Each standby emergency power source must be capable of starting, accelerating to rated speed and voltage, and connecting to its respective safeguards bus(es) on detection of undervoltage within 10 seconds. Each standby emergency power source must also be capable of accepting ESF loads within the predetermined sequence established by the ESF safeguards logic and sequence timers, and continue to operate until offsite power can be restored to the ESF buses. Sequencing of loads is a required function for standby emergency power source OPERABILITY.

APPLICABILITY

The AC sources are required to be OPERABLE in MODES 1, 2, 3, and 4 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.

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The AC power requirements for MODES 5 and 6 are covered in LCO 3.8.2, "AC Sources-Shutdown.

Bases Table B 3.8.1-1 provides a reference of Conditions that are applicable based on various inoperabilities.

A.1 and A.2

To ensure a highly reliable power source of offsite power remains available when the associated unit's X03 transformer is inoperable, Required Action A.1 requires verification that offsite power is supplying the associated unit's 4.16 kV safeguards buses from the opposite unit's X03 transformer within 24 hours and Required Action A.2 requires that the gas turbine generator be placed in operation within 24 hours. The 24 hour Completion Time associated with Required Action A.2 is sufficient time to start, synchronize and load the gas turbine.

The 24 hour Completion Time associated with Required Action A.1 is sufficient to verify that the associated unit's safeguards buses continue to be energized from offsite power, since transfer to the opposite unit's X03 transformer should have occurred automatically. If auto bus transfer has not occurred, the 24 hour Completion Time is sufficient to return offsite power to the associated unit's safeguards buses.

B.1

Required Action B.1 applies when the associated unit's X04 transformer is inoperable. The inoperability of the associated unit's X04 transformer renders offsite power to the associated units safeguards buses inoperable. According to Regulatory Guide 1.93 (Ref. 5), operation may continue in Condition B 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.

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

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

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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 the required offsite circuit 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 the offsite circuits commensurate with the importance of maintaining an AC electrical power system capable of meeting its design criteria.

C.1

Required Action C.1, applies when offsite power to both safeguards buses on the same unit are inoperable (i.e., 1A05 and 1A06, or 2A05 and 2A06), or offsite power to safeguards buses 1A05 and 2A06 are inoperable. This level of degradation means that the offsite electrical power system does not have the capability to supply the minimum number of ESF systems required to effect a safe shutdown and to mitigate the effects of an accident; however, the onsite AC sources have not been degraded. This condition is similar to that of Condition B, which according to Regulatory Guide 1.93 (Ref. 5), allows operation to continue for a period that should not exceed 24 hours. Because of the normally high availability of the offsite source, this level of degradation may appear to be more severe than other combinations of AC sources inoperable that involve one or more inoperable standby emergency power sources. However, two factors tend to decrease the severity of this level of degradation:

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

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

With the required offsite circuit 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 the

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ACTIONS (continued)

offsite circuits commensurate with the importance of maintaining an AC electrical power system capable of meeting its design criteria.

D.1

Condition D applies when offsite power is inoperable to one or more required 4.16 kV safeguards bus(es). The Required Actions for this Condition provide appropriate compensatory actions for each inoperable power supply, while the combination of Condition C and Condition D dictates which combinations of buses with inoperable power sources are allowed for 7 days versus 24 hours.

Required Action D.1 is intended to provide assurance that an event coincident with a single failure of the associated standby emergency power source will not result in a complete loss of safety function of critical redundant required features. These features are powered from the redundant safeguards train.

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

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

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

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

Discovering no offsite power to one safeguards bus coincident with one or more inoperable required redundant support or supported features, or both, results in starting the Completion Times for the Required Action. Twelve hours is acceptable because it minimizes risk while allowing time for restoration before subjecting the unit to transients associated with shutdown.

The remaining OPERABLE safeguards bus(es)' offsite power supplies and standby emergency power sources are adequate to supply electrical power to Train A and Train B of the onsite Class 1E Distribution System. The 12 hour Completion Time takes into account the component OPERABILITY of the redundant counterpart to the inoperable required feature. Additionally, the 12 hour Completion Time

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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.

D.2

Operation may continue in Condition D for a period that should not exceed 7 days with offsite power to one or more 4.16 kV safeguards buses inoperable. In this condition, the reliability of the offsite system is degraded, and the potential for a loss of offsite power may be increased, with attendant potential for a challenge to the unit safety systems. However, the remaining OPERABLE 4.16 kV safeguards buses supplied by offsite power and standby emergency power sources are adequate to supply electrical power to the onsite Class 1E Safeguards Distribution System.

The 7 day 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.

The second Completion Time for Required Action D.2 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 D is entered while, for instance, a standby emergency power source is inoperable and that standby emergency power source is subsequently returned to OPERABLE, the LCO may already have been not met for up to 7 days. This could lead to a total of 14 days, since initial failure to meet the LCO, to restore the offsite power supply. At this time, a standby emergency power source could again become inoperable, the offsite power supply restored OPERABLE, and an additional 7 days (for a total of 21 days) allowed prior to complete restoration of the LCO. The 14 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 D and E are entered concurrently. The "AND" connector between the 7 day and 14 day Completion Times means that both Completion Times apply simultaneously, and the more restrictive Completion Time must be met.

As in Required Action D.1, the Completion Time allows for an exception to the normal "time zero" for beginning the allowed outage time "clock." This will result in establishing the "time zero" at the time that the LCO was initially not met, instead of at the time Condition D was entered.

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ACTIONS (continued) E.1

Condition E applies when one or more standby emergency power supplies are inoperable. Condition E contains a Note which provide clarification that, for this Condition, separate Condition entry is allowed for each inoperable standby emergency power supply. This is acceptable since the Required Actions for this Condition provide appropriate compensatory actions for each inoperable power supply, while the combination of Condition E and Condition G dictates which combinations of buses with inoperable power sources are allowed for 7 days versus 2 hours.

Required Action E.1 is intended to provide assurance that a loss of offsite power, during the period that a standby emergency power source is inoperable, does not result in a complete loss of safety function of critical systems. These features are designed with redundant safety related trains. Redundant required feature failures consist of inoperable features associated with a train, redundant to the train that has the inoperable standby emergency power source.

The Completion Time for Required Action E.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. An inoperable standby emergency power source exists; and

b. A required redundant feature is inoperable.

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

Discovering an inoperable standby emergency power source coincident with one or more inoperable required support or supported features, or both, that are associated with the remaining OPERABLE standby emergency power source, 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.

In this Condition, the remaining OPERABLE standby emergency power source(s) and offsite circuits are adequate to supply electrical power to the onsite Class 1E Distribution System. Thus, on a component basis,

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ACTIONS (continued)

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 OPERABILITY of the redundant counterpart to the inoperable required feature. Additionally, the 4 hour Completion Time takes into account the capacity and capability of the remaining AC sources, a reasonable time for repairs, and the low probability of a DBA occurring during this period.

E.2.1, E.2.2, and E.2.3

Required Action E.2.1 provides an allowance to avoid unnecessary testing of OPERABLE standby emergency power source(s). If it can be determined that the cause of the inoperable standby emergency power source does not exist on the OPERABLE standby emergency power source, SR 3.8.1.2 does not have to be performed. If the cause of inoperability exists on other standby emergency power source(s), the other standby emergency power source(s) would be declared inoperable upon discovery and Condition E of LCO 3.8.1 would be entered for the additional inoperable source. Which additional standby emergency power supply(ies) are inoperable will dictate whether entry into LCO 3.8.1 Condition F is required. Once the failure is repaired, the common cause failure no longer exists, and Required Action E.2.1 is satisfied. If the cause of the initial inoperable standby emergency power source cannot be confirmed not to exist on the remaining standby emergency power source(s), performance of SR 3.8.1.2 suffices to provide assurance of continued OPERABILITY of that standby emergency power source.

In the event the inoperable standby emergency power source is restored to OPERABLE status prior to completing either E.2.1 or E.2.2, the plant corrective action 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 E.

According to Generic Letter 84-15 (Ref. 6), 24 hours is reasonable to confirm that the OPERABLE standby emergency power source(s) is not affected by the same problem as the inoperable standby emergency power source.

Failure to complete Required Action E.2.1 or E.2.2 outlined above will result in declaring the other required standby emergency power sources inoperable in accordance with Required Action E.2.3.

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ACTIONS (continued) E.3

Operation may continue in Condition E for a period that should not exceed 7 days.

In Condition E, the remaining OPERABLE standby emergency power source and offsite circuits are adequate to supply electrical power to the onsite Class 1E Distribution System. The 7 day 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.

The second Completion Time for Required Action E.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 E is entered while, for instance, an offsite source is inoperable and that source is subsequently restored OPERABLE, the LCO may already have been not met for up to 7 days. This could lead to a total of 14 days, since initial failure to meet the LCO, to restore the standby emergency power source. At this time, an offsite source could again become inoperable, the standby emergency power source restored OPERABLE, and an additional 7 days (for a total of 21 days) allowed prior to complete restoration of the LCO. The 14 day Completion Time provides a limit on time allowed in a specified condition after discovery of failure to meet the LCO. This limit is considered reasonable for situations in which Conditions D and E are entered concurrently. The "AND" connector between the 7 day and 14 day Completion Times means that both Completion Times apply simultaneously, and the more restrictive Completion Time must be met.

As in Required Action E.1, the Completion Time allows for an exception to the normal "time zero" for beginning the allowed time "clock." This will result in establishing the "time zero" at the time that the LCO was initially not met, instead of at the time Condition E was entered.

F.1 and F.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 Action of Condition F are modified by a Note to indicate that when Condition F is entered with no AC power to any Class 1E 4.16 kV bus, the Conditions and Required Actions for LCO 3.8.9, "Distribution Systems – Operating" must be immediately entered. This allows Condition F to provide requirements for the loss of one offsite power source to one or more Class 1E 4.16

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ACTIONS (continued)

kV bus(es) and one required standby emergency power source, without regard to whether a train is de-energized. LCO 3.8.9 provides appropriate restrictions for a de-energized Class 1E 4.16 kV bus.

G.1

Required Action G.1 applies to each unit in MODE 1, 2, 3 or 4, when standby emergency power to both safeguards buses on the same unit are inoperable (i.e., 1A05/1B03 and 1A06/1B04, or 2A05/2B03 and 2A06/2B04), or standby emergency power to safeguards buses 1A05/1B03 and 2A06/2B04 are inoperable. Thus, with an assumed loss of offsite electrical power, insufficient standby emergency power sources are available to power the minimum required ESF functions.

Since the offsite electrical power system is the only source of AC power for 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 Reference 5, operation may continue for a period that should not exceed 2 hours.

H.1 and H.2

If the inoperable AC electric power sources cannot be restored to OPERABLE status within the required 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 at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging plant systems.

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 the Point Beach Design Criteria (Ref. 1). Periodic component tests are supplemented by extensive functional tests during refueling outages (under simulated accident conditions).

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SURVEILLANCE REQUIREMENTS (continued)

Where various SRs discussed herein specify voltage and frequency limitations, the following is applicable. The minimum continuous rating for safety-related electrical motors is 90% of nominal motor voltage as recommended by ANSI C50.41-1977 and NEMA MG-1. Additionally, the safety-related motors have a one-minute rating of 75% of nominal motor voltage as recommended by ANSI C50.41-1977. Therefore, under a worst case (maximum) loading condition, safeguards bus voltages must be maintained high enough to prevent the terminal voltage at any 4160 or 480 V motor from falling below 3600 / 414 V continuous (90% of nominal) or 3000 / 345 V for one minute (75% of normal). Additionally, motor control center continuous and instantaneous voltages must be maintained above 400 V and 308 V, respectively, to ensure that 480 V Motor Control Center contactors are able to close and do not drop out. These voltages are below the minimum continuous and instantaneous 480 V motor voltage requirements.

The maximum allowable 4160 V system voltage must be low enough to ensure all connected equipment will operate properly. Motors are the most sensitive 4.16 kV and 480 V loads to high voltages. The maximum continuous rating for safety-related motors is 110% of nominal as recommended by ANSI C50.41-1977. Therefore, under a worst case (minimum) loading condition, 4160 V System voltages should be maintained low enough to remain below 110% of the ratings.

The safeguards distribution system frequency must be maintained within the limits allowed by connected equipment; below the setting of overcurrent relays; and above the setting of underfrequency relays. Electrical motors are sensitive to variations in operating frequency.

Equipment Technical Manuals for various 4160 V and 480 V motors have indicated motor terminal frequency must be maintained between 57 - 63 Hz, which is consistent with industry motor standards. The 57 - 63 Hz rating is also consistent with the allowable frequency ranges for other frequency sensitive non-motor loads (i.e., 480 V battery chargers). Although 63 Hz is the upper limit for motor operation to prevent motor damage, motors may not be capable of operating at 63 Hz due to circuit breaker settings. Since motor current increases with frequency, the possibility exists that circuit breakers supplying 480 V motors may trip on overcurrent if the 4160 V System is operated at elevated frequencies. Calculations performed verify that all safety related 480 V motors will not trip on overcurrent assuming their terminal frequency does not exceed 62.4 Hz. Therefore, to ensure that connected safety-related loads do not trip on overcurrent, 4160 V System frequency must not exceed 62.4 Hz.

BASES

SURVEILLANCE REQUIREMENTS (continued)

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. The 7 day Frequency is adequate since breaker position is not likely to change without the operator being aware of it and because its status is displayed in the control room.

