B 3.7 PLANT SYSTEMS

B 3.7.1 Service Water (SW) System and Ultimate Heat Sink (UHS)

BASES

BACKGROUND

The SW System is designed to provide cooling water for the removal of heat from unit auxiliaries, such as Residual Heat Removal (RHR) System heat exchangers, emergency diesel generator (DG) coolers, and room coolers for Emergency Core Cooling System equipment required for a safe reactor shutdown following a Design Basis Accident (DBA) or transient. The SW System also provides cooling to unit components, as required, during normal operation and shutdown conditions. During a loss of offsite power (LOOP) or loss of coolant accident (LOCA) coincident with a LOOP, the SW supply header cross connect valves (these valves are open to crosstie the supply headers of the two SW subsystems) are closed and the non-safety related equipment required for normal operation is isolated (both supply and return flow paths) from the SW System, and cooling is directed only to safety related equipment. However, if a partial LOOP occurs (i.e., one offsite circuit is lost, resulting in deenergization of either the Division 1 or Division 2 4.16 kV emergency bus), while the non-safety related equipment is still isolated, the SW supply header cross connect valves will not isolate. In addition, during the LOOP or LOCA/LOOP, one pump in each subsystem is restarted automatically in timed sequence (provided the associated pump discharge valve has automatically closed). If a pump fails to restart, a standby pump is started automatically to ensure one pump is running in each subsystem. During a LOCA (without a coincident LOOP), the SW pumps which are running remain in service (no SW pumps are automatically started on a LOCA signal), the SW supply headers remain crosstied (the SW supply header cross connect valves are not automatically closed), and the non-safety related loads are not isolated from the SW System.

The SW System consists of the UHS, two essential cooling water headers (subsystems A and B), and their associated pumps, piping, valves, and instrumentation. Subsystems A and B are redundant and service equipment in SW Divisions 1 and 2, respectively.

(continued)

BASES

BACKGROUND (continued)

The UHS consists of Lake Ontario and the SW Intake and Discharge System. The SW Intake System includes the two intake structures, the Intake Deicer Heating System, and the SW pump intake bay. The UHS is capable of providing sufficient cooling for all SW System post LOCA cooling requirements for a 30 day period (Regulatory Guide 1.27, Ref. 1).

Cooling water is pumped from the SW pump intake bay of the UHS by the SW pumps to the essential components through the two main redundant supply headers (subsystems A and B). After removing heat from the components, the water is discharged to Lake Ontario via the SW pump discharge bay, the discharge tunnel, and the diffuser nozzles.

Subsystems A and B supply cooling water to redundant equipment required for a safe reactor shutdown. Additional information on the design and operation of the SW System and UHS along with the specific equipment for which the SW System supplies cooling water is provided in the USAR, Sections 9.2.1 and 9.2.5 and the USAR, Table 9.2-1 (Refs. 2, 3, and 4, respectively). The SW System is designed to withstand a single active failure, coincident with a loss of offsite power, without losing the capability to supply adequate cooling water to equipment required for safe reactor shutdown.

Following a DBA or transient, the SW System will operate automatically without operator action.

APPLICABLE SAFETY ANALYSES

Sufficient water inventory is available for all SW System post LOCA cooling requirements for a 30 day period with no additional makeup water source available (Ref. 1). The ability of the SW System to support long term cooling of the reactor or containment is assumed in evaluations of the equipment required for safe reactor shutdown presented in the USAR, Sections 9.2.1, 6.2, and 6.3, Chapter 15, and Appendix A (Refs. 2, 5, 6, 7, and 8 respectively). These analyses include the evaluation of the long term primary containment response after a design basis LOCA. The SW System provides cooling water for the RHR suppression pool cooling mode to limit suppression pool temperature and primary containment pressure following a LOCA. This ensures that the primary containment can perform its intended function of limiting the release of radioactive materials to the environment following a LOCA. The SW System also

(continued)

APPLICABLE SAFETY ANALYSES (continued)

provides cooling to other components assumed to function during a LOCA (e.g., RHR pump seal coolers, control building chillers, and safety related area coolers). Also, the ability to provide onsite emergency AC power is dependent on the ability of the SW System to cool the DGs.

The safety analyses for long term containment cooling were performed, as discussed in the USAR, Section 6.2.2 (Ref. 9), for a LOCA, and a LOCA concurrent with a LOOP. The worst case single failure affecting the performance of the SW System during a LOCA/LOOP is the failure of the Division 1 or 2 standby DG, which would in turn affect one SW subsystem. The analysis shows that two SW pumps in one subsystem are adequate to perform the long term containment cooling function (one SW pump is automatically started and is sufficient for the first 10 minutes of the accident sequence, while a second SW pump is manually started 10 minutes into the accident sequence and is necessary to meet the long term cooling requirements).

The worst case single failure affecting performance of the SW System during a LOCA (without a coincident LOOP) is the failure of one of the operating SW pumps. This is the most limiting analysis since the non-safety related loads are not automatically isolated during a LOCA. The analysis shows that, for SW supply header water temperature ≤ 82°F, three SW pumps (the SW pumps can be in one subsystem since the SW supply headers must be crosstied) are adequate to perform the long term containment cooling function (three pumps remain running when the accident occurs and are sufficient for the first 10 minutes of the sequence, while the non-safety related equipment is manually isolated 10 minutes into the accident sequence to meet the long term cooling requirements). When SW supply header water temperature is > 82°F and ≤ 84°F, four SW pumps are required to ensure sufficient SW flow to the control building chillers to meet accident analysis assumptions.

The SW flow assumed in the analyses is 7400 gpm to the RHR heat exchanger (USAR, Table 9.2-1A, Ref. 4). Reference 2 discusses SW System performance during these conditions. The UHS is also assumed in these analyses. Both intake structures are assumed, with 14 intake deicer heaters OPERABLE and in operation in each intake structure. The required number of intake deicer

(continued)

BASES

APPLICABLE SAFETY ANALYSES (continued)

heaters ensures that the necessary intake structure suction area is available during both a LOCA and a LOCA/LOOP. During a LOCA/LOOP, 14 heaters are available in one division (assuming a DG failure) per intake structure to support the two required SW pumps. During a LOCA, 14 heaters are available in each division (since power is not lost) per intake structure to support the three required pumps. Therefore, the LOCA/LOOP is the most limiting condition for the intake deicer heater requirements. In addition, 14 heaters per intake structure will also ensure sufficient intake structure suction area is available during normal operations.

The SW System, together with the UHS, satisfy Criterion 3 of Reference 10.

LCO

The OPERABILITY of subsystem A (Division 1) and subsystem B (Division 2) of the SW System is required to ensure the effective operation of the RHR System in removing heat from the reactor, and the effective operation of other safety related equipment during a DBA or transient. Requiring both subsystems to be OPERABLE ensures that either subsystem A or B will be available to provide adequate capability to meet cooling requirements of the equipment required for safe shutdown in the event of a single failure. The OPERABILITY requirements for the SW System are dependent on the SW supply header water temperature, as follows:

a. For SW supply header water temperature ≤ 82°F:

   A subsystem is considered OPERABLE when:

   1. Two pumps are OPERABLE; and

   2. The associated piping, valves (including the SW supply header cross connect valve and non-safety related supply and return isolation valves), instrumentation, and controls required to perform the safety related function are OPERABLE. In addition, the SW supply header cross connect valve must also be open to be OPERABLE.

