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1CAN081004

August 24, 2010

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: License Amendment Request
Changes to Technical Specification Related to Completion Times for One Inoperable RCS Cooling Loop
Arkansas Nuclear One, Unit 1
Docket No. 50-313
License No. DPR-51

Dear Sir or Madam:

Pursuant to 10 CFR 50.90, Entergy Operations, Inc. (Entergy) hereby requests the following amendment to the Arkansas Nuclear One, Unit 1 (ANO-1) Operating License. The proposed amendment would revise several Technical Specifications (TS) to permit a greater time period for one of two required Reactor Coolant System (RCS) cooling loops to be inoperable. The affected TSs are applicable in lower Modes of Operation (Modes 4, 5, and 6).

A detailed description and justification of the proposed change is provided in Attachment 1. A mark-up of the affected TS pages is contained in Attachment 2 of this submittal. Attachment 3 contains a mark-up of the associated TS Bases for information only.

The proposed change has been evaluated in accordance with 10 CFR 50.91(a)(1) using criteria in 10 CFR 50.92(c) and it has been determined that the change involves no significant hazards consideration. The bases for these determinations are included in the attached submittal.

The proposed change does not include any new commitments.

Entergy requests approval of the proposed amendment by September 1, 2011. Once approved, the amendment shall be implemented within 90 days. Although this request is neither exigent nor emergency, your prompt review is requested.

If you have any questions or require additional information, please contact Mark Giles at 479-858-4710.

I declare under penalty of perjury that the foregoing is true and correct. Executed on August 24, 2010.

Sincerely,

Original signed by Brad L. Berryman

BLB/dbb

Attachments:

1. Analysis of Proposed Technical Specification Change
2. Proposed Technical Specification Changes (mark-up)
3. Mark-up of Technical Specification Bases (information only)

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Attachment 1

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Analysis of Proposed Technical Specification Change

1.0 DESCRIPTION

This letter is a request to amend Operating License DPR-51 for Arkansas Nuclear One, Unit 1 (ANO-1).

This proposed License Amendment Request (LAR) is a request pursuant to 10 CFR 50.90 to revise several Technical Specifications (TS) to permit a greater time in which one of two required Reactor Coolant System (RCS) cooling loops may be inoperable. Note that some references may refer to the RCS cooling loop as a Decay Heat Removal (DHR) loop. These terms are used interchangeably throughout this submittal. The affected TSs are applicable in lower Modes of Operation (Modes 4, 5, and 6).

2.0 PROPOSED CHANGE

The time in which one of two required RCS cooling loops may be inoperable is revised for the following TSs. A markup of the affected TSs is included in Attachment 2 of this submittal. A mark-up of associated TS Bases is included in Attachment 3, for information only.

<u>TS 3.4.6 RCS Loops – Mode 4</u>

Required Action A.1 requires *immediate* action to be taken to restore the inoperable coolant loop to an operable status and Required Action A.2 requires the unit to be placed in Mode 5 within *24 hours*.

These Completion Times (CTs) are revised to *48 hours* and *72 hours*, respectively.

<u>TS 3.4.7 RCS Loops – Mode 5, Loops Filled</u>

AND

<u>TS 3.4.8 RCS Loops – Mode 5, Loops Not Filled</u>

AND

<u>TS 3.9.5 Decay Heat Removal (DHR) and Coolant Circulation – Low Water Level</u>

The time in which the idle RCS cooling loop may be inoperable for testing purposes in Limiting Condition for Operation (LCO) Note 2 is revised from ≤ 2 hours to ≤ 8 hours.

While increasing the time above, an additional condition was added to LCO Note 2 which permits the loop to be inoperable for testing only if the loop can be restored to an operable status within the calculated time to boil. Because this is a second condition to the LCO Note, the formatting has been revised to list the two conditions separately in sub-bullets “a” and “b.”

3.0 BACKGROUND

In Mode 4, core heat removal for ANO-1 can be supported by a reactor coolant loop with an operable Steam Generator (SG) or, when pressure and temperature has been reduced sufficiently, by one of two DHR loops. In this operating mode, a steam bubble remains in the Pressurizer such that cooling by either method can be easily accomplished. Natural circulation cooling via a SG can also be used for core decay heat removal in this mode. RCS pressure can be adjusted as required via Pressurizer heaters, Pressurizer spray, or RCS vent paths to accommodate the desired cooling method. All of the aforementioned equipment is powered from vital electrical buses, with the exception of the RCPs. Vital power sources are backed by Emergency Diesel Generator (EDG) or station battery, depending on the voltage level and type.

