Industry/TSTF Standard Technical Specification Change Traveler

Revise LCO 3.5.5 for RCP seal injection flow resistance

NUREGs Affected: ☐ 1430 ☑ 1431 ☐ 1432 ☐ 1433 ☐ 1434

Classification: 2) Consistency/Standardization Recommended for CLIIP?: No

Priority: 3)Low

Simple or Complex Change: Complex

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1.0 DESCRIPTION

This proposed traveler modifies TS 3.5.5, "Seal Injection Flow," to allow a seal injection flow limit, a seal injection flow resistance limit, or flow limits within an established flow limit curve. LCO 3.5.5 ensures that seal injection flow [resistance] will be sufficient for RCP seal integrity but limited so that the ECCS trains will be capable of delivering sufficient water to match boiloff rates soon enough to minimize uncovering of the core following a large LOCA. It also ensures that the centrifugal charging pumps will deliver sufficient water for a small LOCA and sufficient boron to maintain the core subcritical. For smaller LOCAs, the charging pumps alone deliver sufficient fluid to overcome the loss and maintain RCS inventory.

2.0 PROPOSED CHANGE

LCO 3.5.5 states: "Reactor coolant pump seal injection flow shall be ≤ [40] gpm with [centrifugal charging pump discharge header] pressure ≥ [2480] psig and the [charging flow] control valve full open." This change revises LCO 3.5.5 to state:

> "Reactor coolant pump seal injection flow [resistance] shall be [≤ [40] gpm with [centrifugal charging pump discharge header] pressure ≥ [2480] psig and the [charging flow] control valve full open or ≥ [0.2117] ft/gm^2 or within the limit of Figure 3.5.5-1.]"

The ACTIONS Condition A state, "Seal injection flow not within limit." Condition A is revised to state, "Seal injection flow [resistance] not within limit." Required Action A.1 states, "Adjust manual seal injection throttle valves to give a flow within limit with [centrifugal charging pump discharge header] pressure ≥ [2480] psig and the [charging flow] control valve full open." Required Action A.1 is revised to state, "Adjust manual seal injection throttle valves to give a flow [resistance] within limit."

SR 3.5.5.1 states: "Verify manual seal injection throttle valves are adjusted to give a flow within limit with [centrifugal charging pump discharge header] pressure ≥ [2480] psig and the [charging flow] control valve full open." This change revises the SR to state:

> "Verify manual seal injection throttle valves are adjusted to give a flow [resistance] [of ≤ [40 gpm] with [centrifugal charging pump discharge header] pressure ≥ [2480] psig and the [charging flow] control valve full open or ≥ [0.2117] ft/gm^2 or within the limit of Figure 3.5.5-1.]"

3.0 BACKGROUND

TS 3.5.5 is applicable only to those units that utilize the centrifugal charging pumps for safety injection (SI). The function of the seal injection throttle valves during an accident is similar to the function of the ECCS throttle valves in that each restricts flow from the centrifugal charging pump header to the Reactor Coolant System (RCS). The restriction on reactor coolant pump (RCP) seal injection flow limits the amount of ECCS flow that would be diverted from the injection path following an accident. This limit is based on safety analysis assumptions that are required because RCP seal injection flow is not isolated during SI.

TSTF-337, Rev. 0, proposed to move the specific LCO limit to the TS Bases. In September 2000, the NRC provided comments that stated, in part: "...we find that the WOG's acceptance criteria for the proposed flow resistance limits would provide the same level of protection as the current STS 3.5.5 with respect to ECCS performance, and are acceptable. However, the specific values of the seal flow resistance limits are different for each plant and are subject to the staff review and approval for plant specific licensing applications. Additionally, we find that the WOG's approach to relocate the specific values of seal flow resistance limits from the LCO to the Bases section is not acceptable." The letter further indicates that an STS may be acceptable if one or more of the acceptance criteria are included in the proposed LCO, and ACTION and SR.

Revision 1 to this TSTF proposes to maintain several acceptance limit alternatives within the LCO and SR.

