UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

AMENDMENT NUMBER 251 TO FACILITY OPERATING LICENSE NUMBER DPR-52,

AND AMENDMENT NUMBER 210 TO FACILITY OPERATING LICENSE NUMBER DPR-68

TENNESSEE VALLEY AUTHORITY

BROWNS FERRY NUCLEAR PLANT, UNITS 2 AND 3

DOCKET NOS 50-260, AND 50-296

1.0 INTRODUCTION

By application dated December 11, 1996,[1] as supplemented by letter dated November 3, 1997,[2] the Tennessee Valley Authority (TVA) proposed an amendment to the Appendix A Technical Specifications (TSs) Limiting Safety System Setting (LSSS) 2.2.A for the Browns Ferry Nuclear Plant (BFN), Units 1, 2, and 3. Specifically, the proposed amendment would allow TVA to increase the allowable main steam safety/relief valve (SRV) set point tolerance to ±3% from the current ± 11 pound per square inch (approximately 1% of set point value) tolerance. Bases 1.2 and 3.6D/4.6D also would be revised. The supplemental submittal did not affect the initial no significant hazards consideration determination.

2.0 BACKGROUND

The Boiling Water Reactor Owners Group (BWROG) has previously submitted the licensing topical report (LTR) NEDC-31753, "BWROG In-Service Pressure Relief Valve Technical Specification Licensing Topical Report,"[3] for staff review. The staff review,[4] dated March 8, 1993, concluded that the LTR provided an acceptable basis for General Electric (GE) BWRs to increase SRV set point tolerances, provided that six plant-specific analysis conditions are satisfied. The staff safety evaluation also concluded that the LTR was acceptable as the basis for the frequency of testing the valves as half the number of valves at least once per 18 months and all within 40 months, with two additional valves tested for each valve found outside the acceptable tolerance.

3.0 DISCUSSION AND EVALUATION

The safety objective of the Nuclear System Pressure Relief System is to prevent over pressurization of the nuclear system. This protects the nuclear system process barrier from failure which could result in the uncontrolled release of fission products. The pressure relief system includes 13 SRVs, arranged into three set point groupings of four valves set at 1105 psig, four valves at 1115 psig and five valves at 1125 psig. The current TSs provide

approximately ±1% set point tolerance. The staff safety evaluation of NEDC-31753 approved the increase in SRV set point tolerance to ±3%, provided that six plant-specific conditions are met. These conditions are reviewed below.

Item 1: Transient analyses of all abnormal operational occurrences (AOOs), as described in NEDC-31753P, should be performed utilizing a ±3% set point tolerance for the safety mode of SSVs and SRVs. In addition, the standard reload methodology (or other method approved by the staff) should be used for this analysis.

TVA has stated that the current core Supplemental Reload Licensing Report (SRLR) includes the bounding analyses for AOOs described in NEDC-31753. The analyses were performed utilizing a ±3% set point tolerance. The reload analysis was performed in accordance with the approved GESTAR-II methodology.[5]

Item 2: Analysis of the design basis over pressurization event using the 3% tolerance limit for the SRV set point is required to confirm that the vessel pressure does not exceed the American Society of Mechanical Engineers (ASME) pressure vessel code upset limit.

The current reload licensing report also analyzed the design basis over pressurization event, a main steam isolation valve (MSIV) closure with scram on high reactor power level, utilizing a 3% set point tolerance. The peak vessel pressure for the transient was 1257 psig -- below the ASME limit of 1375 psig.

Item 3: The plant-specific analyses described in Conditions 1 and 2 should assure that the number of SSVs, SRVs, and RVs included in the analyses correspond to the number of valves required to be operable in the technical specification.

Current BFN TSs require that the safety/relief function of 12 of 13 SRVs be operable. This is consistent with the assumptions of the SRLR for the AOOs in Conditions 1 and 2 above.

Item 4: Re-evaluation of the performance of high-pressure systems (pump capacity, discharge pressure, etc.), motor-operated valves, and vessel instrumentation and associated piping must be completed, considering the 3% tolerance limit.

