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Docket No. 50-440

ATTN: Document Control Desk
United States Nuclear Regulatory Commission
Washington, DC 20555

Subject: Perry Nuclear Power Plant License Amendment Request - Revise MODE 3 Hot Shutdown Requirements to Add a Note Addressing Situations When Both Residual Heat Removal (RHR) Shutdown Cooling Subsystems Are Inoperable

Pursuant to 10 CFR 50.90, a license amendment is requested for the Perry Nuclear Power Plant (PNPP). The requested change modifies Technical Specification 3.4.9, "Residual Heat Removal (RHR) Shutdown Cooling System – Hot Shutdown," to revise the Required Actions when both RHR Shutdown Cooling subsystems are inoperable in MODE 3. An enclosure provides the evaluation of the proposed license amendment.

Approval of the proposed license amendment is requested by June of 2007. The proposed approval date was selected to allow for Nuclear Regulatory Commission (NRC) review; the plant does not need this amendment by that date in order to continue safe full power operations. Once approved, the amendment will be implemented within 120 days.

There are no regulatory commitments contained in this submittal. If there are any questions or if additional information is required, please contact Mr. Gregory A. Dunn, Manager – FENOC Fleet Licensing, at (330) 315-7243.

I declare under penalty of perjury that the foregoing is true and correct. Executed on June 1, 2006

L. W. Pearce

L. William Pearce

Enclosure: Evaluation of the Proposed License Amendment

cc: NRC Project Manager
NRC Resident Inspector
NRC Region III
State of Ohio

A001

EVALUATION OF THE PROPOSED LICENSE AMENDMENT

Subject: **Perry Nuclear Power Plant License Amendment Request - Revise MODE 3 Hot Shutdown Requirements to Add a Note Addressing Situations When Both Residual Heat Removal (RHR) Shutdown Cooling Subsystems Are Inoperable**

ATTACHMENTS:

1. **Proposed Changes to the PNPP Technical Specification Pages (Mark-up)**
2. **Pressurized Water Reactor (PWR) Technical Specification Notes That Serve As Models for the Proposed Change**
3. **Associated Bases Changes (provided for information)**

1.0 DESCRIPTION

The requested change modifies Technical Specification 3.4.9, "Residual Heat Removal (RHR) Shutdown Cooling System – Hot Shutdown," by revising the Required Actions that apply when both RHR Shutdown Cooling subsystem(s) are inoperable in MODE 3. This request provides resolution of Technical Specification issues identified at PNPP in 2004 and 2005, due to the occurrence of inoperabilities of the PNPP Emergency Service Water (ESW) system pumps which provide a support function for RHR Shutdown Cooling.

2.0 PROPOSED CHANGE

The proposed change to Hot Shutdown Specification 3.4.9 modifies existing Required Action A.3 by adding a Note (see Attachment 1 to this Enclosure). The Note is added to resolve an existing conflict. Specifically, a Technical Specification ACTION (A.3) directs cooldown of the plant from MODE 3 into MODE 4 even in situations when both of the redundant systems designed to provide that cooldown function are inoperable.

The required cooldown involves reducing the reactor coolant temperature from approximately 350°F down to below the boiling point (less than or equal to 200°F) within 24 hours if one <u>or both</u> RHR Shutdown Cooling subsystems are inoperable. The new Note modifies this Required Action A.3 cooldown requirement so the cooldown to MODE 4 is only required if one of the RHR shutdown cooling subsystems is OPERABLE. If both RHR subsystems are inoperable, the Note will allow the plant to remain in MODE 3 with decay heat removal being provided by the main condenser, while restoration efforts on RHR are pursued. The new Note is modeled after Notes in the Pressurized Water Reactor (PWR) improved Standard Technical Specification (iSTS) NUREGs [References 1, 2, and 3] that address this issue.

3.0 BACKGROUND

3.1 <u>System Description</u> -- Two redundant, manually controlled Shutdown Cooling subsystems (A and B) of the RHR System provide decay heat removal from the reactor vessel. Each loop consists of a motor driven pump, two heat exchangers in series, and associated piping and valves. Both loops have a common suction from the same recirculation loop. After the reactor coolant has been cooled by circulation through the respective heat exchangers, the water is returned to the reactor vessel. The RHR A and B heat exchangers are cooled by the ESW A and B subsystems, respectively, which take suction from and return flow to Lake Erie.

10CFR50 Appendix A, General Design Criterion (GDC) 34, "Residual Heat Removal," requires two (2) safety-related decay heat removal paths. The two redundant RHR subsystems satisfy this design requirement. There are no design requirements to have additional backup methods for each of these two redundant paths.

The RHR Shutdown Cooling subsystems can only be placed in service when reactor pressures and temperatures have been reduced below the RHR cut-in permissive pressure. This setpoint is set at approximately 135 psig, which corresponds to reactor coolant temperature of approximately 350°F. The Applicability of Specification 3.4.9, "Residual Heat Removal (RHR) Shutdown Cooling System – Hot Shutdown," is "MODE 3 with reactor steam dome pressure less than the RHR cut in permissive pressure."

The other plant system with large decay heat removal capability in MODE 3, "Hot Shutdown," when the plant is still producing steam, is the Power Conversion System (PCS), which is the decay heat removal path through the four main steam lines to the main condenser.

Although use of the PCS is a valid option for decay heat removal in MODE 3, the use of steaming to the condenser to achieve and maintain MODE 4, "Cold Shutdown" (reactor vessel head installed and coolant temperature less than or equal to 200°F) is not currently proceduralized and has not been proven to be a viable and acceptable alternate method of decay heat removal for achieving and maintaining MODE 4 at PNPP. Therefore, use of the PCS is not considered to be an available option for satisfying the current Technical Specification Required Action to place the plant into MODE 4 within 24 hours.

The Reactor Water Cleanup (RWCU) system also has decay heat removal capabilities in MODE 3, but it is not capable of achieving and maintaining MODE 4, "Cold Shutdown" until 40 to 50 days into an outage.

3.2 **Current Requirements** -- There are situations when it would not be possible to fully comply with the Technical Specification (TS) requirements that currently apply in MODE 3 if both of the redundant RHR Shutdown Cooling subsystems (A and B) become inoperable due to a problem such as an inoperable pump or heat exchanger shortly after a plant shutdown when decay heat loads are high. Limiting Condition for Operation (LCO) 3.4.9 is applicable in MODE 3 when reactor steam dome pressure drops below the RHR cut-in permissive, which corresponds to a pressure of approximately 135 psig (approximately 350°F).

Therefore, if the plant has been shut down with both loops of RHR Shutdown Cooling inoperable and then cools down below approximately 350°F, LCO 3.4.9 becomes applicable and the three Required Actions in Condition A must be applied. The third Required Action (A.3) requires that the plant be further cooled down into MODE 4 within 24 hours. If both RHR paths become inoperable, it is still possible to maintain the plant safely in MODE 3 using the plant's main condenser for decay heat removal. However, as discussed in the System Description Section above, with both RHR Shutdown Cooling subsystems inoperable and without a viable Mode 4 alternate method of sufficient heat removal capacity for cooling the Reactor early in an outage, compliance with Required Action A.3 to be in Mode 4 (≤ 200 °F) within the 24 hour Completion Time is not possible.