4.0 TECHNICAL ANALYSIS

This proposed traveler modifies TS 3.5.5, "Seal Injection Flow," to allow a seal injection flow limit, a seal injection flow resistance limit, or flow limits within an established flow limit curve. This proposed change allows for alternate acceptance criteria and methods for verifying the correct position of the RCP seal injection throttle valves.

Flow Resistance Acceptance Limit

The ECCS flow analysis determines RCP seal injection flow as a function of system conditions based on the RCP seal line resistance. Line resistances used in the ECCS flow model are in the form of head loss per unit flow rate squared, or ft/gpm^2. The total head loss in the RCP seal flow path is the summation of pressure losses due to piping resistances, filter resistances, valve resistance, and fitting resistances between the centrifugal charging pump discharge and the RCP balance chamber. To obtain the minimum line resistance, total head loss is minimized while the flow rate is maximized.

The minimum RCP seal flow resistance assumed in the ECCS flow analysis is based on a minimum allowable centrifugal charging pump discharge pressure, a maximum RCP balance chamber pressure, and a maximum RCP seal flow rate. The use of maximum and minimum values results in a conservatively calculated minimum flow resistance.

The RCP seal hydraulic flow resistance is established by positioning the manual seal injection throttle valves and does not change if the valves are not adjusted and the RCP seal filters are not changed. Utilizing a hydraulic resistance model allows the accident analysis assumptions (based on hydraulic resistance) to be satisfied for various charging flow rates, even though the indicated RCP seal injection flow may excced the maximum flow rate for various plant operating conditions.

Seal Injection Flow Curve

Two safety-related centrifugal charging pumps (CCPs) are used to provide flow to both the high head safety injection (SI) portion of the emergency core cooling system (ECCS) and to the RCP seals. The function of the seal injection throttle valves during an accident is similar to the function of the ECCS throttle valves covered in TS 3.5.2 in that they function to restrict flow from the CCP header to the RCS. The TS 3.5.5 LCO limits the amount of ECCS flow that could be diverted from the SI flow path to the seal injection flow path following a loss of coolant accident (LOCA). The seal injection flow limit supports safety analysis assumptions that are required because RCP seal injection flow is not isolated by a SI signal and RCP seal injection is not credited for core cooling in the minimum SI flow cases. The seal injection flow limit is met by controlling the seal injection flow path flow resistance. The intent of LCO 3.5.5 is to control that resistance through proper positioning of the seal injection throttle valves.

The seal injection flow curve is a function of the total RCP seal injection line flow versus the pressure differential between the charging pump header and the RCS pressurizer steam space pressure (as determined by the average of four pressurizer pressure instruments). The seal injection flow curve graphically represents this acceptance criteria. The seal injection curve ensures adequate flow to the reactor coolant pump seals while ensuring the safety analysis assumption for minimum ECCS flow is maintained while avoiding charging pump runout conditions. This figure Specifying a curve, rather than a single point, facilitates the determination of an acceptable surveillance test and is an improvement from a human factors perspective.

5.0 REGULATORY ANALYSIS

5.1 No Significant Hazards Consideration

The TSTF has evaluated whether or not a significant hazards consideration is involved with the proposed generic change by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

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

Response: No.

Overall protection system performance will remain within the bounds of the previously performed accident analyses since there are no hardware changes. The Reactor Trip System instrumentation and reactivity control systems will be unaffected. Protection systems will continue to function in a manner consistent with the plant design basis. All design, material, and construction standards that were applicable prior to the request are maintained.

The proposed changes do not adversely affect accident initiators or precursors nor alter the design assumptions, conditions, or configuration of the facility, or the manner in which the plant is operated and maintained. The proposed changes do not alter or prevent the ability of structures, systems, and components (SSCs) from performing their intended function to mitigate the consequences of an initiating event within the assumed acceptance limits. The initiating event for a loss of coolant accident, as discussed in the safety analysis, is a break in the RCS piping. Since the RCS piping design is unchanged, there will be no initiating event frequency increase associated with pipe breaks. The proposed changes do not affect the source term, containment isolation, or radiological release assumptions used in evaluating the radiological consequences of an accident previously evaluated. Further, the proposed changes do not increase the types or amounts of radioactive effluent that may be released offsite, nor significantly increase individual or cumulative occupational/public radiation exposures. The proposed changes are consistent with the safety analysis assumptions and resultant consequences.