SR 3.8.1.2

This SR helps to ensure the availability of the standby electrical power supply to mitigate DBAs and transients and to 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, SR 3.8.1.2 is modified by a Note to indicate that all standby emergency power source starts for this surveillance may be preceded by an engine prelube and followed by a warmup period prior to loading.

For the purposes of SR 3.8.1.2 testing, the standby emergency power sources are started from standby conditions. Standby conditions for a standby emergency power source mean that the diesel engine coolant and oil are being continuously circulated and temperature is being maintained consistent with manufacturer recommendations.

SR 3.8.1.2 requires that, at a 31 day Frequency, the standby emergency power source starts from standby conditions and achieves required voltage and frequency.

The 31 day Frequency for SR 3.8.1.2 is consistent with Regulatory Guide 1.9 (Ref. 4). This Frequency provides adequate assurance of standby emergency power source OPERABILITY, while minimizing degradation resulting from testing.

SR 3.8.1.3

This Surveillance verifies that the standby emergency power sources are capable of synchronizing with the offsite electrical system and accepting loads ≥ 2500 kW and ≤ 2850 kW. A minimum run time of 60 minutes is required to stabilize engine temperatures, while minimizing the time that the standby emergency power source is connected to the offsite source.

BASES

SURVEILLANCE REQUIREMENTS (continued)

Although no power factor requirements are established by this SR, the standby emergency power source is normally operated at a power factor between 0.8 lagging and 1.0. The 0.8 value is the design rating of the machine, while the 1.0 is an operational limitation to ensure circulating currents are minimized. The load band is provided to avoid routine overloading of the standby emergency power source. Routine overloading may result in more frequent teardown inspections in accordance with vendor recommendations in order to maintain standby emergency power source OPERABILITY.

The 31 day Frequency for this Surveillance is consistent with Regulatory Guide 1.9 (Ref. 4).

This SR is modified by three Notes. Note 1 indicates that diesel engine runs for this Surveillance may include gradual loading, so that mechanical stress and wear on the diesel engine are minimized. Note 2 states that momentary transients, because of changing bus loads, do not invalidate this test. Similarly, momentary power factor transients above the limit do not invalidate the test. Note 3 stipulates a prerequisite requirement for performance of this SR. A successful standby emergency power source start must precede this test to credit satisfactory performance.

SR 3.8.1.4

This Surveillance demonstrates that each required fuel oil transfer pump system operates and transfers fuel oil from its associated storage tank to its associated day tank and engine mounted sump as applicable. This is required to support continuous operation of standby power sources. This Surveillance provides assurance that the fuel oil transfer system 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.

The design of fuel transfer systems is such that pumps and valves operate automatically to maintain an adequate volume of fuel oil in the day and engine mounted sump tanks during or following standby emergency source testing.

The 31 day Frequency is adequate to assure that the fuel oil transfer system is OPERABLE, since low level alarms are provided.

SR 3.8.1.5

In the event of a DBA coincident with a loss of offsite power, the standby emergency power sources are required to supply the

BASES

SURVEILLANCE REQUIREMENTS (continued)

necessary power to ESF systems so that the fuel, RCS, and containment design limits are not exceeded.

This Surveillance demonstrates the standby emergency power source operation, during a loss of offsite power actuation test signal in conjunction with an ESF actuation signal.

This test verifies all actions encountered from the loss of offsite power, including shedding of the nonessential loads and energization of the emergency buses and respective loads from the standby emergency power source. It further demonstrates the capability of the standby emergency power source to automatically achieve the required voltage and frequency within analysis limits.

The standby emergency power source autostart time of 10 seconds is derived from requirements of the accident analysis to respond to a design basis large break LOCA. The Surveillance should be continued for a minimum of 5 minutes in order to demonstrate that all starting transients have decayed and stability is achieved.

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 standby emergency power source 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, Emergency Core Cooling Systems (ECCS) injection valves are not desired to be stroked open, or high pressure injection systems are not capable of being operated at full flow, or residual heat removal (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 connection and loading of loads, testing that adequately shows the capability of the standby emergency power source systems to perform these functions is acceptable. This testing may include any series of sequential, overlapping, or total steps so that the entire connection and loading sequence is verified.

The Frequency of 18 months is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 4), takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with standard fuel cycle lengths.

For the purpose of this testing, the standby emergency power sources must be started from standby conditions. That is, with the engine oil continuously circulated and engine temperature maintained consistent

BASES

SURVEILLANCE REQUIREMENTS (continued)

with manufacturer recommendations for standby emergency power sources.

This SR is modified by a note. The reason for the Note is that the performance of the Surveillance would remove a required offsite source from service, perturb the electrical distribution system and challenge safety systems.

SR 3.8.1.6

As required by Regulatory Guide 1.9 (Ref. 4), this Surveillance ensures that the manual synchronization and load transfer from the standby emergency power source to the offsite source can be made and the standby emergency power source can be returned to ready to load status when offsite power is restored. It also ensures that the autostart logic is reset to allow the standby emergency power source to reload if a subsequent loss of offsite power occurs. The standby emergency power source is considered to be in ready to load status when the standby emergency power source is at rated speed and voltage, the output breaker is open and can receive an autoclose signal on bus undervoltage, and the load sequence timers are reset.

The Frequency of 18 months is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 4), and takes into consideration unit conditions required to perform the Surveillance.

REFERENCES

1. FSAR. Section 1.3.
2. FSAR. Chapter 8.
3. FSAR. Chapter 14.
4. Regulatory Guide 1.9, Rev. 3, July 1993.
5. Regulatory Guide 1.93, Rev. 0, December 1974.
6. Generic Letter 84-15, "Proposed Staff Actions to Improve and Maintain Diesel Generator Reliability," July 2, 1984.

Table B 3.8.1-1 (page 1 of 2)
Conditions for AC Sources Component Inoperabilities

Inoperable Equipment	Condition(s)
Inoperable standby emergency power source to 1A05/1B03, 1A06/1B04, 2A05/2B03, or 2A06/2B04. OR Inoperable standby emergency power sources to 1A05/1B03 and 2A05/2B03. OR Inoperable standby emergency power sources to 1A06/1B04 and 2A06/2B04.	Condition E
Inoperable standby emergency power source to A05/B03 and A06/B04 on the same unit. OR Inoperable standby emergency power to 1A05/1B03 and 2A06/2B04.	Condition E AND Condition G
One or more de-energized 4.16 kV safeguards buses (1A05/2A05/1A06/2A06). OR One or more 4.16 kV safeguards buses (1A05/2A05/1A06/2A06) with inoperable standby emergency power source(s) and inoperable offsite power source(s).	Condition D AND Condition E AND Condition F OR Condition G
Inoperable offsite power source to the associated unit's A05 and A06. OR Inoperable offsite power to 1A05 and 2A06.	Condition C AND Condition D
Inoperable offsite power source to 1A05, 1A06, 2A05, or 2A06. OR Inoperable offsite sources to 1A05 and 2A05. OR Inoperable offsite sources to 1A06 and 2A06.	Condition D

Table B 3.8.1-1 (page 2 of 2)
Conditions for AC Sources Component Inoperabilities

Inoperable Equipment	Condition(s)
X04 transformer de-energized.	Condition B AND Condition C AND Condition D
Associated unit's X03 transformer de-energized.	Condition A -------NOTE------- Enter appropriate Conditions for a de-energized X04 if auto bus transfer is incomplete. ---------------------

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 5 and 6 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.

In general, when the unit is shut down, 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, 3, and 4 have no specific analyses in MODES 5 and 6. Worst case bounding events are deemed not credible in MODES 5 and 6 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 conditions are allowed by the LCO for required systems.

During MODES 1, 2, 3, and 4, various deviations from the analysis assumptions and design requirements are allowed within the Required Actions. This allowance is in recognition that certain testing and maintenance activities must be conducted provided an acceptable level of risk is not exceeded. During MODES 5 and 6, performance of a significant number of required testing and maintenance activities is also required. In MODES 5 and 6, the activities are generally planned and administratively controlled. Relaxations from MODE 1, 2, 3, and 4 LCO requirements are acceptable during shutdown modes based on:

BASES

APPLICABLE SAFETY ANALYSES (continued)

a. The fact that time in an outage is limited. This is a risk prudent goal as well as a 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, 3, and 4 OPERABILITY requirements) with systems assumed to function during an event.

In the event of an accident during shutdown, this LCO ensures the capability to support 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 the NRC Policy Statement.

LCO

One offsite circuit capable of supplying the onsite Class 1E power distribution subsystem(s) of LCO 3.8.10, "Distribution Systems-Shutdown," ensures that all required loads are powered from offsite power. An OPERABLE standby emergency power source, associated with the distribution system train required to be OPERABLE by LCO 3.8.10, ensures a diverse power source is available to provide electrical power support, assuming a loss of the offsite circuit. Together, OPERABILITY of the required offsite circuit and standby emergency power source ensures the availability of sufficient AC sources to operate the unit in a safe manner and to mitigate the consequences of postulated events during shutdown.

The offsite circuit must be capable of maintaining rated frequency and voltage, and accepting required loads during an accident, while connected to the Engineered Safety Feature (ESF) bus(es). Offsite circuits are those that are described in the FSAR.

The AC electrical offsite sources for a unit in MODE 5 or 6 is described as follows:

One circuit between the offsite transmission network and the associated unit's 480 V Class 1E safeguards buses, B03 and B04, utilizing:

BASES

LCO (continued)

a. Either unit's X03 and X04 transformers;

b. Either unit's 4.16 kV buses, A03 and A04;

c. Associated unit's 4.16 kV Class 1E safeguards buses, A05 and A06; and,

d. All associated breakers, switches, interrupting devices, cabling, and controls required to transmit power from the Offsite 345 kV Distribution System to the required 480 VAC safeguards buses B03 and B04.

The standby emergency power source 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 10 seconds. The standby emergency power source must be capable of accepting required loads within the assumed loading sequence intervals and continue to operate until offsite power can be restored to the ESF buses. These capabilities are required to be met from a variety of initial conditions such as standby emergency power source in standby with the engine hot and standby emergency power source in standby at ambient conditions.

It is acceptable for safeguards buses to be cross tied during shutdown conditions for limited periods of time as addressed in LCO 3.8.9 and 3.8.10.

APPLICABILITY

The AC sources required to be OPERABLE in MODES 5 and 6 provide assurance that:

a. Systems to provide adequate coolant inventory makeup are available for the irradiated fuel assemblies in the core;

b. Systems necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and

c. 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, 3, and 4 are covered in LCO 3.8.1.

BASES

ACTIONS

A.1 and A.2

An offsite circuit would be considered inoperable if it were not available to the safeguards buses required to be OPERABLE by LCO 3.8.10. Declaring the required features associated with an inoperable offsite circuit inoperable ensures that the appropriate restrictions are implemented in accordance with the affected supported features LCO Required Actions. The Completion Time of immediately is consistent with the required times for actions requiring prompt attention.

It is further required to immediately initiate action to restore the required AC sources and to continue this action until restoration is accomplished in order to provide the necessary AC power to the unit safety systems. 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 unit safety systems may be without sufficient power.

B.1 and B.2

With the required standby emergency power source inoperable, the minimum required diversity of AC power sources is not available. Declaring the required features associated with the inoperable standby emergency power source inoperable ensures that the appropriate restrictions are implemented in accordance with the affected supported features LCO Required Actions. The Completion Time of immediately is consistent with the required times for actions requiring prompt attention.

It is further required to immediately initiate action to restore the required standby emergency power source to OPERABLE status. The restoration of the required standby emergency power sources should be completed as quickly as possible in order to minimize the time during which the unit safety systems may be without sufficient power.

SURVEILLANCE REQUIREMENTS

SR 3.8.2.1

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

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.2.2

This SR helps to ensure the availability of the standby electrical power supply to mitigate DBAs and to maintain the unit in a safe shutdown condition.

To minimize wear on moving parts that do not get lubricated when the engine is not running, SR 3.8.2.2 is modified by a Note to indicate that all standby emergency power source starts for this Surveillance may be preceded by an engine prelube period and followed by a warmup period prior to loading.

SR 3.8.2.2 requires that, at a 31 day Frequency, the standby emergency power source starts from standby conditions and achieves required voltage and frequency. While not specifically stated within this SR, the standby emergency power source must be capable of starting and accepting loads.

This Frequency provides adequate assurance of standby emergency power source OPERABILITY, while minimizing degradation resulting from testing.

SR 3.8.2.3

This Surveillance demonstrates that each required fuel oil transfer system operates and transfers fuel oil from its associated storage tank to its associated day tank. This is required to support continuous operation of standby power sources. This Surveillance provides assurance that the fuel oil transfer system 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.

The design of fuel transfer systems is such that pumps and valves operate automatically in order to maintain an adequate volume of fuel oil in the day tanks during or following standby emergency source testing.

The 31 day Frequency is adequate to assure that the fuel oil transfer system is OPERABLE, since low level alarms are provided.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.2.4

In the event of a loss of offsite power, the standby emergency power source is required to supply support systems necessary to avoid immediate difficulty, to operate the unit in a safe manner and to mitigate the consequences of postulated events during shutdown (e.g., fuel handling accidents).

This test verifies all actions encountered from a loss of offsite power, including shedding of the nonessential loads and energization of the emergency buses and respective connected loads from the standby emergency power source. It further demonstrates the capability of the standby emergency power source to automatically achieve the required voltage and frequency.

The Surveillance should be continued for a minimum of 5 minutes in order to demonstrate that all starting transients have decayed and stability is achieved.