In addition, depending on what caused the inoperability of the two RHR subsystems, there may be other Technical Specification LCOs such as Suppression Pool Cooling, Containment Spray, or Emergency Service Water that would also require the plant to be taken to MODE 4. With both RHR subsystems inoperable, it is also not possible to comply with these other Technical Specification Required Actions early in an outage.

The change proposed in this license amendment request will resolve these compliance issues.

3.3 **Regulatory Background** -- The issues described above relative to the MODE 3 decay heat removal requirements existed in the original PNPP Technical Specifications at the time of initial licensing in 1986 [Reference 4], and these requirements were discussed but not revised during the conversion to the improved Standard Technical Specifications (iSTS) at PNPP.

An explanation of why the RHR Shutdown Cooling specifications were not revised during the iSTS conversion process is provided in Section 3.3 of a License Amendment Request letter dated 6/1/2006 (PY-CEI/NRR-2963L). That explanation is included herein by reference [Reference 6]. In summary, as the iSTS were being developed in the early 1990s, an ongoing effort was underway to develop a new regulation on Shutdown Safety requirements, which

included consideration of possible Technical Specification changes. This Shutdown rulemaking effort was not complete during the iSTS development period, and no changes to the RHR – Shutdown specifications were made. Also, when the rulemaking process was completed, no Technical Specification changes resulted.

An NRC Unresolved Item in 2004 and a follow-on Violation in 2005 [Reference 5] raised issues with the RHR Shutdown Cooling Specifications, although the Violation focused more on Specification 3.4.10 (Cold Shutdown) than Specification 3.4.9 (Hot Shutdown). During the Corrective Action Program (CAP) investigation of those Cold Shutdown TS 3.4.10 issues in 2005, an extent of condition review identified that the Hot Shutdown TS 3.4.9 requirements should be revised as well. This License Amendment Request is the corrective action for that extent of condition review. The Cold Shutdown TS 3.4.10 changes are being addressed by a separate License Amendment Request, as referenced above.

4.0 TECHNICAL ANALYSIS

The new Note being added to A.3 is modeled after two Notes in the PWR iSTS NUREGs (see Attachment 2 to this Enclosure for a copy of the two example PWR Notes). The PWR Specifications provide the models for this proposed change since the PWR specifications recognize in several places that the requirement to cool down to Cold Shutdown should only apply when one cooling loop remains OPERABLE, and that the cooldown should not be required when all of the required cooling loops are inoperable.

Model for the placement of and the Bases for the PNPP Note

The model for the placement/location of the PNPP Note is a Note in the PWR Specification for the Reactor Coolant System (RCS) Loops in Hot Shutdown (see Attachment 2). That Note is placed directly before the Required Action that requires cooldown into Cold Shutdown. This is where the PNPP Note is placed as well; directly before Required Action A.3.

The Bases for this PWR Note are also consistent with the Bases for the proposed PNPP Note. The PWR Bases for the Reactor Coolant System Loops in Hot Shutdown explain that:

> This Required Action is modified by a Note which indicates that the unit must be placed in MODE 5 [Cold Shutdown] only if a [decay heat removal] 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 the restoration of a DHR loop, rather than a cooldown of extended duration.

Consistent with the above philosophy that actions are to be concentrated on the restoration of a decay heat removal loop, existing Required Action A.1 in the PNPP specifications, which is coupled with A.3, requires operators to initiate action to restore any inoperable RHR shutdown cooling subsystem(s) to OPERABLE status, with a Completion Time of "Immediately." "Immediately" is defined in TS Section 1.3, "Completion Times," as "...the Required Action should be pursued without delay and in a controlled manner." The PNPP Bases for TS 3.4.9 Action A.1 also stress that the inoperable RHR subsystem(s) must be restored without delay.

Model for the specific wording of the PNPP Note

The model for the specific wording used in the new PNPP Note is a different PWR Note found in the Specifications for Auxiliary Feedwater (AFW) in the Combustion Engineering and Westinghouse specifications and Emergency Feedwater (EFW) in the Babcock & Wilcox specifications. This Note in the PWR Specs states:

> LCO 3.0.3 and all other LCO Required Actions requiring MODE changes are suspended until one AFW [EFW] train is restored to OPERABLE status.

This alternative wording, which suspends MODE changes in Specifications throughout the entire TS manual rather than just in the RHR Shutdown Cooling Specification, is appropriate for a BWR. This is because the BWR Residual Heat Removal (RHR) system serves several purposes other than just Shutdown Cooling. The RHR system at PNPP has four (4) modes of operation. The other modes are Containment Spray, Suppression Pool Cooling, and Low Pressure Coolant Injection [Reference 7]. Each of these other three modes of RHR has its own Technical Specification LCO. As a result, if an RHR pump becomes inoperable, that single problem can affect all the various modes of RHR rather than just the Shutdown Cooling mode, and multiple Technical Specifications will be directing that the plant be shut down into MODE 4 once their associated Completion Times are reached.

Therefore, it is not sufficient to attempt to resolve the issue being addressed by this License Amendment Request utilizing a Note that narrowly applies only within this MODE 3 Shutdown Cooling specification. The wording of the Note must be similar to the PWR Note in the Auxiliary [Emergency] Feedwater specifications (see above), so that it applies throughout the Technical Specifications to any Required Action(s) that might require the plant to cool down from MODE 3 to MODE 4. Therefore, the wording of the Note proposed for PNPP Specification 3.4.9 is:

> If no RHR shutdown cooling subsystems are OPERABLE, LCO 3.0.3.c and all other Required Actions requiring MODE changes into MODE 4 are suspended and their Completion Times reset until one RHR shutdown cooling subsystem is restored to OPERABLE status. LCO 3.0.2 is not applicable to suspended actions.

To avoid misapplication of this Note, several new clauses were added, which are explained in more detail in a section below. Despite these new clauses, the intent of the PWR Note is maintained. The Note modifies the Completion Times for the various MODE 4 shutdown requirements to which it applies, similar to how the "Frequency" of a Surveillance Requirement can be modified by a Note located in the "Surveillance" column. Specifically, the new Note modifies the various Completion Times throughout the TS to which it applies by explaining that their MODE change requirements into MODE 4 are suspended until one RHR subsystem is restored to OPERABLE status.

The result of the addition of this Note into Required Action A.3 is that in the unlikely situation when both of the redundant RHR Shutdown Cooling subsystems are simultaneously inoperable and the plant is in MODE 3, the specification will continue to require restoration of RHR without delay, but will not require cooldown into MODE 4 until one shutdown cooling subsystem is restored. Until an RHR subsystem is restored, this Note will allow the plant to continue to utilize the Power Conversion System (the decay heat removal path through the steam lines to the main condenser), which is available in MODE 3 but not in MODE 4. This is an appropriate action when both loops of shutdown cooling are inoperable.