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

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

Response: No.

There are no hardware changes nor are there any changes in the method by which any safety related plan system performs its safety function. The changes do not involve a physical alteration of the plant (i.e., no new or different type of equipment will be installed) or a change in the methods governing normal plant operation. The changes do not alter any assumptions made in the safety analysis. The proposed changes are consistent with the safety analysis assumptions and current plant operating practices regarding limits on RCP seal injection flow.

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

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

Response: No.

There will be no effect on the manner in which safety limits or limiting safety system settings are determined nor will there be any effect on those plant systems necessary to assure the accomplishment of protection functions. There will be no impact on the overpower limit, departure from nucleate boiling ratio (DNBR) limits, heat flux hot channel factor (F_Q), nuclear enthalpy rise hot channel factor ($F\Delta H$), loss of coolant accident peak cladding temperature (LOCA PCT), peak local power density, or any other margin of safety. The radiological dose consequence acceptance criteria listed in the Standard Review Plan will continue to be met. The safety analysis acceptance criteria are not impacted by this change. The proposed changes will not result in plant operation in a configuration outside of the design basis.

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

5.2 Applicable Regulatory Requirements

The regulatory requirements associated with ECCS seal injection flow, TS 3.5.5, are covered in 10CFR50.46 and 10CFR Appendix A, GDCs 35, 36, and 37.

TS 3.5.5, in conjunction with TS 3.5.2, "ECCS Operating," helps to ensure that the following acceptance criteria, established by 10CFR50.46, will be met following a LOCA:

a. Maximum fuel element cladding temperature is $\leq 2200°F$;
b. Maximum cladding oxidation is ≤ 0.17 times the total cladding thickness before oxidation;
c. Maximum hydrogen generation from a zirconium-water reaction is ≤ 0.01 times the hypothetical amount generated if all of the metal in the cladding cylinders surrounding the fuel, excluding the cladding surrounding the plenum volume, were to react;
d. Core is maintained in a coolable geometry; and
e. Adequate core cooling capability is maintained.

GDC 35, "Emergency Core Cooling," requires that a system be provided for abundant emergency core cooling. The GDC requires redundancy be provided such that the safety function of the ECCS shall be met while energized from either offsite or onsite power, assuming a single failure.

GDC 36, "Inspection of Emergency Core Cooling System," requires the ECCS to be designed to permit periodic inspections.

GDC 37, "Testing of Emergency Core Cooling System," requires the ECCS to be designed to permit periodic demonstrations of the full operational sequence that brings the system into operation.

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

6.0 ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed change would change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed change does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

7.0 REFERENCES

The proposed changes are similar to changes approved in the following References.

1. Wolf Creek Generating Station License Amendment 123 dated March 31, 1999, Conversion to Improved Technical Specifications (TAC No. M98738).

2. Wolf Creek Generating Station License Amendment 132 dated March 1, 2000, Revised RCP Seal Injection Flow Curve, Figure 3.5.5-1 (TAC No. MA7792).

3. Diablo Canyon Power Plant License Amendment No. 148 dated May 7, 2001, Revision of TS 3.5.5, "ECCS Seal Injection Flow."

