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U. S. Nuclear Regulatory Commission
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Attention: Document Control Desk

Subject: Oconee Nuclear Station
Docket Numbers 50-269, 270, and 287
Technical Specification Bases (TSB) Change

Please see attached revisions to Technical Specification Bases (TSB) to Tech Spec Bases 3.4.7, RCS Loops- MODE 5, Loops Filled; 3.4.8, RCS Loops - MODE 5, Loops Not Filled; 3.7.8, ECCW; 3.9.4 DHR and Coolant Circulation - High Water Level; 3.9.5, DHR and Coolant Circulation- Low Water Level. The changes revise the bases sections listed above to add clarifying information with regard to LPSW and ECCW requirements in MODES 5 and 6. The existing TS Bases sections explain that the operability of LPSW and ECCW in MODES 5 and 6 is dependent on the systems that are supported. Without additional clarification, these statements are vague with respect to actual equipment/train Technical Specification operability requirements. This change also corrects a typographical error in SR 3.7.8.8 related to frequency. The frequency is being revised to 92 days. This is the frequency that was approved by the NRC in Amendment 300, 300 and 300. It is also the frequency recorded in the work control surveillance tables.

Attachment 1 contains the new TSB pages and Attachment 2 contains the markup version of the Bases page.

If any additional information is needed, please contact Larry E. Nicholson, at (864-885-3292).

Very truly yours,

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A001

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Attachment 1

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.7 RCS Loops – MODE 5, Loops Filled

BASES

BACKGROUND

In MODE 5 with RCS loops filled, the primary function of the reactor coolant is the removal of decay heat and transfer of this heat either to the steam generator (SG) secondary side coolant or the low pressure service water via the LPI heat exchangers. While the principal means for decay heat removal is via the DHR loops, the SGs are specified as a backup means for redundancy. Although the SGs do not typically remove heat unless steaming occurs (which is not possible in MODE 5), they are available as a temporary heat sink and can be used by allowing the RCS to heat up into the temperature region of MODE 4 where steaming can be effective for heat removal. The secondary function of the reactor coolant is to act as a carrier for soluble neutron poison, boric acid.

In MODE 5 with RCS loops filled, DHR loops are the principal means for heat removal. The number of loops in operation can vary to suit the operational needs. The intent of this LCO is to provide forced flow from at least one DHR loop for decay heat removal and transport. The flow provided by one DHR loop is adequate for decay heat removal. The other intent of this LCO is to require that a second path be available to provide a backup method for heat removal.

The LCO provides for either SG heat removal or DHR loop heat removal. In this MODE, reactor coolant pump (RCP) operation may be restricted because of net positive suction head (NPSH) limitations, and the SG will not be able to provide steam for the turbine driven feed pumps. However, to ensure that the SGs can be used as a heat sink, a motor driven feedwater pump is needed, because it is independent of steam. Condensate pumps, auxiliary feedwater pump, or a motor driven emergency feedwater pump can be used. If RCPs are available, the steam generator level need not be adjusted. If RCPs are not available, the water level must be adjusted for natural circulation. The high entry point in the generator should be accessible from the feedwater pumps so that natural circulation can be stimulated. The SGs are primarily a backup to the DHR loops, which are used for forced flow. By requiring the SGs to be a backup heat removal path, the option to increase RCS pressure and temperature for heat removal in MODE 4 is provided.

BASES (continued)

APPLICABLE SAFETY ANALYSES

No safety analyses relating to RCS flow requirements are performed with initial conditions in MODE 5.

RCS Loops – MODE 5 (Loops Filled) satisfy Criterion 4 of 10 CFR 50.36 (Ref. 1).

LCO

The purpose of this LCO is to require that at least one of the DHR loops be OPERABLE and in operation with an additional DHR loop OPERABLE or both SGs with secondary side water level ≥ 50%. One DHR loop provides sufficient forced circulation to perform the safety functions of the reactor coolant under these conditions. The second DHR loop is normally maintained as a backup to the operating DHR loop to provide redundancy for decay heat removal. However, if the standby DHR loop is not OPERABLE, a sufficient alternate method of providing redundant heat removal paths is to provide both SGs with their secondary side water levels ≥ 50%. Should the operating DHR loop fail, the SGs could be used to remove the decay heat.

Note 1 permits the DHR pumps to not be in operation for up to 1 hour per 8 hour period. The circumstances for stopping both DHR loops are to be limited to situations where: (a) Pressure and temperature increases can be maintained well within the allowable pressure (P/T and low temperature overpressure protection) and 10°F subcooling limits; and (b) no operations are in progress that will result in a reduction of RCS boron concentration.

The Note prohibits boron dilution when DHR forced flow is stopped because an even concentration distribution cannot be ensured. Core outlet temperature is to be maintained at least 10°F below saturation temperature so that no vapor bubble would form and possibly cause a natural circulation flow obstruction. In this MODE, the steam generators are used as a backup for decay heat removal and, to ensure their availability, the RCS loop flow path is to be maintained with subcooled liquid.

In MODE 5, it is sometimes necessary to stop all RCP or DHR loop forced circulation. For example, this may be necessary to change operation from one DHR loop to the other, perform surveillance or startup testing, perform the transition to and from the DHR loops, or to avoid operation below the RCP minimum NPSH limit. The time period is acceptable because natural circulation is acceptable for heat removal, the reactor coolant temperature can be maintained subcooled, and boron stratification affecting reactivity control is not expected.

BASES

LCO (continued)

Note 2 allows one required DHR loop to be inoperable for a period of ≤ 2 hours provided that the other loop is OPERABLE and in operation. This permits periodic surveillance tests to be performed on the inoperable loop during the only time when such testing is safe and possible.

Note 3 provides for an orderly transition from MODE 5 to MODE 4 during a planned heatup by permitting DHR loops to not be in operation when at least one RCP is in operation. This Note provides for the transition to MODE 4 where an RCP is permitted to be in operation and replaces the RCS circulation function provided by the DHR loops.

Note 4 allows a DHR loop to be considered OPERABLE during alignment and when aligned for low pressure injection if it is capable of being manually (locally or remotely) realigned to the DHR mode of operation and is not otherwise inoperable. This provision is necessary because of the dual requirements of the components that comprise the low pressure injection/decay heat removal system.