The Frequency of 18 months is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 1), takes into consideration unit conditions required to perform the Surveillance, and is intended to be consistent with standard fuel cycle lengths.

For the purpose of this testing, the Standby emergency power sources must be started from standby conditions, that is, with the engine oil continuously circulated and engine temperature maintained consistent with manufacturer recommendations for standby emergency power sources.

This SR is modified by a note which exempts performance of this SR if the Frequency has expired. The standby emergency power source must continue to be capable of automatically starting and accepting loads; however, performance of the SR is not required if it is not met solely due to an expired frequency. The reason for the Note is to preclude requiring the OPERABLE standby emergency power source(s) from being paralleled with the offsite power network or otherwise rendered inoperable during performance of SRs, and to preclude deenergizing a required 4160 V ESF 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 standby emergency power source. It is the intent that these SRs must still be capable of being met, but actual performance is not required during periods when the standby emergency power source and offsite circuit is required to be OPERABLE.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.2.5

As required by Regulatory Guide 1.9 (Ref. 1), this Surveillance ensures that the manual synchronization and automatic load transfer from the standby emergency power source to the offsite source can be made and the standby emergency power source can be returned to ready to load status when offsite power is restored. It also ensures that the autostart logic is reset to allow the standby emergency power source to reload if a subsequent loss of offsite power occurs.

The standby emergency power source is considered to be in ready to load status when the standby emergency power source is at rated speed and voltage, the output breaker is open and can receive an autoclose signal on bus undervoltage, and the load sequence logic is reset.

The Frequency of 18 months is consistent with the recommendations of Regulatory Guide 1.9 (Ref. 1), and takes into consideration unit conditions required to perform the Surveillance.

This SR is modified by a note which exempts performance of this SR if the Frequency has expired. The standby emergency power source must continue to be capable of synchronizing with offsite power and returning to a ready to load status, however performance of the SR is not required if it is not met solely due to an expired frequency. The reason for the Note is to preclude requiring the OPERABLE standby emergency power source(s) from being paralleled with the offsite power network or otherwise rendered inoperable during performance of SRs, and to preclude deenergizing a required 4160 V ESF 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 is required to be OPERABLE.

REFERENCES

1. Regulatory Guide 1.9, Rev. 3, July 1993

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.3 Diesel Fuel Oil and Starting Air

BASES

BACKGROUND

There are two underground fuel oil storage tanks on site (T-175A/B). Each tank has a capacity of approximately 35,000 gallons. Sufficient fuel is normally maintained between the two tanks to allow one diesel to operate continuously at the required load for 7 days (Ref. 1). At minimum required level, which is 11,000 gallons in each emergency diesel fuel oil storage tank, one tank could provide enough fuel for an emergency diesel generator to operate for over 48 hours.

The onsite fuel oil capacity is sufficient to operate the standby emergency power sources for longer than the time to replenish the onsite supply from outside sources.

Fuel oil is transferred from storage tank to day tank by either of 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 train of standby emergency power sources. The Train A day tanks are normally split and the Train B day tanks are normally split, but can be cross-connected allowing either tank to supply either diesel generator in the same Train.

For proper operation of the standby emergency power sources, 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), and impurity level.

Each standby emergency power source has an air start system capable of storing sufficient air to roll the associated diesel generator up to starting speed fast enough to complete its starting cycle and be up to final speed and voltage within 10 seconds from receipt of a start signal.

The air start system for each standby emergency power source consists of two separate and redundant starting air banks, each capable of five successive start attempts without recharging.

BASES

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the FSAR, Chapter 14 (Ref. 4), assume Engineered Safety Feature (ESF) systems are OPERABLE. The standby emergency power sources 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 3.4, Reactor Coolant System (RCS); and Section 3.6, Containment Systems.

Since diesel fuel oil and the air start subsystem support the operation of the standby AC power sources, they satisfy Criterion 3 of the NRC Policy Statement.

LCO

Stored diesel fuel oil is required to have sufficient capacity to support standby emergency power source operation until fuel oil can be delivered from off-site or offsite power can be restored. Onsite storage of fuel oil, in conjunction with an ability to obtain additional fuel oil if required, supports the availability of standby emergency power sources 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.

Fuel oil is also required to meet specific standards for quality.

Standby emergency power source day tank requirements, as well as fuel oil 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 such that the standby emergency power source is capable of being started and ready to accept load in 10 seconds from receipt of a start signal.

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 and the starting air subsystem support LCO 3.8.1 and LCO 3.8.2, stored diesel fuel oil and starting air are required to be within limits when the associated standby emergency power source is required to be OPERABLE.

BASES

ACTIONS

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

A.1

In this Condition, the minimum required fuel supply for a standby emergency power source is not available. All standby emergency power sources that are associated with any fuel oil storage tank (T-175A or T-175B) that does not meet the 11,000 gallon requirement must be declared inoperable immediately and the applicable Conditions for the associated standby emergency power sources that are declared inoperable must be entered.

B.1

This Condition is entered as a result of a failure to meet the acceptance criterion of SR 3.8.3.2. 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 particulates does not mean failure of the fuel oil to burn properly in the diesel engine, and particulate concentration is unlikely to change significantly between Surveillance Frequency intervals, and proper engine performance has been recently demonstrated (within 31 days), it is prudent to allow a brief period prior to declaring the associated standby emergency power source inoperable. The 7 day Completion Time allows for further evaluation, resampling and re-analysis of the standby emergency power source fuel oil.

C.1

With the new fuel oil properties defined in the Diesel Fuel Oil Testing Program for SR 3.8.3.2 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

ACTIONS (continued)

that the new fuel oil, when mixed with previously stored fuel oil, remains acceptable, or to restore the stored fuel oil properties. This restoration may involve feed and bleed procedures, filtering, or combinations of these procedures. Even if a standby emergency power source start and load was required during this time interval and the fuel oil properties were outside limits, there is a high likelihood that the standby emergency power source would still be capable of performing its intended function.

D.1

With one or more standby emergency power sources' starting air system not within limits, the associated standby emergency power source may be incapable of performing its intended function and must be immediately declared inoperable.

E.1

With a Required Action and associated Completion Time of Condition B or C not met, or one or more standby emergency power source's fuel oil not within limits for reasons other than addressed by Conditions B or C, the associated standby emergency power source 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 operation of each standby emergency power source. The required fuel oil capacity is sufficient to place the unit in a safe shutdown condition and to bring in replenishment fuel from an offsite location.

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

SR 3.8.3.2

The tests listed in the Diesel Fuel Oil Testing Program 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. 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

BASES

SURVEILLANCE REQUIREMENTS (continued)

fuel oil in the storage tanks. These tests are to be conducted in accordance with the Diesel Fuel Oil Testing Program.

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

a. Sample the new fuel oil in accordance with ASTM D4057-88 (Ref. 5);

b. Verify in accordance with the test specified in ASTM D1298-99 (Ref. 5) that the sample has an absolute specific gravity at 60/60°F of ≥ 0.83 and ≤ 0.89 or an API specific gravity at 60°F of ≥27° and ≤ 39°. Verify in accordance with tests specified in ASTM D975-98b (Ref. 6) a kinematic viscosity at 40°C of ≥ 1.9 centistokes and ≤ 4.1 centistokes, and a flashpoint of ≥ 125°F; and

c. Verify that the new fuel oil has a clear and bright appearance with proper color when testing in accordance with ASTM D4176-91 (Ref. 5).

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 concern since the fuel oil is not added to the storage tanks.

Within 31 days following the initial new fuel oil sample, the fuel is analyzed to establish that the other properties specified in Table 1 for Grade Low Sulfur No. 2D of ASTM D975-98b (Ref. 6) are met for new fuel oil when tested in accordance with ASTM D975-98b (Ref. 6), except that the analysis for sulfur may be performed in accordance with ASTM D1552-95 (Ref. 5) or ASTM D 2622-98 (Ref. 5). The 31 day period is acceptable because the fuel oil properties of interest, even if they were 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, due mostly to oxidation. The presence of particulate does not mean the fuel oil will not burn properly in a diesel engine. The particulate can cause fouling of filters and fuel oil injection equipment, however, which can cause engine failure.

Particulate concentrations should be determined in accordance with ASTM D6217-98, Method A (Ref. 5). This method involves gravimetric determination of total particulate concentration in the fuel oil and has a limit of 10 mg/ml. It is acceptable to obtain a field sample for subsequent laboratory testing.

BASES

SURVEILLANCE REQUIREMENTS (continued)

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

SR 3.8.3.3

This Surveillance ensures that, without the aid of the refill compressor, sufficient air start capacity for each standby emergency power source is available. The system design requirements provide the capability to start and ready the standby emergency power source to accept load in 10 seconds from receipt of a start signal. The pressure specified in this SR is intended to reflect the lowest value at which the 10 second start can be accomplished. The 31 day Frequency takes into account the capacity, capability, redundancy, and diversity of the AC sources and other indications available in the control room, including alarms, to alert the operator to below normal air start pressure.

SR 3.8.3.4

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 storage tanks once every 92 days 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 standby emergency power source operation. Water may come from any of several sources, including condensation, ground water, rain water, and 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 Frequencies are established by Regulatory Guide 1.137 (Ref. 2). This SR is for preventive maintenance. The presence of water does not necessarily represent failure of this SR, provided the accumulated water is removed during performance of the Surveillance.

REFERENCES

1. FSAR. Section 8.8.
2. Regulatory Guide 1.137.
3. ANSI N195-1976, Appendix B.
4. FSAR, Chapter 14.

BASES

REFERENCES (continued)	5. ASTM Standards: D4057-88; D1298-99; D4176-91; D1552-95; D2622-98; D6217-98, Method A.
	6. ASTM Standards D975-98b, Table 1.

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 and preferred AC vital instrument bus power (via inverters). As required by the Point Beach Design Criteria (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 safety-related 125 VDC system consists of four main distribution buses: D01, D02, D03, and D04, in addition to two swing buses (D301 and D302) each capable of supplying one of the four 125 VDC buses.

Each of the four main distribution buses is powered by a battery charger (D07, D08, D107 and D108) and a station battery (D05, D06, D105, and D106). The function of the battery chargers is to supply their respective DC loads, while maintaining the batteries at full charge. All of the battery chargers are powered from the 480 VAC Engineered Safety Feature (ESF) system.

The battery chargers are interlocked such that a loss of offsite power combined with a safety injection signal will disconnect the battery chargers from their 480 VAC source. This limits the loading on the standby emergency power supply during the period immediately following a safety injection signal. During this period, the 125 VDC loads are supplied by their associated station battery until such time as power to the chargers is restored.

Two swing battery chargers are available through one of the swing DC distribution buses. Swing charger D09 is connected to swing DC distribution bus D301 and can provide a source of DC power to distribution buses D01 or D02. Likewise, swing charger D109 is connected to swing DC distribution bus D302 and can provide a source of DC power to distribution buses D03 or D04. In addition, there exists a swing safety-related battery D305 which is connected to swing DC distribution bus D301. This swing battery is capable of being aligned to any one of the four main distribution buses to take the place of the normal battery. Interlocks exist on swing DC distribution buses D301 and D302 which prevent the paralleling of redundant DC buses.

The station batteries have been sized to carry their expected shutdown loads following a plant trip/LOCA and loss of offsite power, or following

BASES

BACKGROUND (continued)

a station blackout for a period of one hour, without battery terminal voltage falling below 105 volts. Major battery loads, with their approximate operating times, are listed in FSAR Table 8.7-1 (Ref. 2). The swing station battery, D305, has been sized to provide an equivalent voltage at each of the four main DC buses. The swing battery chargers and the swing battery allow the normally on-line battery chargers and batteries to be removed from service for maintenance or testing that can not be performed with the equipment on-line.

Each 125 VDC battery is separately housed in a ventilated room apart from its charger and distribution centers. Each subsystem is located in an area separated physically and electrically from the other subsystem 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 distribution subsystems.

The batteries 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. Battery size is based on 125% of required capacity. The voltage limit is 2.13 V per cell; however, to ensure that the battery is maintained in a charged state, the minimum cell voltage is 2.17 V per cell, which corresponds to a minimum voltage of 128 V for batteries D05 and D06, and 130.2 V for batteries D105 and D106. The criteria for sizing large lead storage batteries are defined in IEEE-450 (Ref. 6).

Each DC electrical power subsystem 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 also has sufficient capacity to restore the battery from the design minimum charge to its fully charged state within 24 hours while supplying normal steady state loads discussed in the FSAR, Chapter 8.7 (Ref. 2).

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the FSAR, Chapter 14 (Ref. 4), assume that Engineered Safety Feature (ESF) systems are OPERABLE. The DC electrical power system provides normal and emergency DC electrical power for the standby emergency power sources, emergency auxiliaries, and control and switching during all MODES of operation.

BASES

APPLICABLE SAFETY ANALYSES (continued)

The OPERABILITY of the DC 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 DC sources OPERABLE during accident conditions in the event of:

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

b. A worst case single failure.

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

LCO

The D-01, D-02, D-03 and D-04 DC electrical power subsystems, each subsystem consisting of battery, battery charger, and the corresponding control equipment and interconnecting cabling supplying power to the associated bus 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).

An OPERABLE DC electrical power subsystem requires all required batteries and respective chargers to be operating and connected to the associated DC bus(es).

APPLICABILITY

The DC electrical power sources are required to be OPERABLE in MODES 1, 2, 3, and 4 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 5 and 6 are addressed in the Bases for LCO 3.8.5, "DC Sources-Shutdown."

