REVISED RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.:	**119-7976**
SRP Section:	**16 – Technical Specifications**
Application Section:	**TS Section 3.4 and Bases**
Date of RAI Issue:	**07/27/2015**

Question No. 16-23

10 CFR 50.36, “Technical Specifications” and 10 CFR 52.47(a)(11) provides the regulatory basis for the following questions. 10 CFR 50.36 sets forth requirements for technical specifications to be included as part of the operating license for a nuclear power facility. Subsection 52.47(a) (11) requires that technical specifications be provided in the application for a design certification.

NUREG-1432, “Standard Technical Specifications-Combustion Engineering Plants,” provides NRC guidance on format and content of technical specifications as one acceptable means to meet 10CFR 50.36 requirements.

SPR 16, Part III.2.A states, in part, “when reviewing a difference between the proposed TS provision and the reference TS provision, verify that the applicant’s written technical or administrative reasoning in support of the difference is logical, complete, and clearly written."

1. The TS 3.4.1 Applicability, and hence the construction of Required Actions, are different from those in NUREG-1432. The applicant is requested to provide the reason for these differences.

2. SR 3.4.1.4 specifies both minimum and maximum values for the acceptable flow rate. However only the minimum value is included in the LCO statement. The applicant is requested to address this inconsistency

3. The frequency of SR 3.4.1.4 for a precision calorimetric heat balance is "31 days" instead of "18 months" in NUREG-1432. The discussion in the base is different from the one in NUREG-1432. The applicant is requested to clarify the scope of the precision calorimetric heat balance.

4. On Page B 3.4.1-1, use the full text on the first occurrence of the acronym "DNB."

5. In the LCO section of the bases, discussion of instrumentation error is limited to the collected total flow rate only. The applicant is requested to explain why other DNB parameters (RCS pressure and cold leg temperature) were not addressed.

6. The discussions in the bases for SRs 3.4.1.1, 3.4.1.2, and 3.4.1.3 are different from those in NUREG-1432. The applicant is requested to address the omission of basis information presented in NUREG-1432.

7. The TS 3.4.2 Applicability and SR 3.4.2.1 requirements are specified differently than those in NUREG-1432. The applicant is requested to provide the reason for these differences. Also, as written, the LCO 3.4.2 statement appears to conflict with the LCO 3.4.1 statement. The applicant is requested to resolve this conflict.

8. The LCO 3.4.5 Note and hence Required Action C.1, are stated differently from those presented in NUREG-1432. As a result, the discussion of these items in the bases are not consistent with the stated requirements. The applicant is requested to provide the basis for the difference and to address the inconsistency between the TS and the associated bases.

9. On Pages 3.4.5-1 and 3.4.5-3, correct format errors in the LCO Note; add a line space after the first paragraph, and in SR 3.4.5.3; maintain horizontal alignment for the Frequency entry and the SR description text, respectively.

10. The LCO 3.4.6 Note 1 and hence Required Action C.1, are stated differently from those presented in NUREG-1432. As a result, the discussion of these items in the bases are not consistent with the stated requirements. The applicant is requested to provide the basis for the difference and to address the inconsistency between the TS and the associated bases.

11. The LCO 3.4.6 Note 2 is stated differently from the one presented in NUREG-1432. The applicant is requested to provide the basis for the difference.

12. On Page 3.4.6-3, to correct format error in SR 3.4.6.3; maintain horizontal alignment for the Frequency entry and the SR description text.

13. The LCO 3.4.7 Note 1 and hence Required Action C.1, are stated differently from those presented in NUREG-1432. As a result, the discussion of these items in the bases are not consistent with the stated requirements. The applicant is requested to provide the basis for the difference and to address the inconsistency between the TS and the associated bases.

14. The LCO 3.4.7 Note 3 is stated differently from the one presented in NUREG-1432. In Technical Report APR1400-K-O-NR-14001-NP, the applicant states "APR1400 POSRV is qualified for water relief" as basis for the difference. This basis is not relevant to LCO 3.4.7 which is for Mode 5 and Note 3 is related to meeting LTOP requirements. POSRVs are not used in APR1400 design for LTOP. The applicant is requested to provide a

different basis for the difference.

15. On Pages 3.4.7-1 and 3.4.7-3, correct editorial/format errors in LCO Note 1; replace "LCO 3.1.1" with "LCO 3.1.2," and in SR 3.4.7.3; maintain horizontal alignment for the Frequency entry and the SR description text.

16. The LCO 3.4.8 Note 1 and hence Required Action B.1, are stated differently from those presented in NUREG-1432. As a result, the discussion of these items in the bases is not consistent with the stated requirements. The applicant is requested to provide the rationale for the differences and to address the inconsistency between the TS and the associated bases.

17. On Page 3.4.8-3, correct format error: Maintain horizontal alignment for the Frequency entry and the SR description text.

18. LCO 3.4.8 Note 3 and Action B.3 are added to address safety concerns during Mid-Loop operations as identified in GL 88-17. LCO 3.4.8 Note 3 states “3. A containment spray pump can be manually realigned to meet the requirement of a SC pump,” and Action B.3 states “B.3 Initiate action to raise RCS level to > EL. 38.72 m (127 ft-1/4 in) with a completion time of “Immediately.”. The proposed addition to TS 3.9.5 to address these same safety concerns are more elaborate in order to implement the sfaff’s recommendations presented in GL 88-17. The proposed additions to TS 3.9.5 include the following:
    a) LCO 3.9.5.b which states “With REDUCED RCS INVENTORY, the containment spray pump in the same train as an operating SCS train shall be OPERABLE.”
    b) All exceptions presented in STS LCO 3.9.5 Notes regarding stopping of the SC pump in operation are removed to provide extra conservatism.
    c) Action B.3 which states “Initiate action to raise RCS level to > EL 38.72 m (127’-1/4”) when in REDUCED RCS INVENTORY.” With a CT of “Immediately.”
    d) Conditions C and D to address a failure to meet the new LCO 3.9.5.b for the containment spray pump.
    Since “Mid-Loop operations” occur in both Modes 5 and 6, the same proposed changes should be effected in TS 3.4.8 and TS 3.9.5. The applicant is requested to revise TS 3.4.8 to reflect proposed changes to TS 3.9.5.

19. SR 3.4.10.6 states “Verify downstream manual valves of spring-loaded pilot valves are locked in open position.” The staff could not identify these downstream manual valves in DCD Figure 5.4.10-1, “Pilot Operated Safety Relief Valve Schematic Diagram.” The applicant is requested to provide the applicable DCD section where these valves are described.

20. On Page B 3.4.10-2, in the second paragraph, correct editorial error as follows: “it is in OPERABLE status.”

    On Page B 3.4.10-4, in the second paragraph, improve its clarity as follows: “The LCO is not applicable in MODE 4 when all RCS cold leg temperatures are less than or equal to less than or equal to the LTOP enable temperature specified in the PTLR, MODE 5, and MODE 6 with RV Head on, because LTOP protection is provided in LCO 3.4.11, “LTOP

System". Overpressure protection is not required in MODE 6 with the reactor vessel closure head detensioned."

On Page B 3.4.10-4, remove the third paragraph regarding an LCO Note which allows the hot setting test at Mode 3. This LCO Note has been removed from the generic TS 3.4.10.

In the discussion of SR 3.4.10.2 for verification of removal of power from the valve operators, the applicant states, in part, "Verification of correct breaker alignment and power availability to the valve position indicators ensures that valves can be operated when required, and valve positions can be monitored." This sentence is not relevant to the scope of SR 3.4.10.2, and should be deleted. Further, only the upstream valve of the double motor operated pilot valves required the power disconnection, not both. The applicant is requested to revise this discussion to reflect the actual scope of SR 3.4.10.2.

21. The applicant is requested to add DCD Subsection 5.4.10 to the list of References in the TS Bases.

22. LCO 3.4.16 Applicability includes "MODES 1, 2 and 3, [and] Mode 4 with RCS pressure > 31.6 kg/cm2A (450 psia." TS Table 1-1 defines MODE 4 as having RCS Tcold < 350°F. For RCS Tcold = 350°F, the associated RCS pressure is 450 psia. As such there is no need to list the additional pressure requirement after the term MODE 4. As a result, Action C.2 should also be changed from "Be in MODE 4 with RCS pressure < 31.6 kg/cm2A (450 psia)" within 12 hours to "Be in MODE 5" within 36 hours."

    SR 3.4.16.1 states "Cycle each RCGV valve to the fully closed and fully open position" with Frequency of 18 months. For safety-related valves, the cycling should be in accordance with the "inservice testing (IST) program."

    In the "Action" section of the TS Bases, the applicant states "The ACTIONS are modified by a Note which is added to provide clarification that each RCS gas vent path of the reactor vessel closure head and the pressurizer steam space allows a separate entry into a Condition." There is no such Note posted in the specified LCO 3.4.16.

    The discussion of SR 3.4.16.2 in the TS Bases states, in part, "This SR requires verification of flow through each vent path and the Surveillance test must be performed in MODE 5 or 6." The safety function of the vent path is venting non-condensible gases or steam from the RCS at operating RCS pressure and temperature. The applicant is requested to explain how testing at Mode 5 or 6 will produce an equivalent results.

23. For TS 3.4.17 and related provisions in TS 5.5.9, the applicant is request to consider adoption of TSTF-510, Revision 2, "Revision to Steam Generator Program Inspection Frequencies and Tube Sample Selection," which provides improvements to the SG Tube Program which was first established under TSTF-449, Revision 4, "Steam Generator Tube Integrity."