Revision History

OG Revision 0 Revision Status: Closed

Revision Proposed by: Diablo Canyon

Revision Description:
Original Issue

Owners Group Review Information

Date Originated by OG: 17-Mar-99

Owners Group Comments:
(No Comments)

Owners Group Resolution: Approved Date: 17-Mar-99

TSTF Review Information

TSTF Received Date: 15-Jun-99 Date Distributed for Review: 15-Jun-99

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:
(No Comments)

TSTF Resolution: Approved Date: 15-Jun-99

NRC Review Information

OG Revision 0 Revision Status: Closed

NRC Received Date: 23-Jun-99

NRC Comments:

NRC Letter of 9/7/2000:

The Westinghouse Owner's Group (WOG) proposes to change TS 3.5.5 LCO to "Reactor coolant pump seal injection flow resistance shall be within limits." WOG further defines RCP seal flow resistance limits in the Bases section of Surveillance Requirement (SR) 3.5.5.1. The three acceptance criteria for flow resistance limits proposed by the WOG are:

1. The flow resistance shall restrict a maximum seal injection flow to 40 gpm for the plant conditions with the reactor coolant system (RCS) at normal operating pressure, a minimum charging pump discharge header pressure of 2480 psig and the charging flow control valve at the full-open position.

2. The flow resistance shall limit seal injection flow and differential pressure within the acceptable region of Figure B 3.5.5-1.

3. The flow resistance shall be greater than 0.2117 ft/gpm2.

Further, the WOG states that the acceptance criteria for flow resistance limits discussed in items 1 through 3 above are established to ensure that the limits are sufficient for RCP seal integrity but limited so that the ECCS trains are capable of delivering sufficient water to match boiloff rates soon enough to minimize uncovering of the core following a large LOCA. Since we find that the WOG's acceptance criteria for the flow resistance limits meet the intent of the current STS 3.5.5, we conclude that acceptance criteria for the proposed flow resistance limits would provide the same level of protection as the current STS 3.5.5 with respect to ECCS performance, and are acceptable. However, the specific values of the seal flow resistance limits are different for each plant and are subject to the staff review and approval for plant specific licensing applications.

Additionally, we find that the WOG's approach to relocate the specific values of seal flow resistance limits from the LCO to the Bases section is not acceptable. As stated in WOG STS B 3.5.5, RCP seal flow limits have been identified as important parameters that affect the initial condition (including ECCS flow) of design basis accidents (such as an LOCA). In accordance with the 10 CFR 50.36(c)(2)(ii)(B) requirements, an LCO of RCP seal flow shall be established in the TS. 10 CFR 50.36(a) further states that " ... A summary statement of the Bases or reasons for such specifications ... shall not become part of the technical specifications." The WOG has proposed to use the sentence "Reactor coolant pump seal injection flow resistance shall be within limits" in STS LCO 3.5.5, and proposed to further define the "flow resistance limits" in the Bases section of TS SR 3.5.5.1 for completion of the LCO. Since the Bases, according to 10 CFR 50.36(a), are not part of the TS, the proposed TS 3.5.5 is not a complete TS. To satisfy the requirements of 10 CFR 50.36(c)(Z)(ii)(B), the WOG should propose a complete LCO for RCP seal injection flow in TS 3.5.5 without relying on a definition of "flow resistance limits" in the Bases section of the TS. An STS may be acceptable if one or more of the acceptance criteria discussed in items 1 through 3 above are included in the proposed LCO, and ACTION and SURVEILLANCE REQUIREMENT items are corrected to be consistent with the corresponding acceptance criteria. In addition, if a figure is used to define the acceptance criteria for the LCO, that figure must be included in the LCO itself.

Final Resolution: NRC Requests Changes: TSTF Considering Final Resolution Date: 07-Sep-00

TSTF Revision 1 Revision Status: Active Next Action: NRC

Revision Proposed by: WOG

TSTF Revision 1 **Revision Status: Active** **Next Action: NRC**

Revision Description:
In a letter dated 9/7/2000, the NRC provided comments on TSTF-337, Rev. 0. TSTF-337, Rev. 0, proposed to move the specific LCO limit to the TS Bases. The NRC comments stated, in part: "we find that the WOG's acceptance criteria for the proposed flow resistance limits would provide the same level of protection as the current STS 3.5.5 with respect to ECCS performance, and are acceptable. However, the specific values of the seal flow resistance limits are different for each plant and are subject to the staff review and approval for plant specific licensing applications. Additionally, we find that the WOG's approach to relocate the specific values of seal flow resistance limits from the LCO to the Bases section is not acceptable." The letter further indicates that an STS may be acceptable if one or more of the acceptance criteria are included in the proposed LCO, and ACTION and SR.

