



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
SUPPORTING AMENDMENT NO. 107 TO FACILITY OPERATING LICENSE NO. DPR-33
AMENDMENT NO. 101 TO FACILITY OPERATING LICENSE NO. DPR-52
AMENDMENT NO. 74 TO FACILITY OPERATING LICENSE NO. DPR-68
TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT, UNIT NOS. 1, 2 AND 3
DOCKET NOS. 50-259, 50-260 AND 50-296

1.0 Introduction

By letters dated August 12, 1980, and superseded November 3, 1982, the Tennessee Valley Authority (the licensee or TVA) requested amendments to Facility Operating License Nos. DPR-33, DPR-52 and DPR-68 for the Browns Ferry Nuclear Plant, Units 1, 2 and 3. The proposed amendments would modify the Appendix A Technical Specifications to permit reactor operation for up to 30 days with one of the sixteen main steam line high temperature switches bypassed.

By letter dated August 12, 1980, the licensee proposed to delete the requirements that the main steam line tunnel temperature switches automatically initiate isolation of Group 1 primary containment isolation and instead to require that this set of instrumentation initiate an alarm in the control room. On July 11, 1982, the licensee determined that one of these temperature switches failed non-conservatively. On July 15, 1982, the licensee requested a temporary waiver of the Technical Specification to allow plant operation without being in a "half-tripped" status with regard to Group 1 isolation. As a result of the staff's evaluation of the July 15, 1982 request and our discussions with the licensee, TVA submitted the amendment requests which are the subject of this Safety Evaluation.

2.0 Discussion

In the steam tunnel, four temperature switches are associated with each of the four main steam lines, for a total of 16 switches. One temperature switch above each steam line operates in one trip logic channel for Group 1 isolation (i.e., each trip channel contains four temperature switches). A "trip system" is made up of two trip channels; each trip system is required to have two temperature sensor channels operable per steam line. Two trip systems are connected to provide a one-out-of-two-taken-twice per steam line logic for actuation of Group 1 isolation.

Other plant parameters can cause Group 1 isolation. These other instruments (along with the temperature switches) are arranged in a one-out-n local coincidence logic for each trip logic channel. Accordingly, trip of a single sensor channel assigned to the "A" trip system of one parameter and trip of single sensor channel assigned to the "B" trip system of a different parameter or the same parameter are sufficient to cause full actuation of Group 1 isolation. The plant parameters that can cause Group 1 isolation include:

- Main steam line high flow rate.
- Main steam line high temperature (tunnel).
- Main steam line high radiation (tunnel).
- Main steam line low pressure.
- Reactor vessel low-low water level.

3.0 Evaluation

Automatic protection to mitigate a postulated main steam line break accident is initiated primarily by two diverse and redundant sets of instruments - main steam line flow and area temperature in the steam tunnel. The protective action is closure of the Group 1 isolation valves which include the main steam isolation valves (MSIVs), main steam drain isolation valves, and reactor sample lines. In anticipation of the back pressure, the reactor is automatically tripped as the MSIVs start to close. Other plant parameters, such as high radiation in the steam tunnel and low steam line pressure, may also cause Group 1 isolation. Instruments for these other conditions are provided primarily to protect against plant conditions other than a main steam line break and accordingly the setpoints are selected for the primary objectives.

In support of the request to remove the automatic protection from the steam line temperature switches, the licensee stated the change would provide operational flexibility and would avoid non-conservative reactor water level fluctuations due to spurious MSIV closures. The licensee's proposal included providing the protective action manually after the operator determined the validity of high temperature alarm, by comparison with other instrumentation. The licensee's safety justification centered on the fact that other instrumentation is available to provide automatic protection against a steam line break accident.