When a SG is relied upon as a heat removal source, makeup to the SG may be accomplished by the Emergency Feedwater (EFW) system, the Auxiliary Feedwater (AFW) pump, or by the Condensate and Feedwater (CFW) system. Only the EFW system is powered from a vital bus; however, ANO maintains a station blackout diesel generator capable of supplying vital or non-vital electrical buses on either ANO unit. Steaming of the SG is accomplished via Turbine Bypass Valves (TBVs) or Atmospheric Dump Valves (ADVs) located upstream of the Main Steam Isolation Valves (MSIVs). Steaming can be controlled from the Control Room or by local-manual operation of the valves per OP 1203.002, Alternate Shutdown, Exhibit A. When relying on the DHR system, residual heat is removed via a heat exchanger cooled by the Service Water (SW) system. The SW system is powered from a vital bus.

In Mode 5, a steam bubble may or may not exist in the Pressurizer. Therefore, the preferred core heat removal method is via one of two DHR coolant loops. However, provided SG inventory is maintained within operable limits, natural circulation cooling is also available. If necessary, the RCS can be closed, a steam bubble drawn in the Pressurizer, RCS pressure raised, and RCPs started in support of forced circulation cooling via one or more SGs.

In Mode 6, the RCS is vented (opened) and cannot be readily closed to support RCS pressurization. Therefore, the preferred cooling method in this mode is via the DHR system. However, water level above the active fuel seated in the core is sufficient to provide cooling via pool boiling if all DHR system capability is lost.

Current TS limitations do not permit sufficient time for a single core cooling method to be inoperable in order to support outage-related activities, such as Engineered Safeguards (ES) testing. In this example, a DHR pump breaker may be racked down and a patch cord installed. However, because many other components must also be reconfigured to support this test, it is not possible to set-up and complete testing within the current 2 hours provided by the aforementioned TSs. The proposed increase in time (8 hours) will support such surveillance testing. The individual TS applications are described in detail in Section 4.0 below.

4.0 TECHNICAL ANALYSIS

The affected TS associated with Mode 4 operation is revised differently than the remaining affected TSs. Therefore, this TS is discussed separately below. In addition, separate discussions are included with regard to drained and filled RCS conditions for the remaining affected TSs.

TS 3.4.6 RCS Loops – Mode 4

TS 3.4.6, RCS Loops – Mode 4, requires two RCS cooling loops to be operable and one cooling loop to be in operation. Any two of four cooling methods may be used to meet this requirement: 1) RCS cooling loop via SG "A", 2) RCS cooling loop via SG "B", 3) "A" DHR loop, or 4) "B" DHR loop. If no cooling loop is operable or if the required cooling loop is not in operation, Action B requires immediate suspension of any activity that might reduce the boron concentration of the RCS and immediate actions to restore at least one cooling loop to operable status. No changes are proposed relating to Action B. However, Action A requires *immediate* action to restore a second cooling loop to operable status when only one of the two required loops is inoperable. The Limiting Condition for Operation (LCO) permits all loops to be out of service for up to 8 hours in any 24-hour period, but only for the purpose of transitioning to/from the RCS – SG cooling method to/from the DHR cooling method. The LCO also permits all cooling loops to be out of service for up to 1 hour in any 8-hour period. Neither of the allowances are sufficient to support other outage activities that may be necessary, depending on the activities scheduled, which differ from outage-to-outage. Entergy believes the CTs associated with Action A are overly restrictive and are not consistent with other TS requirements.

In Mode 3, TS 3.4.5, RCS Loops – Mode 3, also requires two cooling loops to be operable and one loop to be in operation. In this mode, DHR cooling is not available. Only the two RCS loops, one via SG "A" and one via SG "B" are available to meet the TSs. Natural circulation cooling is available, but cannot be relied upon as a TS-required cooling method. In addition, the energy contained within the RCS is significantly greater than that of Mode 4. However, Action A permits the idle loop to be inoperable for up to 72 hours.

In Mode 4, less energy exists in the RCS and more cooling methods are available or can be made available in a short period of time. Natural circulation cooling also remains available should all preferred cooling methods be lost. EFW TS requirements for Mode 4 are equivalent to Mode 3 when one or more SGs are being relied upon for core heat removal. In addition, TS 3.5.3, ECCS – Shutdown, permits 48 hours to restore an inoperable Low Pressure Injection (LPI) pump. This is the same pump utilized for the DHR system in Mode 4.