Additional clauses contained in the PNPP Note

The words "If no RHR shutdown cooling subsystems are OPERABLE," were added at the beginning of the PNPP Note to clarify that the MODE change suspension cannot be applied when only one shutdown cooling subsystem is inoperable. These words were added to reduce the potential for misapplication of the Note when only one subsystem is inoperable.

The reference to LCO 3.0.3 was narrowed down to only refer to LCO 3.0.3.c, which is the subsection of 3.0.3 that directs the cooldown into MODE 4, and the words "into MODE 4" were added into the PNPP Note. These were added to clarify that the MODE change suspension cannot be applied to power reduction requirements from MODE 1 down into MODE 2 or MODE 3. Although the PNPP

Note applies broadly across all the MODE 3 Technical Specifications, it does not apply as broadly as the PWR AFW [EFW] Note does since the PWR Note applies in PWR MODES 1, 2, and 3 in addition to PWR MODE 4. The PNPP Note only applies to MODE changes from BWR MODE 3 into MODE 4, since the specification in which the Note is located (3.4.9) is only applicable in BWR MODE 3 below the RHR cut-in permissive pressure. Therefore the proposed PNPP Note is different from the PWR Note in that it will not suspend any MODE changes required by the Technical Specifications from MODE 1 down into MODE 2 or MODE 3.

Another wording change from the PWR Note is the addition of a reset clause for the MODE 4 Completion Times, which states "and their Completion Times reset." The PWR Note is not clear about how Completion Time clocks are addressed at the point in time when an RHR subsystem is restored and the Required Actions are no longer "suspended." Therefore, the proposed Note states that the Completion Time clocks are reset, and this concept is explained in the Bases. The Bases (see Attachment 3 to this Enclosure) are revised to explain that if both RHR subsystems are inoperable when the plant is in MODE 3, and then one subsystem is restored, that the start of each MODE 4 Completion Time is reset to the point in time when the RHR shutdown cooling subsystem is restored to OPERABLE status. The 24-hour time provided is typical of the time provided in many specifications to cool down from MODE 3 into MODE 4 during a plant shutdown. The allowed 24-hour Completion Time is reasonable, based on operating experience, to reach MODE 4 in an orderly manner without challenging plant systems. Without this clock reset, the amount of time remaining in the Completion Time after the "suspension" is over might not be sufficient to allow an appropriate cooldown rate for the reactor coolant pressure boundary. In some Specifications, the reset will result in a 36 hour Completion Time being started, but the 24-hour Completion Time in TS 3.4.9 Required Action A.3 will remain the limiting, controlling time.

Finally, the PWR Note which allows suspension of Required Actions throughout the Technical Specifications constitutes an exception to the requirements of LCO 3.0.2, which states:

> LCO 3.0.2 Upon discovery of a failure to meet an LCO, the Required Actions of the associated Conditions shall be met, except as provided in LCO 3.0.5 and LCO 3.0.6.

Therefore, in order to literally comply with all Technical Specification requirements when utilizing this Note, LCO 3.0.2 needs to be revised as well, to acknowledge that individual specifications can contain exceptions to its requirements. Therefore, a change to LCO 3.0.2 is provided as part of this license amendment request. Also, a clause is added at the end of the new Note in TS 3.4.9 to state "LCO 3.0.2 is not applicable to suspended actions."

Qualitative examination of the proposed change

When examined qualitatively, the proposed change is a risk-neutral change. Qualitative and quantitative studies have been performed for a separate "risk-informed" Technical Specification change entitled TSTF-423, Revision 0, "Technical Specifications End States." Some of the qualitative conclusions from those studies can be applied to this License Amendment Request, even though the RHR Shutdown Cooling Technical Specifications were not within the scope of the End States TSTF. The TSTF focused on TS-required plant shutdowns starting from "at power" conditions (from MODE 1). This can be seen in Appendix C "Summary of BWR-4 and 6 End State Assessment" to Topical Report NEDC-32988 [Reference 8], in Table C-1, which does not address the two RHR Shutdown Cooling Specifications within the scope of the Topical Report. In mid-2004 when the difficulty with the TS 3.4.9 required shutdown into MODE 4 was identified at PNPP, it was not possible to include this MODE 3 RHR Specification within the scope of the TSTF, since the NRC Safety Evaluation (SE) for the supporting Topical Report NEDC-32988 had been completed in September of 2002.

Despite this, as noted in the NRC SE for TSTF-423, the supporting studies did include qualitative, defense-in-depth considerations of remaining in MODE 3 rather than requiring a shutdown into MODE 4. Those conclusions are applicable to this proposed change. The qualitative considerations in the NRC SE concluded that remaining in MODE 3 rather than proceeding to MODE 4 maintains the availability of more decay heat removal options, such as the main condenser, and that, "in general, plant operation in MODE 3 (hot shutdown) offers at least the same robustness to plant upsets as operation in MODE 4 (cold shutdown)." [Reference 9]

5.0 REGULATORY SAFETY ANALYSIS

5.1 Applicable Regulatory Requirements/Criteria

The precedent for this amendment is the PWR Notes discussed above. There are no other precedents for this proposed amendment, since as described above, previous industry wide discussions on this issue have not resulted in changes to the BWR RHR MODE 3 Technical Specifications.

5.2 Significant Hazards Consideration

The proposed change is primarily associated with the "Residual Heat Removal (RHR) Shutdown Cooling System - Hot Shutdown" Specification (LCO 3.4.9). The addition of a new Note into Specification 3.4.9 modifies the Required Action A.3 cooldown requirement so a cooldown from MODE 3 Hot Shutdown into MODE 4 Cold Shutdown is only required if one of the RHR subsystems is OPERABLE. The new Note is modeled after Notes in the Pressurized Water Reactor (PWR) improved Standard Technical Specification (iSTS) NUREGs that properly address this issue. A corollary change is also made to LCO 3.0.2 to clarify that the Note being added to LCO 3.4.9 is acceptable. An evaluation of whether or not a significant hazards consideration is involved with the proposed amendment was performed, by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

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

   Response: No. The proposed amendment does not change the design of any structures, systems or components (SSCs), and does not affect the manner in which plant systems are operated. It is a change to the Technical Specifications only, to provide guidance to plant operators on appropriate actions to take, when both RHR shutdown cooling subsystems are inoperable. Since the design of plant SSCs is not changed and plant systems and components are not operated in a different manner, there is no change to previously identified accident initiators, and the proposed amendment would not impact the probability of any of the previously evaluated accidents in the Updated Safety Analysis Report (USAR).

   The USAR event that evaluates the consequences of a loss of RHR Shutdown Cooling is included in Section 15.2.9 entitled "Failure of RHR Shutdown Cooling." This event examines the consequences of a loss of not only an RHR shutdown cooling subsystem, but also the loss of the suction source from the recirculation system leading to both RHR Shutdown Cooling subsystems, and a loss of offsite power. Even with these multiple failures, this event is not one of the limiting

transients. As noted in Section 15.2.9.5, "Radiological Consequences," there are no fuel failures, and the consequences of the event are much less than those for the "Main Steam Isolation Valve Closure" transient, which is evaluated with acceptable results in USAR Section 15.2.4.5. Since the proposed amendment only involves the addition of a Required Action where no guidance currently exists, and the design of plant SSCs is not changed and plant systems and components are not operated in a different manner, the proposed amendment does not affect the consequences of the Section 15.2.9 analysis, nor does it affect the ability of the installed RHR subsystems to perform their shutdown cooling function.