24. In the APR1400 design, the shutdown cooling system (SCS) is completely separated from the safety injection system (SIS). In the plant transient and accident analyses as described in DCD Chapter 15, operator actions ae credited to manually place the SCS in

service for RCS cooling to the safe shutdown Mode 5. In NUREG-1432, the SC pump is a shared component with the low pressure safety injection (LPSI) pump, and is tested as part of STS LCO 3.5.2 during Modes 1, 2, and 3. The applicant is requested to provide an LCO for the SCS, preferably in TS Section 3.4, in accordance with Criterion 3 of 10 CFR 50.36(c)(2)(ii).

Response – (Rev. 1)

1. The core power, as an initial condition of safety analyses for APR1400, is specified in DCD Table 15.0-3. Mode 2 includes the core power of 0%.

   Pressurizer pressure, cold leg temperature and RCS flow rate are included in LCO 3.4.1 to maintain consistency with the initial conditions in DCD Table 15.0-3.

   A NOTE on pressurizer pressure limit during power variations is added in Applicability. Refer to Attachment 1.

2. Since the design maximum RCS flow rate is not related to a DNB parameter, there is no need to include it in LCO 3.4.1.

   SR 3.4.1.4 will be modified to include only the Surveillance for minimum RCS flow rate. Refer to Attachment 2.

3. The precision calorimetric heat balance is used to measure the RCS flow rate. The surveillance frequency of 31 days in SR 3.4.1.4 has been adopted for Korean plants at the recommendation of the Korean nuclear regulatory organization.

   Because the RCS flow rate is not expected to vary during operation, a monthly measurement is not required. The frequency of SR 3.4.1.4 will be modified to 18 months to align with NUREG-1432.

   The bases will also be modified to align with NUREG-1432. Refer to Attachment 2.

4. On page B 3.4.1-1, the full text has been added at the first occurrence of DNB. See Attachment 3.

5. The bases for LCO 3.4.1 will be updated to indicate how instrument errors are accounted for in the LCO values for pressurizer pressure, RCS cold leg temperature and RCS flow. Refer to the Attachment 4.

6. Those values are not included in the COLR. Values in SR 3.4.1.1, 3.4.1.2 and 3.4.1.3 are taken from input data for safety analyses. The LCOs for pressure and temperature are adjusted for instrument errors. They shall be met to ensure that they are maintained with the value specified in DCD Table 15.0-3. The Note on SR 3.4.1.3, “Only required to be met in MODE 1” was deleted and replaced by APPLICABILITY, “MODE 1 for RCS total flow rate.” The second paragraph of Bases for SR 3.4.1.2 will be revised as commented. Refer to Attachment 2.

7. Per BACKGROUND of B 3.4.2, “The reactor coolant moderator temperature coefficient used in core operating and accident analysis is typically defined for the normal operating temperature range 285 to 295 °C (545 to 563 °F)”. The temperature is consistent with DCD Table 15.0-3. Core power is 0 ~ 102 % per DCD Table 15.0-3 in which Mode 2 is included.

   Temperature distance of 15 °F is provided in NUREG-1432. For APR1400, a temperature distance of 3 °F is sufficient per APPLICABLE SAFTY ANALYSES per B 3.4.2.

   The Frequency of SR 3.4.2.1 is revised to incorporate the response to Question No. 16-145 of RAI 481-8546. Refer to Attachment 5.

8. Because Action C. 1 described in NUREG-1432 is more optimistic, Technical Specification Action C.1 and relevant Bases will be modified to more closely align with NUREG-1432 as follows.

   - Action C.1, "Suspend all operations involving a reduction of RCS boron concentration", is modified to the following sentence: "Suspend all operations that would cause reduction of the RCS boron concentration less than required to meet the SDM of LCO 3.1.1."

   - The sentence of Bases C.1 and C.2, "all operations involving a reduction of RCS boron concentration must be immediately suspended", will be modified by "all operation involving reduction of the RCS boron concentration less than required to meet the minimum SDM of LCO 3.1.1 must be immediately suspended."

   - In addition, the following sentences will be added in the Bases C.1 and C.2: "Suspending the introduction into the RCS of coolant with boron concentration less than required to meet the minimum SDM of LCO 3.1.1 is required to assure 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 ensure subcritical operation."

     Pages 3.4.5-1 and B 3.4.5-3 will be revised as indicated in Attachment 6.

9. The format corrections were incorporated into APR1400 DCD Tier 2 Chapter 16 Revision 1. Pages 3.4.5-1 and 3.4.5-3 has been revised as indicated in Attachment 7.

10. LCO 3.4.6 and B 3.4.6 revert to GTS 3.4.6 Rev.1, which is basically same as STS LCO 3.4.6 Rev.1, because APR1400 did not incorporate TSTF-422 Rev.2 which is related to risk assessment and management techniques in TS.

    Pages 3.4.6-1 and 2, and B 3.4.6-1 through 5 will be revised as indicated in Attachment 8.

11. A pressurizer solid condition is not limited because the POSRVs are qualified for steam, steam-water mixture and liquid conditions. Refer to DCD Section 5.2.2.4.1 and Table 5.4-14.1.

12. The format corrections were incorporated into APR1400 DCD Tier 2 Chapter 16 Revision 1.

13. The LCO Note for no pump running of Subsection 3.4.5 and 3.4.6 will be revised as same as description in STS. The LCO Note of Subsection 3.4.7 was incorporated into APR1400 DCD Tier 2 Chapter 16 Revision 1.

    Refer to Attachment 7, Attachment 8 and Attachment 9.

14. Refer to the responses to 16-23.10 and 16.23-13. And the LTOP analysis was done with the pressurizer (also RCS) water-solid condition. In this condition a mass and energy addition cases were analyzed. The mass addition case is for four SIPs running and one charging pump running, and the energy addition is for a higher SG temperature than the RCS temperature. This LTOP transient is discussed in FSAR 5.2.2.2.2.

15. The format corrections were incorporated into APR1400 DCD Tier 2 Chapter 16 Revision 1.

16. Refer to the responses to 16-149.

17. The format corrections were incorporated into APR1400 DCD Tier 2 Chapter 16 Revision 1.

18. It is agreed that LCO 3.4.8, LCO Note 3 and Required Action B.3 will be revised to be consistent with the proposed changes to Subsection 3.9.5. All comments will be incorporated. Refer to Attachment 10.

19. Downstream manual valves of spring-loaded pilot valves are shown on Figure 5.1.2-3. Valve tags are V310, V311, V312, V313, V314, V315, V316 and V317.

20. In DCD Rev. 1, the NOTE of LCO 3.4.10 was added in accordance with RAI 481-8546 Q16-148 with deviation in cold setting compared to STS 3.4.10. The LCO Note is needed to include cold setting requirement to comply with STS 3.410. The cold setting of the POSRVs should be performed before entry into MODE 4 in order to provide assurances that the valves are operable near their design condition for the POSRV tests. This cold setting may be performed in removed condition or installed condition before MODE 4 but it may have deviation from hot setting. Detailed acceptance criteria for cold setting will be developed at a site based on the information from the POSRV supplier considering the deviation from cold condition to hot condition to ensure the function of overpressure protection. The lift setting by cold setting does not need to meet the range of As-left setpoint in SR 3.4.10.3 because its purpose is to perform the tests in MODE 3 with overpressure protection and the lift settings will be verified and adjusted within the range of As-left setpoint in SR 3.4.10.3. The LCO Note will be revised. Refer to Attachment 11.

    20a. The APPLICABILITY will be revised as indicated below to change “temperature” to “temperatures”. Refer to Attachment 12.

    20b. In the B 3.4.10 Background section:

- The third paragraph, last sentence will be corrected to read "...valves be set while in a hot condition."
- The fourth, fifth and sixth paragraphs will be revised as markup.

Refer to Attachment 13.

20c. In the B 3.4.10 ASA section:
- The first paragraph will be revised as markup.
- In the second paragraph, a citation of the FSAR Chapter 5A for "loss of load event with delayed reactor trip" will be added;
- The sentence of third paragraph was replaced with "As such, the pressurizer POSRVs satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii)." in accordance with RAI 507-8587 Q16-175 and 16-177.

Refer to Attachment 13.

20d. In the B 3.4.10 LCO section:
- The paragraphs of first, second and third will be revised as markup.
- Generally, decreasing DNBR can impact the SAFDL in the cases of higher power or temperature and lower pressure or flowrate than normal condition. The purpose of the pressurizer relief valve is to limit increasing reactor coolant pressure and the transient reactor coolant pressure is higher than normal operating pressure during pressurizer relief valve operation except in case of pressurizer relief valve opening before a reactor trip. The POSRVs adopted in APR1400 have an inherent time delay of 0.5 seconds between the operation of the pilot valves and the main valve that is longer than reactor trip time, which results in higher transient RCS pressure than normal pressure. Hence, the STS 3.4.10 is not concerned with DNBR for APR1400 with POSRV. The fourth paragraph will remain as it is.

Refer to Attachment 14.

20e. In the B 3.4.10 APPLICABILITY section:
- The first paragraph will remain as it is. Full credit is allowed for spring-loaded safety valves designed in accordance with the requirements of ASME NB-7511.1 and POSRVs are designed in accordance with the ASME code and operated by system pressure and the stored energy of a passive spring. Two spring-loaded pilot valves are provided for each POSRV and the POSRV can be opened by one of two spring-loaded pilot valves. As a result, the four required POSRVs are available.
- in the second paragraph, the redundant phrase "less than or equal to" in first sentence will be removed and; the paragraphs related to LTOP and the NOTE will be revised as described in 16-23.20 above.