(continued)

LCO (continued)

Four SW pumps are required to be in operation since the SW pumps do not receive an automatic start on a LOCA signal. There are no restrictions as to the allowed combinations of operating SW pumps (i.e., two SW pumps in each subsystem or three SW pumps in one subsystem and one SW pump in the other subsystem are allowed), since any combination of four operating SW pumps will meet the accident analysis assumptions.

b. For SW supply header water temperature > 82°F and ≤ 84°F:

A subsystem is considered OPERABLE when:

1. Either two or three pumps are OPERABLE, provided a total of five SW pumps are OPERABLE; and

2. The associated piping, valves (including the SW supply header cross connect valve and non-safety related supply and return isolation valves), instrumentation, and controls required to perform the safety related function are OPERABLE. In addition, the SW supply header cross connect valve must also be open to be OPERABLE.

In this case, five SW pumps are required to be in operation. There are no restrictions as to the allowed combinations of operating SW pumps, since any combination of five operating SW pumps will meet the accident analysis assumptions. Prior to the SW supply header water temperature exceeding 82°F, pre-planned actions are taken to manage SW system flow rates and heat loads, and the minimum required SW flow rate to the control building chillers is verified. These actions ensure that sufficient SW flow to the control building chillers is available to meet accident analysis assumptions.

The isolation of the SW System to components or systems may render those components or systems inoperable, but does not affect the OPERABILITY of the SW System.

OPERABILITY of the UHS is based on a maximum water temperature of 84°F, a minimum SW pump intake bay water level of 233.1 ft mean sea level, and 14 intake deicer heaters (of the 21 installed) OPERABLE (which includes being in operation) per division in each intake structure, when the intake tunnel water temperature is < 38°F.

(continued)

BASES

APPLICABILITY

In MODES 1, 2, and 3, the SW System and UHS are required to be OPERABLE to support OPERABILITY of the equipment serviced by the SW System and UHS, and are required to be OPERABLE in these MODES.

In MODES 4 and 5, the OPERABILITY requirements of the SW System and UHS are determined by the systems they support and therefore, the requirements are not the same for all facets of operation in MODES 4 and 5. Thus, the LCOs of the systems supported by the SW System and UHS will govern SW System and UHS OPERABILITY requirements in MODES 4 and 5.

ACTIONS

A.1 and A.2

If one SW supply header cross connect valve is inoperable due to being closed, an assumption of the LOCA analysis is not met. Therefore, the SW supply header cross connect valve must be opened within 1 hour. The 1 hour Completion Time provides a period of time to correct the problem and takes into account the low probability of a LOCA occurring during this time. If one SW supply header cross connect valve is inoperable due to being incapable of automatically closing, the remaining OPERABLE SW supply header cross connect valve is adequate to ensure the two Divisions can be split, thus ensuring the SW heat removal function is maintained during a LOOP or LOOP/LOCA. However, the overall reliability is reduced because a single failure of the OPERABLE SW supply header cross connect valve could result in loss of the SW function during a LOOP or LOOP/LOCA. Therefore, the SW supply header cross connect valve must be restored to OPERABLE status within 72 hours. The 72 hour Completion Time was developed taking into account the redundant capabilities afforded by the OPERABLE SW supply header cross connect valve and the low probability of a LOOP or LOOP/LOCA occurring during this period.

(continued)

ACTIONS (continued)

B.1

When one or more non-safety related SW flow paths (i.e., the two supply and two return flow paths) have one SW isolation valve that is inoperable, the remaining OPERABLE SW isolation valve in each affected non-safety related SW flow path is adequate to ensure the non-safety related flow paths can be isolated from the safety related flow paths, thus ensuring the SW heat removal function is maintained. However, the overall reliability is reduced because a single failure of the OPERABLE SW isolation valve in an affected non-safety related flow path could result in loss of the SW function during a LOOP or LOOP/LOCA. Therefore, the affected non-safety related flow path(s) must be isolated within 72 hours. Isolating the affected non-safety related flow path(s) is acceptable since this action performs the function of the SW isolation valves. The 72 hour Completion Time was developed taking into account the redundant capabilities afforded by the OPERABLE SW isolation valve in each affected non-safety related flow path and the low probability of a LOOP or LOOP/LOCA occurring during this period.

C.1

If one SW subsystem is inoperable for reasons other than Conditions A and B (e.g., one or two required SW pumps inoperable in one subsystem), it must be restored to OPERABLE status within 72 hours. With the unit in this condition, the remaining OPERABLE SW subsystem is adequate to perform the heat removal function. However, the overall reliability is reduced because a single failure in the OPERABLE SW subsystem could result in a loss of the SW function. The 72 hour Completion Time was developed taking into account the redundant capabilities afforded by the OPERABLE subsystem and the low probability of a DBA occurring during this period.

D.1

If one division of intake deicer heaters is inoperable, it must be restored to OPERABLE status within 72 hours. With the unit in this condition, the remaining OPERABLE deicer heater division is adequate to ensure both intake structures

(continued)

ACTIONS

D.1 (continued)

remain free of ice blockage, thus ensuring the UHS is adequate to perform the heat removal function. However, the overall reliability is reduced because a single failure in the OPERABLE intake deicer heater division could result in loss of the UHS function during a DBA. The 72 hour Completion Time was developed taking into account the redundant capabilities afforded by the OPERABLE intake deicer heater division and the low probability of a DBA occurring during this period.

E.1

If one required SW pump is not in operation, it must be restored to operation within 72 hours. With the unit in this condition, the remaining operating SW pumps are adequate to perform the heat removal function. However, the overall reliability is reduced because a single failure of a remaining operating pump could result in loss of the SW function during a DBA LOCA. The 72 hour Completion Time was developed taking into account the redundant capabilities afforded by the operating pumps and the low probability of a DBA LOCA occurring during this period.

F.1

If two or more required SW pumps are not in operation, all but one of the required SW pumps must be in operation within 1 hour. The 1 hour Completion Time provides a period of time to correct the problem and is consistent with the 1 hour provided in LCO 3.0.3. This time period also takes into account the low probability of a DBA LOCA occurring during this time.

G.1 and G.2

If any Required Action and associated Completion Time of Condition A, B, C, D, E, or F are not met, or both SW subsystems are inoperable for reasons other than Conditions A, B, and C, or the UHS is inoperable for reasons other than Condition D, 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 12 hours and in MODE 4 within 36 hours.

(continued)

ACTIONS

G.1 and G.2 (continued)

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.

The Required Actions are modified by a Note indicating that the applicable Conditions of LCO 3.4.9, "Residual Heat Removal (RHR) Shutdown Cooling System — Hot Shutdown," be entered and the Required Actions taken if the inoperable SW System or UHS results in an inoperable RHR shutdown cooling subsystem. This is in accordance with LCO 3.0.6 and ensures the proper actions are taken for the RHR Shutdown Cooling System.