To be considered OPERABLE, a DHR loop must consist of a pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path and to determine the temperature. The flow path starts in one of the RCS hot legs and is returned to reactor vessel via one or both Core Flood tank injection nozzles. The BWST recirculation crossover line through valves LP-40 and LP-41 may be part of a flow path if it provides adequate decay heat removal capability. The operability of the operating DHR loop and the supporting heat sink is dependent on the ability to maintain the desired RCS temperature. LPSW and ECCW are required to support the OPERABLE DHR train(s). One LPSW pump and one ECCW header can simultaneously support one or two DHR trains. Single failure protection is not required for LPSW or support systems in these modes.

To be considered OPERABLE, DHR loops must be capable of being powered and are able to provide flow if required. An OPERABLE SG can perform as a heat sink when it has an adequate water level and is OPERABLE in accordance with the Steam Generator Tube Surveillance Program.

APPLICABILITY

In MODE 5 with loops filled, forced circulation is provided by this LCO to remove decay heat from the core and to provide proper boron mixing. One loop of DHR in operation provides sufficient circulation for these purposes.

Operation in other MODES is covered by:
LCO 3.4.4, "RCS Loops – MODES 1 and 2";
LCO 3.4.5, "RCS Loops – MODE 3";

BASES (continued)

APPLICABILITY (continued)	LCO 3.4.6, "RCS Loops – MODE 4"; LCO 3.4.8, "RCS Loops – MODE 5, Loops Not Filled"; LCO 3.9.4, "Decay Heat Removal (DHR) and Coolant Circulation – High Water Level" (MODE 6); and LCO 3.9.5, "Decay Heat Removal (DHR) and Coolant Circulation – Low Water Level" (MODE 6).

ACTIONS

A.1 and A.2

If one required DHR loop is inoperable and any required SG has secondary side water level < 50%, redundancy for heat removal is lost. Action must be initiated to restore a second DHR loop to OPERABLE status or initiate action to restore the secondary side water level in the SGs, and action must be taken immediately. Either Required Action A.1 or Required Action A.2 will restore redundant decay heat removal paths. The immediate Completion Time reflects the importance of maintaining the availability of two paths for heat removal.

B.1 and B.2

If no required DHR loop is in operation (no DHR loop is required to be in operation provided the conditions of Note 1 are met), or no required DHR loop is OPERABLE, all operations involving the reduction of RCS boron concentration must be suspended and action to restore a DHR loop to OPERABLE status and operation must be initiated. Boron dilution requires forced circulation for proper mixing, and the margin to criticality must not be reduced in this type of operation. The immediate Completion Time reflects the importance of maintaining operation for decay heat removal.

SURVEILLANCE REQUIREMENTS

SR 3.4.7.1

This SR requires verification every 12 hours that the required DHR loop is in operation. Verification includes flow rate, temperature, or pump status monitoring, which help ensure that forced flow is providing heat removal. The 12 hour Frequency has been shown by operating practice to be sufficient to regularly assess degradation. In addition, control room indication and alarms will normally indicate loop status.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.4.7.2

Verifying the SGs are OPERABLE by ensuring their secondary side water levels are ≥ 50% ensures that redundant heat removal paths are available if the second DHR loop is not OPERABLE. If both DHR loops are OPERABLE, this Surveillance is not needed. The 12 hour Frequency has been shown by operating practice to be sufficient to regularly assess degradation and verify operation within safety analyses assumptions.

SR 3.4.7.3

Verification that each required DHR pump is OPERABLE ensures that a DHR loop can be placed in operation if needed to maintain decay heat removal and reactor coolant circulation. If the secondary side water level is ≥ 50% in both SGs, this Surveillance is not needed. Verification is performed by verifying proper breaker alignment and power available to the required pumps. 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. 10 CFR 50.36.

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.8 RCS Loops – MODE 5, Loops Not Filled

BASES

BACKGROUND

In MODE 5 with loops not filled, the primary function of the reactor coolant is the removal of decay heat and transfer of this heat to the LPI heat exchangers. The steam generators (SGs) are not available as a heat sink when the loops are not filled. The secondary function of the reactor coolant is to act as a carrier for the soluble neutron poison, boric acid.

Loops are not filled when RCS draining is initiated as might be the case for refueling or maintenance. GL 88-17 (Ref. 1) expresses concerns for loss of decay heat removal for this operating condition. With water at this low level, the margin above the decay heat suction piping connection to the hot leg is small. The possibility of loss of level or inlet vortexing exists and if it were to occur, the operating pump could become air bound and fail resulting in a loss of forced flow for heat removal. As a consequence the water in the core will heat up and could boil with the possibility of core uncovering due to boil off. Because the containment hatch may be open at this time, a pathway to the outside for fission product release could exist if core damage were to occur.

In MODE 5 with loops not filled, only DHR loops can be used for coolant circulation. The number of loops in operation can vary to suit the operational needs. The intent of this LCO is to provide forced flow from at least one DHR loop for decay heat removal and transport, to require that two paths be available to provide redundancy for heat removal.

APPLICABLE SAFETY ANALYSES

No safety analyses are performed with initial conditions in MODE 5 with loops not filled. The flow provided by one DHR loop is adequate for heat removal and for boron mixing.

RCS Loops – MODE 5 (Loops Not Filled) satisfy Criterion 4 of 10 CFR 50.36 (Ref. 2)

LCO

The purpose of this LCO is to require that a minimum of two DHR loops be OPERABLE and that one of these loops be in operation. An OPERABLE loop is one that has the capability of transferring heat from the reactor coolant at a controlled rate. Heat cannot be removed via the DHR loops

BASES

LCO (continued)

unless forced flow is used. A minimum of one running pump meets the LCO requirement for one loop in operation. An additional DHR loop is required to be OPERABLE to provide redundancy for heat removal.

Note 1 permits the DHR pumps to not be in operation for ≤ 15 minutes when switching from one loop to the other or for testing. The circumstances for stopping both DHR pumps are to be limited to situations where the outage time is short and temperature is maintained ≤ 140°F. The Note prohibits boron dilution or draining operations when DHR forced flow is stopped.

Note 2 allows one DHR loop to be inoperable for a period of ≤ 2 hours provided that the other loop is OPERABLE and in operation. This permits periodic surveillance tests to be performed on the inoperable loop during the only time when these tests are safe and possible.

Note 3 allows a DHR loop to be considered OPERABLE if it is capable of being manually (locally or remotely) realigned to the DHR mode of operation and is not otherwise inoperable. This provision is necessary because of the dual function of the components that comprise the low pressure injection/decay heat removal system.