Refer to Attachment 15.

20f. In the B 3.4.10 SR section:
- The inconsistencies between SR 3.4.10.2 and associated Bases will be corrected.

- The last phrase of Bases for SR 3.4.10.3 was revised in APR1400 DCD Tier 2 Chapter 16 Revision 1, to read “then the pressurizer POSRV is OPERABLE.” in accordance with RAI 481-8546.
- The Bases sentences of SR 3.4.10.4 & SR 3.4.10.5 for the 18 months will be revised to “18 month Frequency”
- The Bases for SR 3.4.10.6 will be revised to
  - replace “changed position” with “repositioned’ in second sentence, and
  - rewrite third sentence as indicated, “The 18 month Frequency is based on the POSRVs being easily accessible only during the shutdown conditions of a refueling outage.

Refer to Attachment 16.

20g. In the B 3.4.10 REFERENCES section:

- A reference to the FSAR Chapter 5 for “loss of load event with delayed reactor trip” will be added;

The FSAR Section 5A is describes an intersystem LOCA. But the FSAR Section 5.4.14 describes POSRVs including the capacity and a limiting event such as a total loss of load with delayed reactor trip. The FSAR Chapter 5 is the correct reference.

Refer to Attachment 17.

21. DCD Chapter 5 will be added to the list of References in TS B 3.4.10. Refer to Attachment 17.

22. The APPLICABILITY of LCO 3.4.16 will be changed to:

MODES 1, 2, and 3,
MODE 4 with Shutdown Cooling System (SCS) not aligned for low temperature overpressure protection (LTOP) of the reactor coolant pressure boundary (RCPB).

The Frequency of SR 3.4.16.1 (“Cycle each RCGV valve to the fully closed and fully open position.”) will be changed from “18 months” to “In accordance with the Inservice Testing Program”

In the case that a surveillance test is performed to check whether non-condensable gas or steam flow is produced through each vent path at operating RCS pressure and temperature, a transient may be caused at the power plant, which could be a threat to the safety. For this reason, it is better to be avoided. Furthermore, it is conservative to check that flow is produced in Mode 5 or 6 with low RCS temperature and pressure. Therefore, pages 3.4.16-2 and B 3.4.16-4 will be revised as indicated in Attachment 18.

23. The TS and TS Bases of 3.4.17 and 5.5.9 will be revised to reflect TSTF-510. KHNP had previously committed to incorporate TSTF-510 into the APR1400 Technical Specifications in reply to issues that were transmitted and discussed in a public meeting on July 1, 2015 pertaining to DCD Section 5.4.2.2. KHNP subsequently documented our incorporation of this TSTF in Letter MKD/NW-15-0061L, dated August 4, 2015. Specifically, Enclosure 8, Issue #9 and the associated attachments (2, 4, 5, and 7 address changes to 3.4.17 and 5.5.9) of that submittal provide the details of the revisions to the DCD to address TSTF-510.

24. The “safe shutdown” in the definition of “Safety Function” is to maintain hot standby condition (MODE 3) for APR1400. In this condition, decay heat is being removed. Therefore, SCS to bring the system to MODE 5 is not a “safety-related system”, but a “safety grade system” in accordance to the SRP BTP 5-4. Thus, the SCS is not part of accident mitigation system.

    It is understood that the NUREG-1432 requirement for SCS is for the portion of low pressure safety injection, and is not for the portion of RCS cooling to cold shutdown.

    The LCO for operability of SCS during MODES 1, 2 and 3 was not required for System 80+ in which design SCS was separated from safety injection system. Also, the STS for Westinghouse plants provided in NUREG-1431 does not require LCO for RHRS during MODES 1, 2 and 3. The operability of SCS will be periodically verified by other plant procedures.

Impact on DCD

Same as changes described in the Impact on Technical Specifications section.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

Changes to that were proposed in previous revision to this RAI have been incorporated into Revision 1 of the DCD; therefore, only the pages containing the proposed changes as a result of the Supplement to this response are included in the Attachment.

- LCO 3.4.1 / LCO B 3.4.1.
- LCO 3.4.2.
- LCO 3.4.5 / LCO B 3.4.5.
- LCO 3.4.6 / LCO B 3.4.6.
- LCO 3.4.7 / LCO B 3.4.7.
- LCO 3.4.8.
- LCO 3.4.10 / LCO B 3.4.10.
- LCO 3.4.16 / LCO B 3.4.16.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical or Environmental Report.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.1 RCS Pressure, Temperature, and Flow Limits

LCO 3.4.1 RCS departure from nucleate boiling (DNB) parameters for pressurizer pressure, cold leg temperature, and RCS total flow rate shall be within the limits specified below:

a. Pressurizer pressure ≥ 154.7 kg/cm^{2}A (2,201 psia) and ≤ 161.6 kg/cm^{2}A (2,299 psia);

b. RCS cold leg temperature (T_{cold}) ≥ 286.7°C (548°F) and ≤ 293.3°C (560°F) for < 90% RATED THERMAL POWER (RTP) ≥ 289.4°C (553°F) and ≤ 293.3°C (560°F) for ≥ 90% RTP; and

c. RCS total flow rate ≥ 75.6E6 kg/hr (166.6E6 lb/hr).

----------NOTE----------
Pressurizer pressure limit in MODE 1 does not apply during:
a. THERMAL POWER ramp > 5% RTP per minute or
b. THERMAL POWER step > 10% RTP.

APPLICABILITY: MODES 1 and 2 for pressurizer pressure,
MODE 1 for RCS cold leg temperature (T_{cold}),
MODE 2 (k_{eff} ≥ 1) for RCS cold leg temperature (T_{cold}),
MODE 1 for RCS total flow rate.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. RCS total flow rate not within limits.	A.1 Restore RCS total flow rate to within limits.	2 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 2.	6 hours
C. Pressurizer pressure or RCS cold leg temperature not within limit.	C.1 Restore parameter(s) to within limits.	2 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
D. Required Action and associated Completion Time of Condition C not met.	D.1 Be in MODE 3.	6 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.1.1	Verify pressurizer pressure ≥ 154.7 kg/cm^{2}A (2,201 psia) and ≤ 161.6 kg/cm^{2}A (2,299 psia).	12 hours
SR 3.4.1.2	Verify RCS cold leg temperature ≥ 286.7°C (548°F) and ≤ 293.3°C (560°F) for < 90% RTP or ≥ 289.4°C (553°F) and ≤ 293.3°C (560°F) for ≥ 90% RTP.	12 hours
SR 3.4.1.3	Verify RCS total flow rate ≥ 75.6E6 kg/hr (166.6E6 lb/hr).	12 hours
SR 3.4.1.4	NOTE Not required to be performed until 24 hours after ≥ 95% RTP. Verify by precision heat balance that RCS total flow rate ≥ 75.6E6 kg/hr (166.6E6 lb/hr) ~~and ≤ 86.9E6 kg/hr (191.6E6 lb/hr)~~.	~~31 days~~

OI #45 : Delete

OI #46 : 18 months

BASES

SURVEILLANCE REQUIREMENTS

SR 3.4.1.1

This SR ensures that pressurizer pressure is within limit. The 12 hour Frequency has been shown by operating practice to be sufficient to regularly assess degradation and verify operation within safety analysis assumptions.

SR 3.4.1.2

This SR ensures that RCS cold leg temperature is within limit. The 12 hour Frequency has been shown by operating practice to be sufficient to regularly assess for potential degradation ~~and to verify operation~~ is within safety analysis assumptions.

Since the measurement uncertainty for RCS cold leg temperature of Data Processing System is lower than that of indicator, whether or not ~~the~~ violation of the LCO shall be verified using the RCS cold leg temperature ~~of~~ Data Processing System, if the RCS cold leg temperature ~~is accessing the LCO.~~

the RCS cold leg temperature
the
a
the
has occurred
indication appears to be outside of the LCO limits

SR 3.4.1.3

This SR for RCS total flow rate is performed using the installed flow instrumentation. The 12 hour Frequency has been shown by operating experience to be sufficient to assess potential degradation and to verify operation is within thermal analysis assumptions.

The measurement uncertainty shall be incorporated into the measured RCS flow rate for performing this Surveillance.

SR 3.4.1.4

~~The RCS total flow rate is measured by performance of a precision calorimetric heat balance once per 31 days. This verifies that the actual RCS total flow rate is within the bounds of the analyses.~~

~~Because the RCS flow rate is not excepted to vary during plant operation, the 31 day Surveillance Frequency is sufficient to verify the RCS total flow rate is within the range of design.~~

~~The measurement uncertainty shall be incorporated into measured RCS~~

OI #46 :

The RCS total flow rate is measured by performance of a precision calorimetric heat balance once every 18 months. This allows the installed RCS flow instrumentation to be calibrated and verifies that the actual RCS flow rate is within the bounds of the analyses.

The Frequency of 18 months reflects the importance of verifying flow after a refueling outage where the core has been altered, which may have caused an alteration of flow resistance.

BASES

SURVEILLANCE REQUIREMENTS (continued)

OI #46 : ≥

OI #46 : Surveillance

The SR is modified by a Note which states the SR is only required to be performed 24 hours after ~~reaching~~ 95% RTP. The ~~SR~~ cannot be performed in MODE 2 or below and will not yield accurate results if performed below 95% RTP.

REFERENCES 1. FSAR, Chapter 15.

OI #46 :
The Note is necessary to allow measurement of the flow rate at normal operating conditions at power in Mode 1.