Entergy proposes to revise the current *immediate* CT of TS 3.4.6 Required Action A.1 (restore the inoperable loop to operable status) to *48 hours* and the current *24-hour* CT of Required Action A.2 (be in Mode 5) to *72 hours* (48 + 24). This is consistent with the restoration time for an inoperable LPI pump in Mode 4 and is conservative to the time permitted to restore an inoperable RCS cooling loop in Mode 3. Based on the above information, Entergy has concluded that permitting the equivalent TS restoration period for Mode 4 as provided in Mode 3 for a single inoperable coolant loop is justified.

TS 3.4.7 RCS Loops – Mode 5, Loops Filled

AND

TS 3.4.8 RCS Loops – Mode 5, Loops Not Filled

TS 3.4.7 and 3.4.8 apply to configurations while operating in Mode 5. As discussed in the background section above, the RCS may or may not be in a state that supports prompt system pressurization needed to start RCPs for forced circulation cooling via the SGs. Therefore, the preferred method of core heat removal in Mode 5 is the DHR system. In Mode 5, the energy contained within the RCS is significantly reduced. This energy continues to decrease logarithmically over time as decay heat load decreases. If RCS cool down to Mode 5 occurred immediately after reactor shutdown, sufficient decay heat load could still exist to result in coolant boiling in a relatively short period of time should all other core cooling methods be lost. Therefore, the significance of the loss of normal cooling in Mode 5 is dependent on the initial RCS level. The inventory available at the start of the event and the makeup capacity available, in part, determines the period of time available for operator response to restore cooling.

RCS Loops Filled

As discussed above, if pool boiling is the remaining method of core cooling due to loss of other cooling sources, RCS inventory will slowly decrease. ANO-1 maintains several methods of RCS make-up during Mode 5 and 6 operations. The primary means is via one of three High Pressure Injection (HPI) pumps. These pumps can be aligned to take suction from the Borated Water Storage Tank (BWST) or the Chemical Addition System. The two LPI pumps are the same pumps used by the DHR system. Even if DHR cooling is lost, it is possible that one or more LPI pumps remain available with a flow path for makeup to the core. Finally, one of two Containment Spray pumps could be aligned via the LPI injection paths to makeup to the RCS.

Core uncovery is of greater concern when both required core cooling methods are lost and all makeup capability is lost. This configuration is extremely unlikely. In addition, TS 3.4.7 permits reliance on natural circulation cooling via the SGs in lieu of the DHR system loops. Because cooling can be established via either of two DHR loops or via natural circulation, the probability of losing all TS required cooling methods is also unlikely.

Although core uncovery is extremely unlikely in this mode of operation, reliance on coolant boiling is not a preferred method of cooling. Procedures and protected equipment controls act to prevent the loss of all preferred cooling methods.

The current 2-hour TS limitation supporting surveillance testing affecting the required cooling loops was adopted into the subject ANO-1 TSs during the conversion of the old standard TSs to the improved TSs (ITS) of NUREG-1430, Revision 1, “Revised Standard Technical Specifications for Babcock & Wilcox Plants.” This allowance was not in the previous ANO-1 version of TSs, but was adopted for consistency with the ITS. Less Restrictive change L3 in the ANO-1 application stated that the 2-hour limit was acceptable based on the additional restrictions applied by the LCO Note. The current restriction contained in the Note requires the remaining required cooling loop to be operable and in operation. In actuality, another restriction already exists in the Note in that the inoperability of the idle loop is only permitted to support surveillance testing.

While these restrictions will continue to apply given the proposed change from ≤ 2 hours to ≤ 8 hours, an additional restriction is proposed to prevent use of this allowance if the testing activity and subsequent configuration would prevent restoration of the idle pump to an operable status prior to the point in which boiling would begin. Early in an outage and dependent on RCS level, the time to reach boiling conditions in the RCS (time-to-boil) can be less than one hour. As the outage progresses and decay heat continues to decrease, the time-to-boil increases proportionally. Refueling operations also aid in increasing the time-to-boil by removing irradiated fuel and replacing with new unirradiated fuel.