SURVEILLANCE REQUIREMENTS

SR 3.7.1.1

Verification that the water temperature of the intake tunnels is ≥ 38°F ensures that frazil ice, which can block the intake tunnels, cannot form. This ensures that the intake tunnels can perform their intended function. This Surveillance is only required to be met when SR 3.7.1.5 and SR 3.7.1.8 are not satisfied. With the Intake Deicer Heater System OPERABLE (and SR 3.7.1.5 and SR 3.7.1.8 met), frazil ice cannot form even with the intake tunnels water temperature < 38°F. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.7.1.2

This SR verifies the water level in the SW pump intake bay to be sufficient for the proper operation of the SW pumps (net positive suction head and pump vortexing are considered in determining this limit). The water level limit, 233.1 ft, is referenced to mean sea level. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.7.1.3

Verification of each SW subsystem supply header temperature ensures that the heat removal capability of the SW System is within the assumptions of the DBA analysis. The Surveillance Frequency is

(continued)

BASES

SURVEILLANCE REQUIREMENTS

SR 3.7.1.3 (continued)

controlled under the Surveillance Frequency Control Program. However, if a SW subsystem supply header water temperature is ≥ 78°F, the Surveillance must be performed more frequently (every 4 hours), since the condition is closer to the maximum water temperature limit.

SR 3.7.1.4

Verification that each required SW pump is in operation ensures that an adequate number of SW pumps are operating to perform the long term containment cooling function during a LOCA. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.7.1.5

The current for each required heater feeder cable is required to be checked to ensure the proper number of heaters are OPERABLE for each intake deicer heater division. The Surveillance is performed by verifying, at the motor control centers, that the current is ≥ 20 amps (total for all three phases when adjusted to degraded voltage conditions, i.e., 518 volts) in each intake structure for each division. The current limit is based upon ensuring 14 heaters are OPERABLE (which includes in operation) in an intake structure. This Surveillance is only required to be met when SR 3.7.1.1 is not satisfied, since with the intake tunnels water temperature ≥ 38°F (i.e., SR 3.7.1.1 met), frazil ice cannot form even with the intake deicer heaters inoperable. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.7.1.6

Verifying the correct alignment for each manual, power operated, and automatic valve in each SW subsystem flow path provides assurance that the proper flow paths will exist for SW operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these valves were verified to be in the correct position prior to locking, sealing, or securing. A valve is also allowed to be in the nonaccident

(continued)

SURVEILLANCE REQUIREMENTS

SR 3.7.1.6 (continued)

position and yet considered in the correct position, provided it can be automatically realigned to its accident position within the required time. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of potentially being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves.

This SR is modified by a Note indicating that isolation of the associated SW subsystem to components or systems may render those components or systems inoperable, but does not affect the OPERABILITY of the SW subsystem. As such, when all SW pumps, valves, and piping are OPERABLE, but a branch connection off the main header is isolated, the SW subsystem is still OPERABLE.

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

SR 3.7.1.7

This SR verifies that the automatic isolation valves (i.e., SW isolation valves servicing non-safety related equipment, SW supply header cross connect valves, and SW pump discharge valves of non-operating SW pumps) of the SW System will automatically switch to the safety or emergency position to provide cooling water exclusively to the safety related equipment during a transient event (i.e., LOOP). This is demonstrated by use of an actual or simulated initiation signal. This SR also verifies the automatic start capability of the SW pump (and associated pump discharge valve opening capability) in each subsystem.

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

SR 3.7.1.8

The resistance of each required heater feeder cable and associated heater elements is required to be checked to ensure the required heaters are OPERABLE for each intake deicer heater division. The Surveillance is performed by verifying that the resistance is ≥ 28 ohms for each required heater feeder cable and associated heater element.

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BASES

SURVEILLANCE REQUIREMENTS

SR 3.7.1.8 (continued)

The minimum resistance is based on ensuring the intake structure bar racks are heated sufficiently such that the SW flow assumed to safely shutdown the unit can be achieved through the intake structures. This Surveillance is only required to be met when SR 3.7.1.1 is not satisfied, since with the intake tunnels water temperature ≥ 38°F (i.e., SR 3.7.1.1 met), frazil ice cannot form even with the intake deicer heaters inoperable. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. Regulatory Guide 1.27, Revision 2, January 1976.
2. USAR, Section 9.2.1.
3. USAR, Section 9.2.5.
4. USAR, Tables 9.2-1 and 9.2-1A.
5. USAR, Section 6.2.
6. USAR, Section 6.3.
7. USAR, Chapter 15.
8. USAR, Appendix A.
9. USAR, Section 6.2.2.
10. 10 CFR 50.36(c)(2)(ii).

B 3.7 PLANT SYSTEMS

B 3.7.2 Control Room Envelope Filtration (CREF) System

BASES

BACKGROUND

The CREF System provides a protected environment from which occupants can control the unit following an uncontrolled release of radioactivity, hazardous chemicals, or smoke. The control room envelope (CRE) consists of all rooms and areas located in the main control room and relay room of the control building. Included in the envelope are the main control room, relay room, instrument shop, training room, shift supervisor's office, lunch room, toilets, corridors, work release room, and HVAC equipment rooms (Ref. 1).

The safety related function of the CREF System used to control radiation exposure consists of two independent and redundant high efficiency air filtration subsystems for treatment of recirculated air and outside supply air and a CRE boundary that limits the inleakage of unfiltered air. Each CREF subsystem includes a control room outdoor air special filter train (CROASFT), which consists of an electric heater, a prefilter, a high efficiency particulate air (HEPA) filter, an activated charcoal adsorber section, a second HEPA filter, a filter booster fan, and the associated ductwork, valves or dampers, doors, barriers, and instrumentation. The electric heater is used to reduce the relative humidity of the air entering the filter train but, is not required for CROASFT OPERABILITY. Prefilters and HEPA filters remove particulate matter which may be radioactive. The charcoal adsorbers provide a holdup period for gaseous iodine, allowing time for decay. Each subsystem also includes the necessary outside air intake(s) and two air conditioning units (fan portion only), one for the control room and one for the relay room. Each outside air intake is capable of providing 100% of the necessary makeup flow. Therefore, only one outside air intake is required. The two outside air intakes are allowed to be common to both subsystems (since there are only two outside air intakes for the CREF System).

(continued)

BACKGROUND (continued)

The CRE is the area within the confines of the CRE boundary that contains the spaces that control room occupants inhabit to control the unit during normal and accident conditions. The CRE is protected for normal operation, natural events, and accident conditions. The CRE boundary is the combination of walls, floor, roof, ducting, doors, penetrations and equipment that physically form the CRE. The OPERABILITY of the CRE boundary must be maintained to ensure that the inleakage of unfiltered air into the CRE will not exceed the inleakage assumed in the licensing basis analysis of design basis accident (DBA) consequences to CRE occupants. The CRE and its boundary are defined in the Control Room Envelope Habitability Program.

The CROASFT portion of the safety related CREF System is normally in standby, but the remaining portions of the CREF System (the outside air intakes and fan portion of the air conditioning units) are operated to maintain the CRE environment during normal operation. Upon receipt of the initiation signal(s) (indicative of conditions that could result in radiation exposure to CRE occupants), the CREF System automatically switches to the emergency pressurization mode of operation to minimize infiltration of contaminated air into the CRE. A system of valves and dampers redirects all CRE outside air flow through the two CROASFTs. In addition, a portion of the control room air is recirculated through the CROASFTs. The air conditioning units (fan portion only) maintain a positive pressure; the CROASFT booster fan only provides the motive force to overcome the added resistance of the CROASFT being in service.

The CREF System is designed to maintain a habitable environment in the CRE for a 30 day continuous occupancy (i.e., considering the occupancy factors of Regulatory Guide 1.183, Regulatory Position 4.2.6, Ref. 2) after a DBA, while limiting the dosage to personnel to not more than 5 rem total effective dose equivalent (TEDE). CREF System operation in maintaining the CRE habitability is discussed in the USAR, Sections 6.4.1 and 9.4.1 (Refs. 3 and 4, respectively).

