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.:	**106-8069**
SRP Section:	**16 - Technical Specifications**
Application Section:	**16.0**
Date of RAI Issue:	**07/23/2015**

Question No. 16-16

Paragraph (a)(11) of 10 CFR 52.47 and paragraph (a)(30) of 10 CFR 52.79 states that a design certification (DC) applicant and a combined license (COL) applicant, respectively, are to propose TS prepared in accordance with 10 CFR 50.36 and 50.36a. 10 CFR 50.36 sets forth requirements for technical specifications to be included as part of the operating license for a nuclear power facility.

NUREG-1432, “Standard Technical Specifications-Combustion Engineering Plants,” Rev. 4, provides NRC guidance on format and content of technical specifications as one acceptable means to meet 10 CFR 50.36 requirements.

SRP Section 16.0, 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." STS 3.5.1 Condition A has two condition statements, “One SIT [Safety Injection Tank] inoperable due to boron concentration not within limits. OR One SIT inoperable due to the inability to verify level or pressure.” Required Action A.1, “Restore SIT to OPERABLE status” with a 72 hour Completion Time applies to both condition statements independently because of the logical connector. Proposed generic TS 3.5.1 places the second condition statement into a new separate Condition B and retains STS Required Action A.1 as Required Action B.1. The first condition statement remains in Condition A; however, Required Action A.1 is changed to say “Restore boron concentration to within limits.” Both required actions retain the same 72 hour Completion Time.

When in either condition statement, the SIT is considered inoperable; therefore the two presentations do not alter the operating constraints specified for when one SIT is inoperable for the stated conditions. Therefore, splitting the STS Condition A into two Conditions is not necessary. Since the proposed presentation is not consistent with either the STS or other APR1400 Specifications, such as generic TS 3.5.4 Condition A, it is contrary to the omission policy on TS standardization, not to mention achieving internal consistency within the generic

TS.

The applicant is requested to either justify this deviation from STS 3.5.1, or conform to the STS presentation.

Response

The wording of the proposed generic TS 3.5.1 Condition A will be revised to conform to the STS 3.5.1 presentation.

Impact on DCD

Same as changes described in Impact on Technical Specifications section.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

TS 3.5.1 will be revised as indicated in the Attachment.

Impact on Technical/Topical/Environmental Reports

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

3.5 EMERGENCY CORE COOLING SYSTEM (ECCS)

3.5.1 Safety Injection Tanks (SITs)

LCO 3.5.1 Four SITs shall be OPERABLE.

APPLICABILITY: MODES 1 and 2,
MODES 3 and 4 with pressurizer pressure ≥ 50.3 kg/cm^2 A (715 psia).

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One SIT inoperable due to boron concentration not within limits.	A.1 Restore boron concentration to within limits.	72 hours
B. One SIT inoperable due to inability to verify water level or pressure.	B.1 Restore SIT to OPERABLE status.	72 hours
C. One SIT inoperable for reasons other than Condition A or B.	C.1 Restore SIT to OPERABLE status.	1 hour
D. Required Actions and associated Completion Times of Condition A, B, or C not met.	D.1 Be in MODE 3. AND D.2 Reduce pressurizer pressure to < 50.3 kg/cm^2 A (715 psia).	6 hours 12 hours
E. Two or more SITs inoperable.	E.1 Enter LCO 3.0.3.	Immediately

BASES

ACTIONS (continued)

~~B.1~~

If the level and pressure cannot be verified, pressure and level indication for the affected SIT would not be available to the Operators. However, in this condition the SIT would still be available to fulfill its function because it is unlikely that the level or pressure would deteriorate to outside specified limits within 72 hours. Therefore, based on this, and that the level and pressure instrumentation associated with the SITs do not initiate a safety action, it is reasonable to allow 72 hours to restore the SIT to OPERABLE status. This is consistent with the recommendations of NUREG-1366 (Reference 5).

If there is a known condition where pressure or level could not be maintained within limits for at least 72 hours, then the affected SIT would be considered inoperable for reasons other than the inability to verify level or pressure.