To be considered OPERABLE, a DHR loop must consist of a pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path and to determine the temperature. The flow path starts in one of the RCS hot legs and is returned to reactor vessel via one or both Core Flood tank injection nozzles. The BWST recirculation crossover line through valves LP-40 and LP-41 may be part of a flow path if it provides adequate decay heat removal capability. The operability of the operating DHR loop and the supporting heat sink is dependent on the ability to maintain the desired RCS temperature. LPSW and ECCW are required to support the OPERABLE DHR train(s). One LPSW pump and one ECCW header can simultaneously support one or two DHR trains. Single failure protection is not required for LPSW or support systems in these modes.

To be considered OPERABLE DHR pumps must be capable of being powered and are able to provide flow if required.

APPLICABILITY

In MODE 5 with loops not filled, this LCO requires core heat removal and coolant circulation by the DHR loops.

Operation in other MODES is covered by:
LCO 3.4.4, "RCS Loops – MODES 1 and 2";
LCO 3.4.5, "RCS Loops – MODE 3";

BASES (continued)

APPLICABILITY (continued)

LCO 3.4.6, "RCS Loops – MODE 4";
LCO 3.4.7, "RCS Loops – MODE 5, Loops Filled";
LCO 3.9.4, "Decay Heat Removal (DHR) and Coolant Circulation – High Water Level" (MODE 6); and
LCO 3.9.5, "Decay Heat Removal (DHR) and Coolant Circulation – Low Water Level" (MODE 6).

ACTIONS

A.1

If one required DHR loop is inoperable, redundancy for heat removal is lost. Required Action A.1 is to immediately initiate activities to restore a second loop to OPERABLE status. The immediate Completion Time reflects the importance of maintaining the availability of two paths for heat removal.

B.1 and B.2

If no required loop is OPERABLE or the required loop is not in operation, (no loop is required to be in operation provided the conditions of Note 1 in the LCO are met), the Required Action requires immediate suspension of all operations involving boron reduction and requires initiation of action to immediately restore one DHR loop to OPERABLE status and operation. The Required Action for restoration does not apply to the condition of both loops not in operation when the exception Note in the LCO is in force. The immediate Completion Time reflects the importance of maintaining operations for decay heat removal. The action to restore must continue until one loop is restored.

SURVEILLANCE REQUIREMENTS

SR 3.4.8.1

This Surveillance requires verification every 12 hours that the required loop is in operation. Verification includes flow rate, temperature, or pump status monitoring, which help ensure that forced flow is providing heat removal. The 12 hour interval has been shown by operating practice to be sufficient to regularly assess degradation and verify operation within safety analyses assumptions.

SR 3.4.8.2

Verification that the required number of pumps are OPERABLE ensures that redundancy for heat removal is provided. The requirement also ensures that additional loops can be placed in operation if needed to

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.4.8.2 (continued)

maintain decay heat removal and reactor coolant circulation. Verification is performed by verifying proper breaker alignment and power available to the required pumps. 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. Generic Letter 88-17, October 17, 1988.

2. 10 CFR 50.36.

B 3.7 PLANT SYSTEMS

B 3.7.8 Emergency Condenser Circulating Water (ECCW)

BASES

BACKGROUND

Lake Keowee provides a heat sink for process and operating heat from safety related components during a transient or accident as well as during normal operation. This is done utilizing the ECCW System in conjunction with the Low Pressure Service Water System (LPSW).

The ECCW System consists of six siphon headers shared among the three Units. Each Unit's Condenser Circulating Water (CCW) inlet piping provides two ECCW siphon headers. Each siphon header takes suction from the CCW intake canal and supplies water to the CCW crossover header which connects to the LPSW suction piping. Although sharing some portions of the flow path, each CCW inlet header on a given unit is independent of the other header for the purposes of siphoning water from the intake canal to the CCW crossover header. A loss of siphon header flow from one ECCW siphon header does not prevent the other siphon header from supplying flow to the LPSW suction.

The Essential Siphon Vacuum (ESV) System is provided to remove air accumulation in the ECCW siphon headers. The ESV system consists of three ESV pumps per unit. One ESV pump is associated with each ECCW siphon header. The third ESV pump is a spare pump which can be aligned to replace either one of the other two pumps. Vacuum piping is connected to the top of the ECCW siphon header and contains an automatic float valve which prevents unacceptable amounts of water from entering the system during normal operation. Vacuum piping from each siphon header connects to a small receiver tank which functions to collect entrained liquids and increases system capacitance. The tank also provides a suitable location for installation of instrumentation.

Two Siphon Seal Water (SSW) headers are routed from the LPSW System in the turbine building to the CCW intake structure. One header is supplied from the shared Unit 1 and 2 LPSW System. The other header is supplied from the Unit 3 LPSW System. Two ESV seal supply headers, one from each SSW header, are provided and cross-connected at each ESV pump.

A solenoid valve, located downstream from ESV seal supply cross-connect, is interlocked with ESV pump controls to isolate and restore SSW to an ESV pump that has lost and regained power. The Siphon

BASES

BACKGROUND (continued)

Seal Water (SSW) System's safety function is to provide a seal water supply for the ESV pumps. The system also supplies the normal source of seal/cooling water for the CCW pumps. Supplying seal/cooling water to the CCW pumps is not a safety requirement since it is not required for accident mitigation.

Additional information on the design and operation of the system, along with a list of components served, can be found in Reference 1.

APPLICABLE SAFETY ANALYSES

The ECCW siphon headers supply water from Lake Keowee to the LPSW system suction piping and supports the safety function of the LPSW system. Additional information regarding the LPSW System can be found in the Bases of 3.7.7, "LPSW System."

Maintaining the ECCW siphon headers OPERABLE during accident and transient events is an assumption in the accident and transient analysis. The ESV System and SSW System are required to ensure ECCW siphon header piping remains sufficiently primed to supply siphon flow to the LPSW suction piping.

The ECCW siphon headers satisfy Criterion 3 of 10 CFR 50.36 (Ref. 2).

LCO

Two ECCW siphon headers are required to be OPERABLE during normal unit operation. An ECCW siphon header consists of a flow path from the intake canal through an open CCW pump discharge valve to the LPSW suction piping connection on the CCW crossover header. For an ECCW siphon header to be OPERABLE, an ESV pump must be OPERABLE, in operation, and aligned to the ECCW siphon header. Additionally, the ESV float valve must be OPERABLE. Heat tracing on the ESV float valve must be OPERABLE when the potential for freezing exists.