APPLICABLE SAFETY ANALYSES

The ability of the CREF System to maintain the habitability of the CRE is an explicit assumption for the safety analyses presented in the USAR, Chapters 6 and 15 (Refs. 5 and 6, respectively). The emergency pressurization mode of the CREF System is assumed to operate following a DBA. The radiological doses to CRE occupants as a result of the various DBAs are summarized in Reference 6. No

(continued)

APPLICABLE SAFETY ANALYSES (continued)

single active failure will cause the loss of outside or recirculated air from the CRE.

The CREF System provides protection from smoke and hazardous chemicals to the CRE occupants. The analysis of hazardous chemical releases demonstrates that the toxicity limits are not exceeded in the CRE following a hazardous chemical release (Ref. 9). The evaluation of a smoke challenge demonstrates that it will not result in the inability of the CRE occupants to control the reactor either from the control room or from the remote shutdown panels (Ref. 10).

A periodic offsite chemical survey and procedures for controlling onsite chemicals are essential elements of CRE protection against hazardous chemicals. Changes in offsite, mobile, and onsite hazardous chemical types or quantities are assessed in accordance with the Control Room Envelope Habitability Program. The assessments provide the necessary justification for not installing a toxic gas monitoring automatic isolation system.

The CREF System satisfies Criterion 3 of Reference 7.

LCO

Two redundant subsystems of the CREF System are required to be OPERABLE to ensure that at least one is available, if a single active failure disables the other subsystem. Total CREF System failure, such as from a loss of both ventilation subsystems or from an inoperable CRE boundary, could result in exceeding a dose of 5 rem TEDE to the CRE occupants in the event of a DBA.

Each CREF subsystem is considered OPERABLE when the individual components necessary to limit CRE occupant exposure are OPERABLE. A subsystem is considered OPERABLE when its associated:

a. CROASFT is OPERABLE;

b. Air conditioning units (fan portion only) are OPERABLE (one for the control room and one for the relay room), including the ductwork, to maintain air circulation to and from the CRE; and

c. One of the two outside air intake(s) is OPERABLE.

(continued)

LCO (continued)

A CROASFT is considered OPERABLE when its associated filter booster fan is OPERABLE; HEPA filter and charcoal adsorber are not excessively restricting flow and are capable of performing their filtration functions; and ductwork, valves, and dampers are OPERABLE, and air circulation through the filter train can be maintained.

In order for the CREF subsystems to be considered OPERABLE, the CRE boundary must be maintained such that the CRE occupant dose from a large radioactive release does not exceed the calculated dose in the licensing basis consequence analyses for DBAs, and that CRE occupants are protected from hazardous chemicals and smoke.

The LCO is modified by a Note allowing the CRE boundary to be opened intermittently under administrative controls. This Note only applies to openings in the CRE boundary that can be rapidly restored to the design condition, such as doors, hatches, floor plugs, and access panels. For entry and exit through the doors, the administrative control of the opening is performed by the person(s) entering or exiting the area. For other openings, these controls should be proceduralized and consist of stationing a dedicated individual at the opening who is in continuous communication with operators in the CRE. This individual will have a method to rapidly close the opening and to restore the CRE boundary to a condition equivalent to the design condition when a need for CRE isolation is indicated.

APPLICABILITY

In MODES 1, 2, and 3, the CREF System must be OPERABLE to ensure that the CRE will remain habitable during and following a DBA, since the DBA could lead to a fission product release.

In MODES 4 and 5, the probability and consequences of a DBA are reduced due to the pressure and temperature limitations in these MODES. Therefore, maintaining the CREF System OPERABLE is not required in MODE 4 or 5, except for the following situations under which significant radioactive releases can be postulated:

a. During operations with a potential for draining the reactor vessel (OPDRVs); and

b. During movement of recently irradiated fuel assemblies in the secondary containment. Due to radioactive decay, the CREF System is only required to be OPERABLE during fuel handling involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous 24 hours).

(continued)

BASES (continued)

ACTIONS

A.1

With one CREF subsystem inoperable for reasons other than an inoperable CRE boundary, or with both CREF subsystems inoperable but the CREF System safety function maintained, the inoperable CREF subsystem(s) must be restored to OPERABLE status within 7 days. The CREF System safety function is maintained when the CREF System components equivalent to one CREF subsystem are OPERABLE. With the unit in this condition, the remaining OPERABLE CREF subsystem (or OPERABLE components in both subsystems) is adequate to perform the CRE occupant protection function. However, the overall reliability is reduced because a failure in the OPERABLE subsystem (or remaining OPERABLE portions of the subsystems, as applicable) could result in loss of CREF System function. The 7 day Completion Time is based on the low probability of a DBA occurring during this time period, and that the remaining subsystem (or components in both subsystems) can provide the required capabilities.

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

If the unfiltered inleakage of potentially contaminated air past the CRE boundary and into the CRE can result in CRE occupant radiological dose greater than the calculated dose of the licensing basis analyses of DBA consequences (allowed to be up to 5 rem TEDE), or inadequate protection of CRE occupants from hazardous chemicals or smoke, the CRE boundary is inoperable. Actions must be taken to restore an OPERABLE CRE boundary within 90 days.

During the period that the CRE boundary is considered inoperable, action must be initiated to implement mitigating actions to lessen the effect on CRE occupants from the potential hazards of a radiological or chemical event or a challenge from smoke. Actions must be taken within 24 hours to verify that in the event of a DBA, the mitigating actions will ensure that CRE occupant radiological exposures will not exceed the calculated dose of the licensing basis analyses of DBA consequences, and that CRE occupants are protected from hazardous chemicals and smoke. These mitigating actions (i.e., actions that are taken to offset the consequences of the inoperable CRE boundary) should be preplanned for implementation upon entry into the condition, regardless of whether entry is intentional or unintentional. The 24 hour Completion Time is reasonable based on the low probability of a DBA occurring during this time period, and the use of

(continued)

ACTIONS (continued)

mitigating actions. The 90 day Completion Time is reasonable based on the determination that the mitigating actions will ensure protection of CRE occupants within analyzed limits while limiting the probability that CRE occupants will have to implement protective measures that may adversely affect their ability to control the reactor and maintain it in a safe shutdown condition in the event of a DBA. In addition, the 90 day Completion Time is a reasonable time to diagnose, plan and possibly repair, and test most problems with the CRE boundary.

C.1 and C.2

In MODE 1, 2, or 3, if the inoperable CREF subsystem(s) or the CRE boundary 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 12 hours and in MODE 4 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 the unit systems.

D.1, D.2.1, D.2.2, and D.2.3

The Required Actions of Condition D are modified by a Note stating that LCO 3.0.3 is not applicable. If moving recently irradiated fuel assemblies while in MODES 4 or 5, LCO 3.0.3 would not specify any action. If moving recently irradiated fuel assemblies while in MODES 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend movement of recently irradiated fuel assemblies would not be a sufficient reason to require a reactor shutdown.

During movement of recently irradiated fuel assemblies in the secondary containment or during OPDRVs, if the inoperable CREF subsystem(s) cannot be restored to OPERABLE status within the required Completion Time, the OPERABLE components of the CREF subsystem(s) equivalent to a single CREF subsystem (e.g., the CROASFT and fan portion of the air conditioning units do not have to be powered from the same electrical division) may be placed in the emergency pressurization mode. This action ensures that the remaining subsystem (or components in both subsystems equivalent to a single CREF subsystem) is OPERABLE, that no failures that would prevent automatic actuation will occur, and that any active failure will be readily detected.