BFN has three systems which are required to inject into the vessel at high pressure conditions: High Pressure Coolant Injection (HPCI), Reactor Core Isolation Cooling (RCIC) and Standby Liquid Control (SLC).

The HPCI system is provided to assure that the reactor is adequately cooled to limit fuel cladding temperature in the event of a small break in the nuclear system which does not result in rapid depressurization of the reactor vessel. The HPCI system continues to operate until the vessel pressure is below the pressure at which Low Pressure Coolant Injection or Core Spray can maintain core cooling. The higher system pressure resulting from the increased SRV set point tolerance would result in a small increase in turbine steam flow and steam pressure at both the inlet and outlet of the HPCI turbine, and a corresponding increase in turbine speed. TVA has stated that sufficient margin exists to the steam line high-flow isolation set point and the exhaust line high-pressure trip set point to accommodate the changes in process steam

conditions. Also, the HPCI turbine governor is designed to limit turbine speed during operation to less than the overspend trip set point. TVA also has stated that the piping stresses due to pressures that result from an increase in SRV set point tolerance are within the HPCI piping allowable stress limits.

The RCIC system provides make-up water to the reactor vessel during shutdown and vessel isolation conditions to supplement or replace normal make-up sources. The higher system pressure also would result in a small increase in turbine steam flow and steam pressure at both the inlet and outlet of the RCIC turbine, and a corresponding increase in higher turbine speed. TVA has stated that sufficient margin exists to the steam line high flow isolation set point and the exhaust line high pressure trip set point to accommodate the changes in process steam conditions. Also, the turbine governor is designed to limit turbine speed during operation to less than the overspeed trip set point. TVA has stated that the piping stresses due to pressures that result from an increase in SRV set point tolerance are within the RCIC piping allowable stress limits.

The SLC system is a backup system for making the reactor subcritical over the range of operating conditions. The SLC system uses positive displacement pumps which are limited to a discharge pressure of 1425 psig by discharge relief valves. The increased SRV set point tolerance of 3% is, therefore, within the capacity of the SLC system. TVA has also verified that a pressure increase of 3% would not result in over stressing the SLC system piping.

TVA evaluated the performance of motor-operated valves (MOVs) in accordance with Generic Letter (GL) 89-10 for the increased differential pressure loads associated with the proposed SRV set point tolerance. The performance of the MOVs for the proposed 3% tolerance was found to be acceptable, and TVA stated that the master MOV calculations will include the 3% SRV tolerance when they are revised under the Power Uprate Project for increasing the authorized reactor thermal power by 5%.

Item 5. <u>Evaluation of the 3% tolerance on any plant specific alternate operating modes (e.g., increased core flow, extended operating domain, etc.) should be completed.</u>

The current SRLR includes analysis of alternate operating modes, and was performed utilizing a 3% set point tolerance for the SRVs, and was performed in accordance with the staff approved methodology for the alternate operating modes. Currently, BFN is approved for the Extended Load Line Limit, Increased Core Flow, and Final Feedwater Temperature Reduction as alternate operating modes.

Item 6. <u>Evaluation of the effect of the 3% tolerance limit on the containment response during loss of coolant accidents and the hydrodynamic loads on the SRV discharge lines and containment should be completed.</u>

TVA evaluated (Enclosure 5 of Ref. 1) the increased hydrodynamic loading due to SRV actuation with the increased SRV 3% set point tolerance. This evaluation included the effects of the increased SRV set point actuation on containment structural response, steam and water clearing loads on the SRV piping, quenches, supports, submerged structures, and piping attached to the torus. This evaluation determined that the resulting loads are less than 1%

greater than the loads previously used in the Plant Unique Analysis for the controlling load combination where SRV discharge loads are combined with other design loads including dead weight, pressure, thermal, loss-of-coolant accident (LOCA), and earthquake. TVA determined that the resulting combined stresses are within the existing design basis allowable stresses.