C.1 ← B.1

If one SIT is inoperable, for a reason other than boron concentration or the inability to verify level or pressure, the SIT must be returned to OPERABLE status within 1 hour. In this Condition, the required contents of four SITs cannot be assumed to reach the core during a LBLOCA. Due to the severity of the consequences should a LOCA occur in these conditions, the 1-hour Completion Time to open the valve, remove power to the valve, or restore the proper water volume or nitrogen cover gas pressure ensures that prompt action will be taken to return the inoperable SIT to OPERABLE status. The Completion Time minimizes the exposure of the plant to a LOCA in these conditions.

D.1 and D.2 ← C.1 and C.2

If the SIT cannot be returned to OPERABLE status within the associated Completion Time, the plant must be placed in a MODE in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and pressurizer pressure reduced to less than 50.3 kg/cm^{2}A (715 psia) within 12 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.

BASES

ACTIONS (continued)

E.1 ← D.1

If more than one SIT is inoperable, the unit is in a condition outside the accident analyses. Therefore, LCO 3.0.3 must be entered immediately.

SURVEILLANCE REQUIREMENTS

SR 3.5.1.1

Verification every 12 hours that each SIT isolation valve is fully open, as indicated in the MCR, ensures the SITs are available for injection and ensures timely discovery if a valve should be partially closed. If an isolation valve is not fully open the rate of injection to the RCS would be reduced. Although a motor-operated valve position should not change with power removed, a closed valve could result in not meeting accident analysis assumptions. A 12-hour Frequency is considered reasonable in view of other administrative controls that ensure the unlikelihood of a mispositioned isolation valve.

SR 3.5.1.2 and SR 3.5.1.3

SIT borated water volume and nitrogen cover gas pressure should be verified to within specified limits every 12 hours in order to ensure adequate injection during a LOCA. Due to the static design of the SITs, a 12-hour Frequency allows the operator sufficient time to identify changes before the limits are reached. Operating experience has shown this Frequency to be appropriate for early detection and correction of off normal trends.

SR 3.5.1.4

within 6 hours after a 1% volume increase

A period of 31 days is reasonable for verification to determine that each SIT's boron concentration is within the required limits, because the static design of the SITs limits the ways in which the concentration can be changed. The 31-day Frequency is adequate to identify changes which could occur from mechanisms such as stratification or in-leakage. Sampling the affected SIT will identify whether inleakage from the RCS has caused a reduction in boron concentration to below the required limit. It is not necessary to verify boron concentration if the added water is from the IRWST, because the water contained in the IRWST is within the SIT boron concentration requirements. This is consistent with the recommendations of NUREG-1366 (Reference 5).

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Question No. 16-17

The Frequency for generic TS SR 3.5.1.4 for when borated water has been added to a SIT states, “Whenever a SIT volume change not from the IRWST exceeds the limits of SR 3.5.1.2, immediately after a boron concentration measurement is ready.” The wording in the STS for the same SR is “Once within 6 hours after each solution volume increase of ≥ [1%] of tank volume that is not the result of addition from the refueling tank.” The proposed generic TS SR Frequency phrasing is very confusing and needs to be rewritten. The applicant is requested to justify not using the STS wording and revise the proposed Frequency for clarity.

Response

The wording of the generic TS SR 3.5.1.4 will be revised to conform to the STS wording.

Impact on DCD

Same as changes described in Impact on Technical Specifications section.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

TS SR 3.5.1.4 will be revised as indicated in the Attachment.