BASES

ACTIONS

The ACTIONS are modified by a Note which ensures appropriate remedial actions are taken if a DC bus becomes de-energized.

Pursuant to LCO 3.0.6, the Distribution System ACTIONS would not be entered even if a DC electrical power subsystem were inoperable, resulting in de-energization of a DC bus. Therefore, the Actions are modified by a Note to indicate that when DC bus is de-energized, the Conditions and Required Actions for LCO 3.8.9, "Distribution Systems-Operating," must be entered. This allows Condition A to provide requirements for the inoperability of a battery or charger, without regard to whether a bus is de-energized. LCO 3.8.9 provides the appropriate restrictions for a de-energized bus.

A.1

Condition A represents one DC subsystem 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 any further loss of DC power.

If one of the required DC electrical power subsystems is inoperable (e.g., inoperable battery, inoperable battery charger(s), or inoperable battery charger and associated inoperable battery), the remaining DC electrical power subsystems have the capacity to support a safe shutdown and to mitigate an accident condition. Since a subsequent worst case single failure could result in the loss of an additional 125 VDC electrical power subsystem with the potential for loss of ESF functions, continued power operation should not exceed 2 hours. The 2 hour Completion Time is based on Regulatory Guide 1.93 (Ref. 5) 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 and B.2

If the inoperable DC electrical power subsystem cannot be restored to OPERABLE status within the required 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 at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging plant systems. The Completion Time to bring the unit to MODE 5 is consistent with the time required in Regulatory Guide 1.93 (Ref. 5).

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.4.1

Verifying battery terminal voltage while on float charge for the batteries helps to ensure the effectiveness of the charging system and the ability of the batteries to perform their intended function. Float charge is the condition in which the charger is supplying the continuous charge required to overcome the internal losses of a battery (or battery cell) and maintain the battery (or a battery cell) in a fully charged state. The voltage requirements are based on the nominal design voltage of the battery and are consistent with the initial voltages assumed in the battery sizing calculations. The 7 day Frequency is consistent with manufacturer recommendations and IEEE-450 (Ref. 6).

SR 3.8.4.2

Visual inspection to detect corrosion of the battery cells and connections, or measurement of the resistance of each inter-cell, inter-rack, inter-tier, and terminal connection, provides an indication of physical damage or abnormal deterioration that could potentially degrade battery performance. The presence of visible corrosion does not necessarily represent a failure of this SR provided battery connection resistance is within limits.

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

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

SR 3.8.4.3

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

The 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 12 month Frequency for this SR is consistent with IEEE-450 (Ref. 6), which recommends detailed visual inspection of cell condition and rack integrity on a yearly basis.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.8.4.4 and SR 3.8.4.5

Visual inspection and resistance measurements of inter-cell, inter-rack, inter-tier, and terminal connections provide an indication of physical damage or abnormal deterioration that could indicate degraded battery condition. The anticorrosion material is used to help 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 SR 3.8.4.4.

The connection resistance limits for SR 3.8.4.5 shall be no more than 20% above the resistance as measured during installation, or not above the ceiling value established by the manufacturer.

The Surveillance Frequencies of 12 months is consistent with IEEE-450 (Ref. 6), which recommends cell to cell and terminal connection resistance measurement on a yearly basis.

SR 3.8.4.6

This SR requires that Battery chargers D-07, D-08, and D-09 be capable of supplying 203 amps at 125 V for ≥ 8 hours, and Battery chargers D-107, D-108, and D-109 be capable of supplying 273 amps at 125 V for ≥ 8 hours. These requirements are based on the design capacity of the chargers (Ref. 2). According to Regulatory Guide 1.32 (Ref. 7), the battery charger supply 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 ensures that these requirements can be satisfied.

SR 3.8.4.7

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

The Surveillance Frequency of 18 months is consistent with the recommendations of Regulatory Guide 1.32 (Ref. 7) and Regulatory Guide 1.129 (Ref. 8).

BASES

SURVEILLANCE REQUIREMENTS (continued)

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

The modified performance discharge test is a simulated duty cycle 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 test, both of which envelope the duty cycle of the service test. 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 service test for the duration of time equal to that of the service 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 service test.

<u>SR 3.8.4.8</u>

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 described in the Bases for SR 3.8.4.7. 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 are consistent with IEEE-450 (Ref. 6) and IEEE-485 (Ref. 3). These references recommend that the battery be replaced if its capacity is below 80% of the manufacturer's rating. A capacity of 80% shows that the battery rate of deterioration is increasing, even if there is ample capacity to meet the load requirements.

BASES

SURVEILLANCE REQUIREMENTS (continued)

The Surveillance Frequency for this test is normally 60 months. 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 ≥ 100% of the manufacturer's rating. Degradation is indicated, according to IEEE-450 (Ref. 6), when the battery capacity drops by more than 10% relative to its capacity on the previous performance test or when it is ≥ 10% below the manufacturer's rating. These Frequencies are consistent with the recommendations in IEEE-450 (Ref. 6).

REFERENCES

1. FSAR. Chapter 8.0.
2. FSAR. Chapter 8.7.
3. IEEE-485-1978.
4. FSAR. Chapter 14.
5. Regulatory Guide 1.93, December 1974.
6. IEEE-450-1987.
7. Regulatory Guide 1.32, February 1977.
8. Regulatory Guide 1.129, December 1974.

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 FSAR, Chapter 14 (Ref. 1), 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.

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 5 and 6 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 DC electrical power is provided to mitigate events postulated during shutdown.

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

LCO

The DC electrical power subsystems, each subsystem consisting of a battery, battery charger, and the corresponding control equipment and interconnecting cabling within the subsystem, are required to be OPERABLE to support the required distribution systems required OPERABLE by LCO 3.8.10, "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.

BASES

APPLICABILITY

The DC electrical power sources required to be OPERABLE in MODES 5 and 6 provide assurance that:

a. Required features to provide adequate coolant inventory makeup are available for the irradiated fuel assemblies in the core;

b. Required features necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and

c. 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, 3, and 4 are covered in LCO 3.8.4.

ACTIONS

A.1 and A.2

A DC electrical power subsystem would be considered inoperable if it were not available to the 125 VDC buses required to be OPERABLE by LCO 3.8.10. Declaring the required features inoperable with the associated DC electrical power subsystem inoperable, appropriate restrictions will be implemented in accordance with the affected required features LCO Actions.

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

SURVEILLANCE REQUIREMENTS

SR 3.8.5.1

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

REFERENCES

1. FSAR. Chapter 14.

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 the FSAR, Chapter 14 (Ref. 1), assume 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.

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 the minimum number of DC sources OPERABLE during accident conditions, in the event of:

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

b. A worst case single failure.

Battery cell parameters satisfy the Criterion 3 of the NRC Policy Statement.

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 Category A and B limits not met.

APPLICABILITY

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

BASES

ACTIONS

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

With one or more cells in one or more batteries not within 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 in the accompanying LCO, 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 operation is permitted for a limited period.

The pilot cell electrolyte level and float voltage are required to be verified to meet the Category C limits within 1 hour (Required Action A.1). This check will provide 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 cells. 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 7 day intervals until the parameters are restored to Category A or 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. With the 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 prior to declaring the battery inoperable.

B.1

With one or more batteries with one or more battery cell parameters outside the 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

BASES

ACTIONS (continued)

not completing the Required Actions of Condition A within the required Completion Time or average electrolyte temperature of representative cells falling below 60°F, are also cause for immediately declaring the associated DC electrical power subsystem inoperable.

SURVEILLANCE REQUIREMENTS

SR 3.8.6.1

This SR verifies that Category A battery cell parameters are consistent with IEEE-450 (Ref. 2), which recommends regular battery inspections (at least one per month) including voltage, specific gravity, and electrolyte temperature of pilot cells.

SR 3.8.6.2

The quarterly inspection of specific gravity and voltage is consistent with IEEE-450 (Ref. 2). In addition, within 24 hours of a battery discharge < 105 V or a battery overcharge > 142.8 V, the battery must be demonstrated to meet Category B limits. Transients, such as motor starting transients, which may momentarily cause battery voltage to drop to ≤ 105 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. 2), 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.

SR 3.8.6.3

This Surveillance verification that the average temperature of representative cells is > 60°F, is consistent with a recommendation of IEEE-450 (Ref. 2), that states that the temperature of electrolytes in representative cells should be determined on a quarterly basis.

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 manufacturer recommendations.

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

BASES

SURVEILLANCE REQUIREMENTS (continued)

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 manufacturer recommendations and are consistent with the guidance in IEEE-450 (Ref. 2), with the extra 1/4 inch allowance above the highwater level indication for 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 above the specified maximum level during equalizing 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. 2) 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 the recommendations of IEEE-450 (Ref. 2), which states that prolonged operation of cells < 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 manufacturer 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. 2), 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.

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 specified for specific gravity for each connected cell is ≥ 1.195 (0.020 below the manufacturer fully charged, nominal specific gravity) with the average of all connected cells > 1.205 (0.010 below the manufacturer fully charged, nominal specific gravity). These values are based on manufacturer's recommendations. The

BASES

SURVEILLANCE REQUIREMENTS (continued)

minimum specific gravity value required for each cell ensures that the effects of a highly charged or newly installed cell will not mask overall degradation of the battery.

Category C defines the limits 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 limits, the assurance of sufficient capacity described above no longer exists, and the battery must be declared inoperable.

The Category C limits specified for electrolyte level (above the top of the plates and not overflowing) ensure that the plates suffer no physical damage and maintain adequate electron transfer capability. The Category C limits for float voltage is based on IEEE-450 (Ref. 2), 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 manufacturer recommendations (0.020 below the manufacturer 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 less than 0.020 below the average of all connected cells. This limit ensures that the effect of a highly charged or new cell does not mask overall degradation of the battery.

The footnotes to Table 3.8.6-1 are applicable to Category A, B, and C specific gravity. Footnote B to Table 3.8.6-1 requires the above mentioned correction for electrolyte level and temperature, with the exception that level correction is not required when battery charging current is < 2 amps on float charge. This current provides, in general, an indication of overall battery condition.

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 charger current is an acceptable alternative to specific gravity measurement for determining the state of charge. This phenomenon is discussed in IEEE-450 (Ref. 2). Footnote C to Table 3.8.6-1 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.

BASES

REFERENCES

1. FSAR. Chapter 14.
2. IEEE-450-1978.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.7 Inverters-Operating

BASES

BACKGROUND

The inverters are the preferred source of power for the AC vital instrument buses because of the stability and reliability they achieve. The function of the inverter is to provide AC electrical power to the vital instrument buses.

The function of the inverters is to convert 125 volt DC from station batteries to 120 volt AC for the instrumentation and controls for the Reactor Protective System (RPS) and the Engineered Safety Feature Actuation System (ESFAS). The 120 volt AC instrument supply system consists of sixteen buses, divided among four channels. Each of the four channels (red, white, blue, and yellow) have four buses. The four channel buses are further subdivided into two bus groups, one group serving Unit 1 and the other serving Unit 2. Each channel has three inverters, one inverter is dedicated to the Unit 1 bus group, the second inverter is dedicated to the Unit 2 bus group. The third inverter is an alternate, and can be used as an alternate for either Unit 1 or Unit 2.

The inverters are powered from the 125 volt DC system. The three inverters associated with the same channel (red, white, blue, and yellow) are powered from the same 125 VDC bus. The red channel inverters (1/2DY01 and DY0A) are powered from bus DO1, the blue channel inverters (1/2DY02 and DY0B) are powered from bus DO2, and the white (1/2DY03 and DY0C) and yellow channel (1/2DY04 and DY0D) inverters are powered directly from buses DO3 and DO4, respectively.

Each instrument channel can be powered from a backup power source. The backup power source is from Y15 or Y16 buses which are supplied from 480V bus B09 via regulating transformer XY08. The output of each inverter is connected to a static transfer switch that will automatically transfer the associated instrument buses to the backup power source in the event of an inverter failure. The backup source is designed to maintain power to affected buses only until they can be manually transferred back to an operable inverter.

Specific details on inverters and their operating characteristics are found in the FSAR, Chapter 8.6 (Ref. 1).

BASES

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the FSAR, Chapter 14 (Ref. 2), assume Engineered Safety Feature systems are OPERABLE. The inverters are designed to provide the required capacity, capability, redundancy, and reliability to ensure the availability of necessary power to the RPS and ESFAS 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 3.4, Reactor Coolant System (RCS); and Section 3.6, Containment Systems.

The OPERABILITY of the inverters is consistent with the initial assumptions of the accident analyses and is based on meeting the design basis of the unit. This includes maintaining required AC vital instrument buses OPERABLE during accident conditions in the event of:

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

b. A worst case single failure.

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

LCO

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

Maintaining the required inverters OPERABLE ensures that the redundancy incorporated into the design of the RPS and ESFAS instrumentation and controls is maintained.

One inverter powering each required vital instrument channel ensures an uninterruptible supply of AC electrical power to the AC vital instrument buses even if the 4.16 kV and 480 V safeguards buses are de-energized.

Operable inverters require the associated vital instrument bus to be powered by the inverter with output voltage and frequency within tolerances, and power input to the inverter from a 125 VDC station battery.

BASES

APPLICABILITY

The inverters are required to be OPERABLE in MODES 1, 2, 3, and 4 to ensure that:

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

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

Inverter requirements for MODES 5 and 6 are covered in the Bases for LCO 3.8.8, "Inverters-Shutdown."