Revision 1 to this TSTF proposes to maintain several acceptance limit alternatives within the LCO and SR

TSTF Review Information

TSTF Received Date: 13-Feb-02 Date Distributed for Review: 13-Feb-02

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:
(No Comments)

TSTF Resolution: Approved Date: 13-Feb-02

NRC Review Information

NRC Received Date: 22-Feb-02

Affected Technical Specifications

Bkgnd 3.5.5 Bases	Seal Injection Flow
S/A 3.5.5 Bases	Seal Injection Flow
LCO 3.5.5	Seal Injection Flow Change Description: Added Figure 3.5.5-1
LCO 3.5.5	Seal Injection Flow
LCO 3.5.5 Bases	Seal Injection Flow
Appl. 3.5.5 Bases	Seal Injection Flow
Action 3.5.5.A	Seal Injection Flow
Action 3.5.5.A Bases	Seal Injection Flow
SR 3.5.5.1	Seal Injection Flow

3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3.5.5 Seal Injection Flow

[resistance]

LCO 3.5.5 Reactor coolant pump seal injection flow shall be [≤ [40] gpm with [centrifugal charging pump discharge header] pressure ≥ [2480] psig and the [charging flow] control valve full open] or ≥ [0.2117] ft/gm² or within the limit of Figure 3.5.5-1].

APPLICABILITY: MODES 1, 2, and 3.

ACTIONS

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. Seal injection flow not within limit. [resistance]	A.1 Adjust manual seal injection throttle valves to give a flow within limit with [centrifugal charging pump discharge header] pressure ≥ [2480] psig and the [charging flow] control valve full open.	4 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

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.5.5.1	---------- **- NOTE -** Not required to be performed until 4 hours after the Reactor Coolant System pressure stabilizes at ≥ [2215 psig and ≤ 2255 psig]. ---------- Verify manual seal injection throttle valves are adjusted to give a flow ~~within limit~~ with [centrifugal charging pump discharge header] pressure ≥ [2480] psig and the [charging flow] control valve full open or ≥ [0.2117] ft/gpm² or within the limit of Figure 3.5.5-1.]	31 days

[resistance]

[of ≤ [40gpm]