Impact on Technical/Topical/Environmental Reports

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

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.5.1.1	Verify each SIT isolation valve is fully open.	12 hours
SR 3.5.1.2	Verify borated water volume in each SIT is ≥ 29 % and ≤ 69 % (% narrow range).	12 hours
SR 3.5.1.3	Verify nitrogen cover-pressure in each SIT is ≥ 40.6 kg/cm^{2}G (578 psig) and ≤ 43.9 kg/cm^{2}G (624 psig).	12 hours
SR 3.5.1.4	Verify boron concentration in each SIT is ≥ 2,300 ppm and ≤ 4,400 ppm.	31 days AND ---------- NOTE ---------- Only required to be performed for affected SIT. ---------- Whenever a SIT volume change not from the IRWST exceeds the limits of SR 3.5.1.2, immediately after a boron concentration measurement is ready
SR 3.5.1.5	Verify power is removed from each SIT isolation valve operator when pressurizer pressure is ≥ 50.3 kg/cm^{2}A (715 psia).	31 days

Once within 6 hours after each solution volume increase of ≥1% of tank volume that is not the result of addition from the in-containment refueling water tank

BASES

ACTIONS (continued)

E.1 ← D.1

If more than one SIT is inoperable, the unit is in a condition outside the accident analyses. Therefore, LCO 3.0.3 must be entered immediately.

SURVEILLANCE REQUIREMENTS

SR 3.5.1.1

Verification every 12 hours that each SIT isolation valve is fully open, as indicated in the MCR, ensures the SITs are available for injection and ensures timely discovery if a valve should be partially closed. If an isolation valve is not fully open the rate of injection to the RCS would be reduced. Although a motor-operated valve position should not change with power removed, a closed valve could result in not meeting accident analysis assumptions. A 12-hour Frequency is considered reasonable in view of other administrative controls that ensure the unlikelihood of a mispositioned isolation valve.

SR 3.5.1.2 and SR 3.5.1.3

SIT borated water volume and nitrogen cover gas pressure should be verified to within specified limits every 12 hours in order to ensure adequate injection during a LOCA. Due to the static design of the SITs, a 12-hour Frequency allows the operator sufficient time to identify changes before the limits are reached. Operating experience has shown this Frequency to be appropriate for early detection and correction of off normal trends.

SR 3.5.1.4

within 6 hours after a 1% volume increase

A period of 31 days is reasonable for verification to determine that each SIT's boron concentration is within the required limits, because the static design of the SITs limits the ways in which the concentration can be changed. The 31-day Frequency is adequate to identify changes which could occur from mechanisms such as stratification or in-leakage. Sampling the affected SIT will identify whether inleakage from the RCS has caused a reduction in boron concentration to below the required limit. It is not necessary to verify boron concentration if the added water is from the IRWST, because the water contained in the IRWST is within the SIT boron concentration requirements. This is consistent with the recommendations of NUREG-1366 (Reference 5).

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Question No. 16-18

Condition A of proposed generic TS 3.5.2, “Safety Injection System (SIS) – Operating,” has two condition statements, which should be written as “One train inoperable OR Two trains inoperable and diagonally oriented with respect to reactor vessel.” Required Action A.1, “Restore train to OPERABLE status” with a 72 hour Completion Time apparently intended to apply to both condition statements independently because of the logical connector. However, Required Action A.1 needs to be rewritten, because when in the second condition statement both inoperable trains need to be restored to operable status within the 72 hour Completion Time. The applicant is requested to propose new wording for Required Action A.1.

Response

TS 3.5.2 Action A.1 will be separated into Action A.1 for One train inoperable and Action A.2 for Two trains inoperable and diagonally oriented with respect to the reactor vessel.

Impact on DCD

Same as changes described in Impact on Technical Specifications section.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

TS 3.5.2 Action A.1 will be revised as indicated in the Attachment.

Impact on Technical/Topical/Environmental Reports

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

3.5 EMERGENCY CORE COOLING SYSTEM (ECCS)

3.5.2 Safety Injection System (SIS) – Operating

Two trains inoperable and diagonally oriented with respect to the reactor vessel.

LCO 3.5.2 Four trains of SIS shall be OPERABLE.

A.2 Restore two trains diagonally oriented with respect to the reactor vessel to OPERABLE status.

