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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 223 TO FACILITY OPERATING LICENSE NO. DPR-33

AMENDMENT NO. 238 TO FACILITY OPERATING LICENSE NO. DPR-52

AMENDMENT NO. 197 TO FACILITY OPERATING LICENSE NO. DPR-68

TENNESSEE VALLEY AUTHORITY

BROWNS FERRY NUCLEAR PLANT, UNITS 1, 2, AND 3

DOCKET NOS. 50-259, 50-260, AND 50-296

1.0 INTRODUCTION

By letter dated May 11, 1995, the Tennessee Valley Authority (TVA, the licensee) submitted an application to amend Facility Operating Licenses DPR-33, DPR-52, and DPR-68 for the Browns Ferry Nuclear Plant (BFN) Units 1, 2, and 3. This proposed amendment revises the Technical Specifications (TS) to reflect a design change that adds a scram air header low pressure trip function on BFN Unit 3, and clarifies the description of the scram discharge volume (SDV) high water level bypass in BFN Units 1, 2, and 3. Supplemental information provided by the licensee on June 30, 1995 does not affect the staff's proposed finding of no significant hazards considerations.

2.0 BACKGROUND

The proposed design and TS changes are the result of a BFN Unit 3 event that occurred on June 28, 1980. During that event, 76 control rods in BFN Unit 3 failed to fully insert during a routine shutdown. Two additional manual scrams followed by an automatic scram were required before all control rods were fully inserted. The total time that elapsed from the initial scram until all rods were inserted was approximately 15 minutes.

The NRC's investigation showed that deficiencies in the boiling water reactor (BWR) design caused this event. To recommend corrective measures for the identified deficiencies, the NRC issued Bulletin (IEB) 80-17, "Failure of 76 of 185 Control Rods to Fully Insert During a Scram at a BWR." In IEB 80-17, the NRC staff requested boiling water reactor (BWR) licensees to install a system to continuously monitor (with appropriate alarms) and record water levels in SDVs. In addition, as a short-term measure, the staff requested the BWR licensees to initiate an immediate manual scram when low pressure occurs in the control rod drive air system.

ENCLOSURE

In a Safety Evaluation Report (SER) dated December 9, 1980, the staff documented its acceptance of the BWR Owners Group (BWROG) proposed long-term design changes that correct the deficiencies identified in IEB 80-17. The long-term design changes included the addition of an automatic scram on detection of low scram pilot air header pressure. At that time, all BWR licensees (except TVA) had committed to implement the long-term design modifications in accordance with this generic SER. On January 9, 1981, an Order for Modification of License was issued for BFN Units 1, 2, and 3 to install an automatic system to initiate control rod insertion on low pressure in the control air header, with specified performance criteria. The licensee documented completion of these modifications on February 10, 1982.

By letter dated October 6, 1982, the licensee provided a description of the long-term modifications, required to conform with the generic SER, that were being performed on BFN Unit 2, and would be performed on Units 1 and 3. The licensee completed the implementation of the long-term design modifications on Unit 2 in August 1986. On June 24, 1983, the NRC issued an Order requiring that the licensee install the long-term modifications for Units 1 and 3 during their Cycle 5 outages. In response, by letter dated June 27, 1984, the licensee informed the staff that it would complete the implementation of the long-term modifications to Unit 3 before restart from its Cycle 5 refueling outage.

From early 1985 until May 1991, all three Browns Ferry reactors were shut down to resolve a variety of deficiencies. BFN Unit 2 resumed operations in May 1991. The licensee expects to complete the current extended BFN Unit 3 recovery outage by the end of 1995. Installation of the scram pilot air header low pressure scram function are part of facility modifications required to conform to the criteria of the December 9, 1980 generic SER, and to fulfill the long-term requirements of the June 27, 1984 Order, and will be completed before BFN Unit 3 resumes operations.

The licensee is currently evaluating whether it will pursue recovery of BFN Unit 1. Prior to restarting that reactor, the licensee will be required to demonstrate conformance with the criteria established by the December 9, 1980 generic SER.

During the BFN Unit 3 recovery effort, the licensee reevaluated the necessity of the scram pilot air header low pressure scram function. By letter dated August 17, 1993, the licensee discussed how it intended to fulfill the generic SER criteria without the scram pilot air header low pressure scram function. A request to amend the TS to delete this function was submitted on September 30, 1993. This request was based on an assumption that control rod drive (CRD) stall flow rates would remain within acceptable limits. Operating experience on BFN Unit 2 indicated this assumption may not be supportable on a long-term basis. Therefore, on April 27, 1995, the licensee withdrew its request to remove the scram pilot air header low pressure scram function. On May 11, 1995, the licensee submitted proposed TS changes for the scram pilot air header low pressure function required to support BFN Unit 3 conformance with the generic SER criteria. This submittal, and supplemental information provided on June 30, 1995, is the subject of the evaluation described below.