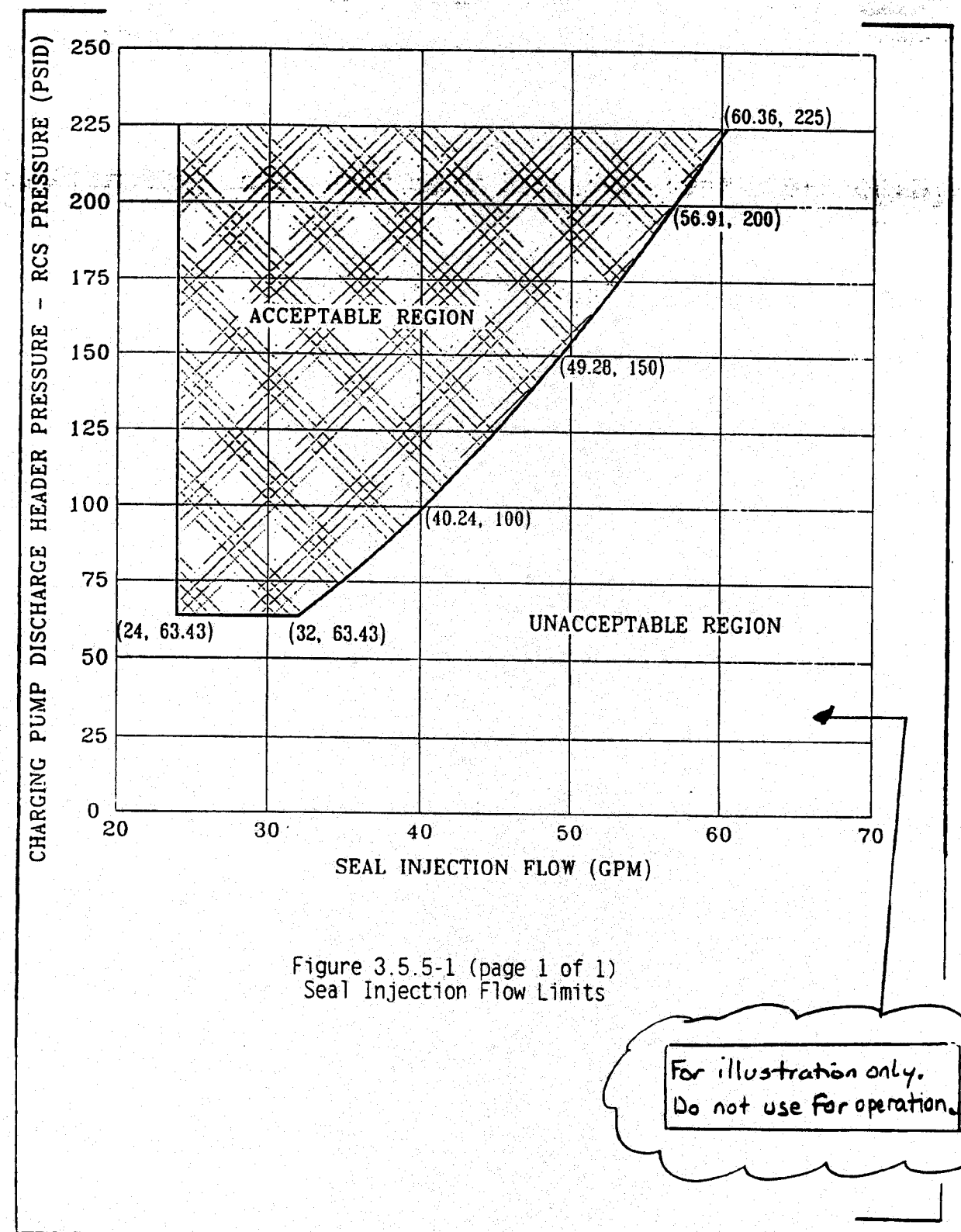

Figure 3.5.5-1 (page 1 of 1)
Seal Injection Flow Limits

For illustration only.
Do not use for operation.

B 3.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

B 3.5.5 Seal Injection Flow

BASES

BACKGROUND

This LCO is applicable only to those units that utilize the centrifugal charging pumps for safety injection (SI). The function of the seal injection throttle valves during an accident is similar to the function of the ECCS throttle valves in that each restricts flow from the centrifugal charging pump header to the Reactor Coolant System (RCS).

The restriction on reactor coolant pump (RCP) seal injection flow limits the amount of ECCS flow that would be diverted from the injection path following an accident. This limit is based on safety analysis assumptions that are required because RCP seal injection flow is not isolated during SI.

INSERT 1

APPLICABLE SAFETY ANALYSES

All ECCS subsystems are taken credit for in the large break loss of coolant accident (LOCA) at full power (Ref. 1). The LOCA analysis establishes the minimum flow for the ECCS pumps. The centrifugal charging pumps are also credited in the small break LOCA analysis. This analysis establishes the flow and discharge head at the design point for the centrifugal charging pumps. The steam generator tube rupture and main steam line break event analyses also credit the centrifugal charging pumps, but are not limiting in their design. Reference to these analyses is made in assessing changes to the Seal Injection System for evaluation of their effects in relation to the acceptance limits in these analyses.

[resistance]

This LCO ensures that seal injection flow ~~of ≤ [40] gpm, with centrifugal charging pump discharge header pressure ≥ [2480] psig and charging flow control valve full open,~~ will be sufficient for RCP seal integrity but limited so that the ECCS trains will be capable of delivering sufficient water to match boiloff rates soon enough to minimize uncovering of the core following a large LOCA. It also ensures that the centrifugal charging pumps will deliver sufficient water for a small LOCA and sufficient boron to maintain the core subcritical. For smaller LOCAs, the charging pumps alone deliver sufficient fluid to overcome the loss and maintain RCS inventory. Seal injection flow satisfies Criterion 2 of 10 CFR 50.36(c)(2)(ii).

