



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 68 TO FACILITY OPERATING LICENSE NO. NPF-30

UNION ELECTRIC COMPANY

CALLAWAY PLANT, UNIT 1

DOCKET NO. 50-483

1.0 INTRODUCTION

By letter dated December 18, 1991, the Union Electric Company (the licensee) requested changes to the Technical Specifications (TSs) for Callaway Plant, Unit 1. Additional information was provided in telephone conversations with the NRC staff on December 20, 1991, and February 20, 1992. The proposed changes would separate current TS surveillance requirement (SR) 4.5.2.h. into two new surveillance requirements; one to specify the requirements for performing a flow balance test of the centrifugal charging pump (CCP) portions of the Emergency Core Cooling System (ECCS) subsystem, and the second to specify similar test requirements for the safety injection pump (SIP) portions of the ECCS subsystem. The revised SRs would also specify new acceptable flow limits, which would allow additional margin and reduce uncertainties in the measurement of ECCS subsystem flow characteristics. The revised surveillance requirements would ensure that the actual system flow characteristics remain consistent with assumptions used in the Callaway accident analysis. The corresponding Bases would also be revised accordingly.

Westinghouse has identified several "Potential Issues" (PIs) concerning ECCS flow measurement and pump performance, which have been evaluated by the licensee for applicability to the Callaway plant. These evaluations have indicated that the CCPs and the SIPs may develop greater flow at pump runout conditions than was previously considered in the Callaway accident analysis. The licensee also investigated expanding the window between maximum and minimum ECCS subsystem flows in order to facilitate the performance of the surveillance. As a result, the licensee and Westinghouse have analyzed the possible impact of the revised ECCS pump flows and have further evaluated the uncertainties in measuring flow and calculating branch line imbalances. The results of these analyses support the proposed TS changes.

Specifically, the proposed TS changes would:

- (1) Separate existing SR 4.5.2.h. into new SRs 4.5.2.h. and 4.5.2.i., to require a flow balance test (during shutdown) only of the affected CCP or SIP portions of the ECCS subsystem following completion of modifications that alter that subsystem's flow characteristics. Current SR 4.5.2.i. will be redesignated as SR 4.5.2.j.

- (2) Retain in revised SR 4.5.2.h. the current CCP maximum flow rate limit of 550 gallons per minute (gpm) for the flow balance test; but would specify that this limit is comprised of a total maximum flow of 469 gpm to the four branch lines, plus a value of 79 +2/-4 gpm for simulated reactor coolant pump seal injection line flow.
- (3) Decrease the minimum limits on total flow for the flow balance tests of the CCP and SIP portions of the ECCS subsystem in new SRs 4.5.2.h. and 4.5.2.i., respectively, and express each limit in terms of total flow to the four branch lines, instead of the sum of the three lowest injection line flow rates.
- (4) Revise the SIP maximum pump flow rate limit from 655 gpm to 675 gpm in new SR 4.5.2.i.

2.0 EVALUATION

The current Callaway TSs require the performance of flow balance tests to ensure that the ECCS subsystems and their components are operable and function in conformance with the assumptions made in the plant safety analyses. These assumptions include the maximum and minimum system and branch line resistances and the maximum and minimum ranges of potential pump performance. The licensee and Westinghouse have evaluated concerns that could potentially impact the safety analyses, and the licensee has concluded that the proposed TS changes will improve the capability to confirm that the actual ECCS subsystem performance is consistent with the safety analyses assumptions.

The licensee evaluated the following accidents, identified in Chapter 15 of the Callaway Final Safety Analysis Report (FSAR), for potential impact as a result of the proposed changes: loss of coolant accidents (LOCAs), main steamline and main feedwater line breaks, Low Temperature Overpressure Protection System (LTOPS) analysis, and steam generator tube rupture (SGTR) margin to overfill. In addition, the licensee evaluated CCP and SIP performance at the higher calculated flow rates under pump runout conditions.

With respect to the large and small break LOCA events for Callaway, the licensee reanalyzed these events for the revised SIP and CCP flow rates using the original Callaway ECCS model. The results indicated that the maximum change in overall delivered ECCS flow for the large break LOCA was less than 1%; consequently, there was no effect on the existing calculated peak cladding temperature (PCT) of 2154.6 F. For the spectrum of small break LOCAs analyzed, the integrated ECCS flows were generally higher than previously analyzed, and the limiting break size and calculated PCT were also unchanged.

For the main steamline break accidents, sensitivity studies were performed which indicated that the impact of the reduced CCP flows on the calculated mass and energy releases inside and outside containment would be negligible. For those scenarios where Reactor Coolant System (RCS) pressure remains high, CCP flow is relatively small and is not a significant factor. For those cases where RCS pressure falls below the shutoff head of the SIPs, additional injection flow

would be provided. Similarly, the peak calculated core heat flux would not change as a result of the revised CCP flows. The previous calculated peak containment pressure of 48.1 psig (which results from the main steamline break) was determined to increase by less than 1%, still well below the design pressure of 60 psig.

For the main feedwater line break, the actuation of one CCP provides additional flow for heat removal from the RCS. Within minutes of the initiating event, RCS pressure increases above the shutoff head of the CCPs. Therefore, ECCS flow is not a significant source of heat removal for this scenario, and the revised CCP flow rates would not impact the existing analysis.

The licensee determined that the revised maximum CCP flow would not require a change to the current LTOPS setpoints, and that adequate capacity exists to relieve the mass input from a single CCP.

The licensee previously analyzed a forced overflow condition for the SGTR event, in which a 15% conservatism was applied to the maximum CCP flow rate. This forced overflow condition, which bounds the case for the proposed revised ECCS flows, resulted in lower offsite doses than for the worst-case SGTR event analyzed in the Callaway FSAR. Therefore, the revised ECCS flows will not impact the current FSAR analysis of this event.

With respect to pump performance, the Westinghouse model predicted potential maximum flow rates of 567 gpm for the CCPs and 691 gpm for the SIPs, when aligned in the recirculation phase of ECCS operation. A replacement CCP was tested at 574 gpm to demonstrate pump capability at the higher flow rate. Similar SIPs to those at Callaway have been operated in the field at flows up to 706 gpm with no observed degradation. The net positive suction head requirements for these pumps at the higher flow rates (less than 50 feet) would be met through the operation of the Residual Heat Removal pumps, which provide a minimum head of 275 feet of water to the CCPs and SIPs when the ECCS is operating in the recirculation phase.

The NRC staff has evaluated the licensee's analyses in support of the proposed changes to the Callaway Technical Specifications. The changes in ECCS flow rates have been evaluated with respect to the relevant accidents and events analyzed in the Callaway FSAR, and the FSAR analyses remain valid. The proposed changes will enable the licensee to more effectively perform ECCS subsystem flow balance testing, while minimizing personnel exposure and unnecessary wear on equipment. Therefore, the staff finds the proposed changes acceptable.

3.0 STATE CONSULTATION

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

4.0 ENVIRONMENTAL CONSIDERATION

This amendment involves changes to surveillance requirements. The 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 this amendment involves no significant hazards consideration and there has been no public comment on such finding (57 FR 2602). Accordingly, this 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 this amendment.

5.0 CONCLUSION

The staff 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 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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