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.1 RCS Pressure, Temperature, and Flow Limits

BASES

BACKGROUND

These Bases address requirements for maintaining Reactor Coolant System (RCS) pressure, temperature, and flow rate within limits assumed in the safety analyses. The safety analyses (Ref. 1) for normal operating conditions and anticipated operational occurrences (AOOs) assume initial conditions within the normal steady state envelope. The limits placed on departure from nucleate boiling (DNB) related parameters ensure that these parameters will not be less conservative than were assumed in the safety analyses and thereby provide assurance that the minimum departure from nucleate boiling ratio (DNBR) will meet the required criteria for each of the transients analyzed.

OI 16-23.4 : First "DNB"

The Limiting Condition for Operation (LCO) limits for the minimum and maximum pressurizer (PZR) pressures are consistent with operation within the nominal operating envelope and are bounded by those used as the initial pressures in the safety analyses.

The LCO limits for minimum and maximum RCS cold leg temperatures are consistent with operation at the indicated power level and are bounded by those used as the initial temperatures in the safety analyses.

The LCO limit for minimum RCS flow rate is bounded by the thermal design flow rate which is the minimum flow rate in the thermal analysis. The RCS flow rate is not expected to vary during plant operation with all pumps running.

APPLICABLE SAFETY ANALYSES

The requirements of LCO 3.4.1 represent the initial conditions for DNB limited transients analyzed in the safety analyses (Ref. 1).

The safety analyses have shown that transients initiated from the limits of this LCO will meet the DNBR criterion of ≥ 1.29. This is the acceptance limit for the RCS DNB parameters. Changes to the facility that could impact these parameters must be assessed for their impact on the DNBR criterion. The transients analyzed include loss of coolant flow events and dropped or stuck control element assembly (CEA) events.

BASES

APPLICABLE SAFETY ANALYSES (continued)

A key assumption for the analysis of these events is that the core power distribution is within the limits of LCO 3.1.6, "Regulating Control Element Assembly (CEA) Insertion Limits," LCO 3.1.7, "Part Strength Control Element Assembly (CEA) Insertion Limits," LCO 3.2.3, "AZIMUTHAL POWER TILT (T_q)," and LCO 3.2.5, "AXIAL SHAPE INDEX (ASI)." The safety analyses are performed over the following range of initial values: RCS pressure 151.9 to 162.4 kg/cm^{2}G (2,160 to 2,310 psig), core inlet temperature ≥ 285°C (545°F) and ≤ 295°C (563°F) for < 90% of RATED THERMAL POWER (RTP), or ≥ 287.8°C (550°F) and ≤ 295°C (563°F) for ≥ 90% of RTP, and reactor vessel inlet coolant flow rate 95 to 116%.

The RCS DNB limits satisfy Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

This LCO specifies limits on the monitored process variables: pressurizer pressure, RCS cold leg temperature, and RCS total flow rate to ensure that the core operates within the limits assumed for the plant safety analyses. Operating within these limits will result in meeting the DNBR criterion in the event of a DNB limited transient.

~~The LCO numerical value for flow rate has not been adjusted for instrument error. Plant specific limits of instrument error are established by the plant staff to meet the operational requirements of this LCO.~~

APPLICABILITY

In MODE 1 for RCS flow rate, MODES 1 and 2 for RCS pressurizer pressure, MODE 1 for RCS cold leg temperature, and MODE 2 with k_{eff} ≥ 1.0 for RCS cold leg temperature, the limits must be maintained during steady state operation in order to ensure that DNBR criteria will be met in the event of an unplanned loss of forced coolant flow or other DNB limited transient. In all other MODES, the power level is low enough so that DNBR is not a concern.

Another set of limits on DNB related parameters is provided in Safety Limit (SL) 2.1.1, "Reactor Core Safety Limits." Those limits are less restrictive than the limits of this LCO, but violation of SLs merits a stricter, more severe Required Action. Should a violation of this LCO occur, the operator should check whether or not an SL could have been exceeded.

The LCO values for pressurizer pressure and RCS cold leg temperature account for instrument error. The LCO value for RCS flow rate does not account for instrument error. Plant specific limits of instrument error for RCS flow rate are established by the plant staff to meet the requirements of this LCO.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.2 RCS Minimum Temperature for Criticality

LCO 3.4.2 Each RCS cold leg temperature (T_{cold}) shall be ≥ 286.7°C (548°F).

APPLICABILITY: MODE 1,
MODE 2 with k_{eff} ≥ 1.0.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. RCS T_{cold} in one or more RCS loops not within limit.	A.1 Be in MODE 3.	30 minutes

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.2.1	Verify RCS T_{cold} in each loop ≥ 286.7°C (548°F).	Once within 15 minutes prior to achieving criticality AND 30 minutes with the reactor critical and ~~Tcold~~ < 289.4°C (553°F) ~~OR~~ 12 hours

is

T_{cold}

Single blank line

OI #49 :
Question No. 16-145 of RAI 481-8546.
Question No. 16-23.7 of RAI 119-7976.

AND

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.5 RCS Loops – MODE 3

LCO 3.4.5 Two RCS loops shall be OPERABLE and one RCS loop shall be in operation.

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

All reactor coolant pumps may be de-energized for up to ≤ 1 hour per 8 hour period, provided:

a. No operations are permitted that would cause reduction of the RCS boron concentration required to meet the SDM of LCO 3.1.1; and

b. Core outlet temperature is maintained at least 5.6°C (10°F) below saturation temperature.

APPLICABILITY: MODE 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One RCS loop inoperable.	A.1 Restore RCS loop to OPERABLE status.	72 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 4.	12 hours
C. No RCS loop OPERABLE. OR Required RCS loop not in operation.	C.1 Suspend all operations ~~involving a reduction of RCS boron concentration.~~ that would cause reduction of the RCS boron concentration below that required to meet the SDM of LCO 3.1.1. AND C.2 Initiate action to restore one RCS loop to OPERABLE status and operation.	Immediately Immediately

BASES

APPLICABILITY (continued)

LCO 3.4.7, "RCS Loops – MODE 5 (Loops Filled)",

LCO 3.4.8, "RCS Loops – MODE 5 (Loops Not Filled)",

LCO 3.9.4, "Shutdown Cooling System (SCS) and Coolant Circulation – High Water Level", and

LCO 3.9.5, "Shutdown Cooling System (SCS) and Coolant Circulation – Low Water Level".

ACTIONS

A.1

If one RCS loop is inoperable, redundancy for forced flow heat removal is lost. The Required Action is restoration of the required RCS loop to OPERABLE status within a Completion Time of 72 hours. This time allowance is a justified period to be without the redundant, non-operating loop because a single loop in operation has a heat transfer capability much greater than that needed to remove the decay heat produced in the reactor core.

B.1

If restoration for Required Action A.1 is not possible within 72 hours, the unit must be placed in MODE 4 within 12 hours. In MODE 4 the plant may be placed on the Shutdown Cooling System. The Completion Time of 12 hours is compatible with required operation to achieve cooldowns and depressurization from the existing plant condition in an orderly manner and without challenging plant systems.

C.1 and C.2

If no RCS loop is OPERABLE or in operation, except as provided by the Note in the LCO section, all operations involving ~~a reduction of RCS boron concentration~~ reduction of the RCS boron concentration below that required to meet the minimum SDM of LCO 3.1.1 must be immediately suspended. This is necessary because boron dilution requires forced circulation for proper homogenization. Action to restore one RCS loop to OPERABLE status and operation shall be immediately initiated and continued until one RCS loop is restored to OPERABLE status and operation. The immediate

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 assure 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 operation.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.5 RCS Loops – MODE 3

LCO 3.4.5 Two RCS loops shall be OPERABLE and one RCS loop shall be in operation.

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

All reactor coolant pumps may be ~~de-energized for up to~~ removed from operation for ≤ 1 hour per 8 hour period, provided:

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

b. Core outlet temperature is maintained at least 5.6°C (10°F) below saturation temperature.

APPLICABILITY: MODE 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One RCS loop inoperable.	A.1 Restore RCS loop to OPERABLE status.	72 hours
B. Required Action and associated Completion Time of Condition A not met.	B.1 Be in MODE 4.	12 hours
C. No RCS loop OPERABLE. OR Required RCS loop not in operation.	C.1 Suspend all operations involving a reduction of RCS boron concentration. AND C.2 Initiate action to restore one RCS loop to OPERABLE status and operation.	Immediately Immediately

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.5.1	Verify required RCS loop is in operation.	12 hours
SR 3.4.5.2	Verify secondary side water level in each steam generator is ≥ 25% wide range indications.	12 hours
SR 3.4.5.3	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 required pump.	7 days

corrected

BASES

LCO

The purpose of this Limiting Condition for Operation (LCO) is to require two RCS loops to be available for heat removal, thus providing redundancy. The LCO requires the two RCS loops to be OPERABLE with the intent of requiring both SGs to be capable (≥ 25% wide range water level) of transferring heat from the reactor coolant at a controlled rate. Forced reactor coolant flow is the required way to transport heat, although natural circulation flow provides adequate removal. A minimum of one running RCP meets the LCO requirement for one loop in operation.

removed from operation for

The Note permits a limited period of operation without RCPs. All RCPs may be ~~de-energized for~~ ≤ 1 hour per 8 hour period. This means that natural circulation has been established. ~~When in natural circulation, boron reduction is prohibited because an even concentration distribution throughout the RCS cannot be ensured.~~ Core outlet temperature is to be maintained at least 5.6°C (10°F) below the saturation temperature so that no vapor bubble could form and possibly cause a natural circulation flow obstruction.