APPLICABILITY: MODES 1, 2, and 3

OR

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. One train inoperable ~~OR Two trains inoperable and diagonally oriented with respect to reactor vessel.~~	A.1 Restore train to OPERABLE status. OR	72 hours 72 hours
B. Required Action and associated Completion Time not met.	B.1 Be in MODE 3. AND B.2 Be in MODE 4.	6 hours 12 hours
C. Two or more trains inoperable for reasons other than Condition A.	C.1 Enter LCO 3.0.3.	Immediately

BASES

APPLICABILITY (continued)

The SIS functional requirements for MODES 4, 5, and 6 are described in LCO 3.5.3.

ACTIONS

A.1 ← A.1 and A.2

If one train is inoperable or two trains are inoperable and diagonally oriented with respect to the reactor vessel (Trains 1 and 3, or Trains 2 and 4; trains associated with the same emergency diesel generator), the inoperable components must be returned to OPERABLE status within 72 hours. The 72-hour Completion Time is based on an NRC study (Reference 4) using a reliability evaluation and is a reasonable amount of time to effect many repairs.

An SIS train is inoperable if it is not capable of delivering the design flow to the RCS. The individual components are inoperable if they are not capable of performing their design function, or if supporting systems are not available (except as allowed by their respective LCOs).

The LCO requires the OPERABILITY of a number of independent subsystems. Due to the redundancy of trains and the diversity of subsystems, the inoperability of one component in a train does not render the SIS incapable of performing its function. Neither does the inoperability of two different components, each in a different train, necessarily result in a loss of function for the SIS. This allows increased flexibility in plant operations when components in opposite trains are inoperable.

An event accompanied by a loss of offsite power and the failure of an emergency diesel generator can disable one SIS train until power is restored. Full flow from two diagonally oriented SI pumps is credited for a break in an RCP discharge leg and flow is initially directed to the associated DVI and later a portion of the flow is directed to the hot leg via one of the available trains (Train 3 or 4). Hence, continued operation for 72 hours is justified.

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Question No. 16-19

Proposed generic TS SR 3.5.2.1 includes a table listing four valves with all having the same position of “CLOSED” and the same function of “Hot Leg Injection.” Therefore, the table is not needed and only the valve numbers need be listed with the same requirement to be “locked in the closed position.” Justify the table or revise SR 3.5.2.1 to state something similar to: "Verify the following hot leg injection valves are locked in the closed position: SI-321, SI-331, SI-604, and SI-609."

Response

The wording of TS SR 3.5.2.1 will be revised to eliminate the table and state that the hot leg injection isolation valves SI-321, SI-331, SI-604, and SI-609 will be verified in the locked closed position.

Impact on DCD

Same as changes described in Impact on Technical Specifications section.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

TS SR 3.5.2.1 will be revised as indicated in the Attachment.

Impact on Technical/Topical/Environmental Reports

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

Verify the following hot leg injection isolation valves are locked in the closed position: SI-321, SI-331, SI-604, and SI-609 .

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.5.2.1	Verify the following valves are locked in the listed position: Valve Number — Position — Function SI-321 — CLOSED — Hot Leg Injection SI-331 — CLOSED — Hot Leg Injection SI-604 — CLOSED — Hot Leg Injection SI-609 — CLOSED — Hot Leg Injection	12 hours
SR 3.5.2.2	---------- NOTE ---------- Not required to be met for system vent flow paths opened under administrative control. ---------- Verify each SIS manual, power-operated, and automatic valve in the flow path that is not locked, sealed, or otherwise secured in position is in correct position.	31 days
SR 3.5.2.3	Verify SIS piping locations susceptible to gas accumulation are sufficiently filled with water.	31 days
SR 3.5.2.4	Verify each safety injection pump develops required differential pressure on minimum flow of 123.8 kg/cm^2 D (1,761 psid).	In accordance with Inservice Testing Program
SR 3.5.2.5	Verify each SIS pump develops a flow of greater than or equal to 3,407 lpm (900 gpm) at a differential pressure greater than or equal to 86.9 kg/cm^2D (1,236 psid).	In accordance with Inservice Testing Program
SR 3.5.2.6	Verify each SIS train automatic valve in the flow path actuates to correct position on an actual or simulated actuation signal.	18 months