As an example, the new restriction would prevent performance of testing that requires the idle cooling loop to be inoperable for one hour, if the current time-to-boil is less than one hour. Time-to-boil calculations are required on a routine basis in Modes 5 and 6 and also required when significant configuration changes are planned such as a reduction in RCS level.

In addition to the above, station administrative measures control testing and other activities that can unnecessarily challenge any required RCS cooling loop or required make-up source during low inventory conditions (such as lowered inventory which includes any RCS level below an elevation of 376.5 feet). Controls established for these configurations are consistent with the recommendations of Generic Letter 88-17, Loss of Decay Heat Removal, and Institute of Nuclear Power Operations (INPO) Significant Operating Experience Report (SOER) 09-01, Shutdown Safety. Such plant conditions require two operable cooling loops and two makeup sources to be administratively protected and controlled. Therefore, activities that could present a significant challenge to RCS cooling or makeup sources are prohibited during conditions where RCS inventory is significantly reduced.

RCS Loops Not Filled

At times during an outage, small reductions in RCS level are required to support specific activities. The TS 3.4.8 Bases define loops as not being filled when RCS draining is initiated. The current TS 2-hour limit does not support testing activities that do no otherwise challenge RCS cooling or makeup capability where RCS inventory is being maintained at sufficiently high levels. Therefore, the proposed 8-hour allowance is also applicable to and necessary for Note 2 of LCO 3.4.8. Again, the same restrictions will apply in that the remaining cooling loop must be operable and in operation, along with the planned test period verified to be less than the calculated time-to-boil for the level in which the RCS will be drained to.

Based on the above information, Entergy has concluded that the proposed change to TS 3.4.7 and 3.4.8 is acceptable.

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

As discussed above, for Mode 5 conditions when RCS loops are not filled, small reductions in RCS level are sometimes required to support specific activities. In Mode 6, the refueling canal is normally maintained with ≥ 23 feet of water above the top of active fuel in the core. The TS 3.9.5 Bases defines "low water level" as any level below 23 feet above the top of the fuel seated in the core. During activities that require a reduction in RCS level by only inches or a few feet, the aforementioned procedural controls may not be in place since a large amount of inventory remains over the top of the fuel in the core. Therefore, the proposed 8-hour allowance is also applicable to and necessary for Note 2 of LCO 3.9.5. As described above, the same restrictions will apply in that the remaining cooling loop must be operable and in operation, along with the planned test period verified to be less than the calculated time-to-boil for the level in which the RCS will be drained to.

Based on the above information, Entergy has concluded that the proposed change to TS 3.9.5 is acceptable.

5.0 REGULATORY ANALYSIS

5.1 No Significant Hazards Consideration

The proposed change will permit one of two required Reactor Coolant System (RCS) cooling loops to be removed from service for testing for a period of time greater than that currently permitted by the Arkansas Nuclear One, Unit 1 (ANO-1) Technical Specifications (TSs). The change affects only RCS cooling loop requirements in lower Modes of Operation (Modes 4, 5, and 6).

Entergy Operations, Inc. (Entergy) has evaluated whether or not a significant hazards consideration is involved with the proposed change by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

1. Does the proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No

   The proposed change does not involve any physical change to the plant and is unrelated to accident initiators. In Mode 4, the energy contained in the RCS is significantly reduced from that of power operations. In addition, RCS pressure can be raised or lowered to accommodate forced circulation using Reactor Coolant Pumps (RCPs) or operation of the Decay Heat Removal (DHR) system. Natural circulation also provides a core heat removal method via any available Steam Generator (SG). Several sources of secondary feedwater are, or could be made available to a required SG in support of forced circulation or natural circulation. Based on this information, any mitigation strategy which assumes use of these core cooling methods is not significantly affected by the proposed increase in the time in which one required train may be inoperable.

No accidents associated with the reactor core or core cooling are postulated for Mode 5. In Mode 6, the fuel handling accident (FHA) is the only postulated accident scenario. The proposed change has no bearing on the FHA from either an initiation aspect or with regard to accident consequences.

Based on the above, the proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No

The proposed change only extends the period in which one of two required core heat removal methods may be unavailable. The proposed change involves no changes to the physical plant and is not associated with any accident initiator.