TVA's Engineering Report (Enclosure 5 of Ref. 1) enclosed with the December 11, 1996, application states that because SRVs do not open to relieve pressure in the course of a large break LOCA, an increase in the SRV set point tolerance will have no effect on the containment peak accident temperature or pressure. The application further states that for smaller breaks the SRVs may open, but the change has been determined to be negligible, the pressure increase results in a decrease in the specific enthalpy of the steam that is released. Also, the Technical Evaluation Report, prepared by Brookhaven National Laboratory, which was attached with the staff's review[4] of Topical Report NEDC-31753P, indicates that the suppression pool peak temperature would not be affected because the integrated heat load would not change.

Based on the Engineering Report, the proposed amendment would have no significant effect on the peak accident pressure to which the primary containment might be subjected during a design basis accident.

Containment temperature response to a LOCA is of concern with respect to the environmental qualification of electric equipment in containment. The BFN primary containment design temperature of 281°F was based on a double-ended guillotine break of the Recirculation System piping (DBA-LOCA). It was later discovered that a small-break LOCA may produce a greater containment temperature which can be limited by manual operator initiation of the containment spray system within 30 minutes. Based on the availability of containment spray to limit the primary containment post-accident temperature, the proposed amendment would not introduce any new containment temperature concerns.

The proposed amendment will allow TVA to increase the allowable SRV set point tolerance from approximately ±1% to ±3%. The BWROG has previously submitted NEDC-31753, "BWROG In-service Pressure Relief Valve Technical Specification Licensing Topical Report," for staff review. The staff review concluded that the LTR provided an acceptable basis for GE BWRs to relax SRV set point tolerances, provided certain plant-specific analyses are provided. TVA has provided these analyses for BFN units 2 and 3, and the results of these analyses are acceptable to the staff. Therefore, the changes are acceptable based on the conditions as given in the staff Safety Evaluation[4] for NEDC-31753.

Furthermore, the staff has determined the proposed increase in SRV set point tolerance from 1% to 3% will not result in an unacceptable increase in containment DBA-LOCA pressure/temperature loads. This determination is based on the information provided in the TVA Engineering Report which addresses the containment response analysis requirement identified in the staff's March 8, 1993, Safety Evaluation for NEDC-31753. Therefore, the proposed change to Limiting Safety System Setting 2.2.A is acceptable. The change requires verification that the lift settings of the safety/relief valves are within ±3% of the specified set points.

TVA has proposed to revise Bases 1.2 to reference the *reload licensing report* vice the *reload licensing submittal* and has updated a referenced section in the safety analysis report. Additionally, TVA has proposed changes to Bases 3.6D/4.6D to refer to testing on a cycle basis and to delete reference to the specific set point tolerance. The staff has no objection to these proposed changes.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Alabama State official was notified of the proposed issuance of the amendment. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes a surveillance requirement. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (62 FR 2194). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

6.0 CONCLUSION

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

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7.0 REFERENCES

1. Letter from T. E. Abney (TVA) to NRC, "Browns Ferry Nuclear Plant - Units 1, 2, and 3 - Technical Specification (TS) 386 - Proposed change to Safety/Relief Valve (S/RV) set point Requirements for Reactor Coolant System Integrity, TS 2.2.A," December 11, 1996.

2. Letter from T. E. Abney (TVA) to NRC, "Browns Ferry Nuclear Plant (BFN) - Units 1, 2, and 3 - Request for Additional Information Regarding Increase in Main Steam Safety/Relief Valve (S/RV) Set point Tolerance," November 3, 1997.

3. NEDC-31753P, "BWROG In-Service Pressure Relief Technical Specification Revision Licensing Topical Report," February 1990.

4. Letter from A. C. Thadani (NRC) to C. L. Tully (BWROG), "Acceptance for Referencing of Licensing Topical Report NEDC-31753P, 'BWROG In-Service Pressure Relief Technical Specification Licensing Topical Report,'" March 8, 1993.

5. NEDE-24011-P-A-11, "General Electric Standard Application for Reactor Fuel, GESTAR II," and NEDE-24011-P-A-11-US, "GESTAR II U. S. Supplement,"