The ESV pump must be capable of restarting, after an appropriate time delay following restoration of emergency power after a loss of off-site power. This ensures air introduced by inleakage or degassing does not prevent siphon header function. Operation of an ESV pump requires a continuous seal water supply from the SSW System. The cross connection between ESV System headers on a Unit must be closed. Instrumentation necessary to provide indication of SSW flow to ESV is required to be OPERABLE to ensure continued availability following a design basis event.

BASES

LCO (continued)

Sharing of siphon headers between units is acceptable with certain restrictions. Net positive suction head requirements for Unit 1 and 2 LPSW pumps cannot be met with suction supplied from a Unit 3 siphon header. Therefore, the two ECCW siphon headers for Units 1 and 2 must be two of the four ECCW siphon headers associated with the Units 1 and 2 CCW piping. Units 1 and 2 may simultaneously share two of the four suction headers. Similarly, NPSH requirements for the Unit 3 LPSW pumps cannot be met with suction supplied from a Unit 1 ECCW siphon header. Therefore, the two ECCW siphon headers for Unit 3 must be two of the four siphon headers associated with Units 2 and 3 CCW piping. The Unit 2 ECCW siphon headers may be credited with supplying either the Unit 1 and 2 LPSW System or the Unit 3 LPSW System but not both LPSW Systems simultaneously. Both Unit 2 ECCW siphon headers must be credited to the same LPSW System (i.e., the two Unit 2 headers may not be split with one siphon header credited to the Unit 1 and 2 LPSW System and the other siphon header credited to the Unit 3 LPSW System). The two Unit 3 siphon headers may only be credited to Unit 3 (i.e., they cannot be credited to another unit).

An unanalyzed condition exists if one ECCW flowpath is aligned to simultaneously supply the Unit 1 and 2 LPSW System and the Unit 3 LPSW System even if one of the Units is in MODE 5, 6 or NO MODE. If Unit 1 or 2 is in MODE 1, 2, 3 or 4, Unit 3 is in MODE 5, 6 or NO MODE with Unit 3 LPSW inservice and 3CCW-42 is open, an OPERABLE Unit 2 or Unit 3 ECCW header must be credited to the Unit 3 LPSW system. Conversely, if Unit 1 and 2 are in MODE 5, 6 or NO MODE and Unit 3 is in MODE 1, 2, 3 or 4 and 3CCW-42 is open, an OPERABLE Unit 1 or 2 ECCW header must be credited to the Unit 1 and 2 LPSW system.

The LCO is modified by a Note which indicates the requirements are not applicable to a Unit until after completion of the Service Water upgrade modifications on the respective Unit. This is necessary since the specification is based on the Unit's design after implementation of the modifications.

APPLICABILITY

In MODES 1, 2, 3, and 4, the ECCW siphon headers are normally operating to support the OPERABILITY of the equipment serviced by the ECCW siphon headers and are required to be OPERABLE in these MODES.

In MODES 5 and 6, the OPERABILITY requirements of the ECCW siphon headers are determined by the systems they support.

BASES

ACTIONS

A.1

If one required ECCW siphon header is inoperable, action must be taken to restore the inoperable ECCW siphon header to OPERABLE status within 72 hours.

In this Condition, the remaining ECCW siphon header is adequate to perform the heat removal function. However, the overall reliability is reduced because a single failure in the OPERABLE ECCW siphon header could result in loss of ECCW system function. The 72 hour Completion Time is based on the redundant capabilities afforded by the OPERABLE ECCW siphon header, and the low probability of a accident occurring during this period.

B.1 and B.2

If the Required Action and associated Completion Time are not met, 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 5 within 60 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 3.7.8.1

This SR requires verification every 12 hours that the required ESV pumps are in operation. Verification includes confirming appropriate vacuum tank pressure or pump status monitoring, which help ensure that ECCW siphon headers are maintained sufficiently primed. The 12 hour Frequency has been shown by operating practice to be sufficient to regularly assess degradation. In addition, control room indication normally indicate pump status and an alarm is provided for low vacuum tank vacuum.

SR 3.7.8.2

Verifying Keowee Lake level is within limit ensures ECCW siphons can provide sufficient flow to ensure adequate NPSH is available for operating the LPSW pumps. The 24 hour Frequency is based on operating experience related to the trending of the parameter variations during the applicable MODES. This SR verifies that the Keowee water level is ≥ limit specified in UFSAR Chapter 16. Lake level requirements are maintained in UFSAR Chapter 16 (Ref. 3) since the values are

BASES

SURVEILLANCE REQUIREMENTS

SR 3.7.8.2 (continued)

subject to change resulting from modifications and changes in operating practices, which may impact LPSW System flow requirements.

SR 3.7.8.3

This SR verifies that the average water temperature at the CCW inlet is ≤ 90°F. This SR verifies that CCW inlet temperature is consistent with assumptions in the safety analysis regarding inlet temperature for the LPSW system. The 24 hour Frequency is based on operating experience related to the trending of the parameter variations during the applicable MODES.

SR 3.7.8.4

Verifying the correct alignment for manual, and non-automatic power operated valves in the ECCW siphon header flow paths, required ESV flow paths and required SSW flow paths provides assurance that the proper flow paths exist for ECCW siphon header operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since those valves are verified to be in the correct position prior to locking, sealing, or securing. Additionally, this SR does not apply to automatic valves since these valves actuate to the correct position upon initiation. 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 potentially 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.

SR 3.7.8.5

Verification that ESV float valves open upon an actual or simulated actuation ensures a flow path is provided to the ESV pumps to assure the ECCW siphon headers are maintained sufficiently primed. The basis for the Frequency of 92 days is ASME Code, Section XI (Ref. 4).

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.8.6

Verification that required ESV valves actuate to the correct position ensures the ESV tank minimum flow valves will automatically close during a loss of offsite power event so that the full capacity of the ESV pumps will be aligned to the ECCW siphon headers. Verification that required SSW valves actuate to the correct position ensures sufficient seal water is provided to ESV pumps. The basis for the Frequency of 92 days is ASME Code, Section XI (Ref. 4).

SR 3.7.8.7

Verifying that each ESV pump's capacity at the test point is greater than or equal to the required capacity ensures that pump performance has not degraded below the acceptance criteria during the cycle. ESV pump capacity is determined by measuring the "apparent" flow rate and calculating the "corrected" flow rate by adjusting for air density changes between the measurement point and the pump inlet. The vacuum level must be within a prescribed range during this measurement to ensure that the flowmeter is on-scale and the pump operating liquid is not cavitating. Note that the pump is a constant volume machine. Thus, there is not a single test point but a range of acceptable vacuum levels. Although ASME code for inservice testing does not specifically address vacuum pumps, manufacturers test methods coupled with the ASME standard (OM-6) (Ref. 5) requirements for testing methodology are used as a guide for testing. Accordingly, the basis for the Frequency of 92 days is ASME Code, Section XI (Ref. 4).