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 forced flow is stopped because an even concentration distribution cannot be ensured.

In MODES 3, 4, and 5, it is sometimes necessary to stop all RCPs or shutdown cooling (SC) pump forced circulation (e.g., to change operation from one SC train to the other, to perform surveillance or startup testing, to perform the transition to and from SC System cooling, or to avoid operation below the RCP minimum net positive suction head (NPSH) limit). The time period is acceptable because natural circulation is adequate for heat removal, or the reactor coolant temperature can be maintained subcooled and boron stratification affecting reactivity control is not expected.

An OPERABLE RCS loop consists of at least one OPERABLE RCP and an SG that is OPERABLE in accordance with the steam generator tube surveillance program. An RCP is OPERABLE if it is capable of being powered and is able to provide forced flow if required.

APPLICABILITY

In MODE 3, the heat load is lower than at power; therefore, one RCS loop in operation is adequate for transport and heat removal. A second RCS loop is required to be OPERABLE but not in operation for redundant heat removal capability.

Operation in other MODES is covered by:

LCO 3.4.4, "RCS Loops – MODES 1 and 2",

LCO 3.4.6, "RCS Loops – MODE 4",

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.6 RCS Loops – MODE 4

LCO 3.4.6 Two loops or trains consisting of any combination of RCS loops and shutdown cooling (SC) trains shall be OPERABLE and one loop or train shall be in operation.

NOTES

1. All reactor coolant pumps (RCPs) and SC pumps may be ~~de-energized~~ ≤ 1 hour per 8 hour period, provided:
   a. No operations are permitted that would cause ~~reduction~~ of the RCS boron concentration required to meet the SHUTDOWN MARGIN (SDM) of LCO 3.1.1; and
   b. Core outlet temperature is maintained at least 5.6°C (10°F) below saturation temperature.
2. No RCP shall be started with any RCS cold leg temperatures less than or equal to the Low Temperature Overpressure Protection (LTOP) enable temperature specified in the PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR), unless secondary side water temperature in each steam generator (SG) is < 55.6°C (100°F) above each of the RCS cold leg temperatures.

removed from operation for

with

introduction

less than

APPLICABILITY: MODE 4.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One required RCS loop inoperable. AND Two SC trains inoperable.	A.1 Initiate action to restore a second loop or train to OPERABLE status.	Immediately
B. One required SC train inoperable. AND Two required RCS loops inoperable.	B.1 Be in MODE 5.	24 hours

ACTIONS (continued)

CONDITION	REQUIRED ACTION	COMPLETION TIME
C. Two required RCS loops or SC trains inoperable. OR Required RCS loop or SC train not in operation.	C.1 Suspend all operations ~~involving reduction in RCS boron concentration~~. that would cause introduction of coolant into the RCS with boron concentration below that required to meet SDM of LCO 3.1.1. AND C.2 Initiate action to restore one loop or train to OPERABLE status and operation.	Immediately Immediately

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.4.6.1	Verify one RCS loop or SC train is in operation.	12 hours
SR 3.4.6.2	Verify secondary side water level in required SG(s) is ≥ 25% wide range indication.	12 hours
SR 3.4.6.3	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 ~~required RCPs and SC~~ each required pump.	7 days
SR 3.4.6.4	NOTE Not required to be performed until 12 hours after entering MODE 4. Verify required ~~SCS~~ SC train locations susceptible to gas accumulation are sufficiently filled with water.	31 days

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.6 RCS Loops – MODE 4

BASES

BACKGROUND

In MODE 4, the primary function of the reactor coolant is the removal of decay heat and transfer of this heat to the steam generators (SGs) or shutdown cooling (SC) heat exchangers. The secondary function of the reactor coolant is to act as a carrier for soluble neutron poison, boric acid.

In MODE 4, either reactor coolant pumps (RCPs) or SC trains can be used for coolant circulation. The intent of this Limiting Condition for Operation (LCO) is to provide forced flow from at least one RCP or one SC train for decay heat removal and transport. The flow provided by one RCP or SC train is adequate for heat removal. The other intent of this LCO is to require that two paths be available to provide redundancy for heat removal.

APPLICABLE SAFETY ANALYSES

In MODE 4, RCS circulation is considered in the determination of the time available for mitigation of the accidental boron dilution. The RCS loops and SC trains provide this circulation.

RCS Loops – MODE 4 have been included in Specification as important contributors to risk reduction according to Criterion 4 of 10 CFR 50.36(c)(2)(ii).

LCO

The purpose of this LCO is to require that at least two RCS loops or SC trains shall be OPERABLE in MODE 4 and one of these loops or trains be in operation. The LCO allows the two loops that are required to be OPERABLE to consist of any combination of RCS loops and SC trains. Any one loop or train in operation provides enough flow to remove the decay heat from the core with forced circulation. An additional loop or train is required to be OPERABLE to provide redundancy for heat removal.

removed from operation for

Note 1 permits all RCPs and SC pumps to be ~~de-energized~~ ≤ 1 hour per 8 hour period. This means that natural circulation has been established using the steam generators. ~~The Note 1 prohibits boron dilution when forced flow is stopped because an even concentration distribution cannot be ensured.~~

The Note prohibits boron dilution with coolant at boron concentrations below that required to assure the SDM of LCO 3.1.1 is maintained when forced flow is stopped because an even concentration distribution cannot be ensured.

BASES

LCO (continued)

Core outlet temperature is to be maintained at least 5.6°C (10°F) below saturation temperature so that no vapor bubble can form and possibly cause a natural circulation flow obstruction. The response of the RCS without the RCPs or SC pumps depends on the core decay heat load and the length of time that the pumps are stopped. As decay heat diminishes, the effects on RCS temperature and pressure diminish. Without cooling by forced flow, higher heat loads will cause the reactor coolant temperature and pressure to increase at a rate proportional to the decay heat load. Because pressure can increase, the applicable system pressure limits (pressure and temperature (P/T) limits or low temperature overpressure protection (LTOP) limits) must be observed and forced SC flow or heat removal via the SGs must be re-established prior to reaching the pressure limit. The circumstances for stopping both RCPs or SC pumps are to be limited to situations where:

a. Pressure and temperature increases can be maintained well within the allowable pressure (P/T limits and LTOP) and 5.6°C (10°F) subcooling limits or

b. An alternate heat removal path through the SGs is in operation.

Note 2 requires, before an RCP is started with any RCS cold leg temperature less than or equal to the LTOP enable temperature specified in the PTLR, that secondary side water temperature in each SG is < 55.6°C (100°F) above each of the RCS cold leg temperatures.

condition

Satisfying the above ~~conditions~~ will preclude a large pressure surge in the RCS when the RCP is started.

An OPERABLE RCS loop consists of at least one OPERABLE RCP and an SG that is OPERABLE in accordance with the steam generator tube surveillance program and has the minimum water level specified in SR 3.4.6.2.

Similarly, for the SC System (SCS), an OPERABLE SC train is composed of the OPERABLE SC pump capable of providing forced flow to the SC heat exchanger.

RCPs and SC pumps are OPERABLE if they are capable of being powered and are able to provide flow if required. Management of gas voids is important to SCS OPERABILITY.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.7 RCS Loops – MODE 5 (Loops Filled)

LCO 3.4.7 One shutdown cooling (SC) train shall be OPERABLE and in operation, and either:

a. One additional SC train shall be OPERABLE, or

b. The secondary side water level of each steam generator (SG) shall be ≥ 25% wide range indication.

NOTES

Corrected

1. The SC pump of the train in operation may be removed from operation for ≤ 1 hour per 8 hour period provided:

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

   b. Core outlet temperature is maintained at least 5.6°C (10°F) below saturation temperature.

2. One required SC train may be inoperable for up to 2 hours for surveillance testing provided that the other SC train is OPERABLE and in operation.

low temperature overpressure protection

3. No reactor coolant pump (RCP) shall be started with one or more of the RCS cold leg temperatures less than or equal to the ~~LOW TEMPERATURE OVERPRESSURE PROTECTION~~ (LTOP) enable temperature specified in the PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR), unless secondary water temperature of each SG is < 55.6°C (100°F) above each of the RCS cold leg temperatures.

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

5. A containment spray pump can be manually realigned to meet the requirement of a SC pump.

APPLICABILITY: MODE 5 with RCS loops filled.

BASES

LCO (continued)

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

Note 3 requires that before an RCP may be started with any RCS cold leg temperature less than or equal to the LTOP enable temperature specified in the PTLR, that secondary side water temperature in each SG is < 55.6°C (100°F) above each of the RCS cold leg temperatures.

condition

Satisfying the above ~~conditions~~ will preclude a low temperature overpressure event due to a thermal transient when the RCP is started.

Note 4 provides for an orderly transition from MODE 5 to MODE 4 during a planned heatup by permitting removal of SC trains 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 SC trains.

An OPERABLE SC train is composed of an OPERABLE SC pump and an OPERABLE SC heat exchanger. Management of gas voids is important to SCS OPERABILITY.

SC pumps are OPERABLE if they are capable of being powered and are able to provide flow if required. An OPERABLE SG can perform as a heat sink when it has an adequate secondary water level and is OPERABLE in accordance with the In-service Inspection Program.

Note 5 permits the alignment of a containment spray pump if a SC pump is not available or becomes inoperable. These pumps are designed to be interchangeable for operational flexibility.