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Question No. 16-20

Proposed generic TS 3.5.3 Condition B states “Required Action and associated Completion Time of Condition A not met.” Required Action B.1.1 is to “Verify RCS level >39.7 m (130 ft 0 in),” which is unnecessary because Required Action B.1.2 is to ‘Initiate actions to restore “RCS level > 39.7 m (130 ft 0 in),” and the TS Applicability is “… MODE 6 with RCS level < 39.7 m (130 ft 0 in).” The applicant is requested to justify the need for Required Action B.1.1, or remove it and renumber Required Action B.1.2 as B.1.

Response

TS 3.5.3 Required Action B.1.1 will be removed and Required Action B.1.2 will be renumbered as B.1.

Impact on DCD

Same as changes described in Impact on Technical Specifications section.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

TS 3.5.3 will be revised as indicated in the Attachment.

Impact on Technical/Topical/Environmental Reports

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

3.5 EMERGENCY CORE COOLING SYSTEM (ECCS)

3.5.3 Safety Injection System (SIS) – Shutdown

LCO 3.5.3 ~~Two trains of SIS shall be OPERABLE and diagonally oriented with respect to reactor vessel.~~

Two trains of SIS diagonally oriented with respect to the reactor vessel shall be OPERABLE.

APPLICABILITY: MODES 4 and 5,
MODE 6 with RCS level < 39.7 m (130 ft 0 in)

ACTIONS

trains

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Required SIS train inoperable.	A.1 Restore required SIS train to OPERABLE status.	1 hour
B. Required Action and associated Completion Time of Condition A not met.	~~B.1.1 Verify RCS level ≥ 39.7 m (130 ft 0 in).~~ ~~OR~~	~~Immediately~~
B.1	B.1.2 Initiate actions to restore RCS level to ≥ 39.7 m (130 ft 0 in). AND	Immediately
	B.2 Reduce RCS cold leg temperature to < 57.2 °C (135 °F).	24 hours

BASES

APPLICABILITY

In MODES 1, 2 and 3, the OPERABILITY requirements for SIS are covered by LCO 3.5.2.

In MODES 4, 5, and 6 with RCS level less than 39.7 m (130 ft), a loss of coolant resulting from a DVI line break requires two SI trains to be operable to ensure that if a LOCA disables one train an alternate SIS train is available. The requirement of having two OPERABLE SI trains is acceptable without single failure consideration on the basis of the stable reactivity condition and the limited core cooling requirements.

ACTIONS

A.1

With only one SI pump or two SI pump OPERABLE and not diagonally oriented with respect to the reactor vessel, the unit is not prepared to respond to a LOCA. The 1-hour Completion Time to restore at least two SIS trains to OPERABLE status ensures prompt action is taken to restore the required cooling capacity.

B.1.1, B.1.2, and B.2 ← B.1 and B.2

The plant must be placed in a condition in which the LCO does not apply if SIS cannot be returned to OPERABLE status within the associated completion time. ~~An RCS level of greater than 39.7m (130 ft) (the top of the reactor vessel flange) will provide a minimum water inventory in the event of a LOCA. In addition, the reduction of RCS cold leg temperature to less than 57.2 °C (135°F) will provide a reduction in clad temperature. The 24-hour Completion Time limits the time the plant is subject to conditions where the LCO is applicable.~~

SURVEILLANCE REQUIREMENTS

SR 3.5.3.1

The applicable Surveillance descriptions from Bases LCO 3.5.2 apply.

REFERENCES

The applicable references from bases 3.5.2 apply.

In MODE 6, an RCS level greater than 39.7m (130 ft) (the top of the reactor vessel flange) will provide sufficient water inventory in the event of a LOCA. In MODE 4 or MODE 5, the reduction of RCS cold leg temperature to less than 57.2 °C (135°F) will enhance the margin for the peak cladding temperature for LOCA conditions. The reduction of cold leg temperature does not yield the unit conditions where the LCO is not applicable. However, considering that the possibility of a LOCA during MODE 4 or MODE 5 is extremely low, this action is considered acceptable. It is possible to reduce RCS cold leg temperature from any shutdown conditions to < 57.2 °C (135 °F) within 24 hours; therefore, the associated completion time is reasonable.