SR 3.7.8.8

Verification that each required ESV pump automatically starts within 1200 seconds after an actual or simulated restoration of emergency power assures required ESV pumps will function after a loss of offsite power to maintain ECCW siphon headers sufficiently primed to maintain necessary flow to the suction of LPSW pumps. The Frequency of 92 days is based on engineering judgement.

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.8.9

This SR verifies the ECCW system functions to supply siphon header flow to the suction of the LPSW pumps during design basis conditions by ensuring air accumulation in the ECCW siphon headers is within the removal capabilities of the ESV System. This SR establishes siphon flow with the ESV pumps off. Air accumulation in the pipe results in a corresponding reduction in water level in the CCW piping over a time period. The rate of water level reduction is recorded and compared to limits established in design basis documents. The limits on the rate of water level reduction over a time period are established to ensure ECCW siphon header air accumulation rate is within the removal capabilities of the ESV System under design basis conditions. The Frequency of 18 months is based on the need to perform this SR when the Unit is shutdown. This SR is not required to be performed with the Unit 3 LPSW System taking suction from the siphon. This is acceptable since aligning the LPSW pumps to the Unit 3 ECCW siphon headers is not necessary to demonstrate that the ECCW air accumulation is within the ESV capacity which is the basic purpose of the test. The flow path from the Unit 3 CCW piping to the suction of the Unit 3 LPSW pumps is demonstrated by normal operation of the LPSW pumps.

A Note states that for Units 1 and 2, the SR is not required to be performed with the shared LPSW System for Units 1 and 2 taking suction from the siphon. This is necessary to avoid potential effects on an operating unit and is acceptable since the capability of the LPSW pumps to take suction from the CCW crossover header is demonstrated by normal, day-to-day operation of the LPSW pumps. Although a loss of suction to the LPSW pumps is unlikely during this SR, it is prudent to minimize the potential for jeopardizing the LPSW suction supply to the LPSW pumps when they are supporting an operating Unit.

REFERENCES

1. UFSAR, Chapter 9.
2. 10 CFR 50.36.
3. UFSAR, Chapter 16.
4. ASME, Boiler and Pressure Vessel Code, Section XI.
5. ASME Standard OM-6.

B 3.9 REFUELING OPERATIONS

B 3.9.4 Decay Heat Removal (DHR) and Coolant Circulation – High Water Level

BASES

BACKGROUND

The purposes of the DHR Loops in MODE 6 are to remove decay heat and sensible heat from the Reactor Coolant System (RCS), to provide mixing of borated coolant, to provide sufficient coolant circulation to minimize the effects of a boron dilution accident, and to prevent boron stratification. Heat may be removed from the RCS by two methods. In the first method, heat is removed by circulating reactor coolant through the LPI heat exchanger(s), where the heat is transferred to the Low Pressure Service Water (LPSW) System via the LPI heat exchanger(s). The coolant is then returned to the reactor vessel via the core flood tank injection nozzles. Operation of a DHR Loop for normal cooldown or decay heat removal is manually accomplished from the control room. The heat removal rate is adjusted by control of the flow of reactor coolant through the LPI heat exchanger(s), bypassing the heat exchanger(s) and throttling of LPSW through the heat exchangers. Mixing of the reactor coolant is maintained by this continuous circulation of reactor coolant through the DHR Loop.

In the second method, the "B" spent fuel cooling pump may be lined up to take suction on the transfer canal, or the reactor vessel, and discharge to the spent fuel pool. Heat is removed by circulating reactor coolant through the spent fuel pool (SFP) heat exchanger, where the heat is transferred to the Recirculated Cooling Water (RCW) System. The coolant is then returned to the reactor vessel via the fuel transfer canal and the fuel transfer tubes. When using this method the remaining SF cooling trains operate normally.

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 inadequate cooling of the reactor fuel as a result of 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 the activity, and because of the possible addition of water to reactor vessel with a lower

BASES

APPLICABLE SAFETY ANALYSES (continued)

boron concentration than is required to keep the reactor subcritical. The loss of reactor coolant and the reduction in boron concentration in the reactor coolant would eventually challenge the integrity of the fuel cladding, which is a fission product barrier. One loop of DHR is required to be operational in MODE 6, with the water level ≥ 21.34 feet above the top of the reactor vessel flange, to prevent this challenge. The LCO does permit de-energizing the DHR pump for short durations under the condition that the boron concentration is not diluted. This conditional de-energizing of the DHR pump does not result in a challenge to the fission product barrier. The DHR loop satisfies Criteria 4 of 10 CFR 50.36 (Ref. 2).

LCO

Only one DHR loop is required for decay heat removal in MODE 6 with a water level ≥ 21.34 feet above the top of the reactor vessel flange. Only one DHR 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 DHR 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.

To be considered OPERABLE, a DHR loop must include a pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path and to determine the temperature. The flow path starts in one of the RCS hot legs and is returned to reactor vessel via either one or both of the Core Flood tank injection nozzles when using an LPI pump or the fuel transfer canal and a fuel transfer tube from the SFP when using a SFP Cooling System Pump. The BWST recirculation crossover line through valves LP-40 and LP-41 may be part of a flow path if it provides adequate decay heat removal capability. The operability of the operating DHR loop and the supporting heat sink is dependent on the ability to maintain the desired RCS temperature. LPSW and ECCW are required to support the DHR train.

Additionally, to be considered OPERABLE, a DHR loop must be capable of being manually aligned (remote or local) in the DHR mode for removal of decay heat. Operation of one loop can maintain the reactor coolant temperature as required. The LCO is modified by a Note that allows the required DHR loop to be removed from operation for up to 1 hour in an 8 hour period, provided no operation that would cause reduction of the

BASES

LCO (continued)

RCS boron concentration is in progress. Boron concentration reduction is prohibited because uniform concentration distribution cannot be ensured without forced circulation, etc. This allowance permits operations such as core mapping, alterations or maintenance in the vicinity of the reactor vessel hot leg nozzles and RCS to LPI isolation valve testing. During this 1 hour period, decay heat is removed by natural convection.