ACTIONS

With a required inverter inoperable, its associated AC vital instrument bus may become deenergized if the automatic transfer to the backup power source fails to occur.

Pursuant to LCO 3.0.6, the Distribution System ACTIONS would not be entered even if a vital instrument bus were de-energized, as a result of an inoperable inverter. For this reason a Note has been included in Condition A requiring the entry into the Conditions and Required Actions of LCO 3.8.9, "Distribution Systems-Operating." This ensures that the appropriate remedial actions are taken, if a vital instrument bus becomes de-energized.

A.1

With a required inverter inoperable, its associated AC vital instrument bus may continue to remain energized based on automatic transfer to the associated backup power source. When the AC vital instrument bus is powered from its back up power supply, it is relying upon interruptible offsite AC electrical power source.

Required Action A.1 allows 8 hours to restore power to the vital instrument bus from an operable inverter. The 8 hour limit is based upon engineering judgment, taking into consideration the time required place the standby inverter in service and the risk to which the unit is exposed because of the inverter inoperability. This has to be balanced against the risk of an immediate shutdown, along with the potential challenges to safety systems such a shutdown might entail.

BASES

ACTIONS (continued)

B.1 and B.2

If the inoperable inverter cannot be restored to OPERABLE status or the standby inverter placed into service within the required 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 at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit 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 inverters are functioning properly with all required circuit breakers closed and AC vital instrument buses energized from the inverter. The verification of proper voltage output ensures that the required power is readily available for the instrumentation of the RPS and ESFAS connected to the AC vital instrument buses. The 7 day Frequency takes into account the redundant capability of the inverters and other indications available in the control room that alert the operator to inverter malfunctions.

REFERENCES

1. FSAR. Chapter 8.6.
2. FSAR. Chapter 14.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.8 Inverters-Shutdown

BASES

BACKGROUND

A description of the inverters is provided in the Bases for LCO 3.8.7, "Inverters-Operating."

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the FSAR, Chapter 14 (Ref. 1), assume Engineered Safety Feature systems are OPERABLE. The DC to AC inverters are designed to provide the required capacity, capability, redundancy, and reliability to ensure the availability of necessary power to the Reactor Protective System and Engineered Safety Features Actuation System instrumentation and controls so that the fuel, Reactor Coolant System, and containment design limits are not exceeded.

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

The OPERABILITY of the minimum inverters to each AC vital instrument bus during MODES 5 and 6 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 power is available to mitigate events postulated during shutdown.

The inverters were previously identified as part of the distribution system and, as such, satisfy Criterion 3 of the NRC Policy Statement.

LCO

The inverters ensure the availability of electrical power for the instrumentation for systems required to shut down the reactor and maintain it in a safe condition after an anticipated operational occurrence or a postulated DBA. The battery powered inverters provide uninterruptible supply of AC electrical power to the AC vital instrument buses even if the 4.16 kV and 480 V safeguards buses are de-energized. OPERABILITY of the inverters requires that the AC vital instrument bus be powered by the inverter. This ensures the availability

BASES

LCO (continued)	of sufficient inverter power sources to operate the unit in a safe manner and to mitigate the consequences of postulated events during shutdown.

APPLICABILITY

The inverters required to be OPERABLE in MODES 5 and 6 provide assurance that:

a. Systems to provide adequate coolant inventory makeup are available for the irradiated fuel in the core;

b. Systems necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and

c. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition or refueling condition.

Inverter requirements for MODES 1, 2, 3, and 4 are covered in LCO 3.8.7.

ACTIONS

<u>A.1 and A.2</u>

Declaring the required features associated with an inoperable inverter inoperable ensures that the appropriate restrictions are implemented in accordance with the affected supported feature's LCO Required Actions.

It is further required to immediately initiate action to restore the required inverters and to continue this action until restoration is accomplished in order to provide the necessary power to the unit safety systems.

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 that instrumentation supplied by the affected vital bus is not supplied by an uninterruptible source of power.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.8.1

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

REFERENCES

1. FSAR. Chapter 14.

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.9 Distribution Systems-Operating

BASES

BACKGROUND

The onsite Class 1E AC, DC, and AC vital instrument bus electrical power distribution systems are divided into redundant and independent AC, DC, and AC vital instrument bus electrical power distribution subsystems.

The AC electrical power subsystem for each train consists of a 4.16 kV Safeguards bus and 480 V buses and motor control centers. Each 4.16 kV Safeguards bus has an offsite source of power as well as a standby emergency power source. Each 4.16 kV Safeguards bus is normally connected to the preferred offsite source. After a loss of the preferred offsite power source, the standby emergency power source supplies power to the 4.16 kV Safeguards buses. 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 480 VAC electrical power distribution system for each train includes the safety related load centers and motor control centers shown in Table B 3.8.9-1. Cross tie breakers between the B03 and B04 buses have been provided for diversity and to facilitate maintenance and testing activities. These breakers open on a safety injection or loss of bus voltage signal from the associated unit/buses. The normal configuration for these breakers is open with control power removed.

The 120 VAC Vital Instrument System (Y) provides power to various instrument racks for the Reactor Protection System (RPS), the Engineered Safety Feature (ESF) Actuation System, the Nuclear Steam Supply System (NSSS) Controls, and other miscellaneous instrumentation and control systems.

The 120 VAC instrument supply system consists of sixteen buses, divided among four channels. Each of the four channels (red, white, blue, and yellow) have four buses. The four channel buses are further subdivided into two bus groups, one group serving Unit 1 and the other serving Unit 2. Each channel has three inverters; one inverter is dedicated to the Unit 1 bus group, the second inverter is dedicated to the Unit 2 bus group. The third inverter is an alternate, and can be used as an alternate for either Unit 1 or Unit 2.

BASES

BACKGROUND (continued)

The inverters are powered from the 125 VDC system. The three inverters associated with the same channel (red, white, blue, and yellow) are powered from the same 125 VDC bus. The red channel inverters (1/2DY01 and DY0A) are powered from bus DO1, the blue channel inverters (1/2DY02 and DY0B) are powered from bus DO2, and the white (1/2DY03 and DY0C) and yellow channel (1/2DY04 and DY0D) inverters are powered directly from buses DO3 and DO4, respectively.

Each instrument channel can be powered from a backup power source. The backup power source is from Y15 or Y16 buses which are supplied from 480 V bus B09 via regulating transformer XY08. The output of each inverter is connected to a static transfer switch that will automatically transfer the associated instrument buses to the backup power source in the event of an inverter failure. The backup source is designed to maintain power to affected buses only until they can be manually transferred back to an operable inverter.

Instrument Buses Y01/Y101, Y02/Y102, Y03/Y103, and Y04/Y104 must each be supplied by independent, battery-backed sources to ensure that a single failure combined with a loss of offsite power will not prevent mitigation of a design basis accident.

The safety-related 125 VDC system consists of four main distribution buses: D01, D02, D03, and D04, in addition to two swing buses (D301 and D302) each capable of supplying one of the four 125 VDC buses.

Each of the four main distribution buses is powered by a battery charger (D07, D08, D107 and D108) and a station battery (D05, D06, D105, and D106). The function of the battery chargers is to supply their respective DC loads, while maintaining the batteries at full charge. All of the battery chargers are powered from 480 VAC Safeguards buses.

The battery chargers are interlocked such that a loss of offsite power combined with a safety injection signal will disconnect the battery chargers from their 480 VAC source. This limits the loading on the standby emergency power supply during the period immediately following a safety injection signal. During this period, the 125 VDC loads are supplied by their associated station battery until such time as power to the chargers is restored.

Two swing battery chargers are available through one of the swing DC distribution buses. Swing charger D09 is connected to swing DC distribution bus D301 and can provide a source of DC power to distribution buses D01 or D02. Likewise, swing charger D109 is connected to swing DC distribution bus D302 and can provide a source

BASES

BACKGROUND (continued)

of DC power to distribution buses D03 or D04. In addition, there exists a swing safety-related battery D305 which is connected to swing DC distribution bus D301. This swing battery is capable of being aligned to any one of the four main distribution buses to take the place of the normal battery. Interlocks exist on swing DC distribution buses D301 and D302 which prevent the paralleling of redundant DC buses.

The list of all required distribution buses is presented in Table B 3.8.9-1.

APPLICABLE SAFETY ANALYSES

The initial conditions of Design Basis Accident (DBA) and transient analyses in the FSAR, Chapter 14 (Ref. 1), assume ESF systems are OPERABLE. The AC, DC, and AC vital instrument bus 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 3.4, Reactor Coolant System (RCS); and Section 3.6, Containment Systems.

The OPERABILITY of the AC, DC, and AC vital instrument bus electrical power distribution systems is consistent with the initial assumptions of the accident analyses and is based upon meeting the design basis of the unit. This includes maintaining power distribution systems OPERABLE during accident conditions in the event of:

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

b. A worst case single failure.

The distribution systems satisfy Criterion 3 of the NRC Policy Statement.

LCO

The required power distribution subsystems listed in Table B 3.8.9-1 ensure the availability of AC, DC, and AC vital instrument bus 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 AC, DC, and AC vital instrument bus electrical power distribution subsystems are required to be OPERABLE.

Maintaining the AC, DC, and AC vital instrument bus electrical power distribution subsystems OPERABLE ensures that the redundancy incorporated into the design of ESF is not defeated. Therefore, a single

BASES

LCO (continued)

failure within any system or within the electrical power distribution subsystems will not prevent safe shutdown of the reactor. OPERABLE AC electrical power distribution subsystems require the associated buses and motor control centers to be energized to their proper voltages. OPERABLE DC electrical power distribution subsystems require the associated buses to be energized to their proper voltage. OPERABLE vital instrument bus electrical power distribution subsystems require the associated buses to be energized to their proper voltage.

In addition, cross tie breakers between redundant safety related 480 VAC buses must be open. This prevents any electrical malfunction in any power distribution subsystem from propagating to the redundant subsystem that could cause the failure of a redundant subsystem and a loss of essential safety function(s).

This includes a failure of a tie breaker to trip, which under certain conditions could result in an overload and a loss of the associated diesel generator.

The LCOs permit abnormal electrical distribution lineups for a unit in MODE 5 or 6, or defueled, to facilitate maintenance and testing.

When a unit is in MODE 5 or 6, or defueled, the safeguards and safe shutdown systems and equipment associated with that unit are not required to be OPERABLE. However, shared equipment (e.g., Service Water, Auxiliary Feedwater, etc;) in support of a unit in MODE 1, 2, 3, or 4, and residual heat removal for the unit in MODE 5 or 6 or defueled must be considered.

With one unit in MODE 1, 2, 3, or 4 and the other unit in MODE 5 or 6, or defueled, the B03 and B04 buses on the unit in MODE 5 or 6, or defueled, may be cross tied for ≤ 8 hours providing:

a. All required redundant shared equipment (Auxiliary Feedwater and Service Water Systems), for the unit in MODE 1, 2, 3, or 4 are OPERABLE; and

b. The normal offsite power supply and standby emergency power source for the required redundant shared equipment (Auxiliary Feedwater and Service Water Systems), for the unit in MODE 1, 2, 3, or 4 are OPERABLE.

This configuration is considered acceptable for a limited period of time based on maintaining all required redundant shared equipment and their associated power sources for the unit in MODE 1, 2, 3, or 4 in an

BASES

LCO (continued)

OPERABLE status, retaining redundancy in residual heat removal for the unit in MODE 5 or 6, in addition to the low probability for an event resulting in a bus fault or loss of offsite power with a failure of the bus cross tie breaker to open.

With one unit in MODE 1, 2, 3, or 4 and the other unit defueled, the B03 and B04 buses on the defueled unit may be cross tied for > 8 hours and ≤ 7 days providing:

a. All required redundant shared equipment (Auxiliary Feedwater and Service Water Systems), for the unit in MODE 1, 2, 3, or 4 are OPERABLE;

b. The normal offsite power supply and standby emergency power source for the required redundant shared equipment (Auxiliary Feedwater and Service Water Systems), for the unit in MODE 1, 2, 3, or 4 are OPERABLE; and

c. Loads on the B03 and B04 buses on the defueled unit are limited in such a fashion as to preclude the possibility of overloading the standby emergency power source associated with these buses.

This configuration is considered acceptable based on maintaining all required redundant shared equipment and their associated power sources for the unit in MODE 1, 2, 3, or 4 in an OPERABLE status, and limiting the loads on the shutdown unit's B03 and B04 buses such that a single failure in either unit which could affect required redundant feature can still be postulated without a loss of safety function.

With the B03/B04 bus tie breaker closed, offsite power is considered OPERABLE for the 480 V bus being supplied by the tie breaker. However, standby emergency power is considered inoperable for the 480 V bus being supplied by the tie breaker, and the requirements of LCO 3.8.1 and LCO 3.8.2 apply.

If any tie breakers is closed outside of the allowances outlined above, the affected electrical power distribution buses are inoperable. This applies to the onsite, safety related redundant electrical power distribution subsystems. It does not, however, preclude redundant Class 1E 4.16 kV buses from being powered from the same offsite power supply.

BASES

APPLICABILITY

The electrical power distribution subsystems are required to be OPERABLE in MODES 1, 2, 3, and 4 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 instrument functions are maintained in the event of a postulated DBA.

Electrical power distribution subsystem requirements for MODES 5 and 6 are covered in the Bases for LCO 3.8.10, "Distribution Systems-Shutdown."