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Question No. 16-21

Proposed generic TS 3.5.3 Required Action B.2 is to “Reduce RCS cold leg temperature to < 57.2 °C (135 °F)” within 24 hours. Required Action B.2 and the associated Completion Time are not adequately justified or explained in the Bases or elsewhere. Justify and explain in Bases TS 3.5.3 Required Action B.2 and the associated 24 hour Completion Time. Staff notes that in the Bases for ACTION B, the last sentence says “The 24-hour Completion Time limits the time the plant is subject to conditions where the LCO is applicable.” This statement makes no sense because the TS Applicability is MODE 6 which has no lower temperature range limit in its definition.

Response

The APR1400 requires SIS operability not only during MODE 4, but also for MODE 5 and MODE 6 with RCS level < 39.7 m (130 ft 0 in) based on the shutdown risk evaluation. When SIS is not available during MODE 5, there is no other possible action to change the plant conditions that do not require SIS operability, except detensioning one or more reactor vessel head closure bolts; which is considered unreasonable. Cooldown to the refueling temperature (135°F) is selected as an additional action required to place the unit in a safer status. Considering that the possibility of a LOCA during MODE 4 or 5 is extremely low, this action is considered acceptable. It is possible to reduce RCS cold leg temperature from any shutdown condition to < 57.2 °C (135 °F) within 24 hours. Thus, the associated completion time is reasonable.

The BASES for ACTION B will be modified accordingly.

Impact on DCD

Same as changes described in Impact on Technical Specifications section.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

TS 3.5.3.B will be revised as indicated in the Attachment.

Impact on Technical/Topical/Environmental Reports

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

BASES

APPLICABILITY

In MODES 1, 2 and 3, the OPERABILITY requirements for SIS are covered by LCO 3.5.2.

In MODES 4, 5, and 6 with RCS level less than 39.7 m (130 ft), a loss of coolant resulting from a DVI line break requires two SI trains to be operable to ensure that if a LOCA disables one train an alternate SIS train is available. The requirement of having two OPERABLE SI trains is acceptable without single failure consideration on the basis of the stable reactivity condition and the limited core cooling requirements.

ACTIONS

A.1

With only one SI pump or two SI pump OPERABLE and not diagonally oriented with respect to the reactor vessel, the unit is not prepared to respond to a LOCA. The 1-hour Completion Time to restore at least two SIS trains to OPERABLE status ensures prompt action is taken to restore the required cooling capacity.

B.1.1, B.1.2, and B.2 ← B.1 and B.2

The plant must be placed in a condition in which the LCO does not apply if SIS cannot be returned to OPERABLE status within the associated completion time. ~~An RCS level of greater than 39.7m (130 ft) (the top of the reactor vessel flange) will provide a minimum water inventory in the event of a LOCA. In addition, the reduction of RCS cold leg temperature to less than 57.2 °C (135°F) will provide a reduction in clad temperature. The 24-hour Completion Time limits the time the plant is subject to conditions where the LCO is applicable.~~

SURVEILLANCE REQUIREMENTS

SR 3.5.3.1

The applicable Surveillance descriptions from Bases LCO 3.5.2 apply.

REFERENCES

The applicable references from bases 3.5.2 apply.

In MODE 6, an RCS level greater than 39.7m (130 ft) (the top of the reactor vessel flange) will provide sufficient water inventory in the event of a LOCA. In MODE 4 or MODE 5, the reduction of RCS cold leg temperature to less than 57.2 °C (135°F) will enhance the margin for the peak cladding temperature for LOCA conditions. The reduction of cold leg temperature does not yield the unit conditions where the LCO is not applicable. However, considering that the possibility of a LOCA during MODE 4 or MODE 5 is extremely low, this action is considered acceptable. It is possible to reduce RCS cold leg temperature from any shutdown conditions to < 57.2 °C (135 °F) within 24 hours; therefore, the associated completion time is reasonable.