Based on the above, the proposed change does not create the possibility of a new or different kind of accident from any previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

Response: No

As discussed above, the proposed change is unrelated to accident initiators and does not have a significant impact on the consequences of any accident previously evaluated in the ANO-1 Safety Analysis Report (SAR). The proposed change extends the time in which one of two required core heat removal methods may be unavailable. In most cases, more than one additional cooling method remains available. In addition, proceduralized administrative controls act to protect remaining required equipment (including inventory makeup sources) and to prevent removal of important equipment from service during higher risk plant configurations (such as reduced inventory conditions).

In Mode 5 and 6, the idle cooling loop may only be made unavailable in support of surveillance testing and only if the remaining loop is operable and in operation. Additionally, the idle cooling loop can be made unavailable only if it can be recovered within the calculated time-to-boil for the most restrictive plant configuration that may exist during the test window. These restrictions, along with the information in the preceding paragraph, maintain a sufficient margin to safety to preclude a challenge to the integrity of the fuel clad.

Therefore, the proposed change does not involve a significant reduction in the margin to safety.

Based on the above evaluations, Entergy concludes that the activities associated with the above described change presents no significant hazards under the standards set forth in 10 CFR 50.92 and that there is reasonable assurance that the health and safety of the public

will not be endangered by the proposed change. Moreover, because this change does not involve a significant hazards consideration, it will also not result in a condition which significantly alters the impact of the station on the environment as described in the NRC Final Environmental Statement.

5.2 Applicable Regulatory Requirements / Criteria

The proposed change does not impact TS requirements that ensure that the reactor building is capable of containing fission product radioactivity that may be released from the reactor core following a FHA inside the reactor building or that limit the consequences of an FHA. The ANO-1 SAR does not assume an accident initiates in Mode 4 (bounded by higher Modes of Operation) or Mode 5.

10 CFR 50, Appendix A, General Design Criterion (GDC) 34, “Residual Heat Removal,” requires one or more system capabilities to remove residual heat from the reactor core at a rate such that specified acceptable fuel design limits and the design conditions of the reactor coolant pressure boundary are not exceeded.

Various documents since the early 1980s such as Generic Letter 88-17, Loss of Decay Heat Removal, and Institute of Nuclear Power Operations (INPO) Significant Operating Experience Report (SOER) 09-01, Shutdown Safety, discuss the importance of core heat removal during shutdown conditions, especially when the RCS is in a reduced inventory condition.

The proposed change does not prevent a residual (decay) heat removal method from being available. In limited instances, single failure criteria may not be met. However, TS restoration time requirements limit the time in which the plant can be in a configuration where single failure criteria is not met. The proposed change continues to require entry into a TS Action when one of two required cooling methods is inoperable, therefore limiting the time in which this configuration remains acceptable. Proceduralized administrative controls and TS requirements work together to ensure core cooling methods and RCS inventory makeup capability remains available during all configurations, with added restrictions placed on RCS reduced or lowered inventory conditions.

In conclusion, Entergy has determined that the proposed change does not require any exemptions or relief from regulatory requirements, other than the TS, and does not affect conformance with any General Design Criterion differently than described in the SAR.

6.0 ENVIRONMENTAL CONSIDERATION

The proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

Attachment 2

1CAN081004

Proposed Technical Specification Changes (mark-up)

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.6 RCS Loops – MODE 4

LCO 3.4.6 Two loops consisting of any combination of RCS loops and decay heat removal (DHR) loops shall be OPERABLE and one OPERABLE loop shall be in operation.

----------NOTE----------
All reactor coolant pumps (RCPs) and DHR pumps may be removed from operation for ≤ 1 hour provided:

a. No operations are permitted that would cause introduction into the RCS, coolant with boron concentration less than required to meet the SDM of LCO 3.1.1; and

b. Core outlet temperature is maintained at less than or equal to a temperature which is 10°F below saturation temperature.

APPLICABILITY: MODE 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required loop inoperable.	A.1 Initiate action to restore a second loop to OPERABLE status. AND A.2 ----------NOTE---------- Only required if DHR loop is OPERABLE. ---------- Be in MODE 5.	~~Immediately~~48 hours 72~~24~~ hours

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.7 RCS Loops – MODE 5, Loops Filled

LCO 3.4.7 One decay heat removal (DHR) loop shall be OPERABLE and in operation, and either:

a. One additional DHR loop shall be OPERABLE; or

b. The secondary side of each steam generator (SG) shall be ≥ 20 inches.