ACTIONS

A.1

With one required distribution subsystem (i.e., 4.16 kV safeguards bus, 480 VAC safeguards bus or motor control center, 125 VDC safeguards DC distribution bus, or vital instrument bus) inoperable, the remaining AC 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 power distribution subsystems could result in the minimum required ESF functions not being supported. Required Action A.1 requires all required features associated with an inoperable distribution subsystem to be declared inoperable immediately. This Required Action ensures that the appropriate Required Actions for support equipment are entered and taken.

With more than one required bus inoperable, entry into the associated Conditions and Required Actions for the affected required feature will ensure that the appropriate Required Actions are taken if redundant required features are inoperable.

B.1 and B.2

If the required features associated with inoperable electrical power distribution subsystems are not declared inoperable, 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 at least MODE 3 within 6 hours and to MODE 5 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging plant systems.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.8.9.1

This Surveillance verifies that the required AC, DC, and AC vital instrument bus electrical power distribution systems are functioning properly, with the correct circuit breaker alignment. For the 480 VAC buses B03 and B04, correct breaker alignment includes verification that the bus cross tie breakers are open with control power removed, when the system is not aligned in accordance with Note 1 or 2 of the LCO. This ensures the appropriate separation and independence of the electrical divisions is maintained. Correct breaker alignment provides assurance that the appropriate voltage is available to each required bus for motive as well as control functions for critical system loads.

The 7 day Frequency takes into account the redundant capability of the AC, DC, and AC vital instrument bus electrical power distribution subsystems, and other indications available in the control room that alert the operator to subsystem malfunctions.

REFERENCES

1. FSAR. Chapter 14.

Table B 3.8.9-1
(page 1 of 1)

AC and DC Electrical Power Distribution Systems

TYPE	VOLTAGE	TRAIN A	TRAIN B
AC safety buses	4160 VAC 480 VAC	1A05/2A05 1B03/2B03 Motor Control Centers 1B32/2B32 1B30/2B30	1A06/2A06 1B04/2B04 Motor Control Centers 1B42/2B42 1B40/2B40
DC buses	125 VDC	Buses D01 D03	Buses D02 D04
Unit 1 AC vital instrument buses	120 VAC	Red Channel Buses 1Y01/1Y101 White Channel Buses 1Y03/1Y103	Blue Channel Buses 1Y02/1Y102 Yellow Channel Buses 1Y04/1Y104
Unit 2 AC vital instrument buses	120 VAC	Red Channel Buses 2Y01/2Y101 White Channel Buses 2Y03/2Y103	Blue Channel Buses 2Y02/2Y102 Yellow Channel Buses 2Y04/2Y104

B 3.8 ELECTRICAL POWER SYSTEMS

B 3.8.10 Distribution Systems-Shutdown

BASES

BACKGROUND	A description of the AC, DC, and AC vital instrument bus electrical power distribution systems is provided in the Bases for LCO 3.8.9, "Distribution Systems-Operating.
APPLICABLE SAFETY ANALYSES	The initial conditions of Design Basis Accident and transient analyses in the FSAR, Chapter 14 (Ref. 1), assume Engineered Safety Feature (ESF) systems are OPERABLE. The AC, DC, and AC vital instrument bus 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. The OPERABILITY of the AC, DC, and AC vital instrument bus electrical power distribution system is consistent with the initial assumptions of the accident analyses and the requirements for the supported systems' OPERABILITY. The OPERABILITY of the minimum AC, DC, and AC vital instrument bus electrical power distribution subsystems during MODES 5 and 6 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 power is provided to mitigate events postulated during shutdown. The AC and DC electrical power distribution systems satisfy Criterion 3 of the NRC Policy Statement.
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 required features. This LCO explicitly requires energization of the portions of the electrical distribution system

BASES

LCO (continued)

necessary to support OPERABILITY of required systems, equipment, and components-all specifically addressed in each LCO and implicitly required via the definition of OPERABILITY.

Portions of the 4.16 kV and 480 VAC Class 1E safeguards buses are required to be OPERABLE in support of the opposite unit, when the opposite unit is in MODE 1, 2, 3, or 4 as addressed in the Bases of LCO 3.8.9. Accordingly, the redundancy incorporated into the design of the 4.16 kV and 480 VAC Class 1E safeguards buses must be maintained to prevent a single failure within any system or within the electrical power distribution subsystem from presenting a loss of essential safety function(s). To maintain this redundancy, the cross tie breakers between redundant safety related 480 VAC buses must be open with control power removed. This prevents any electrical malfunction in any power distribution subsystem from propagating to the redundant subsystem, that could cause the failure of a redundant subsystem and a loss of essential safety function(s).

The LCOs permit abnormal electrical distribution lineups for a unit in MODE 5 or 6, to facilitate maintenance and testing.

When a unit is in MODE 5 or 6, the safeguards and safe shutdown systems and equipment associated with that unit are not required to be OPERABLE. However, shared equipment (e.g., Service Water, Auxiliary Feedwater, etc.) in support of a unit in MODE 1, 2, 3, or 4, and residual heat removal for the unit in MODE 5 or 6 must be considered.

With one unit in MODE 1, 2, 3, or 4 and the other unit in MODE 5 or 6, the B03 and B04 buses on the unit in MODE 5 or 6 may be cross tied for ≤ 8 hours providing:

a. All required redundant shared equipment (Auxiliary Feedwater and Service Water Systems), powered from the unit in MODE 1, 2, 3, or 4 are OPERABLE;

b. The normal offsite power supply and standby emergency power source for the required redundant shared equipment (Auxiliary Feedwater and Service Water Systems), powered from the unit in MODE 1, 2, 3, or 4 are OPERABLE; and

c. For a unit in MODE 5 or MODE 6, Two residual heat removal loops are OPERABLE with reactor cavity water level < 23 ft above the top of reactor vessel flange; or one residual heat removal loop is OPERABLE when the unit is in MODE 6 with reactor cavity water level ≥ 23 ft above the top of reactor vessel flange.

BASES

LCO (continued)

This configuration is considered acceptable for a limited period of time based on maintaining all required redundant shared equipment and their associated power sources for the unit in MODE 1, 2, 3, or 4 in an OPERABLE status, retaining redundancy in residual heat removal for the unit in MODE 5 or 6, in addition to the probability for an event resulting in a bus fault or loss of offsite power with a failure of the bus cross tie breaker to open.

If any tie breakers is closed outside of the allowances outlined above, the affected electrical power distribution buses are inoperable.

Maintaining these portions of the distribution system energized ensures the availability of sufficient power to operate the unit in a safe manner to mitigate the consequences of postulated events during shutdown.

APPLICABILITY

The AC and DC electrical power distribution subsystems required to be OPERABLE in MODES 5 and 6 provide assurance that:

a. Systems to provide adequate coolant inventory makeup are available for the irradiated fuel in the core;

b. Systems necessary to mitigate the effects of events that can lead to core damage during shutdown are available; and

c. Instrumentation and control capability is available for monitoring and maintaining the unit in a cold shutdown condition and refueling condition.

The AC, DC, and AC vital instrument bus electrical power distribution subsystems requirements for MODES 1, 2, 3, and 4 are covered in LCO 3.8.9.

ACTIONS

<u>A.1, A.2</u>

Although redundant required features may require redundant trains of electrical power distribution subsystems to be OPERABLE, one OPERABLE distribution subsystem train may be capable of supporting sufficient required features to allow continuation of CORE ALTERATIONS and fuel movement. Declaring the required features associated with an inoperable distribution subsystem inoperable ensures that the appropriate restrictions are implemented in accordance with the affected supported features LCO Required Actions.

BASES

ACTIONS (continued)

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 units safety systems.

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 unit safety systems may be without power.

SURVEILLANCE REQUIREMENTS

SR 3.8.10.1

This Surveillance verifies that the required AC, DC, and AC vital instrument bus electrical power distribution systems are functioning properly, with the correct circuit breaker alignment. For the 480 VAC buses B03 and B04, correct breaker alignment includes verification that the bus cross tie breakers are open, when the system is not aligned in accordance with the LCO Note. This ensures the appropriate separation and independence of the electrical divisions is maintained. For the vital instrument buses, correct breaker alignment shall include verification that the inverter static transfer switches are in their correct position, with the inverters supply power to their respective instrument buses. Correct breaker alignment provides assurance that the appropriate voltage is available to each required bus for motive as well as control functions for critical system loads.

The 7 day Frequency takes into account the redundant capability of the AC, DC, and AC vital instrument bus electrical power distribution subsystems, and other indications available in the control room that alert the operator to subsystem malfunctions.

REFERENCES

1. FSAR. Chapter 14

B 3.9 REFUELING OPERATIONS

B 3.9.1 Boron Concentration

BASES

BACKGROUND

The limit on the boron concentrations of the Reactor Coolant System (RCS), the refueling canal, and the refueling cavity during refueling ensures that the reactor remains subcritical during MODE 6. Refueling boron concentration is the soluble boron concentration in the coolant in each of these volumes having direct access to the reactor core during refueling.

The soluble boron concentration offsets the core reactivity and is measured by chemical analysis of a representative sample of the coolant in each of the volumes. The refueling boron concentration limit is specified in the COLR. Plant procedures ensure the specified boron concentration in order to maintain an overall core reactivity of $k_{eff} \leq 0.95$ during fuel handling, with control rods and fuel assemblies assumed to be in the most adverse configuration (least negative reactivity) allowed by plant procedures.

Point Beach design criteria require that two independent reactivity control systems of different design principles be provided (Ref. 1). One of these systems must be capable of holding the reactor core subcritical under cold conditions. The Chemical and Volume Control System (CVCS) is the system capable of maintaining the reactor subcritical in cold conditions by maintaining the boron concentration.

The reactor is brought to shutdown conditions before beginning operations to open the reactor vessel for refueling. After the RCS is cooled and depressurized and the vessel head is unbolted, the head is slowly removed to form the refueling cavity. The refueling canal and the refueling cavity are then flooded with borated water from the refueling water storage tank through the open reactor vessel by gravity feeding or by use of the Residual Heat Removal (RHR) System pumps.

The pumping action of the RHR System in the RCS and the natural circulation due to thermal driving heads in the reactor vessel and refueling cavity mix the added concentrated boric acid with the water in the refueling canal. The RHR System is in operation during refueling (see LCO 3.9.4, "Residual Heat Removal (RHR) and Coolant Circulation-High Water Level," and LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation-Low Water Level") to provide forced circulation in the RCS and assist in maintaining the boron concentrations in the RCS, the refueling canal, and the refueling cavity above the COLR limit.

BASES

APPLICABLE SAFETY ANALYSES

During refueling operations, the reactivity condition of the core is consistent with the initial conditions assumed for the boron dilution accident in the accident analysis and is conservative for MODE 6. The boron concentration limit specified in the COLR is based on the core reactivity at the beginning of each fuel cycle (the end of refueling) and includes an uncertainty allowance.

The required boron concentration and the plant refueling procedures that verify the correct fuel loading plan (including full core mapping) ensure that the k_{eff} of the core will remain ≤ 0.95 during the refueling operation. Hence, at least a 5% Δk/k margin of safety is established during refueling.

During refueling, the water volume in the spent fuel pool, the transfer canal, the refueling canal, the refueling cavity, and the reactor vessel form a single mass. As a result, the soluble boron concentration is relatively the same in each of these volumes.

The limiting boron dilution accident analyzed occurs in MODE 5 (Ref. 2). A detailed discussion of this event is provided in Bases B 3.1.1, "SHUTDOWN MARGIN (SDM)."

The RCS boron concentration satisfies Criterion 2 of the NRC Policy Statement.

LCO

The LCO requires that a minimum boron concentration be maintained in the RCS, the refueling canal, and the refueling cavity while in MODE 6. The boron concentration limit specified in the COLR ensures that a core k_{eff} of ≤ 0.95 is maintained during fuel handling operations. Violation of the LCO could lead to an inadvertent criticality during MODE 6.

APPLICABILITY

This LCO is applicable in MODE 6 to ensure that the fuel in the reactor vessel will remain subcritical. The required boron concentration ensures a k_{eff} ≤ 0.95. Above MODE 6, LCO 3.1.1, "SHUTDOWN MARGIN (SDM)," ensure that an adequate amount of negative reactivity is available to shut down the reactor and maintain it subcritical.

ACTIONS

A.1 and A.2

Continuation of CORE ALTERATIONS or positive reactivity additions (including actions to reduce boron concentration) is contingent upon maintaining the unit in compliance with the LCO. If the boron

BASES

ACTIONS (continued)

concentration of any coolant volume in the RCS, the refueling canal, or the refueling cavity is less than its limit, all operations involving CORE ALTERATIONS or positive reactivity additions must be suspended immediately.

Suspension of CORE ALTERATIONS and positive reactivity additions shall not preclude moving a component to a safe position.

A.3

In addition to immediately suspending CORE ALTERATIONS or positive reactivity additions, boration to restore the concentration must be initiated immediately.

In determining the required combination of boration flow rate and concentration, no unique Design Basis Event must be satisfied. The only requirement is to restore the boron concentration to its required value as soon as possible. In order to raise the boron concentration as soon as possible, the operator should begin boration with the best source available for unit conditions.

Once actions have been initiated, they must be continued until the boron concentration is restored. The restoration time depends on the amount of boron that must be injected to reach the required concentration.