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

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

   Response: No. This change to the required Technical Specification actions does not involve a change in the design function or operation of plant SSCs. It does not introduce credible new failure mechanisms, malfunctions, or accident initiators not considered in the existing plant design and licensing basis.

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

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

   Response: No. This proposed amendment only involves a change to the required Technical Specification actions. It does not involve a change in the evaluation and analysis methods used to demonstrate compliance with regulatory and licensing requirements, and does not exceed or alter a design basis or safety limit. The safety margin before the change remains unchanged after the proposed amendment.

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

Based on the above, it was concluded that the proposed amendment does not present a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

In conclusion, based on the considerations discussed in 5.1 and 5.2 above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

6.0 ENVIRONMENTAL CONSIDERATION

The proposed Technical Specification change was evaluated against the criteria of 10CFR51.22 for environmental considerations. The proposed change does not significantly increase individual or cumulative occupational radiation exposures, does not significantly change the types or significantly increase the amounts of effluents that may be released off-site and, as discussed above, does not involve a significant hazards consideration. Based on the foregoing, it has been concluded that the proposed change meets the criteria given in 10CFR51.22(c)(9) for categorical exclusion from the requirement for an Environmental Impact Statement.

7.0 REFERENCES

1. NUREG-1430, "Standard Technical Specifications Babcock and Wilcox Plants"
2. NUREG-1431, "Standard Technical Specifications Westinghouse Plants"
3. NUREG-1432, "Standard Technical Specifications Combustion Engineering Plants"
4. Original issue of the PNPP Technical Specifications, as part of the low power license, dated 3/18/1986, Specification 3.4.9.1, "Reactor Coolant System Residual Heat Removal – Hot Shutdown"
5. NRC Inspection Report 05000440/2005002 dated 5/5/2005, "Perry Nuclear Power Plant NRC Integrated Inspection Report," Violation 2005002-12
6. Letter dated 6/1/2006 (PY-CEI/NRR-2963L), "Perry Nuclear Power Plant License Amendment Request - Revise MODE 4 Residual Heat Removal Shutdown Cooling Requirements to Add a Default Condition Addressing Situations When Condition A Cannot Be Met Within Its Completion Time"
7. Updated Safety Analysis Report (USAR) Section 5.4.7 "Residual Heat Removal System"
8. NEDC-32988-A, "Technical Justification to Support Risk-Informed Modification to Selected Required Action End States for BWR Plants," Revision 2, December 2002
9. NRC letter dated 9/27/2002, "Safety Evaluation of Topical Report NEDC-32988, Rev. 2, Technical Justification To Support Risk-Informed Modification To Selected Required Action End States For BWR Plants (TAC NO. MB1054)"

Proposed Changes to the PNPP Technical Specification Pages (Mark-up)

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.9 Residual Heat Removal (RHR) Shutdown Cooling System-Hot Shutdown

LCO 3.4.9 Two RHR shutdown cooling subsystems shall be OPERABLE, and, with no recirculation pump in operation, at least one RHR shutdown cooling subsystem shall be in operation.

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

1. Both RHR shutdown cooling subsystems and recirculation pumps may be removed from operation for up to 2 hours per 8 hour period.

2. One RHR shutdown cooling subsystem may be inoperable for up to 2 hours for performance of Surveillances.

APPLICABILITY: MODE 3 with reactor steam dome pressure less than the RHR cut in permissive pressure.

ACTIONS

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

Separate Condition entry is allowed for each RHR shutdown cooling subsystem.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or two RHR shutdown cooling subsystems inoperable.	A.1 Initiate action to restore RHR shutdown cooling subsystem(s) to OPERABLE status. AND	Immediately (continued)

No Changes to this page. Provided for continuity of Condition A.

ACTIONS

CONDITION	REQUIRED ACTION		COMPLETION TIME
A. (continued)	A.2	Verify an alternate method of decay heat removal is available for each inoperable RHR shutdown cooling subsystem.	1 hour
	AND		
	A.3	Be in MODE 4.	24 hours
B. No RHR shutdown cooling subsystem in operation. AND No recirculation pump in operation.	B.1	Initiate action to restore one RHR shutdown cooling subsystem or one recirculation pump to operation.	Immediately
	AND		
	B.2	Verify reactor coolant circulation by an alternate method.	1 hour from discovery of no reactor coolant circulation AND Once per 12 hours thereafter
	AND		
	B.3	Monitor reactor coolant temperature and pressure.	Once per hour

-------NOTE----------
If no RHR shutdown cooling subsystems are OPERABLE, LCO 3.0.3.c and all other Required Actions requiring MODE changes into MODE 4 are suspended and their Completion Times reset until one RHR shutdown cooling subsystem is restored to OPERABLE status. LCO 3.0.2 is not applicable to suspended actions.

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.9.1	----------NOTE---------- Not required to be met until 2 hours after reactor steam dome pressure is less than the RHR cut in permissive pressure. ---------- Verify one RHR shutdown cooling subsystem or recirculation pump is operating.	12 hours

No changes to this page.
Provided for continuity.

3.0 LIMITING CONDITION FOR OPERATION (LCO) APPLICABILITY

LCO 3.0.1

LCOs shall be met during the MODES or other specified conditions in the Applicability, except as provided in LCO 3.0.2 and LCO 3.0.7.

LCO 3.0.2

Upon discovery of a failure to meet an LCO, the Required Actions of the associated Conditions shall be met, except as provided in LCO 3.0.5 and LCO 3.0.6, or as stated in individual Specifications.

If the LCO is met or is no longer applicable prior to expiration of the specified Completion Time(s), completion of the Required Action(s) is not required, unless otherwise stated.

LCO 3.0.3

When an LCO is not met and the associated ACTIONS are not met, an associated ACTION is not provided, or if directed by the associated ACTIONS, the unit shall be placed in a MODE or other specified condition in which the LCO is not applicable. Action shall be initiated within 1 hour to place the unit, as applicable, in:

a. MODE 2 within 7 hours;

b. MODE 3 within 13 hours; and

c. MODE 4 within 37 hours.

Exceptions to this Specification are stated in the individual Specifications.

Where corrective measures are completed that permit operation in accordance with the LCO or ACTIONS, completion of the actions required by LCO 3.0.3 is not required.

LCO 3.0.3 is only applicable in MODES 1, 2, and 3.

LCO 3.0.4

When an LCO is not met, entry into a MODE or other specified condition in the Applicability shall only be made:

a. When the associated ACTIONS to be entered permit continued operation in the MODE or other specified condition in the Applicability for an unlimited period of time;

(continued)

Pressurized Water Reactor (PWR) Technical Specification Notes That Serve As Models for the Proposed Change

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 loop shall be in operation.