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Question No. 16-22

Proposed wording referring to IRWST water temperature and water volume uses “borated water temperature,” and “borated water volume” in generic TS 3.5.4 (Conditions A and B; SR 3.5.4.1 and SR 3.5.4.2; and associated Bases). Since there is a Condition addressing boron concentration, the need to use the adjective “borated” prior to the word water is questioned.

Justify using the term “borated” before “water temperature,” and “water volume” or revise the wording appropriately.

Response

The word “borated” before “water temperature” and “water volume” will be deleted to be a concise statement.

Impact on DCD

Same as changes described in Impact on Technical Specifications section.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

TS 3.5.4 and the associated Bases for 3.5.4 will be revised as indicated in the attached markup.

Impact on Technical/Topical/Environmental Reports

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

3.5 EMERGENCY CORE COOLING SYSTEM (ECCS)

3.5.4 In-Containment Refueling Water Storage Tank (IRWST)

LCO 3.5.4 The IRWST shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3, 4, and 5,
MODE 6 with RCS level < 39.7 m (130 ft 0 in)

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. IRWST boron concentration not within limits. OR IRWST ~~borated~~ water temperature not within limits.	A.1 Restore IRWST to OPERABLE status.	8 hours
B. IRWST ~~borated~~ water volume not within limits.	B.1 Restore IRWST to OPERABLE status.	1 hour
C. Required Action and associated Completion Time of Condition A or B not met in MODE 1, 2, 3, or 4.	C.1 Be in MODE 3. AND C.2 Be in MODE 5.	6 hours 36 hours
D. Required Action and associated Completion Time of Condition A or B not met in MODE 5 or MODE 6 with RCS level < 39.7 m (130 ft 0 in).	D.1 Initiate action to restore RCS level to ≥ 39.7 m (130 ft 0 in). AND D.2 Reduce RCS cold leg temperature to < 57.2 °C (135 °F).	Immediately 24 hours

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.5.4.1	Verify IRWST ~~borated~~ water temperature is ≥ 10 °C (50 °F) and ≤ 49 °C (120 °F).	24 hours
SR 3.5.4.2	Verify IRWST ~~borated~~ water volume is ≥ [2,373.5 m^3 (627,000 gal)] and ≤ [2,540.6 m^3 (671,162 gal)] (i.e., ≥ 74.43 % and ≤ 79.67 %).	7 days
SR 3.5.4.3	Verify IRWST boron concentration is ≥ 4,000 ppm and ≤ 4,400 ppm.	7 days

BASES

LCO

The IRWST ensures that an adequate supply of borated water is available to cool and depressurize the containment in the event of a design basis accident (DBA) and to cool and cover the core in the event of a LOCA. The IRWST ensures the reactor remains subcritical following a DBA.

To be considered OPERABLE, the IRWST must meet the limits established in the SR for water volume, boron concentration and temperature.

The flow path for each train must maintain its designed independence to ensure that no single failure can prevent delivery of the minimum required flow rate.

APPLICABILITY

In MODES 1, 2, 3 and 4, the IRWST OPERABILITY requirements are dictated by the SIS and CSS OPERABILITY requirements. Since both the SIS and CSS must be OPERABLE in MODES 1, 2, 3 and 4, the IRWST must be OPERABLE to support these systems.

In MODES 5 and MODE 6 with RCS level less than 39.7 m (130 ft), the IRWST OPERABILITY requirements are dictated by the SIS. The requirements of SIS are specified in LCO 3.5.3. Two trains of SIS, one in each division, are required in these MODES, therefore the IRWST must be OPERABLE to support the SIS.

MODE 6 considers a loss of decay heat removal (DHR) resulting from a break in the bottom of the hot leg or a lower head instrument line (2.8 cm^2 [0.003 ft^2]). If the reactor coolant water level is above the reactor vessel flange (greater than 39.7 m [130 ft]), the low power shutdown risk is negligible because sufficient water inventory in refueling pool is available.