3.0 EVALUATION

In reviewing the licensee's proposed design changes, the staff used the applicable criteria identified in the generic SER dated December 9, 1980, and IEB 80-17.

The proposed design and TS changes reflect a design change that adds the low air header pressure trip function to the BFN Unit 3 reactor protection system and related TS changes, and clarification of the description of the SDV high water level bypass in BFN Units 1, 2, and 3.

3.1 Design Change

The added scram pilot air header low pressure trip is one of the corrective measures identified in both IEB 80-17 and the generic SER. Like the high SDV water level trip, this trip is an anticipatory one that ensures a reactor scram is initiated while sufficient volume remains in the SDV to accept discharged water from the CRDs.

The scram inlet and outlet valves control the water needed for driving control rods during a scram. The valves are normally closed and opened when a scram is initiated. The valves are held closed by air pressure in the scram air header and opened by releasing air into the header.

If the air header system gradually or partially loses air pressure, the outlet scram valves could be partially opened without control rod motion, and opening of scram inlet valves. The rate at which water could leak into the SDV can be such that the volume could be filled with water before high level switches can initiate a reactor scram. This is called a fast-fill event.

The added scram pilot air header low pressure trip function prevents the fast-fill event by initiating a scram upon detection of low air header pressure in anticipation of this event. The air header pressure is set to initiate a trip at 50 psig, which is 10 psig above the opening pressure of the scram outlet valves. Four pressure sensors in two redundant logic channels (two sensors per logic channel) monitor the air header pressure. The licensee stated that the scram pilot air header low pressure trip function actuation logic consists of a one-out-of-two taken twice configuration and initiates the scram if the air header pressure drops below 50 psig. Additionally, by letter dated June 30, 1995, the licensee stated that the scram pilot air header low pressure trip function is a Class 1E, single failure proof design, and is composed of seismically and environmentally qualified safety-related components.

Based on the above, the staff concludes that the added scram pilot air header low pressure trip function complies with the staff-approved criteria identified in the generic SER and meets the criteria of a Class IE system.

3.2 Technical Specification Change

The proposed TS change related to the added scram air header low pressure trip function provides for a functional test once every 6 months and an instrument

calibration once every 18 months. By letter dated June 30, 1995, the licensee stated that a channel that is being functionally tested, calibrated, or maintenance is placed in the trip condition. This places the reactor protection system in a half-scram condition.

The licensee stated that the proposed functional test frequency (once every 6 months) and calibration test frequency (once every 18 months) for the Unit 3 scram pilot air header low pressure trip function are the same as that currently in the BFN Unit 2 TS for this function. The licensee also stated that the proposed functional test frequencies are based on industry generally accepted practices. The licensee further stated that it considered the following issues in determining the functional test frequency:

- Functional reliability previously demonstrated by this trip function on BFN Unit 2 during Cycles 6 and 7.

- Need for minimizing the radiation exposure associated with the functional testing of this function.

- Increased risk to plant availability while the plant is in a half-scram condition during the performance of the functional testing versus the limited increase in reliability that would be obtained by more frequent functional testing.

The licensee also believes that it is highly unlikely that two sensors in one logic channel would experience an undetected failure during the 6 month period between functional tests.

In determining the calibration test frequency, the licensee stated that it performed setpoint scaling calculation to assure that there is an adequate margin between the required trip setpoints and the limiting safety system setting. The licensee also stated in its letter of June 30, 1995 that its setpoint calculation methodology was based on Regulatory Guide 1.105, "Instrument Setpoints for Safety Related Systems." Finally, the licensee stated that the Unit 2 scram pilot air header low pressure trip function have not shown as-found trip values below the minimum acceptable setpoint during the last two cycles of operation.

Based on the above, the staff finds that the proposed TS changes for Unit 3 that reflect the requirements for the low air header pressure trip function to be acceptable.

3.3 TS Clarifications

The description of the SDV high level bypass function in the TS for Units 2 and 3 has been revised to include the capability to reset the scram signals for SDV high-high water level and scram air header low pressure scram signals. In addition, minor wording changes have been made in the SDV bypass description in the TS for Units 1, 2, and 3. The staff finds that these proposed TS changes for Units 1, 2, and 3, are minor and clarify the description of the scram discharge volume high water level bypass, and are acceptable.

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 amendments change requirements with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes the surveillance requirements. The NRC staff has determined that the amendments involve 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 amendments involve no significant hazards consideration, and there has been no public comment on such finding (60 FR 29889). Accordingly, the amendments meet 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 amendments.

6.0 CONCLUSION

The Commission has concluded, based upon 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, and (2) such activities will be conducted in compliance with the Commission's regulations, and (3) issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

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