LCO

The intent of the LCO limit on seal injection flow is to make sure that flow through the RCP seal water injection line is low enough to ensure that sufficient centrifugal charging pump injection flow is directed to the RCS via the injection points (Ref. 2).

INSERT 1

The RCP seal injection flow is restricted by the seal injection line flow [resistance] which is adjusted through positioning of the manual RCP seal injection throttle valves. The RCP seal injection flow [resistance] is determined by measuring the pressurizer pressure, the centrifugal charging pump discharge header pressure, and the RCP seal injection flow rate.

The charging flow control valve throttles the centrifugal charging pump discharge header flow as necessary to maintain the programmed level in the pressurizer. The charging flow control valve fails open to ensure that, in the event of either loss of air or loss of control signal to the valve, when the centrifugal charging pumps are supplying charging flow, seal injection flow to the RCP seals is maintained. Positioning of the charging flow control valve may vary during normal plant operating conditions, resulting in a proportional change to RCP seal injection flow. The flow [resistance] provided by RCP seal injection throttle valves will remain fixed when charging flow control valve is repositioned provided the throttle valve(s) position are not adjusted.

BASES

LCO (continued)

[The LCO is not strictly a flow limit, but rather a flow limit based on a flow line resistance. In order to establish the proper flow line resistance, a pressure and flow must be known. The flow line resistance is determined by assuming that the RCS pressure is at normal operating pressure and that the centrifugal charging pump discharge pressure is greater than or equal to the value specified in this LCO. The centrifugal charging pump discharge header pressure remains essentially constant through all the applicable MODES of this LCO. A reduction in RCS pressure would result in more flow being diverted to the RCP seal injection line than at normal operating pressure. The valve settings established at the prescribed centrifugal charging pump discharge header pressure result in a conservative valve position should RCS pressure decrease. The additional modifier of this LCO, the control valve (charging flow for four loop units and air operated seal injection for three loop units) being full open, is required since the valve is designed to fail open for the accident condition. With the discharge pressure and control valve position as specified by the LCO, a flow limit is established. It is this flow limit that is used in the accident analyses.] INSERT 2

[resistance]

The limit on seal injection flow, combined with the centrifugal charging pump discharge header pressure limit and an open wide condition of the charging flow control valve, must be met to render the ECCS OPERABLE. If these conditions are not met, the ECCS flow will not be as assumed in the accident analyses.

APPLICABILITY

In MODES 1, 2, and 3, the seal injection flow limit is dictated by ECCS flow requirements, which are specified for MODES 1, 2, 3, and 4. The seal injection flow limit is not applicable for MODE 4 and lower, however, because high seal injection flow is less critical as a result of the lower initial RCS pressure and decay heat removal requirements in these MODES. Therefore, RCP seal injection flow must be limited in MODES 1, 2, and 3 to ensure adequate ECCS performance.

[resistance]

ACTIONS

A.1

[resistance] not within

With the seal injection flow ~~exceeding~~ its limit, the amount of charging flow available to the RCS may be reduced. Under this Condition, action must be taken to restore the flow to ~~below~~ its limit. The operator has 4 hours from the time the flow is known to ~~be above~~ the limit to correctly position the manual valves and thus be in compliance with the accident analysis. The Completion Time minimizes the potential exposure of the plant to a LOCA with insufficient injection flow and provides a reasonable

[resistance]

within

not be within

BASES

ACTIONS (continued)

[resistance]

time to restore seal injection flow within limits. This time is conservative with respect to the Completion Times of other ECCS LCOs; it is based on operating experience and is sufficient for taking corrective actions by operations personnel.