APPLICABILITY

In MODE 5 with RCS loops filled, this LCO requires forced circulation to remove decay heat from the core and to provide proper boron mixing. One SC train provides sufficient circulation for these purposes.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.8 RCS Loops – MODE 5 (Loops Not Filled)

LCO 3.4.8 The heat removal system shall be in the following status:

a. Two shutdown cooling (SC) trains shall be OPERABLE and one SC train shall be in operation; and

b. The containment spray pump in the operating SC train shall be OPERABLE.

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

1. All SC pumps may be removed from operation for ≤ 15 minutes when switching from one train to another provided:
   a. Core outlet temperature is maintained at least 5.6°C (10°F) below saturation temperature;
   b. No operations are permitted that would cause introduction of coolant into the RCS with boron concentration less than required to meet the SHUTDOWN MARGIN (SDM) of Limiting Condition for Operation (LCO) 3.1.1; and
   c. No draining operations to further reduce RCS water volume are permitted.
2. One SC train may be inoperable for ≤ 2 hours for surveillance testing provided the other SC train is OPERABLE and in operation.
3. The containment spray pump ~~associated with~~ in the same electrical division as the SC train ~~not~~ in operation may be manually aligned to meet the ~~requirement~~ requirements of its associated SC pump.
4. MID-LOOP operation is allowed ≥ 96 hours after reactor shutdown and core exit temperature is maintained ≤ 57.2°C (135°F).

APPLICABILITY: MODE 5 with RCS loops not filled. (MID-LOOP operation shall be started at least 4 days after shutdown and ≤ 57.2°C (135°F) of initial hot leg temperature.)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One SC train inoperable.	A.1 Initiate action to restore SC train to OPERABLE status.	Immediately
B. Two SC trains inoperable. OR No SC train 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 SC train to OPERABLE status and operation. AND B.3 Initiate action to ~~raise RCS level to > 38.72 m (127 ft 1/4 in).~~ establish ≥ 23 ft of water above the top of the reactor vessel flange.	Immediately Immediately Immediately
C. Containment Spray pump in operating SC train inoperable.	C.1 If the containment spray pump in the alternate train is OPERABLE, initiate action to place that train in operation. AND C.2 Monitor SC System performance. AND C.3 Restore containment spray pump to OPERABLE status.	Immediately Every 30 minutes 48 hours
C. Required Action and associated Completion Time of C.3 not met.	D.1 Raise RCS level > 38.72 m (127 ft 1/4 in).	6 hours

BASES

BACKGROUND (continued)

The overpressure protection function of the POSRVs is achieved by opening the main valve according to opening the spring-loaded pilot valves, resulting in a pressure discharge function. Time difference exists between the opening of pilot valves and the opening of main valves according to their dead time and actuation time, caused by the characteristics of POSRVs. The required opening time of the valve is limited to within 0.5 seconds.

a POSRV

in

satisfy the above requirements

its

Therefore, it is OPERABLE status if the lift setting of two spring-loaded pilot valves per valve satisfies the above requirements and the requirement of opening time for main valve. Since safety analyses do not take credit for motor operated isolation valve operation to mitigate the transition status according to inadvertent opening of spring-loaded pilot valves, this function is not categorized to safety function.

The pressurizer POSRVs are parts of the primary success paths and mitigate the effects of postulated accidents. OPERABILITY of the POSRVs ensures that the RCS pressure will be limited to 110% of design pressure. The consequences of exceeding the ASME pressure limit (Ref. 1) could include damage to RCS components, increased leakage, or a requirement to perform additional stress analyses prior to resumption of reactor operation.

APPLICABLE SAFETY ANALYSES

All safety analyses in FSAR which require safety valve actuation assume operation of all POSRVs to limit increasing RCS pressure. The opening time of valve uses 0.55 seconds and the nominal lift setting of POSRV includes the uncertainty of ± 2%. In total uncertainties, the uncertainty of instrumentation equipment includes 0.5% to verify the lift setting of pressurizer POSRVs.

These valves must accommodate pressurizer insurges, which could occur during various heatup events such as rod withdrawal, ejected rod, loss of main feedwater, loss of load or main feedwater line break accident. The loss of load event with delayed reactor trip establishes the minimum pressurizer POSRV capacity.

BASES

APPLICABILITY

In MODES 1, 2, and 3, and portions of MODE 4 above the low temperature overpressure protection (LTOP) temperatures, OPERABILITY of four POSRVs is required because the combined capacity is required to keep RCS pressure below 110% of its design value during certain accidents. MODE 3 and portions of MODE 4 are conservatively included although the listed accidents may not require all pressurizer POSRVs for protection.

The LCO is not applicable in MODE 4 when all RCS cold leg temperatures are less than or equal to ~~less than or equal to~~ the LTOP enable temperature specified in the PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR) because LTOP protection is provided. Overpressure protection is not required in MODE 6 with the reactor vessel closure head detensioned.

Deleted.

, Mode 5 and Mode 6 with reactor vessel closure head on,

in LCO 3.4.11, "LTOP System".

The Note allows entry into MODES 3 and 4 with the lift settings outside the LCO limits. This permits testing and examination of the pressurizer POSRVs at high pressure and temperature near their normal operating range, but only after opening time measurement and lift setting of POSRVs have had a preliminary cold setting. The cold setting gives assurance that the valves are OPERABLE near their design condition. The 72 hour exception is derived from operating experience that hot testing can be performed within this time frame.

ACTIONS

A.1

With one pressurizer POSRV inoperable, the restoration must take place within 15 minutes. The Completion Time of 15 minutes reflects the importance of maintaining the RCS Overpressure Protection System. An inoperable POSRV coincident with an RCS overpressure event could challenge the integrity of the RCPB.

B.1, B.2.1, and B.2.2

If the Required Action cannot be met within the associated Completion Time, or if two or more POSRVs are inoperable, the plant must be placed in a MODE in which the requirement does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 4 with all RCS cold leg temperature less than or equal to the LTOP enable temperature specified in the PTLR within 12 hours, or a condition where shutdown cooling suction line LTOP relief valves are applied within 12 hours. The 6 hours allowed is a reasonable time based on operating experience to reach MODE 3 from full power without challenging plant systems. Similarly, the 12 hours allowed is a reasonable time based on operating experience to reach MODE 4 without challenging plant systems.

BASES

ACTIONS (continued)

With RCS cold leg temperature less than or equal to the LTOP enable temperature specified in the PTLR, overpressure protection is provided by LTOP.

The change from MODE 1, 2, or 3 to MODE 4 reduces the RCS energy (core power and pressure), lowers the potential for large pressurizer insurges, and thereby removes the need for overpressure protection by four POSRVs.

SURVEILLANCE REQUIREMENTS

SR 3.4.10.1

Periodic verification of the correct valve position indication in the main control room (MCR) for all pressurizer POSRVs, spring-loaded pilot valves, motor operated isolation valves, manual isolation valves, and motor operated pilot valves ensures that the valves are properly aligned and that the position indicators are functioning properly. A Frequency of 12 hours is accepted by industry practice, and has been shown to be acceptable by operating experience.

Deleted.

SR 3.4.10.2

~~Verification of correct breaker alignment and power availability to the valve position indicators ensures that valves can be operated when required, and valve positions can be monitored.~~ Verification of removal of power to motor operated isolation valves and motor operated pilot valves ensures that the motor operated isolation valves are not inadvertently actuated by an operator. The 7 day Frequency is accepted by industry practice and has been shown to be acceptable by operating experience.

SR 3.4.10.3

Surveillance Requirements are specified for verifying the lift pressure settings and opening time of pressurizer POSRVs. The allowable range of the as-found lift pressure setting of each pressurizer POSRV spring-loaded pilot valve is 1.5% of the valve setpoint above the valve setpoint to 1.5% of the valve setpoint below the valve setpoint. The surveillance requires adjusting the as-left lift pressure setting within the allowable range of 0.75% of the valve setpoint above the valve setpoint and 0.75% of the valve setpoint below the valve setpoint. The specified pressurizer POSRV opening time including dead time of 0.5 seconds or less is consistent with the safety analyses. The dead time is from when the pressure reaches the spring-loaded pilot valves' opening setpoint until the main valve begins to move (open). The pressurizer POSRV lift pressure

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.10 Pressurizer Pilot Operated Safety Relief Valves (POSRVs)

LCO 3.4.10 Four pressurizer POSRVs shall be OPERABLE such that:

a. Two spring-loaded pilot valves shall be OPERABLE with lift settings ≥ 171.1 kg/cm^{2}A (2,433 psia) and ≤ 176.3 kg/cm^{2}A (2,507 psia).

b. The opening time of pressurizer POSRV shall be ≤ 0.5 seconds, including dead time.

APPLICABILITY: MODES 1, 2, and 3,
MODE 4 with all RCS cold leg temperature greater than the Low Temperature Overpressure Protection (LTOP) enable temperature specified in the PRESSURE TEMPERATURE LIMITS REPORT (PTLR).

---------- NOTE ----------
The opening time measurement and lift pressure setting of POSRV are not required to be within LCO limits during MODES 3 and 4 for the purpose of setting the POSRVs under ambient (hot) conditions. This exception is allowed for 72 hours following entry into MODE 3.
provided a preliminary cold setting was made prior to heatup.

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.10 Pressurizer Pilot Operated Safety Relief Valves (POSRVs)

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b. The opening time of pressurizer POSRV shall be ≤ 0.5 seconds, including dead time.

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temperatures

APPLICABILITY: MODES 1, 2, and 3,
MODE 4 with all RCS cold leg ~~temperature~~ greater than the Low Temperature Overpressure Protection (LTOP) enable temperature specified in the PRESSURE TEMPERATURE LIMITS REPORT (PTLR).