ACTIONS

A.1

With IRWST boron concentration or ~~borated~~ water temperature not within limits, they must be returned to within limits within 8 hours. In this condition neither the SIS nor the CSS can perform its design functions, therefore, prompt action must be taken to restore the tank to OPERABLE condition.

The allowed Completion Time of 8 hours to restore the IRWST boron concentration or temperature to within limits was developed considering the time required to change boron concentration or temperature and that the contents of the tank are still available for injection.

BASES

ACTIONS (continued)

B.1

With IRWST ~~borated~~ water volume not within limits, it must be returned to within limits within 1 hour. In this condition neither the SIS nor the CSS can perform ~~its design~~ function; therefore, prompt action must be taken to restore the tank to OPERABLE status or to place the plant in a MODE in which these systems are not required. The Completion Time of 1 hour to restore the IRWST to OPERABLE is based on this condition simultaneously affecting multiple trains.

C.1, and C.2

If the IRWST cannot be returned to OPERABLE status within the associated Completion Time, the plant must be brought to a condition in which the LCO does not apply. To achieve this status, the plant must be brought to at least MODE 3 within 6 hours and to MODE 5 within 36 hours.

The allowed Completion Times are reasonable, based on operating experience, to reach the required plant condition from full power and shutdown conditions in an orderly manner and without challenging plant systems.

D.1 and D.2

The plant must be placed in a condition in which the LCO does not apply if SIS cannot be returned to OPERABLE status within the associated Completion Time. An RCS level of greater than 39.7m (130 ft) (the top of the reactor vessel flange) will provide a minimum water inventory in the event of a LOCA. In case that the reactor water level is below the reactor vessel flange with head off in MODE 6, one safety injection pump is required immediately after loss of coolant accident at the low power shutdown condition according to the shutdown LOCA safety analysis. If the reactor coolant water level is above the reactor vessel flange with head off in MODE 6, the low power shutdown risk is negligible because sufficient water inventory in refueling pool is available.

BASES

ACTIONS (continued)

Therefore, the reactor flange water level above the reactor vessel flange with head off in MODE 6 does not require one safety injection pump after loss of coolant accident at low power shutdown risk. In addition, if RCS water level is below the flange of the reactor vessel, there is a potential of evaporation of the coolant. The reduction of RCS cold leg temperature to less than 57.2 °C (135°F) will provide a reduction in clad temperature. If RCS cold leg temperature reaches above 57.2 °C (135°F), there is a potential to evaporate. The 24-hour Completion Time limits the time the plant is subject to conditions where the LCO is applicable.

SURVEILLANCE REQUIREMENTS

SR 3.5.4.1

IRWST ~~borated~~ water temperature shall be verified every 24 hours to be within the limits assumed in the accident analysis. This Frequency has been ~~shown to be~~ sufficient to identify temperature changes that approach either acceptable limit.

SR 3.5.4.2

The IRWST water volume must be maintained equal to or more than the required minimum value and equal to or less than the maximum value. IRWST water volume shall be verified every 7 days. Since the IRWST water volume is normally stable and provided with a low level alarm, a 7-day Frequency is appropriate and has been shown to be acceptable through operating experience.

SR 3.5.4.3

The boron concentration of the IRWST shall be verified every 7 days to be within the required range. This Frequency ensures that the reactor will remain subcritical following a LOCA. Further, it ensures that the resulting IRWST pH is maintained in an acceptable range such that boron precipitation in the core will not occur earlier than predicted and the effect of chloride and caustic stress corrosion on mechanical systems and components will be minimized. Since the IRWST volume is normally stable, a 7-day sampling Frequency is appropriate and has been shown through operating experience to be acceptable.

REFERENCES

1. 10 CFR Part 50, Appendix A, GDC 35.
2. DCD Tier 2, Chapter 6.
3. DCD Tier 2, Chapter 15.