SURVEILLANCE REQUIREMENTS

SR 3.9.1.1

This SR ensures that the coolant boron concentration in the RCS, the refueling canal, and the refueling cavity is within the COLR limits. The boron concentration is determined periodically by chemical analysis of a representative sample of the interconnected volumes.

A minimum Frequency of once every 72 hours is a reasonable amount of time to verify the boron concentration of representative samples. The Frequency is based on operating experience, which has shown 72 hours to be adequate.

REFERENCES

1. FSAR. Sections 1.3.5, 3.1, and 9.3.

2. FSAR. Chapter 14.1.4.

B 3.9 REFUELING OPERATIONS

B 3.9.2 Nuclear Instrumentation

BASES

BACKGROUND

The source range neutron flux monitors are used during refueling operations to monitor the core reactivity condition. The installed source range neutron flux monitors are part of the Nuclear Instrumentation System (NIS). These detectors are located external to the reactor vessel and detect neutrons leaking from the core.

There are three installed source range neutron flux monitors. Two are BF3 detectors operating in the proportional region of the gas filled detector characteristic curve, and one is a fission chamber detector. The detectors monitor the neutron flux in counts per second. The instrument range covers six decades of neutron flux (1 to 1E+6 cps for the BF3 detectors, and 0.1 to 1E+5 cps for the fission chamber detector). All three detectors also provide continuous visual indication in the control room. The BF3 detectors provide an audible count rate to alert operators to a possible dilution accident. The NIS is designed in accordance with the criteria presented in Reference 1.

APPLICABLE SAFETY ANALYSES

Two OPERABLE source range neutron flux monitors are required to provide a signal to alert the operator to unexpected changes in core reactivity such as with a boron dilution accident (Ref. 2) or an improperly loaded fuel assembly.

The audible count rate from the source range neutron flux monitors provides prompt and definite indication of a boron dilution event. The count rate increase is proportional to the subcritical multiplication factor and allows operators to promptly recognize the initiation of a boron dilution event. Prompt recognition of the initiation of the boron dilution event is consistent with the assumption of the safety analysis and is necessary to assure sufficient time is available for isolation of the primary water makeup source before SHUTDOWN MARGIN is lost (Ref. 2).

The source range neutron flux monitors satisfy Criterion 3 of the NRC Policy Statement.

LCO

This LCO requires that two source range neutron flux monitors be OPERABLE to ensure that redundant monitoring capability is available to detect changes in core reactivity.

BASES

LCO (continued)

To be OPERABLE, each monitor must provide visual indication in the control room. In addition, at least one of the two monitors must provide an OPERABLE audible count rate function in the control room to alert operators to the initiation of a boron dilution event.

APPLICABILITY

In MODE 6, the source range neutron flux monitors must be OPERABLE to determine changes in core reactivity. There are no other direct means available to check core reactivity levels. In MODES 2, 3, 4, and 5, the installed BF3 source range detectors and circuitry are also required to be OPERABLE by LCO 3.3.1, "Reactor Trip System (RTS) Instrumentation."

ACTIONS

A.1 and A.2

With only one source range neutron flux monitor OPERABLE, redundancy has been lost. Since these instruments are the only direct means of monitoring core reactivity conditions, CORE ALTERATIONS and positive reactivity additions must be suspended immediately. Performance of Required Action A.1 shall not preclude completion of movement of a component to a safe position.

B.1

With no source range neutron flux monitor OPERABLE, action to restore a monitor to OPERABLE status shall be initiated immediately. Once initiated, action shall be continued until a source range neutron flux monitor is restored to OPERABLE status.

B.2

With no source range neutron flux monitor OPERABLE, there are no direct means of detecting changes in core reactivity.

However, since CORE ALTERATIONS and positive reactivity additions are not to be made, the core reactivity condition is stabilized until the source range neutron flux monitors are OPERABLE. This stabilized condition is determined by performing SR 3.9.1.1 to ensure that the required boron concentration exists.

The Completion Time of once per 12 hours is sufficient to obtain and analyze a reactor coolant sample for boron concentration and ensures that unplanned changes in boron concentration would be identified. The 12 hour Frequency is reasonable, considering the low probability of a change in core reactivity during this time period.

BASES

ACTIONS (continued)

C.1

With no audible count rate available, prompt and definite indication of a boron dilution event, consistent with the assumptions of the safety analysis is lost. In this situation the boron dilution event may not be detected quickly enough to assure sufficient time is available for operations to manually isolate the unborated water sources and stop the dilution prior to the loss of SHUTDOWN MARGIN. Therefore, action must be taken to prevent an inadvertent boron dilution event from occurring. This is accomplished by isolating all of the unborated water flow paths to the reactor coolant system. Isolating these flow paths ensures an inadvertent dilution of the reactor coolant boron concentration is prevented. The Completion Time of "Immediately" assures a prompt response by operations and requires an operator to initiate actions to isolate an affected flow path immediately. Once actions are initiated they must be continued until all the necessary flow paths are isolated or the circuit is restored to OPERABLE status.

SURVEILLANCE REQUIREMENTS

SR 3.9.2.1

SR 3.9.2.1 is the performance of a CHANNEL CHECK, which is a comparison of the parameter indicated on one channel to a similar parameter on other channels. It is based on the assumption that the two indication channels should be consistent with core conditions. Changes in fuel loading and core geometry can result in significant differences between source range channels, but each channel should be consistent with its local conditions.

The Frequency of 12 hours is consistent with the CHANNEL CHECK Frequency specified similarly for the same instruments in LCO 3.3.1.

SR 3.9.2.2

SR 3.9.2.2 is the performance of a CHANNEL CALIBRATION every 18 months. This SR is modified by a Note stating that neutron detectors are excluded from the CHANNEL CALIBRATION. The CHANNEL CALIBRATION for the source range neutron flux monitors consists of obtaining the detector plateau or preamp discriminator curves, evaluating those curves, and comparing the curves to the manufacturer's data. The CHANNEL CALIBRATION also includes verification of the audible count rate function. The 18 month Frequency is based on the need to perform this Surveillance under the conditions that apply during a plant outage. Operating experience has shown these components usually pass the Surveillance when performed at the 18 month Frequency.

BASES

REFERENCES

1. FSAR. Sections 1.3.5, 3.1, 7.1 and 9.3.
2. FSAR. Section 14.1.4.

B 3.9 REFUELING OPERATIONS

B 3.9.3 Containment Penetrations

BASES

BACKGROUND

During CORE ALTERATIONS or movement of irradiated fuel assemblies within containment, a release of fission product radioactivity within containment will be restricted from escaping to the environment when the LCO requirements are met. In MODES 1, 2, 3, and 4, this is accomplished by maintaining containment OPERABLE as described in LCO 3.6.1, "Containment." In MODE 6, the potential for containment pressurization as a result of an accident is not likely; therefore, requirements to isolate the containment from the outside atmosphere can be less stringent. Since there is no potential for containment pressurization, the Appendix J leakage criteria and tests are not required.

The containment serves to minimize the escape of fission product radioactivity to the environment that may be released from the reactor core following an accident, such that offsite radiation exposures are maintained well within the requirements of 10 CFR 100. Additionally, the containment provides radiation shielding from the fission products that may be present in the containment atmosphere following accident conditions.

The containment equipment hatch, which is part of the containment pressure boundary, provides a means for moving large equipment and components into and out of containment. During CORE ALTERATIONS or movement of irradiated fuel assemblies within containment, the equipment hatch must be held in place with all bolts.

The containment air locks, which are also part of the containment pressure boundary, provide a means for personnel access during MODES 1, 2, 3, and 4 unit operation in accordance with LCO 3.6.2, "Containment Air Locks." Each air lock has a door at both ends. The doors are normally interlocked to prevent simultaneous opening when containment OPERABILITY is required. During periods of unit shutdown when containment closure is not required, the door interlock mechanism may be disabled, allowing both doors of an air lock to remain open for extended periods when frequent containment entry is necessary. During CORE ALTERATIONS or movement of irradiated fuel assemblies within containment, one airlock door must always remain capable of being closed.

BASES

BACKGROUND (continued)	The requirements for containment purge and exhaust system penetration closure ensure that a release of fission product radioactivity within containment will be restricted to within regulatory limits. The Containment Purge and Exhaust System includes a 36 inch purge penetration and a 36 inch exhaust penetration. During MODES 1, 2, 3, and 4, the two valves in each of the purge and exhaust penetrations are secured in the closed position. The Containment Purge and Exhaust System is not subject to a Specification in MODE 5. In MODE 6, large air exchanges are necessary to conduct refueling operations. The 36 inch purge system is used for this purpose, and all four valves are closed by the Containment Purge and Exhaust Isolation Instrumentation.
APPLICABLE SAFETY ANALYSES	During CORE ALTERATIONS or movement of irradiated fuel assemblies within containment, the most severe radiological consequences result from a fuel handling accident. The fuel handling accident is a postulated event that involves damage to irradiated fuel (Ref. 1). Fuel handling accidents, analyzed in Reference 2, include dropping a single irradiated fuel assembly and handling tool or a heavy object onto other irradiated fuel assemblies. The requirements of LCO 3.9.6, "Refueling Cavity Water Level," and the minimum decay time of 100 hours prior to CORE ALTERATIONS ensure that the release of fission product radioactivity subsequent to a fuel handling accident, results in doses that are well within the guideline values specified in 10 CFR 100. Standard Review Plan, Section 15.7.4, Rev. 1 (Ref. 2), defines "well within" 10 CFR 100 to be 25% or less of the 10 CFR 100 values. The acceptance limits for offsite radiation exposure will be 25% of 10 CFR 100 values or the NRC staff approved licensing basis (e.g., a specified fraction of 10 CFR 100 limits). Containment penetrations satisfy Criterion 3 of the NRC Policy Statement.
LCO	This LCO limits the consequences of a fuel handling accident in containment by limiting the potential escape paths for fission product radioactivity released within containment. The LCO requires any Containment Purge and Exhaust System penetration to be closed except for the OPERABLE containment purge and exhaust penetrations. For the OPERABLE containment purge and exhaust penetrations, this LCO ensures that these penetrations are isolable by the Containment Purge and Exhaust Isolation System. The

BASES

LCO (continued)

OPERABILITY requirements for this LCO ensure that the automatic purge and exhaust valve closure specified in the FSAR can be achieved.

The containment personnel airlock doors may be open during movement of irradiated fuel in the containment and during CORE ALTERATIONS provided that one door is capable of being closed in the event of a fuel handling accident. Should a fuel handling accident occur inside containment, one personnel airlock door will be closed following an evacuation of containment.

The allowance to have containment personnel airlocks open during fuel movements and CORE ALTERATIONS is based on the Point Beach confirmatory dose calculation of a fuel handling accident. This calculation assumes a ground level release with acceptable radiological consequences. The personnel airlocks are not assumed to be closed during the fuel handling accident, nor are the airlocks assumed to be closed within any amount of time following the fuel handling accident.

APPLICABILITY

The containment penetration requirements are applicable during CORE ALTERATIONS or movement of irradiated fuel assemblies within containment because this is when there is a potential for a fuel handling accident. In MODES 1, 2, 3, and 4, containment penetration requirements are addressed by LCO 3.6.1. In MODES 5 and 6, when CORE ALTERATIONS or movement of irradiated fuel assemblies within containment are not being conducted, the potential for a fuel handling accident does not exist. Therefore, under these conditions no requirements are placed on containment penetration status.

ACTIONS

A.1 and A.2

If the containment equipment hatch, air locks, or any containment Purge and Exhaust System penetration is not in the required status, including the Containment Purge and Exhaust Isolation System not capable of automatic actuation when the purge and exhaust valves are open, the unit must be placed in a condition where the isolation function is not needed. This is accomplished by immediately suspending CORE ALTERATIONS and movement of irradiated fuel assemblies within containment. Performance of these actions shall not preclude completion of movement of a component to a safe position.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.9.3.1

This Surveillance demonstrates that each of the containment penetrations required to be in its closed position is in that position. The Surveillance on the open purge and exhaust valves will demonstrate that the valves are not blocked from closing. Also the Surveillance will demonstrate that each valve operator has motive power, which will ensure that each valve is capable of being closed by an OPERABLE automatic containment purge and exhaust isolation signal.

The Surveillance is performed every 7 days during CORE ALTERATIONS or movement of irradiated fuel assemblies within containment. The Surveillance interval is selected to be commensurate with the normal duration of time to complete fuel handling operations. A surveillance before the start of refueling operations will provide two or three surveillance verifications during the applicable period for this LCO.

SR 3.9.3.2

This Surveillance demonstrates that each containment purge and exhaust valve actuates to its isolation position on manual initiation or on an actual or simulated high radiation signal. The 18 month Frequency maintains consistency with other similar ESFAS instrumentation and valve testing requirements. SR 3.6.3.5 demonstrates that the isolation time of each valve is in accordance with the Inservice Testing Program requirements. These Surveillances performed during MODE 6 will ensure that the valves are capable of closing after a postulated fuel handling accident to limit a release of fission product radioactivity from the containment.

The SR is modified by a Note stating that this demonstration is not applicable to valves in isolated penetrations. LCO 3.9.3.c.1 provides the option to close penetrations in lieu of requiring automatic isolation capability.