---NOTE---

All reactor coolant pumps (RCPs) may be removed from operation for ≤ 8 hours per 24 hour period for the transition to or from the DHR System, and all RCPs and DHR pumps may be de-energized for ≤ 1 hour per 8 hour period for any other reason, provided:

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

b. Core outlet temperature is maintained at least 10°F below saturation temperature.

The BWR Applicability for the RHR-Hot Shutdown Specification is "MODE 3 with reactor steam dome pressure less than the RHR cut in permissive pressure," which is equivalent to PWR MODE 4, so this PWR specification is essentially equivalent to PNPP LCO 3.4.9.

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.	Immediately
	AND	
	A.2 ---NOTE--- Only required if one DHR loop is OPERABLE. ---	
	Be in MODE 5. ← PWR cold shutdown	24 hours

This page is provided to show the proper placement / location of a NOTE that modifies the cooldown to Cold Shutdown requirement so it is only required if one decay heat removal loop is OPERABLE. If both loops are inoperable, plant operator actions should be focused on restoring one loop to OPERABLE status.

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. Two required loops inoperable. OR Required loop not in operation.	B.1 Suspend operations that would cause introduction of coolant into the RCS with boron concentration less than required to meet SDM of LCO 3.1.1. AND B.2 Initiate action to restore one loop to OPERABLE status and operation.	Immediately Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.6.1	Verify required DHR or RCS loop is in operation.	12 hours
SR 3.4.6.2	----------NOTE---------- Not required to be performed until 24 hours after a required pump is not in operation. ---------- Verify correct breaker alignment and indicated power available to each required pump.	 7 days

Provided for continuity

BASES

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 immediate Completion Time reflects the importance of maintaining the availability of two paths for heat removal.

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 24 hours is reasonable, based on operating experience, to reach MODE 5 in an orderly manner and without challenging plant systems.

Bases → for the PWR NOTE in Required Action A.2

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 the restoration of a DHR loop, rather than a cooldown of extended duration.

B.1 and B.2

If two required RCS or DHR loops are inoperable or a required loop is not in operation, except during conditions permitted by the Note in the LCO section, 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, with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 is required to ensure continued safe operation. With coolant added without forced circulation, unmixed coolant could be introduced to the core, however, coolant added with boron concentration meeting the minimum SDM maintains acceptable margin to subcritical operations. The immediate Completion Times reflect the importance of maintaining operation for decay heat removal. The action to restore must continue until one loop is restored to operation.

3.7 PLANT SYSTEMS

3.7.5 Auxiliary Feedwater (AFW) System

Provided for continuity

LCO 3.7.5 [Three] AFW trains shall be OPERABLE.

---NOTE---
Only one AFW train, which includes a motor driven pump, is required to be OPERABLE in MODE 4.

APPLICABILITY: MODES 1, 2, and 3,
[MODE 4 when steam generator is relied upon for heat removal].

ACTIONS

---NOTE---
LCO 3.0.4.b is not applicable.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. [One steam supply to turbine driven AFW pump inoperable. OR ----------NOTE---------- Only applicable if MODE 2 has not been entered following refueling. ---------- One turbine driven AFW pump inoperable in MODE 3 following refueling.	A.1 Restore affected equipment to OPERABLE status.	7 days]

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
B. One AFW train inoperable [for reasons other than Condition A] in MODE 1, 2, or 3.	B.1 Restore AFW train to OPERABLE status.	72 hours
C. Required Action and associated Completion Time of Condition A [or B] not met. [OR [Two] AFW trains inoperable in MODE 1, 2, or 3.]	C.1 Be in MODE 3. AND C.2 Be in MODE 4.	6 hours [18] hours
D. [[Three] AFW trains inoperable in MODE 1, 2, or 3.	D.1 ----------NOTE---------- LCO 3.0.3 and all other LCO Required Actions requiring MODE changes are suspended until one AFW train is restored to OPERABLE status. ---------- Initiate action to restore one AFW train to OPERABLE status.	 Immediately]

Provided to show the wording of the Note which serves as the model for the proposed new Note in the PNPP Spec 3.4.9

Also see the next page →

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
E. Required AFW train inoperable in MODE 4.	E.1 ----------NOTE---------- LCO 3.0.3 and all other LCO Required Actions requiring MODE changes are suspended until one AFW train is restored to OPERABLE status. ---------- Model Note	
	Initiate action to restore one AFW train to OPERABLE status.	Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.7.5.1	Verify each AFW manual, power operated, and automatic valve in each water flow path and in both steam supply flow paths to the steam turbine driven pump, that is not locked, sealed, or otherwise secured in position, is in the correct position.	31 days
SR 3.7.5.2	----------NOTE---------- Not required to be performed for the turbine driven AFW pump until [24] hours after reaching [800] psig in the steam generators. ----------	
	Verify the developed head of each AFW pump at the flow test point is greater than or equal to the required developed head.	In accordance with the Inservice Testing Program

BASES

ACTIONS (continued)

Bases for the PWR Notes

D.1

Required Action D.1 is modified by a Note indicating that all required MODE changes or power reductions are suspended until one AFW train is restored to OPERABLE status.

With all [three] AFW trains inoperable in MODES 1, 2, and 3, the unit is in a seriously degraded condition with no safety related means for conducting a cooldown, and only limited means for conducting a cooldown with nonsafety grade equipment. In such a condition, the unit should not be perturbed by any action, including a power change, that might result in a trip. The seriousness of this condition requires that action be started immediately to restore one AFW train to OPERABLE status. LCO 3.0.3 is not applicable, as it could force the unit into a less safe condition.

E.1

Required Action E.1 is modified by a Note indicating that all required MODE changes or power reductions are suspended until one AFW train is restored to OPERABLE status.

With one AFW train inoperable, action must be taken to immediately restore the inoperable train to OPERABLE status or to immediately verify, by administrative means, the OPERABILITY of a second train. LCO 3.0.3 is not applicable, as it could force the unit into a less safe condition.

In MODE 4, either the reactor coolant pumps or the SDC loops can be used to provide forced circulation as discussed in LCO 3.4.6, "RCS Loops - MODE 4."

SURVEILLANCE REQUIREMENTS

SR 3.7.5.1

Verifying the correct alignment for manual, power operated, and automatic valves in the AFW water and steam supply flow paths provides assurance that the proper flow paths exist for AFW operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these valves are verified to be in the correct position prior to locking, sealing, or securing. This SR also does not apply to valves that cannot be inadvertently misaligned, such as check valves. This Surveillance does not require any testing or valve manipulations; rather, it involves verification that those valves capable of potentially being mispositioned are in the correct position.

Associated Bases Changes (provided for information)

BASES

LCO 3.0.2 (continued)

remedial measures that permit continued operation of the unit that is not further restricted by the Completion Time. In this case, compliance with the Required Actions provides an acceptable level of safety for continued operation.

Completing the Required Actions is not required when an LCO is met or is no longer applicable, unless otherwise stated in the individual Specifications.

The nature of some Required Actions of some Conditions necessitates that, once the Condition is entered, the Required Actions must be completed even though the associated Condition no longer exists. The individual LCO's ACTIONS specify the Required Actions where this is the case. An example of this is in LCO 3.4.11, "RCS Pressure and Temperature (P/T) Limits."