APPLICABILITY

One DHR loop must be OPERABLE and in operation in MODE 6 with the water level ≥ 21.34 ft above the top of the reactor vessel flange, to provide decay heat removal. The 21.34 ft level was selected because it corresponds to the 21.34 ft requirement established for fuel movement in the fuel handling accident analysis. Requirements for the DHR Loops in other MODES are covered by LCOs in Section 3.4, Reactor Coolant System (RCS), and Section 3.5, Emergency Core Cooling Systems (ECCS). DHR loop requirements in MODE 6, with the water level < 21.34 ft above the reactor vessel flange, are located in LCO 3.9.5, "Decay Heat Removal (DHR) and Coolant Circulation-Low Water Level.

ACTIONS

A.1

If DHR loop requirements are not met, there will be no forced circulation to provide mixing to establish uniform boron concentrations. Reduced boron concentrations can occur by adding water with a lower boron concentration than that contained in the RCS. Therefore, actions that reduce boron concentration shall be suspended immediately.

A.2

If DHR loop requirements are not met, actions shall be taken immediately to suspend the 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 21.34 feet above the reactor vessel flange provides an adequate available heat sink. Suspending any operation that would increase decay heat load, such as loading an irradiated fuel assembly, is prudent under this condition.

BASES

ACTIONS (continued)

A.3

If DHR loop requirements are not met, actions shall be initiated immediately in order to satisfy DHR loop requirements.

Restoration of one decay heat removal loop is required because this is the only active method of removing decay heat. Dissipation of decay heat through natural convection should not be relied upon for an extended period of time. Reliance on natural convection can lead to boiling which results in inventory loss. Sustained inventory loss can eventually result in inadequate decay heat removal from the core with subsequent release of fission products from the core to the reactor building atmosphere. The immediate Completion Time reflects the importance of restoring an adequate heat cooling loop.

A.4

If DHR loop requirements are not met, all containment penetrations providing direct access from the containment atmosphere to outside atmosphere shall be closed within 4 hours.

If no means of decay heat removal can be restored, the core decay heat could raise temperatures and cause boiling in the core which could result in uncovering the core and the release of radioactivity to the reactor building atmosphere. Closure of penetrations providing access to the outside atmosphere will prevent uncontrolled release of radioactivity to the environment.

SURVEILLANCE REQUIREMENTS

SR 3.9.4.1

This Surveillance demonstrates that the DHR loop is in operation and circulating reactor coolant. Verification includes flow rate, temperature, or pump status monitoring, which help assure that forced flow is providing heat removal. 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 DHR System.

REFERENCES

1. 10 CFR 50.36.

B 3.9 REFUELING OPERATIONS

B 3.9.5 Decay Heat Removal (DHR) and Coolant Circulation – Low Water Level

BASES

BACKGROUND

The purposes of the DHR Loops in MODE 6 are to remove decay heat and sensible heat from the Reactor Coolant System (RCS), to provide mixing of borated coolant, to provide sufficient coolant circulation to minimize the effects of a boron dilution accident, and to prevent boron stratification. Heat is removed from the RCS by circulating reactor coolant through the LPI heat exchanger(s), where the heat is transferred to the Low Pressure Service Water (LPSW) System via the LPI heat exchanger. The coolant is then returned to the reactor vessel via the core flood tank injection nozzles. Operation of a DHR Loop for normal cooldown/decay heat removal is manually accomplished from the control room. The heat removal rate is adjusted by control of the flow of reactor coolant through the LPI heat exchanger(s), bypassing the heat exchanger(s) and by throttling of LPSW through the heat exchangers. Mixing of the reactor coolant is maintained by this continuous circulation of reactor coolant through the DHR Loop.

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 inadequate cooling of the reactor fuel due to resulting 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, and because of the possible addition of water to the reactor vessel with a lower boron concentration than is required to keep the reactor subcritical. 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. Without a large water inventory to provide a backup means of heat removal, two loops of DHR are required to be OPERABLE, and one is required to be in operation, to prevent this challenge.

The DHR Loops satisfy Criterion 4 of 10 CFR 50.36 (Ref. 1).

BASES (continued)

LCO

In MODE 6, with the water level < 21.34 ft above the top of the reactor vessel flange, two DHR loops must be OPERABLE. Additionally, one DHR loop must be 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.

To be considered OPERABLE, a DHR loop must consist of a pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path and to determine the temperature. The flow path starts in one of the RCS hot legs and is returned to reactor vessel via one or both of the Core Flood tank injection nozzles. The BWST recirculation crossover line through valves LP-40 and LP-41 may be part of a flow path if it provides adequate decay heat removal capability. The operability of the operating DHR loop and the supporting heat sink is dependent on the ability to maintain the desired RCS temperature. LPSW and ECCW are required to support the OPERABLE DHR train(s). One LPSW pump and one ECCW header can simultaneously support one or two DHR trains. Single failure protection is not required for LPSW or support systems in these modes.

Both pumps may be aligned to the Borated Water Storage Tank to support filling or draining of the refueling transfer canal or performance of required testing.

To be considered OPERABLE, each DHR loop must be capable of being manually aligned (remote or local) in the DHR mode for removal of decay heat. Operation of one DHR loop can maintain the reactor coolant temperature as required.

APPLICABILITY

Two DHR loops are required to be OPERABLE, and one in operation in MODE 6, with the water level < 21.34 ft above the top of the reactor vessel flange, to provide decay heat removal. Requirements for the LPI 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). DHR loop requirements in MODE 6, with the water level ≥ 21.34 ft above the top of the reactor vessel flange, are located in LCO 3.9.4, "Decay Heat Removal (DHR) and Coolant Circulation – High Water Level."

BASES (continued)

ACTIONS

A.1 and A.2

With fewer than the required loops OPERABLE, action shall be immediately initiated and continued until the DHR loop is restored to OPERABLE status or until ≥ 21.34 ft of water level is established above the reactor vessel flange. When the water level is established at ≥ 21.34 ft above the reactor vessel flange, the Applicability will change to that of LCO 3.9.4, and only one DHR loop is required to be OPERABLE and in operation. An immediate Completion Time is necessary due to the increased risk of operating without a large available inventory.

B.1

If no DHR loop is in operation or no DHR loop is OPERABLE, there may be no forced circulation to provide mixing to establish uniform boron concentrations. Reduced boron concentration can occur by adding water with a lower boron concentration than that contained in the RCS. Therefore, actions that reduce boron concentration shall be suspended immediately.

B.2

If no DHR loop is in operation or no DHR loop is OPERABLE, actions shall be initiated immediately and continued without interruption to restore one DHR loop to OPERABLE status and operation. Since the unit is in Conditions A and B concurrently, the restoration of two OPERABLE DHR loops and one operating DHR loop should be accomplished expeditiously.