REFERENCES

1. FSAR. Section 14.2.1.

2. NUREG-0800, Section 15.7.4, Rev. 1, July 1981.

B 3.9 REFUELING OPERATIONS

B 3.9.4 Residual Heat Removal (RHR) and Coolant Circulation - High Water Level

BASES

BACKGROUND

The purpose of the RHR System in MODE 6 is to remove decay heat and sensible heat from the Reactor Coolant System (RCS) to provide mixing of borated coolant and to prevent boron stratification (Ref. 1). Heat is removed from the RCS by circulating reactor coolant through the RHR heat exchanger(s), where the heat is transferred to the Component Cooling Water System. The coolant is then returned to the RCS via the RCS cold leg. Operation of the RHR System for normal cooldown or decay heat removal is manually accomplished from the control room. The heat removal rate is adjusted by controlling the flow of reactor coolant through the RHR heat exchanger(s) and the bypass. Mixing of the reactor coolant is maintained by this continuous circulation of reactor coolant through the RHR System.

APPLICABLE SAFETY ANALYSES

If the reactor coolant temperature is not maintained below 200°F, boiling of the reactor coolant could result. This could lead to a loss of coolant in the reactor vessel. Additionally, boiling of the reactor coolant could lead to a reduction in boron concentration in the coolant due to boron plating out on components near the areas of the boiling activity. The loss of reactor coolant and the reduction of boron concentration in the reactor coolant would eventually challenge the integrity of the fuel cladding, which is a fission product barrier. One train of the RHR System is required to be operational in MODE 6, with the water level ≥ 23 ft above the top of the reactor vessel flange, to prevent this challenge. The LCO does permit de-energizing the RHR pump for short durations, under the condition that the boron concentration is not diluted. This conditional de-energizing of the RHR pump does not result in a challenge to the fission product barrier.

Although the RHR System does not meet a specific criterion of the NRC Policy Statement, it was identified in the NRC Policy Statement as an important contributor to risk reduction. Therefore, the RHR System is retained as a Specification.

BASES

LCO

Only one RHR loop is required for decay heat removal in MODE 6, with the water level ≥ 23 ft above the top of the reactor vessel flange. Only one RHR loop is required to be OPERABLE, because the volume of water above the reactor vessel flange provides backup decay heat removal capability. At least one RHR loop must be OPERABLE and in operation to provide:

a. Removal of decay heat;

b. Mixing of borated coolant to minimize the possibility of criticality; and

c. Indication of reactor coolant temperature.

An OPERABLE RHR loop includes an RHR pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path and to determine the low end temperature. The flow path starts in one of the RCS hot legs and is returned to the RCS cold leg.

The LCO is modified by a Note that allows the required operating RHR loop to not be in operation for up to 1 hour per 8 hour period, provided no operations are permitted that would cause a reduction of the RCS boron concentration. Boron concentration reduction is prohibited because uniform concentration distribution cannot be ensured without forced circulation. This permits operations such as core mapping or alterations in the vicinity of the reactor vessel hot leg nozzles and RCS to RHR isolation valve testing. During this 1 hour period, decay heat is removed by natural convection to the large mass of water in the refueling cavity.

APPLICABILITY

One RHR loop must be OPERABLE and in operation in MODE 6, with the water level ≥ 23 ft above the top of the reactor vessel flange, to provide decay heat removal. The 23 ft water level was selected because it corresponds to the 23 ft requirement established for fuel movement in LCO 3.9.6, "Refueling Cavity Water Level." Requirements for the RHR System in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS), and Section 3.5, Emergency Core Cooling Systems (ECCS). RHR loop requirements in MODE 6 with the water level < 23 ft are located in LCO 3.9.5, "Residual Heat Removal (RHR) and Coolant Circulation - Low Water Level."

BASES

ACTIONS

RHR loop requirements are met by having one RHR loop OPERABLE and in operation, except as permitted in the Note to the LCO.

A.1

If RHR loop requirements are not met, there will be no forced circulation to provide mixing to establish uniform boron concentrations.

A.2

If RHR loop requirements are not met, actions shall be taken immediately to suspend loading of irradiated fuel assemblies in the core. With no forced circulation cooling, decay heat removal from the core occurs by natural convection to the heat sink provided by the water above the core. A minimum refueling water level of 23 ft above the reactor vessel flange provides an adequate available heat sink. Suspending any operation that would increase decay heat load, such as loading a fuel assembly, is a prudent action under this condition.

A.3

If RHR loop requirements are not met, actions shall be initiated and continued in order to satisfy RHR loop requirements. With the unit in MODE 6 and the refueling water level ≥ 23 ft above the top of the reactor vessel flange, corrective actions shall be initiated immediately.

SURVEILLANCE REQUIREMENTS

SR 3.9.4.1

This Surveillance demonstrates that the RHR loop is in operation and circulating reactor coolant. Verification includes flow rate, temperature, or pump status monitoring, which help ensure that forced flow is providing decay heat removal capability and mixing of the borated coolant to prevent thermal and boron stratification in the core. The Frequency of 12 hours is sufficient, considering the flow, temperature, pump control, and alarm indications available to the operator in the control room for monitoring the RHR System.

REFERENCES

1. FSAR. Section 9.2 and 14.1.4.

B 3.9 REFUELING OPERATIONS

B 3.9.5 Residual Heat Removal (RHR) and Coolant Circulation - Low Water Level

BASES

BACKGROUND

The purpose of the RHR System in MODE 6 is to remove decay heat and sensible heat from the Reactor Coolant System (RCS) to provide mixing of borated coolant, and to prevent boron stratification (Ref. 1). Heat is removed from the RCS by circulating reactor coolant through the RHR heat exchangers where the heat is transferred to the Component Cooling Water System. The coolant is then returned to the RCS via the RCS cold leg. Operation of the RHR System for normal cooldown decay heat removal is manually accomplished from the control room. The heat removal rate is adjusted by controlling the flow of reactor coolant through the RHR heat exchanger(s) and the bypass lines. Mixing of the reactor coolant is maintained by this continuous circulation of reactor coolant through the RHR System.

APPLICABLE SAFETY ANALYSES

If the reactor coolant temperature is not maintained below 200°F, boiling of the reactor coolant could result. This could lead to a loss of coolant in the reactor vessel. Additionally, boiling of the reactor coolant could lead to a reduction in boron concentration in the coolant due to the boron plating out on components near the areas of the boiling activity. The loss of reactor coolant and the reduction of boron concentration in the reactor coolant will eventually challenge the integrity of the fuel cladding, which is a fission product barrier. Two trains of the RHR System are required to be OPERABLE, and one train in operation, in order to prevent this challenge.

Although the RHR System does not meet a specific criterion of the NRC Policy Statement, it was identified in the NRC Policy Statement as an important contributor to risk reduction. Therefore, the RHR System is retained as a Specification.

LCO

In MODE 6, with the water level < 23 ft above the top of the reactor vessel flange, both RHR loops must be OPERABLE.

Additionally, one loop of RHR must be in operation in order to provide:

a. Removal of decay heat;

b. Mixing of borated coolant to minimize the possibility of criticality; and

c. Indication of reactor coolant temperature.

BASES

LCO (continued)

An OPERABLE RHR loop consists of an RHR pump, a heat exchanger, valves, piping, instruments and controls to ensure an OPERABLE flow path and to determine the low end temperature. The flow path starts in one of the RCS hot legs and is returned to one of the RCS cold legs.

Both RHR pumps may be aligned to the Refueling Water Storage Tank to support filling or draining the refueling cavity or for performance of required testing.

APPLICABILITY

Two RHR loops are required to be OPERABLE, and one RHR loop must be in operation in MODE 6, with the water level < 23 ft above the top of the reactor vessel flange, to provide decay heat removal. Requirements for the RHR System in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS), and Section 3.5, Emergency Core Cooling Systems (ECCS). RHR loop requirements in MODE 6 with the water level ≥ 23 ft are located in LCO 3.9.4, "Residual Heat Removal (RHR) and Coolant Circulation - High Water Level."

ACTIONS

A.1 and A.2

If less than the required number of RHR loops are OPERABLE, action shall be immediately initiated and continued until the RHR loop is restored to OPERABLE status and to operation or until ≥ 23 ft of water level is established above the reactor vessel flange. When the water level is ≥ 23 ft above the reactor vessel flange, the Applicability changes to that of LCO 3.9.4, and only one RHR loop is required to be OPERABLE and in operation. An immediate Completion Time is necessary for an operator to initiate corrective actions.

B.1

If no RHR loop is in operation, there will be no forced circulation to provide mixing to establish uniform boron concentrations.

B.2

If no RHR loop is in operation, actions shall be initiated immediately, and continued, to restore one RHR loop to operation. Since the unit is in Conditions A and B concurrently, the restoration of two OPERABLE RHR loops and one operating RHR loop should be accomplished expeditiously.

BASES

SURVEILLANCE REQUIREMENTS

SR 3.9.5.1

This Surveillance demonstrates that one RHR loop is in operation and circulating reactor coolant. Verification includes flow rate, temperature, or pump status monitoring, which help ensure that forced flow is providing decay heat removal capability and mixing of the borated coolant to prevent thermal and boron stratification in the core. In addition, during operation of the RHR loop with the water level in the vicinity of the reactor vessel nozzles, the RHR pump suction requirements must be met. The Frequency of 12 hours is sufficient, considering the flow, temperature, pump control, and alarm indications available to the operator for monitoring the RHR System in the control room.

SR 3.9.5.2

Verification that the required pump is OPERABLE ensures that an additional RCS or RHR pump can be placed in operation, if needed, to maintain decay heat removal and reactor coolant circulation. Verification is performed by verifying proper breaker alignment and power available to the required pump. The Frequency of 7 days is considered reasonable in view of other administrative controls available and has been shown to be acceptable by operating experience.

REFERENCES

1. FSAR. Section 9.2 and 14.1.4

B 3.9 REFUELING OPERATIONS

B 3.9.6 Refueling Cavity Water Level

BASES

BACKGROUND

The movement of irradiated fuel assemblies or performance of CORE ALTERATIONS, except during latching and unlatching of control rod drive shafts, within containment requires a minimum water level of 23 ft above the top of the reactor vessel flange. During refueling, this maintains sufficient water level in the containment, refueling canal, fuel transfer canal, refueling cavity, and spent fuel pool. Sufficient water is necessary to retain iodine fission product activity in the water in the event of a fuel handling accident (Refs. 1 and 2). Sufficient iodine activity would be retained to limit offsite doses from the accident to < 25% of 10 CFR 100 limits, as provided by the guidance of Reference 3.

APPLICABLE SAFETY ANALYSES

During CORE ALTERATIONS and movement of irradiated fuel assemblies, the water level in the refueling canal and the refueling cavity is an initial condition design parameter in the analysis of a fuel handling accident in containment, as postulated by Regulatory Guide 1.25 (Ref. 1). A minimum water level of 23 ft (Regulatory Position C.1.c of Ref. 1) allows a decontamination factor of 100 (Regulatory Position C.1.g of Ref. 1) to be used in the accident analysis for iodine. This relates to the assumption that 99% of the total iodine released from the pellet to cladding gap of all the dropped fuel assembly rods is retained by the refueling cavity water. The fuel pellet to cladding gap is assumed to contain 10% of the total fuel rod iodine inventory (Ref. 1).

The fuel handling accident analysis inside containment is described in Reference 2. With a minimum water level of 23 ft and a minimum decay time of 100 hours prior to fuel handling, the analysis and test programs demonstrate that the iodine release due to a postulated fuel handling accident is adequately captured by the water and offsite doses are maintained within allowable limits (Refs. 4 and 5).

Refueling cavity water level satisfies Criterion 2 of the NRC Policy Statement.

LCO

A minimum refueling cavity water level of 23 ft above the reactor vessel flange is required to ensure that the radiological consequences of a postulated fuel handling accident inside containment are within acceptable limits, as provided by the guidance of Reference 3.

BASES

APPLICABILITY

LCO 3.9.6 is applicable during CORE ALTERATIONS, except during latching and unlatching of control rod drive shafts, and when moving irradiated fuel assemblies within containment. The LCO minimizes the possibility of a fuel handling accident in containment that is beyond the assumptions of the safety analysis. If irradiated fuel assemblies are not present in containment, there can be no significant radioactivity release as a result of a postulated fuel handling accident. Requirements for fuel handling accidents in the spent fuel pool are covered by LCO 3.7.15, "Fuel Storage Pool Water Level."

ACTIONS

A.1 and A.2

With a water level of < 23 ft above the top of the reactor vessel flange, all operations involving CORE ALTERATIONS or movement of irradiated fuel assemblies within the containment shall be suspended immediately to ensure that a fuel handling accident cannot occur.

The suspension of CORE ALTERATIONS and fuel movement shall not preclude completion of movement of a component to a safe position.

SURVEILLANCE REQUIREMENTS

SR 3.9.6.1

Verification of a minimum water level of 23 ft above the top of the reactor vessel flange ensures that the design basis for the analysis of the postulated fuel handling accident during refueling operations is met. Water at the required level above the top of the reactor vessel flange limits the consequences of damaged fuel rods that are postulated to result from a fuel handling accident inside containment (Ref. 2).

The Frequency of 24 hours is based on engineering judgment and is considered adequate in view of the large volume of water and the normal procedural controls of valve positions, which make significant unplanned level changes unlikely.

REFERENCES

1. Regulatory Guide 1.25, March 23, 1972.
2. FSAR. Section 14.2.1.
3. NUREG-0800, Section 15.7.4.
4. 10 CFR 100.10.

BASES

REFERENCE (continued)

5. Malinowski, D. D., Bell, M. J., Duhn, E., and Locante, J., WCAP-828, Radiological Consequences of a Fuel Handling Accident, December 1971.