AND

each

---------- NOTE ----------
The opening time measurement and lift pressure setting of POSRV are not required to be within LCO limits during MODES 3 and 4 for the purpose of setting the POSRVs under ambient (hot) conditions. This exception is allowed for 72 hours following entry into MODE 3.
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provided a preliminary cold setting was made prior to heatup.

B 3.4 REACTOR COOLANT SYSTEM (RCS)

B 3.4.10 Pressurizer Pilot Operated Safety Relief Valves (POSRVs)

BASES

BACKGROUND

Pressurizer POSRVs are designed to provide overpressure protection function and rapid depressurization function for Reactor Coolant System (RCS). Two spring-loaded pilot valves per each main valve are installed to provide RCS overpressure protection. Motor operated isolation valves and manual isolation valves are installed to isolate spring-loaded pilot valves, ~~which~~ are maintained open position during normal operation. Two motor operated pilot valves per each main valve are installed in series to provide rapid depressurization function. These motor operated pilot valves are maintained closed position during normal operation. Operating in conjunction with the Reactor Protection System, four ~~valves~~ are used to ensure that the safety limit (SL) of 193.3 kg/cm^{2}A (2,750 psia) is not exceeded for analyzed transients during operation in MODES 1 and 2. Four POSRVs are ~~always used for~~ MODE 3 and a portion of MODE 4. ~~For~~ the remainder of MODE 4 and ~~for~~ MODE 5, overpressure protection is provided by operating procedures and ~~Limiting Condition for Operation (LCO)~~ 3.4.11.

The self-actuated pressurizer POSRVs are designed in accordance with the requirements set forth in the ASME Boiler and Pressure Vessel Code, Section III (Ref. 1). The pressurizer POSRVs discharge steam from the pressurizer to the in-containment refueling water storage tank (IRWST) located in the containment.

The lift pressure setpoint ~~for~~ four pressurizer POSRVs is 173.7 kg/cm^{2}A (2,470 psia). The lift pressure ~~for~~ four POSRVs is established to prevent the RCS pressure from exceeding SL and maintain the assumed conditions ~~of~~ analyses. ~~For testing the lift pressure setpoint, the upper and lower lift pressure limits for verified allowable range (as found setpoint) of ±1.5% are established based on 0.5% of the measurement uncertainty of examination equipment plus some operating margin. After testing, however, the allowable range of setpoint (as-left setpoint) is adjusted within the ±0.75% being considered by the change of lift setting and operating margin according to operating environmental factors.~~ The lift setting ~~is~~ for the ambient conditions associated with MODES 1, 2, and 3. This requires that the valves be set a hot condition.

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POSRVs
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, "Low Temperature Overpressure Protection (LTOP)"
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acounts
The POSRV lift settings (as-found setpoint) include a tolerance of 1.5% for the lifting pressure during operation. After testing, the the lift settings (as-left setpoint) are adjusted within the setpoint tolerance of 0.75%.

BASES

BACKGROUND (continued)

in response to the opening of

The inherent time delay (dead time) between the operations of the pilot valves and the main valve is

The overpressure protection function of the POSRVs is achieved by opening the main valve ~~according to opening~~ the spring-loaded pilot valves, resulting in a pressure ~~discharge~~ function. ~~Time difference exists between the opening of pilot valves and the opening of main valves according to their dead time and actuation time,~~ caused by the characteristics ~~of~~ POSRVs. The required opening time of the ~~valve~~ is limited to within 0.5 seconds.

relief

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design

a POSRV

POSRVs

each main

and the opening time of the POSRVs satisfy

its

Therefore, ~~it~~ is OPERABLE ~~status if the lift setting of two~~ spring-loaded pilot valves ~~per valve satisfies~~ the above requirements ~~and the requirement of opening time for main valve.~~ Since safety analyses do not take credit for motor operated isolation valve operation to mitigate the ~~transition status according to~~ inadvertent opening of spring-loaded pilot valves, this ~~function~~ is not ~~categorized to~~ safety function.

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to

isolation valve operation

The pressurizer POSRVs are parts ~~of~~ the primary success paths and mitigate the effects of postulated accidents. OPERABILITY of the POSRVs ensures that the RCS pressure will be limited to 110% of design pressure. The consequences of exceeding the ASME pressure limit (Ref. 1) could include damage to RCS components, increased leakage, or a requirement to perform additional stress analyses prior to resumption of reactor operation.

considered to be a

accident analyses described in the

APPLICABLE SAFETY ANALYSES

four

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All ~~safety analyses in~~ FSAR ~~which~~ require safety valve actuation assume operation of all POSRVs to limit increasing RCS pressure. ~~The opening time of valve uses 0.55 seconds and the nominal lift setting of POSRV includes the uncertainty of ± 2%. In total uncertainties, the uncertainty of instrumentation equipment includes 0.5% to verify the lift setting of pressurizer POSRVs.~~

These valves must accommodate pressurizer insurges, which could occur during various heatup events such as rod withdrawal, ejected rod, loss of main feedwater, loss of load or main feedwater line break accident. The loss of load event with delayed reactor trip establishes the minimum pressurizer POSRV capacity.

startup,

which is described in FSAR Chapter 5

relieving

,

The overpressure protection analysis is based on operation of all POSRVs and assumes that the valves open at the high end of the range of allowable lift setting (nominal lift setting pressure plus a total uncertainty of 2%) with an opening time of 0.55 seconds. The total uncertainty in the lift setting pressure includes 0.5% of the uncertainty of instrumentation to verify the lift setting of the valves plus some operating margin and the 0.55 second opening time includes a 0.05 second operating margin.

BASES

APPLICABLE SAFETY ANALYSES (continued)

The pressurizer POSRVs are components that are parts of the primary success paths and which function or actuate to mitigate a design basis event or transient that either assumes the failure of, or presents a challenge to, the integrity of a fission product barrier. As such, the pressurizer POSRVs satisfy the requirements of Criterion 3 of 10 CFR 50.36(c)(2)(ii).

(single space)

the RCS pressure

the safety

LCO

the

The four pressurizer POSRVs are set to open at 173.7 kg/cm^{2}A (2,470 psia). The lift pressure of four POSRVs is established to prevent RCS pressure from exceeding SL and the assumed conditions of analyses. For testing the lift pressure setpoint, the upper and lower lift pressure limits for verified allowable range (as-found setpoint) of ±1.5% are established based on 0.5% of the measurement uncertainty of examination equipment plus some operating margin. After testing, however, the allowable range of setpoint (as-left setpoint) is adjusted within the ±0.75% considering the change of lift setting and operating margin according to operating environmental factors.

The POSRV lift settings (as-found setpoint) include a tolerance of 1.5% for the lifting pressure during operation. After testing, the the lift settings (as-left setpoint) are adjusted to the setpoint with a tolerance of 0.75%.

to be

The fully opening time is assumed the delay time of total 0.55 seconds, including the measurement uncertainty of 0.05 seconds, in the safety analyses. Therefore, the delayed opening time of the valve shall be maintained within 0.5 seconds and checked the time for refueling cycle.

required opening time of the POSRVs is limited to

a

and is verified once during each

If the two spring-loaded pilot valves per valve satisfy the requirements of lift setting and opening time, then it is OPERABLE status. Isolation of the main valve is limited to pertinent test valve if the verification of lift setting of spring-loaded pilot valves is performed.

The limit protected by this Specification is the reactor coolant pressure boundary SL of 110% of design pressure.

The consequences of exceeding the ASME pressure limit could include damage to one or more RCS components, increased leakage, or additional stress analysis being required prior to resumption of reactor operation.

If the lift settings of two spring-loaded pilot valves and the actuation times of the POSRVs are within the LCOs, then the POSRVs are OPERABLE.

BASES

APPLICABILITY

In MODES 1, 2, and 3, and portions of MODE 4 above the low temperature overpressure protection (LTOP) temperatures, OPERABILITY of four POSRVs is required because the combined capacity is required to keep RCS pressure below 110% of its design value during certain accidents. MODE 3 and portions of MODE 4 are conservatively included although the listed accidents may not require all pressurizer POSRVs for protection.

, Mode 5 and Mode 6 with reactor vessel closure head on,

Deleted.

The LCO is not applicable in MODE 4 when all RCS cold leg temperatures are less than or equal to ~~less than or equal to~~ the LTOP enable temperature specified in the PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR) because LTOP protection is provided in LCO 3.4.11, "LTOP System". Overpressure protection is not required in MODE 6 with the reactor vessel closure head detensioned.

The Note allows entry into MODES 3 and 4 with the lift settings outside the LCO limits. This permits testing and examination of the pressurizer POSRVs at high pressure and temperature near their normal operating range, but only after opening time measurement and lift setting of POSRVs have had a preliminary cold setting. The cold setting gives assurance that the valves are OPERABLE near their design condition. The 72 hour exception is derived from operating experience that hot testing can be performed within this time frame.

ACTIONS

A.1

With one pressurizer POSRV inoperable, the restoration must take place within 15 minutes. The Completion Time of 15 minutes reflects the importance of maintaining the RCS Overpressure Protection System. An inoperable POSRV coincident with an RCS overpressure event could challenge the integrity of the RCPB.

B.1, B.2.1, and B.2.2

If the Required Action cannot be met within the associated Completion Time, or if two or more POSRVs are inoperable, the plant must be placed in a MODE in which the requirement does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 4 with all RCS cold leg temperature less than or equal to the LTOP enable temperature specified in the PTLR within 12 hours, or a condition where shutdown cooling suction line LTOP relief valves are applied within 12 hours. The 6 hours allowed is a reasonable time based on operating experience to reach MODE 3 from full power without challenging plant systems. Similarly, the 12 hours allowed is a reasonable time based on operating experience to reach MODE 4 without challenging plant systems.

