September 10, 2002

Mr. Anthony Pietrangelo
Nuclear Energy Institute
1776 I Street, N. W.
Suite 400
Washington, DC 20006-3708

Dear Mr. Pietrangelo:

The Nuclear Regulatory Commission (NRC) has completed its review of the Nuclear Energy Institute Technical Specification Change Traveler, TSTF-337, Revision 1, "Revise LCO 3.5.5 for RCP Seal Injection Flow Resistance" proposed changes to NUREGs-1430, -1431, and -1432, Rev. 2, "Standard Technical Specifications."

TSTF-337 Revision 1 proposes to modify Technical Specification 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. Seal injection flow must be sufficient to maintain reactor coolant pump (RCP) integrity but limited so that the emergency core cooling system (ECCS) trains are capable of delivering sufficient water to match boiloff rates following a large loss-of-coolant accident. The proposed acceptance criteria for flow resistance limits listed above meet the intent of the current Standard Technical Specification (STS) 3.5.5 and would provide the same level of protection as the current STS 3.5.5 with respect to ECCS performance. Therefore, the staff finds the proposed changes acceptable without modification. Accordingly, enclosed is the staff safety evaluation approving TSTF-337, Revision 1, for plant-specific license amendment requests and for incorporation into NUREG-1430, -1431, and -1432, Rev. 2, "Standard Technical Specifications."

Please contact me at (301) 415-1161 or e-mail wdb@nrc.gov if you have any questions or need further information on these proposed changes.

Sincerely,

/RA/
William D. Beckner, Program Director
Operating Reactor Improvements Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Enclosure: As stated

cc: D. Hoffman, EXCEL
D. Bice, CEOG
P. Infanger, BWOG
S. Wideman, WOG
T. Silko, BWROG

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SAFETY EVALUATION ON

**PROPOSED CHANGES TO NUREG-1430,
NUREG-1431, and NUREG-1432
STANDARD TECHNICAL SPECIFICATIONS**

1.0 INTRODUCTION

By letter dated March 5 2002 (Reference 1), the Nuclear Energy Institute (NEI) submitted Technical Specification (TS) Change Traveler, TSTF-337, Revision 1, "Revise LCO 3.5.5 for RCP Seal Injection Flow Resistance" to NUREG-1430, -1431, and -1432, Rev. 2, "Standard Technical Specifications." The proposed changes would modify Standard Technical Specification (STS) 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. The associated Required Actions, Surveillance Requirements, and Bases are modified to address the proposed changes.

2.0 BACKGROUND

Seal injection flow to the four reactor coolant pumps (RCPs) is provided by two safety-related centrifugal charging pumps (CCPs) from the charging header through the seal injection flow path. The CCPs provide high pressure water to the charging header for safety injection into the reactor coolant system (RCS) and seal injection flow to the RCP seals. The seal injection flow protects the integrity of the RCP seals and prevents the seals from becoming a break in the RCS. Seal injection flow is a design feature which is an assumption in the loss-of-coolant accident (LOCA) analysis and as such meets the criterion 2 of 10 CFR 50.36(c)(2)(ii).

The three acceptance criteria for seal injection flow limits were proposed by TSTF-337 Revision 1:

1. Reactor coolant pump seal injection flow [resistance] shall be [$\leq$ [40] gpm with [centrifugal charging pump discharge header] pressure $\geq$ [2480] psig and the [charging flow] control valve full open, or

2. Reactor coolant pump seal injection flow [resistance] $\geq$ [0.2117] ft/gpm^2, or

3. Reactor coolant pump seal injection flow [resistance] within the limits of Figure 3.5.5-1.]

The NRC has previously approved the subject change on a plant specific basis. These previous approvals include Wolf Creek Generating Station, dated March 1, 2000 (ADAMS Accession Number ML003689047), Diablo Canyon Power Plant, Units 1 and 2, dated May 7, 2001 (ADAMS Accession Number ML011300299), and Callaway Plant, Unit 1, dated May 2, 2002 (ADAMS Accession Number ML020160333).

3.0 EVALUATION

TSTF-337 Revision 1 proposes two alternate criteria, criteria 2 and 3 described above, for STS Limiting Condition for Operation (LCO) 3.5.5, Seal Injection Flow. Criterion 1 is currently in the Standard Technical Specifications, NUREGs-1430, -1431, and -1432, and is acceptable.