The Completion Times of the Required Actions are also applicable when a system or component is removed from service intentionally. The reasons for intentionally relying on the ACTIONS include, but are not limited to, performance of Surveillances, preventive maintenance, corrective maintenance, or investigation of operational problems. Entering ACTIONS for these reasons must be done in a manner that does not compromise safety. Intentional entry into ACTIONS should not be made for operational convenience. Alternatives that would not result in redundant equipment being inoperable should be used instead. Doing so limits the time both subsystems/divisions of a safety function are inoperable and limits the time other conditions exist which result in LCO 3.0.3 being entered. Individual Specifications may specify a time limit for performing an SR when equipment is removed from service or bypassed for testing. In this case, the Completion Times of the Required Actions are applicable when this time limit expires, if the equipment remains removed from service or bypassed.

Exceptions to LCO 3.0.2 are provided in LCO 3.0.5 and LCO 3.0.6, or as stated in individual Specifications. An example of an exception in an individual Specification is the Note in Specification 3.4.9, "Residual Heat Removal (RHR) Shutdown Cooling System-Hot Shutdown" that suspends all MODE 4 Required Actions throughout the Technical Specifications, until one RHR shutdown cooling subsystem is restored to OPERABLE status.

When a change in MODE or other specified condition is required to comply with Required Actions, the unit may enter a MODE or other specified condition in which another Specification becomes applicable. In this case, the Completion Times of the associated Required Actions would apply from the point in time that the new Specification becomes applicable and the ACTIONS Condition(s) are entered

(continued)

BASES

LCO 3.0.3 (continued)

A unit shutdown required in accordance with LCO 3.0.3 may be terminated and LCO 3.0.3 exited if any of the following occurs:

a. The LCO is now met.

b. A Condition exists for which the Required Actions have now been performed.

c. ACTIONS exist that do not have expired Completion Times. These Completion Times are applicable from the point in time that the Condition is initially entered and not from the time LCO 3.0.3 is exited.

The time limits of Specification 3.0.3 allow 37 hours for the unit to be in MODE 4 when a shutdown is required during MODE 1 operation. If the unit is in a lower MODE of operation when a shutdown is required, the time limit for reaching the next lower MODE applies. If a lower MODE is reached in less time than allowed, however, the total allowable time to reach MODE 4, or other applicable MODE, is not reduced. For example, if MODE 2 is reached in 2 hours, then the time allowed for reaching MODE 3 is the next 11 hours, because the total time for reaching MODE 3 is not reduced from the allowable limit of 13 hours. Therefore, if remedial measures are completed that would permit a return to MODE 1, a penalty is not incurred by having to reach a lower MODE of operation in less than the total time allowed.

In MODES 1, 2, and 3, LCO 3.0.3 provides actions for Conditions not covered in other Specifications. The requirements of LCO 3.0.3 do not apply in MODES 4 and 5 because the unit is already in the most restrictive Condition required by LCO 3.0.3. The requirements of LCO 3.0.3 do not apply in other specified conditions of the Applicability (unless in MODE 1, 2, or 3) because the ACTIONS of individual Specifications sufficiently define the remedial measures to be taken.

No changes to this page. Provided for context.

Exceptions to LCO 3.0.3 are provided in instances where requiring a unit shutdown, in accordance with LCO 3.0.3, would not provide appropriate remedial measures for the associated condition of the unit. An example of this is in LCO 3.7.7, "Fuel Pool Water Level." LCO 3.7.7 has an Applicability of "During movement of irradiated fuel

(continued)

BASES

LCO 3.0.3 (continued)

assemblies in the associated fuel storage pool." Therefore, this LCO can be applicable in any or all MODES. If the LCO and the Required Actions of LCO 3.7.7 are not met while in MODE 1, 2, or 3, there is no safety benefit to be gained by placing the unit in a shutdown condition. The Required Action of LCO 3.7.7 of "Suspend movement of irradiated fuel assemblies in the associated fuel storage pool(s)" is the appropriate Required Action to complete in lieu of the actions of LCO 3.0.3. These exceptions are addressed in the individual Specifications.

LCO 3.0.4

Another exception to the requirements of LCO 3.0.3 is provided in instances where both of the Residual Heat Removal (RHR) shutdown cooling subsystems are inoperable. A Note in Specification 3.4.9 suspends all MODE 4 requirements throughout the Technical Specifications, including the one in LCO 3.0.3.c, until one RHR shutdown cooling subsystem is restored to OPERABLE status.

LCO 3.0.4 establishes limitations on changes in MODES or other specified conditions in the Applicability when an LCO is not met. It allows placing the unit in a MODE or other specified condition stated in that Applicability (e.g., the Applicability desired to be entered) when unit conditions are such that the requirements of the LCO would not be met, in accordance with LCO 3.0.4.a, LCO 3.0.4.b, or LCO 3.0.4.c.

LCO 3.0.4.a allows entry into a MODE or other specified condition in the Applicability with the LCO not met when the associated ACTIONS to be entered permit continued operation in the MODE or other specified condition in the Applicability for an unlimited period of time. Compliance with Required Actions that permit continued operation of the unit for an unlimited period of time in a MODE or other specified condition provides an acceptable level of safety for continued operation. This is without regard to the status of the unit before or after the MODE change. Therefore, in such cases, entry into a MODE or other specified condition in the Applicability may be made in accordance with the provisions of the Required Actions.

LCO 3.0.4.b allows entry into a MODE or other specified condition in the Applicability with the LCO not met after performance of a risk assessment addressing inoperable systems and components, consideration of the results, determination of the acceptability of entering the MODE or other specified condition in the Applicability, and establishment of risk management actions, if appropriate.

(continued)

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.9 Residual Heat Removal (RHR) Shutdown Cooling System-Hot Shutdown

BASES

BACKGROUND

No changes to this page.

Irradiated fuel in the shutdown reactor core generates heat during the decay of fission products and increases the temperature of the reactor coolant. This decay heat removal is in preparation for performing maintenance operations, or for keeping the reactor in the Hot Shutdown condition.

System description

The two redundant, manually controlled shutdown cooling subsystems of the RHR System provide decay heat removal. Each loop consists of a motor driven pump, two heat exchangers in series, and associated piping and valves. Both loops have a common suction from the same recirculation loop. Each pump discharges the reactor coolant, after it has been cooled by circulation through the respective heat exchangers, to the reactor via separate feedwater lines or to the reactor via the LPCI injection path. The RHR heat exchangers transfer heat to the Emergency Service Water System (LCO 3.7.1, "Emergency Service Water (ESW) System-Divisions 1 and 2").

APPLICABLE SAFETY ANALYSES

Decay heat removal by the RHR System in the shutdown cooling mode is not required for mitigation of any event or accident evaluated in the safety analyses. Decay heat removal is, however, an important safety function that must be accomplished or core damage could result. Although the RHR Shutdown Cooling System does not meet a specific criterion of the NRC Policy Statement, it was identified in the NRC Policy Statement as a significant contributor to risk reduction. Therefore, the RHR Shutdown Cooling System is retained as a Technical Specification.