B.3

If no DHR loop is in operation, all containment penetrations providing direct access from the containment atmosphere to the outside atmosphere must be closed within 4 hours. With the DHR loop requirements not met, the potential exists for the coolant to boil and release radioactive gas to the containment atmosphere. Closing the containment penetrations that are open to the outside atmosphere prevents the uncontrolled release of radioactivity.

BASES (continued)

SURVEILLANCE REQUIREMENTS

SR 3.9.5.1

This Surveillance demonstrates that one DHR loop is in operation. The flow rate is determined by the operator as that necessary to provide adequate decay heat removal capability.

The Frequency of 12 hours is sufficient, considering the flow, temperature, pump control, and alarm indications available to the operator to monitor the DHR Loops in the control room.

SR 3.9.5.2

Verification that each required pump is OPERABLE ensures that an additional DHR 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. 10 CFR 50.36.

Attachment 2

BASES

LCO (continued)

Note 2 allows one required DHR loop to be inoperable for a period of ≤ 2 hours provided that the other loop is OPERABLE and in operation. This permits periodic surveillance tests to be performed on the inoperable loop during the only time when such testing is safe and possible.

Note 3 provides for an orderly transition from MODE 5 to MODE 4 during a planned heatup by permitting DHR loops to not be in operation when at least one RCP is in operation. This Note provides for the transition to MODE 4 where an RCP is permitted to be in operation and replaces the RCS circulation function provided by the DHR loops.

Note 4 allows a DHR loop to be considered OPERABLE during alignment and when aligned for low pressure injection if it is capable of being manually (locally or remotely) realigned to the DHR mode of operation and is not otherwise inoperable. This provision is necessary because of the dual requirements of the components that comprise the low pressure injection/decay heat removal system.

To be considered OPERABLE, a DHR loop must consist of a pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path and to determine the temperature. The flow path starts in one of the RCS hot legs and is returned to reactor ~~vessel via one or both~~ Core Flood tank ~~injection~~ nozzles. The BWST recirculation crossover line through valves LP-40 and LP-41 may be part of a flow path if it provides adequate decay heat removal capability. The operability of the operating DHR loop and the supporting heat sink is dependent on the ability to maintain the desired RCS temperature. LPSW and ECCW are required to support the ~~operable~~ OPERABLE DHR train(s). One LPSW pump and one ECCW header can simultaneously support one or two DHR trains. Single failure protection is not required for LPSW or support systems in these modes.

To be considered OPERABLE, DHR loops must be capable of being ~~powered~~ and are able to provide flow if required. An OPERABLE SG can perform as a heat sink when it has an adequate water level and is OPERABLE in accordance with the Steam Generator Tube Surveillance Program.

APPLICABILITY

In MODE 5 with loops filled, forced circulation is provided by this LCO to remove decay heat from the core and to provide proper boron mixing. One loop of DHR in operation provides sufficient circulation for these purposes.

Operation in other MODES is covered by:
LCO 3.4.4, "RCS Loops – MODES 1 and 2";
LCO 3.4.5, "RCS Loops – MODE 3";

BASES

LCO (continued)

unless forced flow is used. A minimum of one running pump meets the LCO requirement for one loop in operation. An additional DHR loop is required to be OPERABLE to provide redundancy for heat removal.

Note 1 permits the DHR pumps to not be in operation for ≤ 15 minutes when switching from one loop to the other or for testing. The circumstances for stopping both DHR pumps are to be limited to situations where the outage time is short and temperature is maintained ≤ 140°F. The Note prohibits boron dilution or draining operations when DHR forced flow is stopped.

Note 2 allows one DHR loop to be inoperable for a period of ≤ 2 hours provided that the other loop is OPERABLE and in operation. This permits periodic surveillance tests to be performed on the inoperable loop during the only time when these tests are safe and possible.

Note 3 allows a DHR loop to be considered OPERABLE if it is capable of being manually (locally or remotely) realigned to the DHR mode of operation and is not otherwise inoperable. This provision is necessary because of the dual function of the components that comprise the low pressure injection/decay heat removal system.

To be considered OPERABLE, a DHR loop must consist of a pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path and to determine the temperature. The flow path starts in one of the RCS hot legs and is returned to reactor vessel via one or both Core Flood tank injection nozzles. The BWST recirculation crossover line through valves LP-40 and LP-41 may be part of a flow path if it provides adequate decay heat removal capability. The operability of the operating DHR loop and the supporting heat sink is dependent on the ability to maintain the desired RCS temperature. LPSW and ECCW are required to support the ~~operable~~ OPERABLE DHR train(s). One LPSW pump and one ECCW header can simultaneously support one or two DHR trains. Single failure protection is not required for LPSW or support systems in these modes.

To be considered OPERABLE DHR pumps must be capable of being powered and are able to provide flow if required.

APPLICABILITY

In MODE 5 with loops not filled, this LCO requires core heat removal and coolant circulation by the DHR loops.

Operation in other MODES is covered by:
LCO 3.4.4, "RCS Loops – MODES 1 and 2";
LCO 3.4.5, "RCS Loops – MODE 3";

BASES

LCO (continued)

Sharing of siphon headers between units is acceptable with certain restrictions. Net positive suction head requirements for Unit 1 and 2 LPSW pumps cannot be met with suction supplied from a Unit 3 siphon header. Therefore, the two ECCW siphon headers for Units 1 and 2 must be two of the four ECCW siphon headers associated with the Units 1 and 2 CCW piping. Units 1 and 2 may simultaneously share two of the four suction headers. Similarly, NPSH requirements for the Unit 3 LPSW pumps cannot be met with suction supplied from a Unit 1 ECCW siphon header. Therefore, the two ECCW siphon headers for Unit 3 must be two of the four siphon headers associated with Units 2 and 3 CCW piping. The Unit 2 ECCW siphon headers may be credited with supplying either the Unit 1 and 2 LPSW System or the Unit 3 LPSW System but not both LPSW Systems simultaneously. Both Unit 2 ECCW siphon headers must be credited to the same LPSW System (i.e., the two Unit 2 headers may not be split with one siphon header credited to the Unit 1 and 2 LPSW System and the other siphon header credited to the Unit 3 LPSW System). The two Unit 3 siphon headers may only be credited to Unit 3 (i.e., they cannot be credited to another unit).