(continued)

ACTIONS (continued)

An alternative to Required Action D.1 is to immediately suspend activities that present a potential for releasing radioacitivity that might require the CREF System to be in the pressurization mode of operation. This places the unit in a condition that minimizes the accident risk.

If applicable, movement of recently irradiated fuel assemblies in the secondary containment must be suspended immediately. Suspension of these activities shall not preclude completion of movement of a component to a safe position. Also, if applicable, action must be initiated immediately to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Action must continue until the OPDRVs are suspended.

E.1

If both CREF subsystems are inoperable with the CREF System safety function not maintained in MODE 1, 2, or 3 for reasons other than an inoperable CRE boundary (i.e., Condition B), the CREF System may not be capable of performing the intended function and the unit is in a condition outside of the accident analyses. Therefore, LCO 3.0.3 must be entered immediately.

F.1, F.2, and F.3

The Required Actions of Condition F are modified by a Note stating that LCO 3.0.3 is not applicable. If moving recently irradiated fuel assemblies while in MODES 4 or 5, LCO 3.0.3 would not specify any action. If moving recently irradiated fuel assemblies while in MODES 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend movement of recently irradiated fuel assemblies would not be a sufficient reason to require a reactor shutdown.

During movement of recently irradiated fuel assemblies in the secondary containment or during OPDRVs, with two CREF subsystems inoperable with the CREF System safety function not maintained, or with one or more CREF subsystems inoperable due to an inoperable CRE boundary, action must be taken immediately to suspend activities that present a potential for releasing radioactivity that might require isolation of the CRE. This places the unit in a condition that minimizes the accident risk.

(continued)

ACTIONS (continued)

If applicable, movement of recently irradiated fuel assemblies in the secondary containment must be suspended immediately. Suspension of these activities shall not preclude completion of movement of a component to a safe position. If applicable, actions must be initiated immediately to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Actions must continue until the OPDRVs are suspended.

SURVEILLANCE REQUIREMENTS

SR 3.7.2.1

Operating (from the control room) each CREF subsystem for ≥ 1 continuous hour ensures that both subsystems are OPERABLE and that all associated controls are functioning properly. It also ensures that blockage, filter booster or air conditioning unit fan or motor failure, or excessive vibration can be detected for corrective action. In addition, it is not necessary to operate all components of a single subsystem simultaneously for the 1 hour period. It is acceptable to operate the fan portion of the air conditioning unit(s) of one subsystem with the CROASFT of the other subsystem, such that the CROASFTs and fan portion of the air conditioning units are each operated for 1 continuous hour. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.7.2.2

This SR verifies that the required CROASFT testing is performed in accordance with Specification 5.5.7, "Ventilation Filter Testing Program (VFTP)." The CROASFT filter tests are in accordance with Regulatory Guide 1.52 (Ref. 8). The VFTP includes testing HEPA filter performance, charcoal adsorber efficiency, system flow rate, and the physical properties of the activated charcoal (general use and following specific operations). Specific test Frequencies and additional information are discussed in detail in the VFTP.

SR 3.7.2.3

This SR verifies that each CREF subsystem starts and operates on an actual or simulated initiation signal. This SR also includes ensuring the air conditioning units (fan portion only) start on a low flow signal after the appropriate time delay. The LOGIC SYSTEM FUNCTIONAL TEST in LCO 3.3.7.1, "Control Room Envelope Filtration (CREF) System Instrumentation," overlaps this SR to provide complete testing of the safety function. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.2.4

This SR verifies the OPERABILITY of the CRE boundary by testing for unfiltered air inleakage past the CRE boundary and into the CRE. The details of the testing are specified in the Control Room Envelope Habitability Program.

The CRE is considered habitable when the radiological dose to CRE occupants calculated in the licensing basis analyses of DBA consequences is no more than 5 rem TEDE and the CRE occupants are protected from hazardous chemicals and smoke. This SR verifies that the unfiltered air inleakage into the CRE is no greater than the flow rate assumed in the licensing basis analyses of DBA consequences. When unfiltered air inleakage is greater than the assumed flow rate, Condition B must be entered. Required Action B.3 allows time to restore the CRE boundary to OPERABLE status provided mitigating actions can ensure that the CRE remains within the licensing basis habitability limits for the occupants following an accident. Compensatory measures are discussed in Regulatory Guide 1.196, Section C.2.7.3, (Ref. 11) which endorses, with exceptions, NEI 99-03, Section 8.4 and Appendix F (Ref. 12). These compensatory measures may also be used as mitigating actions as required by Required Action B.2. Temporary analytical methods may also be used as compensatory measures to restore OPERABILITY (Ref. 13). Options for restoring the CRE boundary to OPERABLE status include changing the licensing basis DBA consequence analysis, repairing the CRE boundary, or a combination of these actions. Depending upon the nature of the problem and the corrective action, a full scope inleakage test may not be necessary to establish that the CRE boundary has been restored to OPERABLE status.

REFERENCES

1. USAR, Section 6.4.2.1.
2. Regulatory Guide 1.183, July 2000.
3. USAR, Section 6.4.1.
4. USAR, Section 9.4.1.
5. USAR, Chapter 6.

(continued)

REFERENCES (continued)

6. USAR, Chapter 15.

7. 10 CFR 50.36(c)(2)(ii).

8. Regulatory Guide 1.52, Revision 2, March 1978.

9. USAR, Section 2.2.3.1.3.

10. USAR, Section 9.4.

11. Regulatory Guide 1.196, Revision 0, May 2003.

12. NEI 99-03, "Control Room Habitability Assessment," June 2001.

13. Letter from Eric J. Leeds (NRC) to James W. Davis (NEI) dated January 30, 2004, "NEI Draft White Paper, Use of the Generic Letter 91-18 Process and Alternative Source Terms in the Context of Control Room Habitability." (ADAMS Accession No. ML040160868).

B 3.7 PLANT SYSTEMS

B 3.7.3 Control Room Envelope Air Conditioning (AC) System

BASES

BACKGROUND

The control room envelope AC portion of the Control Building Heating, Ventilation, and Air Conditioning (HVAC) System (hereafter referred to as the Control Room Envelope AC System) provides temperature control for the control room envelope following isolation of the control room envelope.

The Control Room Envelope AC System consists of two independent, redundant subsystems that provide cooling of recirculated and outside air makeup control room envelope air. Each subsystem consists of two air conditioning units (one for the Main Control Room area and one for the Relay Room area), one control building chilled water subsystem (which provides cooling water to the cooling coils of the two air conditioning units), ductwork, dampers, and instrumentation and controls to provide for control room envelope temperature control. Each air conditioning unit includes an air filter assembly, cooling coil, and fan. Each control building chilled water subsystem includes a hermetic centrifugal water chiller, chilled water pump, expansion tank, controls, piping, and valves.

The Control Room Envelope AC System is designed to provide a controlled environment under both normal and accident conditions. A single subsystem provides the required temperature control to maintain a suitable control room envelope environment for a sustained occupancy of 37 persons. The design conditions for the control room envelope environment are 75°F and 50% relative humidity. The Control Room Envelope AC System operation in maintaining the control room envelope temperature is discussed in the USAR, Sections 6.4 and 9.4.1 (Refs. 1 and 2, respectively).