LCO

Two RHR shutdown cooling subsystems are required to be OPERABLE, and, when no recirculation pump is in operation, one shutdown cooling subsystem must be in operation. An RHR shutdown cooling subsystem is OPERABLE when the RHR pump, two heat exchangers in series, associated piping, valves, and instrumentation and controls are OPERABLE. Additionally, each RHR shutdown cooling subsystem is considered OPERABLE if it can be manually aligned (remote

(continued)

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BASES

LCO (continued)

or local) in the shutdown cooling mode for removal of decay heat. In MODE 3, one RHR shutdown cooling subsystem can provide the required cooling, but two subsystems are required to be OPERABLE to provide redundancy. Operation (either continuous or intermittent) of one subsystem can maintain or reduce the reactor coolant temperature as required. However, to ensure adequate core flow to allow for accurate average reactor coolant temperature monitoring, nearly continuous operation is required.

Note 1 permits both RHR shutdown cooling subsystems and recirculation pumps to be shut down for a period of 2 hours in an 8 hour period. Note 2 allows one RHR shutdown cooling subsystem to be inoperable for up to 2 hours for performance of surveillance tests. These tests may be on the affected RHR System or on some other plant system or component that necessitates placing the RHR System in an inoperable status during the performance. This is permitted because the core heat generation can be low enough and the heatup rate slow enough to allow some changes to the RHR subsystems or other operations requiring RHR flow interruption and loss of redundancy.

APPLICABILITY

No changes to this page; provided for context.

In MODES 1 and 2, and in MODE 3 with reactor steam dome pressure greater than or equal to the RHR cut in permissive pressure, this LCO is not applicable. Operation of the RHR System in the shutdown cooling mode is not allowed above this pressure because the RCS pressure may exceed the design pressure of the shutdown cooling piping. Decay heat removal at reactor pressures greater than or equal to the RHR cut in permissive pressure is typically accomplished by condensing the steam in the main condenser. Additionally, in MODE 2 below this pressure, the OPERABILITY requirements for the Emergency Core Cooling Systems (ECCS) (LCO 3.5.1, "ECCS-Operating") do not allow placing the RHR shutdown cooling subsystem into operation.

In MODE 3 with reactor steam dome pressure below the RHR cut in permissive pressure (i.e., the actual pressure at which the interlock resets) the RHR System may be operated in the shutdown cooling mode to remove decay heat to reduce or maintain coolant temperature. Otherwise, a recirculation pump is required to be in operation.

(continued)

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BASES

APPLICABILITY (continued)

The requirements for decay heat removal in MODES 4 and 5 are discussed in LCO 3.4.10, "Residual Heat Removal (RHR) Shutdown Cooling System-Cold Shutdown"; LCO 3.9.8, "Residual Heat Removal (RHR)-High Water Level"; and LCO 3.9.9, "Residual Heat Removal (RHR) -Low Water Level."

ACTIONS

A Note has been provided to modify the ACTIONS related to RHR shutdown cooling subsystems. Section 1.3, Completion Times, specifies once a Condition has been entered, subsequent divisions, subsystems, components or variables expressed in the Condition, discovered to be inoperable or not within limits, will not result in separate entry into the Condition. Section 1.3 also specifies Required Actions of the Condition continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable shutdown cooling subsystems provide appropriate compensatory measures for separate inoperable shutdown cooling subsystems. As such, a Note has been provided that allows separate Condition entry for each inoperable RHR shutdown cooling subsystem.

Provided to show the Bases for Condition A.

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

With one required RHR shutdown cooling subsystem inoperable for decay heat removal, except as permitted by LCO Note 2, the inoperable subsystem must be restored to OPERABLE status without delay. In this condition, the remaining OPERABLE subsystem can provide the necessary decay heat removal. The overall reliability is reduced, however, because a single failure in the OPERABLE subsystem could result in reduced RHR shutdown cooling capability. Therefore, an alternate method of decay heat removal must be provided.

(continued)

BASES

ACTIONS

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

With both RHR shutdown cooling subsystems inoperable, an alternate method of decay heat removal must be provided in addition to that provided for the initial RHR shutdown cooling subsystem inoperability. This re-establishes backup decay heat removal capabilities, similar to the requirements of the LCO. The 1 hour Completion Time is based on the decay heat removal function and the probability of a loss of the available decay heat removal capabilities.

The required cooling capacity of the alternate method should be ensured by verifying (by calculation or demonstration) its capability to maintain or reduce temperature. Decay heat removal by ambient losses can be considered as contributing to the alternate method capability. Alternate methods that can be used include (but are not limited to) the Reactor Water Cleanup System; pathway(s) to the main condenser in combination with method(s) capable of returning water to the reactor pressure vessel (RPV); or use of Automatic Depressurization System (ADS) Safety/Relief Valve(s) (SRV) to the suppression pool, in combination with method(s) capable of returning water to the RPV and method(s) capable of removing the heat from the containment.

Per Required Action A.3, the plant is also required to enter Mode 4. This action is required because the alternate methods of decay heat removal may not be as reliable as the RHR shutdown cooling subsystems.

However, Required Action A.3 is modified by a Note, such that the unit must be placed in MODE 4 only if an RHR shutdown cooling subsystem is OPERABLE. When no shutdown cooling subsystems are OPERABLE, the unit is in a condition with only limited cooldown capabilities. Therefore, actions are to be concentrated on restoration of an RHR shutdown cooling subsystem rather than a cooldown of extended duration. If both subsystems are inoperable, to permit the focus to be on restoration of RHR, the Note provides an exception to LCO 3.0.2 by suspending Required Actions anywhere in the Technical Specifications that require a MODE change into MODE 4, such as in the Suppression Pool Cooling or Emergency Service Water specifications, until one shutdown cooling subsystem is restored to OPERABLE status. The Note also modifies Completion Times by resetting the start of each MODE 4 Completion Time to the point in time when one RHR shutdown cooling subsystem is restored to OPERABLE status. The allowed Completion Time is reasonable, based on operating experience, to reach MODE 4 in an orderly manner without challenging plant systems.

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

With no RHR shutdown cooling subsystem and no recirculation pump in operation, except as is permitted by LCO Note 1, reactor coolant circulation by the RHR shutdown cooling subsystem or one recirculation pump must be restored without delay.

Until RHR or recirculation pump operation is re-established, an alternate method of reactor coolant circulation must be placed into service. This will provide the necessary circulation for monitoring coolant temperature. The 1 hour Completion Time is based on the reactor coolant circulation function and is modified such that the 1 hour is applicable separately for each occurrence involving a loss of coolant circulation. Furthermore, verification of the functioning of the alternate method must be reconfirmed every 12 hours thereafter. This will provide assurance of continued temperature monitoring capability.

(continued)

BASES

ACTIONS

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

During the period when the reactor coolant is being circulated by an alternate method (other than by the required RHR shutdown cooling subsystem or recirculation pump), the reactor coolant temperature and pressure must be periodically monitored to ensure the proper functioning of the alternate method. The once per hour Completion Time is deemed appropriate.