----------NOTES----------

1. The DHR pump of the loop in operation may be removed from operation for ≤ 1 hour provided:

   a. No operations are permitted that would cause introduction into the RCS, coolant with boron concentration less than required to meet the SDM of LCO 3.1.1; and

   b. Core outlet temperature is maintained at less than or equal to a temperature which is 10°F below saturation temperature.

2. One required DHR loop may be inoperable for ≤ 8~~2~~ hours for surveillance testing provided that

   a. ~~-~~the other DHR loop is OPERABLE and in operation, and

   b. the inoperable DHR loop can be restored to OPERABLE status within the calculated time-to-boil period.

3. All DHR loops may be removed from operation during planned heatup to MODE 4 when at least one RCS loop is in operation.

APPLICABILITY: MODE 5 with RCS loops filled.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.8 RCS Loops – MODE 5, Loops Not Filled

LCO 3.4.8 Two decay heat removal (DHR) loops shall be OPERABLE and one OPERABLE DHR loop shall be in operation.

----------NOTES----------

1. All DHR pumps may be removed from operation for ≤ 1 hour provided:

   a. No operations are permitted that would cause introduction into the RCS, coolant with boron concentration less than required to meet the SDM of LCO 3.1.1; and

   b. No draining operations to further reduce the RCS water volume are permitted.

2. One DHR loop may be inoperable for ≤ 8~~2~~ hours for surveillance testing provided that

   a. ~~-~~the other DHR loop is OPERABLE and in operation, and

   b. the inoperable DHR loop can be restored to OPERABLE status within the calculated time-to-boil period.

APPLICABILITY: MODE 5 with RCS loops not filled.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One DHR loop inoperable.	A.1 Initiate action to restore DHR loop to OPERABLE status.	Immediately

3.9 REFUELING OPERATIONS

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

LCO 3.9.5 Two DHR loops shall be OPERABLE, and one DHR loop shall be in operation.

----------NOTE----------

1. All DHR pumps may be de-energized for ≤ 15 minutes when switching from one train to another provided:

   a. The core outlet temperature is maintained > 10 degrees F below saturation temperature;

   b. No operations are permitted that would cause a reduction of the Reactor Coolant System boron concentration; and

   c. No draining operations to further reduce RCS water volume are permitted.

2. One required DHR loop may be inoperable for ~~up to~~≤ 8~~2~~ hours for surveillance testing~~,~~ provided that

   a. ~~-~~the other DHR loop is OPERABLE and in operation, and

   b. the inoperable DHR loop can be restored to OPERABLE status within the calculated time-to-boil period.

APPLICABILITY: MODE 6 with the water level < 23 ft above the top of the irradiated fuel seated in the reactor pressure vessel.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Less than required number of DHR loops OPERABLE.	A.1 Initiate action to restore DHR loop to OPERABLE status.	Immediately
	OR	
	A.2 Initiate action to establish ≥ 23 feet of water above the top of the irradiated fuel seated in the reactor pressure vessel.	Immediately

Attachment 3

1CAN081004

Mark-up of Technical Specification Bases
(Information Only)

APPLICABILITY (continued)

- 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

If only one required RCS loop or DHR loop is OPERABLE and in operation, redundancy for heat removal is lost. Action must be initiated to restore a second loop to OPERABLE status. The 48-hour~~immediate~~ Completion Time reflects the importance of maintaining the availability of two paths for heat removal. The 48-hour completion time is consistent with the restoration period permitted for an LPI pump in Mode 4 (TS 3.5.3) and conservative to the restoration period for an inoperable RCS loop in Mode 3 (TS 3.4.5). The time allowance is justified because a single loop in operation has a heat transfer capability greater than that needed to remove the decay heat produced in the reactor core.

A.2

If restoration is not accomplished and a DHR loop is OPERABLE, the unit must be brought to MODE 5 within the following 24 hours. Bringing the unit to MODE 5 is a conservative action with regard to decay heat removal. With only one DHR loop OPERABLE, redundancy for decay heat removal is lost and, in the event of a loss of the remaining DHR loop, it would be safer to initiate that loss from MODE 5 rather than MODE 4. The Completion Time of 72~~24~~ hours is reasonable, based on operating experience, to reach MODE 5 in an orderly manner and without challenging unit systems.

This Required Action is modified by a Note which indicates that the unit must be placed in MODE 5 only if a DHR loop is OPERABLE. With no DHR loop OPERABLE, the unit is in a condition with only limited cooldown capabilities. Therefore, the actions are to be concentrated on restoration of a DHR loop, rather than a cooldown of extended duration.