APPLICABLE SAFETY ANALYSES

The design basis of the Control Room Envelope AC System is to maintain the control room envelope temperature for a 30 day continuous occupancy following isolation of the control room envelope.

The Control Room Envelope AC System components are arranged in redundant safety related subsystems. During emergency operation, the Control Room Envelope AC System maintains a habitable environment and ensures the OPERABILITY of

(continued)

APPLICABLE SAFETY ANALYSES (continued)

components in the control room envelope. A single active failure of a component of the Control Room Envelope AC System, assuming a loss of offsite power, does not impair the ability of the system to perform its design function. Redundant detectors and controls are provided for control room envelope temperature control. The Control Room Envelope AC System is designed in accordance with Seismic Category I requirements. The Control Room Envelope AC System is capable of removing sensible and latent heat loads from the control room envelope, including consideration of equipment heat loads and personnel occupancy requirements to ensure equipment OPERABILITY.

The Control Room Envelope AC System satisfies Criterion 3 of Reference 3.

LCO

Two independent and redundant subsystems of the Control Room Envelope AC System are required to be OPERABLE for both the Main Control Room area and the Relay Room area to ensure that at least one is available, assuming a single failure disables the other subsystem. Total system failure could result in the equipment operating temperature exceeding limits.

The Control Room Envelope AC System is considered OPERABLE when the individual components necessary to maintain the control room envelope temperature (including both the Main Control Room area and the Relay Room area) are OPERABLE in both subsystems. These components include the Main Control Room area and Relay Room area air conditioning units (cooling coils and fans only), the control building chilled water subsystems, ductwork, dampers, and associated instrumentation and controls. In addition, during conditions in MODES other than MODES 1, 2, and 3 when the Control Room Envelope AC System is required to be OPERABLE (e.g., during operations with a potential for draining the reactor vessel (OPDRVs)), the necessary portions of the SW System and Ultimate Heat Sink capable of providing cooling to the hermetic centrifugal water chillers are part of the OPERABILITY requirements covered by this LCO.

APPLICABILITY

In MODE 1, 2, or 3, the Control Room Envelope AC System must be OPERABLE to ensure that the control room envelope temperature will not exceed equipment OPERABILITY limits following control room envelope isolation.

In MODES 4 and 5, the probability and consequences of a Design Basis Accident are reduced due to the pressure and

(continued)

APPLICABILITY (continued)

temperature limitations in these MODES. Therefore, maintaining the Control Room Envelope AC System OPERABLE is not required in MODE 4 or 5, except for the following situations under which significant radioactive releases can be postulated:

a. During operations with a potential for draining the reactor vessel (OPDRVs); and

b. During movement of recently irradiated fuel assemblies in the secondary containment. Due to radioactive decay, the Control Room Envelope AC System is only required to be OPERABLE during fuel handling involving handling recently irradiated fuel (i.e., fuel that has occupied part of a critical reactor core within the previous 24 hours).

ACTIONS

A.1

With one control room envelope AC subsystem inoperable for the Main Control Room area, the inoperable control room envelope AC subsystem for the Main Control Room area must be restored to OPERABLE status within 30 days. With the unit in this condition, the remaining OPERABLE control room envelope AC subsystem for the Main Control Room area is adequate to perform the control room envelope air conditioning function for the Main Control Room area. However, the overall reliability is reduced because a single failure in the OPERABLE subsystem could result in loss of the control room envelope air conditioning function for the Main Control Room area. The 30 day Completion Time is based on the low probability of an event occurring requiring control room envelope isolation, the consideration that the remaining subsystem can provide the required protection, and the availability of alternate cooling methods.

B.1

With one control room envelope AC subsystem inoperable for the Relay Room area, the inoperable control room envelope AC subsystem for the Relay Room area must be restored to OPERABLE status within 30 days. With the unit in this condition, the remaining OPERABLE control room envelope AC subsystem for the Relay Room area is adequate to perform the control room envelope air conditioning function for the Relay Room area. However, the overall reliability is reduced because a single failure in the OPERABLE subsystem could result in loss of the control room envelope air conditioning function in the Relay Room area. The 30 day Completion Time is based on the low probability of an event occurring requiring

(continued)

ACTIONS

B.1 (continued)

control room envelope isolation, the consideration that the remaining subsystem can provide the required protection, and the availability of alternate cooling methods.

C.1 and C.2

If both control room envelope AC subsystems for the Main Control Room area are inoperable, the Control Room Envelope AC System may not be capable of performing its intended function. Therefore, the control room envelope Main Control Room area temperature is required to be monitored to ensure that temperature is being maintained low enough that equipment in the Main Control Room area of the control room envelope is not adversely affected. With the Main Control Room area temperature of the control room envelope being maintained within the temperature limit of <90ºF (Reference 2), 72 hours is allowed to restore a Main Control Room area control room envelope subsystem to OPERABLE status. This Completion Time is reasonable considering that the Main Control Room area control room envelope temperature is being maintained within limits and the low probability of an event occurring requiring control room envelope isolation.

D.1 and D.2

If both control room envelope AC subsystems for the Relay Room area are inoperable, the Control Room Envelope AC System may not be capable of performing its intended function. Therefore, the control room envelope Relay Room area temperature is required to be monitored to ensure that temperature is being maintained low enough that equipment in the Relay Room area of the control room envelope is not adversely affected. With the Relay Room area temperature of the control room envelope being maintained within the temperature limit of <90ºF (Reference 2), 72 hours is allowed to restore a Relay Room area control room envelope subsystem to OPERABLE status. This Completion Time is reasonable considering that the Relay Room area control room envelope temperature is being maintained within limits and the low probability of an event occurring requiring control room envelope isolation.

(continued)

ACTIONS (continued)

E.1 and E.2

In MODE 1, 2, or 3, if the inoperable control room envelope AC subsystem cannot be restored to OPERABLE status within the associated Completion Time, the unit must be placed in a MODE that minimizes risk. To achieve this status the unit must be placed in at least MODE 3 within 12 hours and in MODE 4 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.

F.1, F.2.1, and F.2.2

The Required Actions of Condition F are modified by a Note stating that LCO 3.0.3 is not applicable. If moving recently irradiated fuel assemblies while in MODES 4 or 5, LCO 3.0.3 would not specify any action. If moving recently irradiated fuel assemblies while in MODES 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend movement of recently irradiated fuel assemblies would not be a sufficient reason to require a reactor shutdown.

During movement of recently irradiated fuel assemblies in the secondary containment or during OPDRVs, if Required Action A.1 cannot be completed within the required Completion Time, the OPERABLE control room envelope AC subsystem for the Main Control Room area may be placed immediately in operation. This action ensures that the remaining subsystem is OPERABLE, that no failures that would prevent actuation will occur, and that any active failure will be readily detected.

An alternative to Required Action F.1 is to immediately suspend activities that present a potential for releasing radioactivity that might require isolation of the control room envelope. This places the unit in a condition that minimizes risk.

If applicable, movement of recently irradiated fuel assemblies in the secondary containment must be suspended immediately. Suspension of these activities shall not preclude completion of movement of a component to a safe position. Also, if applicable, action must be initiated immediately to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Action must continue until the OPDRVs are suspended.

(continued)

ACTIONS (continued)

G.1, G.2.1, and G.2.2

The Required Actions of Condition G are modified by a Note stating that LCO 3.0.3 is not applicable. If moving recently irradiated fuel assemblies while in MODES 4 or 5, LCO 3.0.3 would not specify any action. If moving recently irradiated fuel assemblies while in MODES 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend movement of recently irradiated fuel assemblies would not be a sufficient reason to require a reactor shutdown.