B.1 and B.2

When the Required Actions cannot be completed within the required Completion Time, a controlled shutdown must be initiated. The Completion Time of 6 hours for reaching MODE 3 from MODE 1 is a reasonable time for a controlled shutdown, based on operating experience and normal cooldown rates, and does not challenge plant safety systems or operators. Continuing the plant shutdown begun in Required Action B.1, an additional 6 hours is a reasonable time, based on operating experience and normal cooldown rates, to reach MODE 4, where this LCO is no longer applicable.

SURVEILLANCE REQUIREMENTS

SR 3.5.5.1

INSERT 3

Verification every 31 days that the manual seal injection throttle valves are adjusted to give a flow within the limit ensures that proper manual seal injection throttle valve position, and hence, proper seal injection flow, is maintained. The Frequency of 31 days is based on engineering judgment and is consistent with other ECCS valve Surveillance Frequencies. The Frequency has proven to be acceptable through operating experience.

As noted, the Surveillance is not required to be performed until 4 hours after the RCS pressure has stabilized within a ± 20 psig range of normal operating pressure. The RCS pressure requirement is specified since this configuration will produce the required pressure conditions necessary to assure that the manual valves are set correctly. The exception is limited to 4 hours to ensure that the Surveillance is timely.

REFERENCES

1. FSAR, Chapter [6] and Chapter [15].
2. 10 CFR 50.46.

INSERT 2

OR

This is accomplished by limiting the seal injection line resistance to a value consistent with the assumptions in the accident analysis. The limit on RCP seal injection flow resistance must be met to assure that the ECCS is OPERABLE. If this limit is not met, the ECCS flow may not be as assumed in the accident analysis. The restriction on seal injection flow is accomplished by maintaining the seal water injection flow resistance $\geq$ [0.2117] ft/gpm^2. With the seal injection flow resistance within limit, the resulting total seal injection flow will be within the assumptions made for seal flow during accident conditions.

In order to establish the proper flow line resistance, the centrifugal charging pump discharge header pressure, the RCP seal injection flow rate, and the pressurizer pressure are measure. The line resistance is then determined from those inputs. A reduction in RCP pressure with no concurrent decrease in centrifugal charging pump discharge header pressure would increase the differential pressure across the manual throttle valves, and result in more flow being discharged through the RCP seal injection line. The flow resistance limit assures that when RCS pressure drops during a LOCA and seal injection flow increases in response to the higher differential pressure, the resulting flow will be consistent with the accident analysis.

OR

The LCO is not strictly a flow limit, but rather a flow limit based on a flow line resistance. In order to establish the proper flow line resistance, a pressure and flow must be known. The flow line resistance is established by adjusting the RCP seal injection flow in the acceptable region of Figure 3.5.5-1 at a given pressure differential between the charging header and the RCS. The centrifugal charging pump discharge header pressure remains essentially constant through all the applicable MODES of this LCO. A reduction in RCS pressure would result in more flow being diverted to the RCP seal injection line than at normal operating pressure. The valve settings established at the prescribed centrifugal charging pump discharge header pressure result in a conservative valve position should RCS pressure decrease. The flow limits established by Figure 3.5.5-1 ensures that the minimum ECCS flow assumed in the safety analyses is maintained.

TSTF-331, Rev 1

INSERT 3

Verification every 31 days that the manual seal injection throttle valves are adjusted to give a flow [resistance] within the limit ensures that the ECCS injection flows stay within the safety analysis. A differential pressure is established between the charging header and the RCS, and the total seal injection flow is verified to within the limit determined in accordance with the ECCS safety analysis. [The flow [resistance] shall be verified by confirming seal injection flow $\leq$ [40] gpm with the RCS at normal operating pressure, the charging flow control valve full open, and the charging header pressure $\geq$ [2480]. OR The flow [resistance] shall be verified by confirming seal injection flow and differential pressure within the acceptable region of Figure 3.5.5-1. OR The flow resistance shall be $\geq$ [0.2117] ft/gpm^2.] Control valves in the flow path between the charging header and the RCS pressure sensing points must be in their post accident position (e.g., charging flow control valve open) during this surveillance to correlate with the acceptance criteria.