Proposed criterion 2 provides is a hydraulic flow resistance instead of the flow rate in criterion 1. Use of a flow resistance criterion is consistent with the way that flow profiles for these injection paths are calculated in safety analyses for some facilities. In the safety analyses, flow profiles are calculated using flow network models which rely on input of the hydraulic flow resistance. In addition, use of a flow resistance criterion is consistent with the method used by some facilities in performing the surveillance procedure. The surveillance procedure confirms that plant operation is consistent with the accident/transient analyses by obtaining plant parameters and calculating hydraulic flow resistance of the seal injection flow path. Although system pressures and flow rates are used in this procedure, the actual parameter being verified is the hydraulic flow resistance. Establishing a maximum limit on the seal injection flow rate at fixed systems pressures (criterion 1) is essentially the same as establishing a minimum limit on the hydraulic flow resistance of the flow path. Therefore, the proposed use of a hydraulic flow resistance criterion instead of a flow rate criterion is acceptable. Furthermore, the use of hydraulic flow resistance is appropriate if the facility's safety analyses use the hydraulic flow resistance as an input in the calculations and the surveillance requirements confirm that the flow path resistance is consistent with that assumed in the accident/transient analyses.

Proposed criterion 3 provides Figure 3.5.5-1 which establishes acceptable plant specific seal injection flow for a given range of pressures instead of the flow rate in criterion 1. The proposed Figure 3.5.5-1 is based on the plant specific safety analysis assumptions to ensure that there is sufficient safety injection flow into the RCS for cooling the core during a LOCA. Proposed Figure 3.5.5-1 extends the bounds of the acceptable range of seal injection flow to encompass the entire range of acceptable seal injection flow. The upper part of the curve in proposed Figure 3.5.5-1 depicts the flow limit at higher differential pressures which potentially could occur at low RCS pressure. The CCP discharge header pressure is essentially constant. Therefore, a reduction in RCS pressure would result in more seal injection flow, at normal operating pressure, for the settings of the seal injection throttle valves. The upper flow limit includes the flow for the maximum expected differential pressure during a large break LOCA. The lower part of the curve extends to zero flow even though the normal operating seal injection flow is approximately 8 gpm. Plant specific procedures should be in place to restore low seal injection flow. Since the proposed seal injection flow limits in the proposed Figure 3.5.5-1 are within the plant specific safety analysis for LOCA, the addition of the proposed Figure 3.5.5-1 to LCO 3.5.5 is acceptable. In addition, the maximum limit on seal injection flow rate at a fixed systems pressure (criterion 1) is consistent with the upper part of the curve in Figure 3.5.5-1.

Accordingly, the staff concludes that (1) the proposed alternate criteria 2 and 3 meet the intent of the current STS 3.5.5, (2) the proposed alternate criteria 2 and 3 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 (3) the proposed alternate criteria 2 and 3 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.

The proposed STS changes consist of the following:

(1) LCO 3.5.5 will be revised to read as follows: Reactor coolant pump seal injection flow [resistance] shall be [$\leq$ [40] gpm with [centrifugal charging pump discharge header] pressure $\geq$ [2480] psig and the [charging flow] control valve full open, or $\geq$ [0.2117] ft/gpm^2, or within the limit of Figure 3.5.5-1].

(2) STS 3.5.5 Condition A will state "Seal injection flow [resistance] not within limit." STS 3.5.5 Required Action A.1 will be modified to state "Adjust manual seal injection throttle valves to give a flow [resistance] within limit."

(3) STS SR 3.5.5.1 will be modified to state "Verify manual seal injection throttle valves are adjusted to give a flow [resistance] [of $\leq$ [40] gpm with [centrifugal charging pump discharge header] pressure $\geq$ [2480] psig and the [charging flow] control valve full open or $\geq$ [0.2117] ft/gpm^2 or within the limit of Figure 3.5.5-1.]"

(4) [Figure 3.5.5-1] is added to STS 3.5.5.

(5) The associated STS Bases are modified to address the proposed changes discussed in items 1 through 4.

Based on the above, the staff has concluded that proposed alternate criteria 2 and 3, and the associated Bases changes, meet the intent of the current STS 3.5.5 and are acceptable for inclusion into NUREGs-1430, -1431- and -1432.

4.0 CONCLUSION

The staff has concluded, based on the considerations discussed above, that the proposed alternate criteria 2 and 3 can be incorporated into NUREGs-1430, -1431, and 1432, Rev. 2, "Standard Technical Specifications." As such, the staff has concluded that the proposed TSTF-337, Revision 1, changes are acceptable.

5.0 REFERENCES

1. Pietrangelo, A. R., Nuclear Energy Institute, to W. D. Beckner, USNRC, "Forwarding of TSTFs," March 5, 2002.