An unanalyzed condition exists if one ECCW flowpath is aligned to simultaneously supply the Unit 1 and 2 LPSW System and the Unit 3 LPSW System even if one of the Units is in MODE 5, 6 or NO MODE. If Unit 1 or 2 is in MODE 1, 2, 3 or 4, Unit 3 is in MODE 5, 6 or NO MODE with Unit 3 LPSW inservice and 3CCW-42 is open, an ~~operable~~ OPERABLE Unit 2 or Unit 3 ECCW header must be credited to the Unit 3 LPSW system. Conversely, if Unit 1 and 2 are in MODE 5, 6 or NO MODE and Unit 3 is in MODE 1,2,3 or 4 and 3CCW-42 is open, an ~~operable~~ OPERABLE Unit 1 or 2 ECCW header must be credited to the Unit 1 and 2 LPSW system.

The LCO is modified by a Note which indicates the requirements are not applicable to a Unit until after completion of the Service Water upgrade modifications on the respective Unit. This is necessary since the specification is based on the Unit's design after implementation of the modifications.

APPLICABILITY

In MODES 1, 2, 3, and 4, the ECCW siphon headers are normally operating to support the OPERABILITY of the equipment serviced by the ECCW siphon headers and are required to be OPERABLE in these MODES.

In MODES 5 and 6, the OPERABILITY requirements of the ECCW siphon headers are determined by the systems they support.

ACTIONS

A.1

BASES

SURVEILLANCE REQUIREMENTS (continued)

SR 3.7.8.6

Verification that required ESV valves actuate to the correct position ensures the ESV tank minimum flow valves will automatically close during a loss of offsite power event so that the full capacity of the ESV pumps will be aligned to the ECCW siphon headers. Verification that required SSW valves actuate to the correct position ensures sufficient seal water is provided to ESV pumps. The basis for the Frequency of 92 days is ASME Code, Section XI (Ref. 4).

SR 3.7.8.7

Verifying that each ESV pump's capacity at the test point is greater than or equal to the required capacity ensures that pump performance has not degraded below the acceptance criteria during the cycle. ESV pump capacity is determined by measuring the "apparent" flow rate and calculating the "corrected" flow rate by adjusting for air density changes between the measurement point and the pump inlet. The vacuum level must be within a prescribed range during this measurement to ensure that the flowmeter is on-scale and the pump operating liquid is not cavitating. Note that the pump is a constant volume machine. Thus, there is not a single test point but a range of acceptable vacuum levels. Although ASME code for inservice testing does not specifically address vacuum pumps, manufacturers test methods coupled with the ASME standard (OM-6) (Ref. 5) requirements for testing methodology are used as a guide for testing. Accordingly, the basis for the Frequency of 92 days is ASME Code, Section XI (Ref. 4).

SR 3.7.8.8

Verification that each required ESV pump automatically starts within 1200 seconds after an actual or simulated restoration of emergency power assures required ESV pumps will function after a loss of offsite power to maintain ECCW siphon headers sufficiently primed to maintain necessary flow to the suction of LPSW pumps. The Frequency of ~~18 months~~ 92 days is based on engineering judgement.

BASES

APPLICABLE SAFETY ANALYSES (continued)

boron concentration than is required to keep the reactor subcritical. The loss of reactor coolant and the reduction in boron concentration in the reactor coolant would eventually challenge the integrity of the fuel cladding, which is a fission product barrier. One loop of DHR is required to be operational in MODE 6, with the water level ≥ 21.34 feet above the top of the reactor vessel flange, to prevent this challenge. The LCO does permit de-energizing the DHR pump for short durations under the condition that the boron concentration is not diluted. This conditional de-energizing of the DHR pump does not result in a challenge to the fission product barrier. The DHR loop satisfies Criteria 4 of 10 CFR 50.36 (Ref. 2).

LCO

Only one DHR loop is required for decay heat removal in MODE 6 with a water level ≥ 21.34 feet above the top of the reactor vessel flange. Only one DHR 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 DHR 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.

To be considered OPERABLE, a DHR loop must include a pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path and to determine the temperature. The flow path starts in one of the RCS hot legs and is returned to reactor vessel via either one or both of the Core Flood tank injection nozzles when using an LPI pump or the fuel transfer canal and a fuel transfer tube from the SFP when using a SFP Cooling System Pump. The BWST recirculation crossover line through valves LP-40 and LP-41 may be part of a flow path if it provides adequate decay heat removal capability. The operability of the operating DHR loop and the supporting heat sink is dependent on the ability to maintain the desired RCS temperature. LPSW and ECCW are required to support the DHR train.

Additionally, to be considered OPERABLE, a DHR loop must be capable of being manually aligned (remote or local) in the DHR mode for removal of decay heat. Operation of one loop can maintain the reactor coolant temperature as required. The LCO is modified by a Note that allows the required DHR loop to be removed from operation for up to 1 hour in an 8 hour period, provided no operation that would cause reduction of the

BASES (continued)

LCO

In MODE 6, with the water level < 21.34 ft above the top of the reactor vessel flange, two DHR loops must be OPERABLE. Additionally, one DHR loop must be 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.

To be considered OPERABLE, a DHR loop must consist of a pump, a heat exchanger, valves, piping, instruments, and controls to ensure an OPERABLE flow path and to determine the temperature. The flow path starts in one of the RCS hot legs and is returned to reactor vessel via one or both of the Core Flood tank injection nozzles. The BWST recirculation crossover line through valves LP-40 and LP-41 may be part of a flow path if it provides adequate decay heat removal capability. The operability of the operating DHR loop and the supporting heat sink is dependent on the ability to maintain the desired RCS temperature. LPSW and ECCW are required to support the ~~operable~~ OPERABLE DHR train(s). One LPSW pump and one ECCW header can simultaneously support one or two DHR trains. Single failure protection is not required for LPSW or support systems in these modes.

Both pumps may be aligned to the Borated Water Storage Tank to support filling or draining of the refueling transfer canal or performance of required testing.

To be considered OPERABLE, each DHR loop must be capable of being manually aligned (remote or local) in the DHR mode for removal of decay heat. Operation of one DHR loop can maintain the reactor coolant temperature as required.

APPLICABILITY

Two DHR loops are required to be OPERABLE, and one in operation in MODE 6, with the water level < 21.34 ft above the top of the reactor vessel flange, to provide decay heat removal. Requirements for the LPI 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). DHR loop requirements in MODE 6, with the water level ≥ 21.34 ft above the top of the reactor vessel flange, are located in LCO 3.9.4, "Decay Heat Removal (DHR) and Coolant Circulation – High Water Level."