B.1 and B.2

If no RCS or DHR loops are OPERABLE or a required loop is not in operation (no loop is required to be in operation provided the conditions of the Note in the LCO section are met), all operations involving introduction of coolant into the RCS with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 must be suspended and action to restore one RCS or DHR loop to OPERABLE status and operation must be initiated. The required margin to criticality must not be reduced in this type of operation. Suspending the introduction of coolant into the RCS of coolant

LCO (continued)

The LCO provides for either SG heat removal or DHR System 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 SG(s) can be used as a heat sink, a motor driven feedwater pump is needed, because it is independent of steam. Condensate pumps, the auxiliary feedwater pump, or the 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 pumps, 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.

Note 1 permits the DHR pumps to be stopped for up to 1 hour. The circumstances for stopping both DHR trains 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 process that would cause reduction of the RCS boron concentration.

The Note prohibits boron dilution with coolant at boron concentrations less than required to assure the SDM of LCO 3.1.1 is maintained when DHR forced flow is stopped because an even concentration distribution cannot be ensured. Core outlet temperature is to be maintained below saturation temperature by ≥ 10°F 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 pump forced circulation. For example, this may be necessary to change operation from one DHR train to the other, perform surveillance or startup testing, perform the transition to and from the DHR System, or to avoid operation below the RCP minimum NPSH limit. The time period is acceptable because the reactor coolant temperature can be maintained subcooled, and boron stratification affecting reactivity control is not expected.

Note 2 allows one required DHR loop to be inoperable for a period of ≤ 8~~2~~ hours provided that the other loop is OPERABLE and in operation. In addition, the inoperable loop must be capable of being restored to an OPERABLE status within the calculated time-to-boil for the worst case plant configuration expected during the period of inoperability. 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 removal of DHR loops from 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.

LCO (continued)

Note 1 permits the DHR pumps to be de-energized for ≤ 1 hour. The Note prohibits boron dilution with coolant at boron concentrations less than required to assure the SDM of LCO 3.1.1 is maintained or draining operations when DHR forced flow is stopped.

Note 2 allows one DHR loop to be inoperable for a period of ≤ 8~~2~~ hours provided that the other loop is OPERABLE and in operation. In addition, the inoperable loop must be capable of being restored to an OPERABLE status within the calculated time-to-boil for the worst case plant configuration expected during the period of inoperability. This permits periodic surveillance tests to be performed on the inoperable loop during MODE 5 when these tests are safe and possible.

A DHR loop may 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 arises because of the dual requirements of the components that comprise the low pressure injection/decay heat removal system.

An OPERABLE DHR loop is composed of an OPERABLE DHR pump capable of circulating RCS fluid through an OPERABLE DHR heat exchanger and back to the RCS. To be considered OPERABLE, the DHR pumps must have power available and 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 System.

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";
- 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).

LCO (continued)

This LCO is modified by two Notes. Note 1 permits the DHR pumps to be de-energized for ≤ 15 minutes when switching from one train to another. The circumstances for stopping both DHR pumps are to be limited to situations when the outage time is short and the core outlet temperature is maintained > 10 degrees F below saturation temperature. The Note prohibits boron dilution or draining operations when DHR forced flow is stopped.

The second Note allows one DHR loop to be inoperable for a period of ≤ 8~~2~~ hours provided the other loop is OPERABLE and in operation. Prior to declaring the loop inoperable, consideration should be given to the existing plant configuration. This consideration should include that the core time to boil is short, there is no draining operation to further reduce RCS water level and that capability exists to inject borated water into the reactor vessel. The inoperable loop must be capable of being restored to an OPERABLE status within the calculated time-to-boil for the worst case plant configuration expected during the period of inoperability. This permits surveillance tests to be performed on the inoperable loop during a time when these tests are safe and possible.

To be considered OPERABLE, a DHR loop must consist of a DHR 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 the 'A' hot leg and is returned to the reactor vessel via the core flood tank injection nozzles.

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

Both DHR pumps may be aligned to the Borated Water Storage Tank (BWST) to support filling of the refueling canal or the performance of required testing.

APPLICABILITY

Two DHR loops are required to be OPERABLE, and one in operation in MODE 6, with the water level < 23 feet above the top of the fuel seated in the reactor vessel, to provide decay heat removal. Requirements for the DHR 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 are located in LCO 3.9.4.