In our review of this proposal we reviewed Licensee Event Reports for a two-year period. We found no significant problems due to the temperature switches and no spurious MSIV closures from the temperature switches. Further, we reviewed the original GE design basis for the BWRs and found that margin is allotted for water level fluctuation due to MSIV closure. Our present licensing requirements require automatic protection due to high temperature in the steam tunnel. In view of these considerations, we have determined that the complete and permanent absence of automatic protective

action from the temperature switches would reduce the present level of safety below an acceptable level.

When one of the 16 temperature switches in the Browns Ferry Unit 2 failed non-conservatively in July 1982 the licensee manually tripped the A-1 trip logic channel, placing the plant in a "half-tripped" status for Group 1 isolation. The licensee requested a waiver of this requirement on a temporary basis in order to avoid an undesirable MSIV closure that could be caused by a spurious trip from any one of several instrument channels from any of several plant variables. Because the steam tunnel is a hazardous, high radiation area during plant operations, repair action can be initiated only when the plant is shutdown. The licensee agreed to repair or replace the temperature switch at the next plant shutdown, expected about two weeks later. The licensee's safety justification included the points that (1) Trip Channels A-2, B-1, and B-2 remain fully functional for high temperature, (2) three of the four temperature switches (on the other steam lines) in the A-1 trip channel are functional, (3) the steam lines are in one location (the steam tunnel) and the space between the lines is open providing spatial communication between the A-1 temperature switches to all the steam lines, and (4) other types of instrumentation are operable to detect a steam line break.

In our review, we researched the original design basis for the steam tunnel temperature switches, as given in NEDO 10139, "Compliance of Protection Systems to Industry Criteria: GE BWR Nuclear Steam Supply System." We found that switches were located to detect small steam leaks as small as 7-15 gallons per minute on a prompt basis. Also, the number of switches provided is such that a faulty switch could be bypassed until the plant could be shutdown for repair.

A plant trip and the associated pressure transient due to MSIV closure is undesirable and is not in the overall best interest of safety unless plant conditions warrant such action. To operate the plant in a condition where a single spurious channel trip can cause MSIV closure should therefore be avoided to the extent consistent with safety goals.

The redundant and diverse set of instrumentation intended primarily for detection of a break of a main steam line (direct flow channels) remains fully operable, including taking a postulated single failure. Other sets of instruments, while not intended primarily for steam line break protection, do in fact offer considerable backup protection and are expected to trip in the event of a significant break.

The 16 steam tunnel high temperature switches include considerable redundancy. The number of switches are adequate to identify which steam line should break. With 15 of the switches operable and one bypassed, the set of instrumentation retains adequate redundancy such that other switches can monitor the particular area of the one bypassed on a temporary basis.

The system remains highly immune to most single failures that might occur. Certain limiting postulated single failures within the "A" trip system are acceptable for brief periods of time.

In view of considerations above, we have determined that to operate the plant with one of the 16 temperature switches bypassed and all other related instrumentation operable for a period of up to 30 days per switch failure is an acceptable risk. A 30 day period is reasonable and adequate for the licensee to schedule a brief plant shutdown at a time that has minimum impact on the operational needs and the electric load demands. We have discussed our conclusion with the licensee, who has found it to be an agreeable resolution to both the proposal of August 1980 and the request of July 1982.

On the above basis, we have determined that the proposed changes to the Technical Specifications requested by TVA are acceptable.

4.0 Summary

We concluded that TVA's initial purpose to remove completely the automatic protection capability of the temperature switches in the main steam line tunnel is a reduction in the safety level that is not acceptable. However, after discussion with the staff, this proposal was modified by the present request to add a permanent provision in the Technical Specifications that would allow plant power operations to continue with one of the 16 temperature switches in the steam tunnel in a bypassed condition for a period of up to 30 days per switch malfunction/failure. The revised request does not generate a significant reduction in the safety margin and is therefore acceptable.

5.0 Environmental Considerations

The amendments involve a change in the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The 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. 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

We have 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, and (2) such activities will be conducted in compliance with the Commission's regulations, and the issuance of these amendments will not be inimical to the common defense and security or to the health and safety of the public.

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Dated: August 9, 1984