SURVEILLANCE REQUIREMENTS

SR 3.4.9.1

This Surveillance verifies that one RHR shutdown cooling subsystem or recirculation pump is in operation and circulating reactor coolant. The required flow rate is determined by the flow rate necessary to provide sufficient decay heat removal capability. The Frequency of 12 hours is sufficient in view of other visual and audible indications available to the operator for monitoring the RHR shutdown cooling subsystem in the control room.

This Surveillance is modified by a Note allowing sufficient time to align the RHR System for shutdown cooling operation after clearing the pressure interlock that isolates the system, or for placing a recirculation pump in operation.

REFERENCES

None.

No changes. Provided for continuity

BASES

ACTIONS (continued)

C.1

With two ECCS injection subsystems inoperable or one ECCS injection and one ECCS spray subsystem inoperable, at least one ECCS injection/spray subsystem must be restored to OPERABLE status within 72 hours. In this Condition, the remaining OPERABLE subsystems provide adequate core cooling during a LOCA. However, overall ECCS reliability is reduced in this Condition because a single failure in one of the remaining OPERABLE subsystems concurrent with a design basis LOCA may result in the ECCS not being able to perform its intended safety function. Since the ECCS availability is reduced relative to Condition A, a more restrictive Completion Time is imposed. The 72 hour Completion Time is based on a reliability study, as provided in Reference 12.

if at least one RHR shutdown cooling subsystem remains OPERABLE,

D.1 and D.2

If any Required Action and associated Completion Time of Condition A, B, or C are not met, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

If the inoperability of the ECCS also affects the RHR Shutdown Cooling function, such that both RHR shutdown cooling subsystems are inoperable, a NOTE in LCO 3.4.9 suspends all MODE 4 requirements in any Specifications until one RHR shutdown cooling subsystem is restored to OPERABLE status.

E.1

The LCO requires eight ADS valves to be OPERABLE to provide the ADS function. Reference 11 contains the results of an analysis that evaluated the effect of one ADS valve being out of service. Per this analysis, operation of only seven ADS valves will provide the required depressurization. However, overall reliability of the ADS is reduced because a single failure in the OPERABLE ADS valves could result in a reduction in depressurization capability. Therefore, operation is only allowed for a limited time. The 14 day Completion Time is based on a reliability study (Ref. 12) and has been found to be acceptable through operating experience.

(continued)

BASES

ACTIONS (continued)

B.1

With two RHR containment spray subsystems inoperable, one subsystem must be restored to OPERABLE status within 8 hours. In this Condition, there is a substantial loss of the primary containment bypass leakage mitigation function. The 8 hour Completion Time is based on this loss of function and is considered acceptable due to the low probability of a DBA and because alternative methods to remove heat from primary containment are available.

C.1 and C.2

If the inoperable RHR containment spray subsystem cannot be restored to OPERABLE status within the required Completion Time, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and, if at least one RHR shutdown cooling subsystem remains OPERABLE, to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.6.1.7.1

Verifying the correct alignment for manual, power operated, and automatic valves in the RHR containment spray mode flow path provides assurance that the proper flow paths will exist for system operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these were verified to be in the correct position prior to locking, sealing, or securing. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves.

The 31 day Frequency of this SR is justified because the valves are operated under procedural control and because improper valve position would affect only a single subsystem. This Frequency has been shown to be acceptable based on operating experience.

If the inoperability of RHR containment spray also affects the Shutdown Cooling function, such that both RHR shutdown cooling subsystems are also inoperable, a NOTE in LCO 3.4.9 suspends all MODE 4 requirements in any Specifications until one RHR shutdown cooling subsystem is restored to OPERABLE status.

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BASES

ACTIONS (continued)

B.1 and B.2

if at least one RHR shutdown cooling subsystem remains OPERABLE,

If the Required Action and associated Completion Time of Condition A cannot be met or if two RHR suppression pool cooling subsystems are inoperable, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 12 hours and to MODE 4 within 36 hours. The allowed Completion Times are reasonable, based on operating experience, to reach the required plant conditions from full power conditions in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

SR 3.6.2.3.1

If the inoperability of RHR suppression pool cooling also affects the Shutdown Cooling function, such that both RHR shutdown cooling subsystems are also inoperable, a NOTE in LCO 3.4.9 suspends all MODE 4 requirements in any Specifications until one RHR shutdown cooling subsystem is restored to OPERABLE status.

Verifying the correct alignment for manual, power operated, and automatic valves, in the RHR suppression pool cooling mode flow path provides assurance that the proper flow path exists for system operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position since these valves were verified to be in the correct position prior to being locked, sealed, or secured. A valve that receives an initiation signal is allowed to be in the nonaccident position, provided the valve will automatically reposition in the proper stroke time. This is acceptable, since the RHR suppression pool cooling mode is manually initiated. This SR does not require any testing or valve manipulation; rather, it involves verification that those valves capable of being mispositioned are in the correct position. This SR does not apply to valves that cannot be inadvertently misaligned, such as check valves.

The Frequency of 31 days is justified because the valves are operated under procedural control, improper valve position would affect only a single subsystem, the probability of an event requiring initiation of the system is low, and the subsystem is a manually initiated system. This Frequency has been shown to be acceptable, based on operating experience.

(continued)

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BASES

ACTIONS

A.1 (continued)

The 72 hour Completion Time was developed taking into account the redundant capabilities afforded by the OPERABLE subsystem and the low probability of a DBA occurring during this period.

The Required Action is modified by two Notes indicating that the applicable Conditions of LCO 3.8.1, "AC Sources-Operating," and LCO 3.4.9, "Residual Heat Removal (RHR) Shutdown Cooling System-Hot Shutdown," be entered and the Required Actions taken if the inoperable ESW subsystem results in an inoperable DG or RHR shutdown cooling subsystem, respectively. This is in accordance with LCO 3.0.6 and ensures the proper actions are taken for these components.

if at least one RHR shutdown cooling subsystem remains OPERABLE,

B.1 and B.2

If the Division 1 or Division 2 ESW subsystem cannot be restored to OPERABLE status within the associated Completion Time of Condition A, or both Division 1 and Division 2 ESW subsystems are inoperable, the unit must be placed in a MODE in which the LCO does not apply. To achieve this status, the unit must be placed in at least MODE 3 within 12 hours and in MODE 4 within 36 hours. 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 3.7.1.1

Verifying the correct alignment for each manual, power operated, and automatic valve in each Division 1 and 2 ESW subsystem flow path provides assurance that the proper flow paths exist for ESW subsystem operation. This SR does not apply to valves that are locked, sealed, or otherwise secured in position, since these valves were verified to be in the correct position prior to locking, sealing, or securing. A valve that receives an initiation signal is allowed to be in a nonaccident position provided the valve will automatically reposition in the proper stroke time. This SR does not require any testing or valve manipulation;

(continued)

When complying with these shutdown actions, if both RHR shutdown cooling subsystems are inoperable, a NOTE in LCO 3.4.9 suspends all MODE 4 requirements in any Specifications, including this one for ESW, until one RHR shutdown cooling subsystem is restored to OPERABLE status.