During movement of recently irradiated fuel assemblies in the secondary containment or during OPDRVs, if Required Action B.1 cannot be completed within the required Completion Time, the OPERABLE control room envelope AC subsystem for the Relay Room area may be placed immediately in operation. This action ensures that the remaining subsystem is OPERABLE, that no failures that would prevent actuation will occur, and that any active failure will be readily detected.

An alternative to Required Action G.1 is to immediately suspend activities that present a potential for releasing radioactivity that might require isolation of the control room envelope. This places the unit in a condition that minimizes risk.

If applicable, movement of recently irradiated fuel assemblies in the secondary containment must be suspended immediately. Suspension of these activities shall not preclude completion of movement of a component to a safe position. Also, if applicable, action must be initiated immediately to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Action must continue until the OPDRVs are suspended.

H.1 and H.2

The Required Actions of Condition H are modified by a Note stating that LCO 3.0.3 is not applicable. If moving recently irradiated fuel assemblies while in MODES 4 or 5, LCO 3.0.3 would not specify any action. If moving recently irradiated fuel assemblies while in MODES 1, 2, or 3, the fuel movement is independent of reactor operations. Therefore, in either case, inability to suspend movement of recently irradiated fuel assemblies would not be a sufficient reason to require a reactor shutdown.

(continued)

ACTIONS

H.1 and H.2 (continued)

During movement of recently irradiated fuel assemblies in the secondary containment or during OPDRVs if Required Actions of Condition C or Condition D cannot be met within the required Completion Times, action must be taken to immediately suspend activities that present a potential for releasing radioactivity that might require isolation of the control room envelope. This places the unit in a condition that minimizes risk.

If applicable, handling of recently irradiated fuel in the secondary containment must be suspended immediately. Suspension of these activities shall not preclude completion of movement of a component to a safe position. Also, if applicable, action must be initiated immediately to suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Action must continue until the OPDRVs are suspended.

SURVEILLANCE REQUIREMENTS

SR 3.7.3.1

This SR verifies that the heat removal capability of the system is sufficient to remove the control room envelope heat load assumed in the safety analyses for the Main Control Room area and the Relay Room area. The SR consists of a combination of testing and calculation. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

REFERENCES

1. USAR, Section 6.4.
2. USAR, Section 9.4.1.
3. 10 CFR 50.36(c)(2)(ii).

B 3.7 PLANT SYSTEMS

B 3.7.4 Main Condenser Offgas

BASES

BACKGROUND

During unit operation, steam from the low pressure turbine is exhausted directly into the main condenser. Air and noncondensible gases are collected in the main condenser, then exhausted through the steam jet air ejectors (SJAEs) to the Main Condenser Offgas System. The offgas from the main condenser normally includes radioactive gases.

The Main Condenser Offgas System has been incorporated into the unit design to reduce the gaseous radwaste emission. This system uses a catalytic recombiner to recombine radiolytically dissociated hydrogen and oxygen. The gaseous mixture is cooled by the offgas condenser; the water and condensibles are stripped out by the offgas condenser and dryers. The radioactivity of the remaining gaseous mixture (i.e., the offgas recombiner effluent) is monitored downstream of the offgas dryers prior to entering the charcoal adsorbers.

APPLICABLE SAFETY ANALYSES

The main condenser offgas gross gamma activity rate is an initial condition of the Main Condenser Offgas System failure event as discussed in the USAR, Section 15.7.1 (Ref. 1). The analysis assumes a gross failure in the Main Condenser Offgas System that results in the rupture of the Main Condenser Offgas System pressure boundary. The gross gamma activity rate is controlled to ensure that during the event, the calculated offsite doses will be well within the limits (NUREG-1047, Ref. 2) of 10 CFR 100 (Ref. 3). This event has not been re-analyzed using alternative source term methodology.

The main condenser offgas limits satisfy Criterion 2 of Reference 4.

LCO

To ensure compliance with the assumptions of the Main Condenser Offgas System failure event (Ref. 1), the fission product release rate should be consistent with a noble gas release to the reactor coolant of 100 µCi/Mwt-second after decay of 30 minutes. The LCO is established consistent with this requirement (3536 Mwt x 100 µCi/Mwt-second ≈ 350,000 µCi/second).

(continued)

BASES (continued)

APPLICABILITY

The LCO is applicable when steam is being exhausted to the main condenser and the resulting noncondensibles are being processed via the Main Condenser Offgas System. This occurs during MODE 1, and during MODES 2 and 3 with any main steam line not isolated and the SJAE in operation. In MODES 4 and 5, main steam is not being exhausted to the main condenser and the requirements are not applicable.

ACTIONS

A.1

If the offgas radioactivity rate limit is exceeded, 72 hours is allowed to restore the gross gamma activity rate to within the limit. The 72 hour Completion Time is reasonable, based on engineering judgment considering the time required to complete the Required Action, the large margins associated with permissible dose and exposure limits, and the low probability of a Main Condenser Offgas System rupture occurring.

B.1, B.2, B.3.1, and B.3.2

If the gross gamma activity rate is not restored to within the limits within the associated Completion Time, all main steam lines or the SJAE must be isolated. This isolates the Main Condenser Offgas System from significant sources of radioactive steam. The main steam lines are considered isolated if at least one main steam isolation valve in each main steam line is closed, and at least one main steam line drain valve in each drain line is closed. The 12 hour Completion Time is reasonable, based on operating experience, to perform the actions from full power conditions in an orderly manner and without challenging unit systems.

An alternative to Required Actions B.1 and B.2 is to place the unit 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 12 hours and in MODE 4 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.

(continued)

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.7.4.1

This SR requires an isotopic analysis of an offgas sample (taken before holdup and discharge downstream of the recombiner) to ensure that the required limits are satisfied. The noble gases to be sampled are Xe-133, Xe-135, Xe-138, Kr-85, Kr-87, and Kr-88. If the measured rate of radioactivity increases significantly as indicated by either offgas pretreatment radiation monitor (by ≥ 50% after correcting for expected increases due to changes in THERMAL POWER), an isotopic analysis is also performed within 4 hours after the increase is noted, to ensure that the increase is not indicative of a sustained increase in the radioactivity rate. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

This SR is modified by a Note indicating that the SR is not required to be performed until 31 days after any main steam line is not isolated and the SJAE is in operation. Only in this condition can radioactive fission gases be in the Main Condenser Offgas System at significant rates.

REFERENCES

1. USAR, Section 15.7.1.
2. NUREG-1047.
3. 10 CFR 100.
4. 10 CFR 50.36(c)(2)(ii).

B 3.7 PLANT SYSTEMS

B 3.7.5 Main Turbine Bypass System

BASES

BACKGROUND

The Main Turbine Bypass System is designed to control steam pressure when reactor steam generation exceeds turbine requirements during unit startup, sudden load reduction, and cooldown. It allows excess steam flow from the reactor to the condenser without going through the turbine. The bypass capacity of the system is approximately 18.5% of the Nuclear Steam Supply System rated steam flow. Sudden load reductions within the capacity of the steam bypass can be accommodated without reactor scram. The Main Turbine Bypass System consists of a five valve manifold connected to the main steam lines between the main steam isolation valves and the main turbine stop valves. Each of these valves is sequentially operated by hydraulic cylinders. The bypass valves are controlled by the pressure regulation function of the Turbine Electro Hydraulic Control System, as discussed in the USAR, Section 7.7.1.5 (Ref. 1). The bypass valves are normally closed, and the pressure regulator controls the turbine control valves, directing all steam flow to the turbine. If the speed governor or the load limiter restricts steam flow to the turbine, the pressure regulator controls the system pressure by opening the bypass valves. When the bypass valves open, the steam flows from the valve manifold, through connecting piping, to the pressure breakdown assemblies, where a series of orifices are used to further reduce the steam pressure before the steam enters the condenser.