BASES

ACTIONS (continued)

With RCS cold leg temperature less than or equal to the LTOP enable temperature specified in the PTLR, overpressure protection is provided by LTOP.

The change from MODE 1, 2, or 3 to MODE 4 reduces the RCS energy (core power and pressure), lowers the potential for large pressurizer insurges, and thereby removes the need for overpressure protection by four POSRVs.

SURVEILLANCE REQUIREMENTS

SR 3.4.10.1

Periodic verification of the correct valve position indication in the main control room (MCR) for all pressurizer POSRVs, spring-loaded pilot valves, motor operated isolation valves, manual isolation valves, and motor operated pilot valves ensures that the valves are properly aligned and that the position indicators are functioning properly. A Frequency of 12 hours is accepted by industry practice, and has been shown to be acceptable by operating experience.

Deleted.

SR 3.4.10.2

~~Verification of correct breaker alignment and power availability to the valve position indicators ensures that valves can be operated when required, and valve positions can be monitored.~~ Verification of removal of power to motor operated isolation valves and motor operated pilot valves ensures that the motor operated isolation valves are not inadvertently actuated by an operator. The 7 day Frequency is accepted by industry practice and has been shown to be acceptable by operating experience.

upstream valves of

SR 3.4.10.3

Surveillance Requirements are specified for verifying the lift pressure settings and opening time of pressurizer POSRVs. The allowable range of the as-found lift pressure setting of each pressurizer POSRV spring-loaded pilot valve is 1.5% of the valve setpoint above the valve setpoint to 1.5% of the valve setpoint below the valve setpoint. The surveillance requires adjusting the as-left lift pressure setting within the allowable range of 0.75% of the valve setpoint above the valve setpoint and 0.75% of the valve setpoint below the valve setpoint. The specified pressurizer POSRV opening time including dead time of 0.5 seconds or less is consistent with the safety analyses. The dead time is from when the pressure reaches the spring-loaded pilot valves' opening setpoint until the main valve begins to move (open). The pressurizer POSRV lift pressure

BASES

SURVEILLANCE REQUIREMENTS (continued)

setpoint verification and adjustment, and opening time verification are normally performed in MODE 3 during plant heatup following each refueling, which is once every 18 months. The ASME Operations and Maintenance (OM) Code (Ref. 2) recommends performing the lift pressure setting verification and adjustment every 5 years as the necessary Frequency to satisfy the requirements for lift pressure settings of safety relief valves. However, the surveillance to verify the pressurizer POSRV lift pressure setting and opening time are performed every refueling cycle according to the special requirements of the pressurizer POSRVs. If the two spring-loaded pilot valves of a pressurizer POSRV both satisfy the requirements of lift setting and opening time, then the pressurizer POSRV is OPERABLE.

SR 3.4.10.4

Verification of the OPERABILITY of alarm devices for the valve positions and electric power connections for motor operated isolation valves, manual isolation valves, and motor operated pilot valves ensures that inadvertent actuation of each valve can be monitored. This Surveillance must be performed ~~every~~ 18 months~~s~~.

at an

Frequency

SR 3.4.10.5

Verification of the OPERABILITY of position indicators for each valve containing main valve ensures that inadvertent actuation of each valve can be monitored. This Surveillance must be performed ~~every~~ 18 months~~s~~.

at an

Frequency

SR 3.4.10.6

repositioned

When the downstream manual isolation valves of spring-loaded pilot valves are locked in open position, overpressure protection function can be performed properly. Securing these valves in position by removing power or key locking the control in the correct position ensures that the valves cannot be inadvertently misaligned or ~~changed position~~. The 18 month Frequency is based on ~~accessibility~~ during the refueling ~~cycle and consideration of nuclear plant practices.~~

outage.

the POSRVs being easily accessible only

shutdown conditions of a

REFERENCES

1. ASME Section III.
2. ASME OM Code.

BASES

SURVEILLANCE REQUIREMENTS (continued)

setpoint verification and adjustment, and opening time verification are normally performed in MODE 3 during plant heatup following each refueling, which is once every 18 months. The ASME Operations and Maintenance (OM) Code (Ref. 2) recommends performing the lift pressure setting verification and adjustment every 5 years as the necessary Frequency to satisfy the requirements for lift pressure settings of safety relief valves. However, the surveillance to verify the pressurizer POSRV lift pressure setting and opening time are performed every refueling cycle according to the special requirements of the pressurizer POSRVs. If the two spring-loaded pilot valves of a pressurizer POSRV both satisfy the requirements of lift setting and opening time, then the pressurizer POSRV is OPERABLE.

SR 3.4.10.4

Verification of the OPERABILITY of alarm devices for the valve positions and electric power connections for motor operated isolation valves, manual isolation valves, and motor operated pilot valves ensures that inadvertent actuation of each valve can be monitored. This Surveillance must be performed every 18 months.

SR 3.4.10.5

Verification of the OPERABILITY of position indicators for each valve containing main valve ensures that inadvertent actuation of each valve can be monitored. This Surveillance must be performed every 18 months.

SR 3.4.10.6

When the downstream manual isolation valves of spring-loaded pilot valves are locked in open position, overpressure protection function can be performed properly. Securing these valves in position by removing power or key locking the control in the correct position ensures that the valves cannot be inadvertently misaligned or changed position. The 18 month Frequency is based on accessibility during the refueling cycle and consideration of nuclear plant practices.

REFERENCES

1. ASME Section III.

2. ASME OM Code.

3. FSAR Chapter 5

3.4 REACTOR COOLANT SYSTEM (RCS)

3.4.16 Reactor Coolant Gas Vent (RCGV) Function

LCO 3.4.16 The following RCGV flow paths shall be OPERABLE:

a. Two flow paths from the reactor vessel closure head to the in-containment refueling water storage tank (IRWST), and

b. Two flow paths from the pressurizer steam space to the IRWST.

Shutdown Cooling (SC) System not aligned for low temperature overpressure protection (LTOP) of the reactor coolant pressure boundary (RCPB).

APPLICABILITY: MODES 1, 2, and 3,
MODE 4 with ~~RCS pressure ≥ 31.6 kg/cm^{2}A (450 psia).~~

ACTIONS

NOTE

Separate Condition entry is allowed for each RCGV flow path location.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One or both locations with one RCGV flow path inoperable.	A.1 Restore RCGV flow path to OPERABLE status.	72 hours
B. One or both locations with two RCGV flow paths inoperable.	B.1 Restore one RCGV flow path in each location to OPERABLE status.	6 hours
C. One or two RCGV valves in the common flow path to the IRWST inoperable.	C.1 Restore RCGV valve(s) in the common flow path to the IRWST to OPERABLE status.	6 hours
D. Required Action and associated Completion Time of Condition A or B or C not met.	D.1 Be in MODE 3. AND D.2 Be in MODE 4 with RCS pressure < 31.6 kg/cm^{2}A (450 psia).	6 hours 12 hours

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.4.16.1	Cycle each RCGV valve to the fully closed and fully open position. In accordance with the Inservice Testing Program	~~18 months~~
SR 3.4.16.2	Verify flow through the vent paths during venting.	18 months
SR 3.4.16.3	Verify the locally operated manual isolation valve from the reactor vessel closure head and the locally operated manual isolation valve from the pressurizer are locked in the open position.	18 months
SR 3.4.16.4	Verify ~~correct breaker alignment and position indication power available.~~ for each RCGV valve that the solenoid power supply breaker is correctly aligned and position indication power is available.	7 days

BASES

ACTIONS (continued)

D.1 and D.2

If the Required Action and associated Completion Time of Condition A or B or C cannot be met, the plant must be brought to a MODE in which the LCO does not apply. To achieve this status, the plant must be in MODE 3 within 6 hours, and then in MODE 4 with RCS pressure < 31.6 kg/cm^{2}A (450 psia) within 12 hours. The 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 3.4.16.1

The test Frequency is based on the Inservice Testing Program since these valves are designated safety-related.

At least one complete cycling for all remote control valves in each vent path from the MCR verifies the RCGV function valves will function when necessary. There are solenoid-operated valves in the two flow paths from each of the reactor vessel closure head and the pressurizer including the common flow path to the IRWST. The Surveillance test must be performed in MODE 5 ~~or 6. The 18 month Frequency is based on a typical refueling cycle and industry accepted practice.~~

SR 3.4.16.2

This SR requires verification of flow through each vent path and ~~the Surveillance test~~ must be performed in MODE 5 ~~or 6. The Surveillance is performed~~ during venting~~. The 18 month Frequency is based on a typical refueling cycle and is an industry accepted practice.~~

of non-condensible gases from the RCS after operations that involved entering the RCS loops not filled condition. The 18 month Frequency is based on a typical refueling cycle and operating experience which has shown this interval provides adequate assurance that the vent flow paths are not obstructed.

SR 3.4.16.3

avoiding containment entry to access these valves during unit operation and the ease of accessing these valves during a refueling outage in MODE 5 or 6.The administrative control of locking the valves in the open position and the difficulty in accessing the valves during unit operation make inadvertent closure of these valves unlikely.

Ther
vent
oper
pres
RCC
nece
vent path can be established from the reactor vessel closure head and the pressurizer to the IRWST. The Surveillance test must be performed in MODE 5 or 6. The 18 month Frequency is based on ~~accessibility during the refueling cycle and industry accepted practice.~~