APPLICABLE SAFETY ANALYSES

The Main Turbine Bypass System is assumed to function during the design basis feedwater controller failure, maximum demand event, described in the USAR, Section 15.1.2 (Ref. 2). Opening the bypass valves during the pressurization event mitigates the increase in reactor vessel pressure, which affects the MCPR during the event. An inoperable Main Turbine Bypass System may result in an MCPR penalty.

The Main Turbine Bypass System satisfies Criterion 3 of Reference 3.

(continued)

BASES (continued)

LCO

The Main Turbine Bypass System is required to be OPERABLE to limit peak pressure in the main steam lines and maintain reactor pressure within acceptable limits during events that cause rapid pressurization, such that the Safety Limit MCPR is not exceeded. With the Main Turbine Bypass System inoperable, modifications to the MCPR limits (LCO 3.2.2, "MINIMUM CRITICAL POWER RATIO (MCPR)") may be applied to allow continued operation.

An OPERABLE Main Turbine Bypass System requires the bypass valves to open in response to increasing main steam line pressure. This response is within the assumptions of the applicable analysis (Ref. 2). The MCPR limit for the inoperable Main Turbine Bypass System is specified in the COLR.

APPLICABILITY

The Main Turbine Bypass System is required to be OPERABLE at ≥ 23% RTP to ensure that the fuel cladding integrity Safety Limit is not violated during the feedwater controller failure, maximum demand event. As discussed in the Bases for LCO 3.2.2, sufficient margin to this limit exists < 23% RTP. Therefore, these requirements are only necessary when operating at or above this power level.

ACTIONS

A.1

If the Main Turbine Bypass System is inoperable (one or more bypass valves inoperable), and the MCPR limits for an inoperable Main Turbine Bypass System, as specified in the COLR, are not applied, the assumptions of the design basis transient analysis may not be met. Under such circumstances, prompt action should be taken to restore the Main Turbine Bypass System to OPERABLE status or adjust the MCPR limits accordingly. The 2 hour Completion Time is reasonable, based on the time to complete the Required Action and the low probability of an event occurring during this period requiring the Main Turbine Bypass System.

(continued)

BASES

ACTIONS (continued)

B.1

If the Main Turbine Bypass System cannot be restored to OPERABLE status and the MCPR limits for an inoperable Main Turbine Bypass System are not applied, THERMAL POWER must be reduced to < 23% RTP. As discussed in the Applicability section, operation at < 23% RTP results in sufficient margin to the required limits, and the Main Turbine Bypass System is not required to protect fuel integrity during the feedwater controller failure, maximum demand event. The 4 hour Completion Time is 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 3.7.5.1

The Main Turbine Bypass System is required to actuate automatically to perform its design function. This SR demonstrates that, with the required system initiation signals, the valves will actuate to their required position. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

SR 3.7.5.2

This SR ensures that the TURBINE BYPASS SYSTEM RESPONSE TIME is in compliance with the assumptions of the appropriate safety analysis. The response time limits are specified in the Technical Requirements Manual (Ref. 4). The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

(continued)

BASES (continued)

REFERENCES

1. USAR, Section 7.7.1.5.
2. USAR, Section 15.1.2.
3. 10 CFR 50.36(c)(2)(ii).
4. Technical Requirements Manual.

B 3.7 PLANT SYSTEMS

B 3.7.6 Spent Fuel Storage Pool Water Level

BASES

BACKGROUND

The minimum water level in the spent fuel storage pool meets the assumptions of iodine decontamination factors following a fuel handling accident.

A general description of the spent fuel storage pool design is found in the USAR, Section 9.1.2 (Ref. 1). The assumptions of the fuel handling accident are found in the USAR, Section 15.7.4 (Ref. 2).

APPLICABLE SAFETY ANALYSES

The water level above the irradiated fuel assemblies is an explicit assumption of the fuel handling accident (Ref. 2). A fuel handling accident is evaluated to ensure that the radiological consequences (calculated doses at the exclusion area and low population zone boundaries) are ≤ 25% (NUREG-0800, Section 15.0.1, Ref. 3) of the 10 CFR 50.67 (Ref. 4) exposure limits. A fuel handling accident could release a fraction of the fission product inventory by breaching the fuel rod cladding as discussed in Regulatory Guide 1.183 (Ref. 5).

The fuel handling accident is evaluated for the dropping of an irradiated fuel assembly onto the reactor core. The consequences of a fuel handling accident over the spent fuel storage pool are less severe than those of the fuel handling accident over the reactor core (Ref. 2). The water level in the spent fuel storage pool provides for absorption of water soluble fission product gases and transport delays of soluble and insoluble gases that must pass through the water before being released to the secondary containment atmosphere. This absorption and transport delay reduces the potential radioactivity of the release during a fuel handling accident.

The spent fuel storage pool water level satisfies Criterion 2 of Reference 6.

LCO

The specified water level preserves the assumption of the fuel handling accident analysis (Ref. 2). As such, it is the minimum required for fuel movement within the spent fuel storage pool.

(continued)

BASES (continued)

APPLICABILITY	This LCO applies whenever movement of irradiated fuel assemblies occurs in the spent fuel storage pool or whenever movement of new fuel assemblies occurs in the spent fuel storage pool with irradiated fuel assemblies in the spent fuel storage pool, since the potential for a release of fission products exists.
ACTIONS	A.1 LCO 3.0.3 is not applicable while in MODE 4 or 5. However, since fuel assembly movement can occur in MODE 1, 2, or 3, Required Action A.1 is modified by a Note indicating that LCO 3.0.3 does not apply. If moving fuel assemblies while in MODE 1, 2, or 3, the fuel movement is independent of reactor operations. Entering LCO 3.0.3 while in MODE 1, 2, or 3 would require the unit to be shutdown, but would not require immediate suspension of movement of fuel assemblies. The Note to the ACTIONS, "LCO 3.0.3 is not applicable," ensures that the actions for immediate suspension of fuel assembly movement are not postponed due to entry into LCO 3.0.3. When the initial conditions for an accident cannot be met, steps should be taken to preclude the accident from occurring. With the spent fuel storage pool level less than required, the movement of fuel assemblies in the spent fuel storage pool is suspended immediately. Suspension of this activity shall not preclude completion of movement of a fuel assembly to a safe position. This effectively precludes a spent fuel handling accident from occurring.
SURVEILLANCE REQUIREMENTS	SR 3.7.6.1 This SR verifies that sufficient water is available in the event of a fuel handling accident. The water level in the spent fuel storage pool must be checked periodically. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.
REFERENCES	1. USAR, Section 9.1.2. 2. USAR, Section 15.7.4.

(continued)

REFERENCES (continued)

3. NUREG-0800, Section 15.0.1, Revision 0, July 2000.
4. 10 CFR 50.67, "Accident Source Term."
5. Regulatory Guide 1.183, July 2000.
6. 10 CFR 50.36(c)(2)(ii).