



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
SUPPORTING AMENDMENT NO. 33 TO FACILITY OPERATING LICENSE NO. NPF-6

ARKANSAS POWER & LIGHT COMPANY

ARKANSAS NUCLEAR ONE, UNIT 2

DOCKET NO. 50-368

1.0 Introduction

By letter dated May 3, 1982 (Ref. 1), Arkansas Power and Light Company proposed a Technical Specification change for ANO-2 to allow continuing plant operation with the effective RTD response time constant exceeding 6 seconds. This is done by imposing penalty factors in the Core Protection Calculators, CPCS and Core Operating Limit Supervisory System (COLSS) to ensure that the trip functions will not be degraded if the RTD response times degrade beyond the value (6 seconds) assumed in the current software of the CPCS. The licensee has provided in Figure 3.3-1 and Table 3.3-3 of the revised Technical Specifications the corresponding power penalty factors to be applied for DNBR and LPD calculations in CPCS and Power Operating Limit (POL) penalty for COLSS. The staff evaluations of the proposed TS change follow.

2.0 Staff Evaluation

The current CPC software design has a built-in assumption of RTD response time constant of 6 seconds which is a maximum response time allowable in the Technical Specifications. When the reactor coolant RTDs degrade to the point where the response times exceed the time constant assumed in the CPC software design, the signals transmitted to the CPC channels lag the signals the CPC would receive with the assumed delay time. This results in CPC calculating non-conservative values of the reactor coolant system temperature conditions and, in turn, non-conservative DNBR and LPD for certain transients. To compensate for the non-conservatism when RTD time constants exceed the built-in values, penalty factors will be applied to the CPC addressable constants to ensure that the CPC trip functions will not be degraded.

DESIGNATED ORIGINAL

Certified By

Patricia J. Moore

In response to the staff questions, the licensee, by letter dated May 20, 1982 (Ref. 2), submitted CEN-206(A)-P (Ref. 3) describing the method of assessing the RTD response time impact. The staff has reviewed the report and found that the method of assessing the penalties to be applied to CPCS and COLSS to account for the RTD degradation is acceptable.

In order to determine the values of penalty factors associated with the degree of RTD degradation, all the design basis events were analyzed by the licensee. However, it was determined that the limiting events for the anticipated operational occurrences were the loss of load, single CEA withdrawal and asymmetrical steam generator transient events. These three events were used to determine the required penalties associated with CPC DNBR and local power density (LPD) calculations and the required overpower margin (ROPM) penalty in the Core Operational Limit Supervisory System (COLSS).

The CPC DNBR calculation is affected by the core inlet temperature measurement. The impact of degraded RTD response characteristics on the core inlet temperature calculated by the CPCS is evaluated with the loss of load event. The evaluation was performed incorporating RTD response time of 8, 10 and 13 seconds in the analysis. The results indicate that an increase in the CPC power uncertainty penalties of 1.5%, 3.0% and 5.0% will assure conservative CPC DNBR calculations for RTD response times of 8, 10 and 13 seconds, respectively. These penalties are shown in Figure 3.3-1 of the revised TS and will be applied to the CPC addressable constants BERRO and BERR2, which are uncertainty bias factors for total thermal power and reaction flux power, respectively, used in the CPC DNBR calculations algorithm. In other words, rather than changing the CPC software for degraded RTD, a penalty factor corresponding to the degraded RTD response time can be applied to the addressable constants BERRO and BERR2 to achieve the same DNBR calculation with the built-in 6 second RTD response time. The staff concludes this approach acceptable.

The impact on the power used in the determination of LPD by CPC was evaluated with the single CEA withdrawal event. The results indicate that the LPD penalty should be increased by 4%, 10% and 15% for RTD response times of 8, 10 and 13 seconds, respectively. This penalty factor is shown in Figure 3.3-1 of the revised TS and will be applied to the CPC addressable constant BERR4, which is the uncertainty bias factor on power used in the local power density algorithm. This is found acceptable.

In the current CPCs, the asymmetric steam generator trip function monitors the temperature difference between cold legs and initiates a reactor trip when the monitored temperature difference between cold legs exceeds 14°F. In order to determine the additional required overpower margin (ROPM) needed to assure that the fixed asymmetric steam generator trip set point provides adequate protection, an analysis was performed for the instantaneous closure of a single main steam isolation valve event. The results show that additional 4%, 5% and 9% ROM are required for RTD response times of 8, 10 and 13 seconds, respectively. This ROM penalty factor is shown in Table 3.3-3 of the revised TS and will be either applied to the POL in the COLSS, or, with COLSS out of service, applied to the CPC channels being used for monitoring the DNBR LCO. The staff has found this to be acceptable.

As indicated in Table 1 of the letter dated April 2, 1982 (Ref. 4), the licensee has been experiencing RTD response time degradation, and is conducting frequent (monthly) testing to closely follow the problem. The licensee plans to change one channel to a new model of RTDs at the August refueling, and is searching for an improved thermal couplant for the thermowells to improve performance. NRC Region IV will continue to follow the licensee's corrective action program in this matter.

3.0 Summary

The staff has reviewed the proposed Technical Specification change to allow continuing plant operation with effective RTD time constant exceeding 6 seconds. The penalty factors associated with the degraded RTD response time shown in Figure 3.3-1 and Table 3.3-3 of the revised TS are acceptable for applying to the CPC addressable constant BERRO, BERR2 for DNBR calculation, and BERR4 for LPD calculation and POL for the COLSS trip setpoint.

Environmental Consideration

We have determined that the amendment does not authorize a change in effluent types or total amounts nor an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that the amendment involves an action which is insignificant from the standpoint of environmental impact and, pursuant to 10 CFR §51.5(d)(4), that an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with the issuance of this amendment.

Conclusion

We have concluded, based on the considerations discussed above, that: (1) because the amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated, does not create the possibility of an accident of a type different from any evaluated previously, and does not involve a significant reduction in a margin of safety, the amendment does not involve a significant hazards consideration, (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (3) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

Date: July 21, 1982

Principal Contributors:

Y. Hsii
C. Trammell

References

1. Letter, W. Cavanaugh, III to R. A. Clark, "Arkansas Nuclear One, Unit 2, Docket Number 50-368, License Number NPF-6, Technical Specification Change Request for RTD Response Time (File: 2-15104), dated May 3, 1982.
2. Letter, J. R. Marshall to J. T. Collins, "ANO-2, Docket Number 50-368, License Number NPF-6, Response to Questions on Proposed Change to Technical Specification 3.3.1.1", dated May 20, 1982.
3. CEN-206 (A)-P, "Method of Assessing ANO-2 RTD Response Time Impact, Docket Number 50-368", dated April 1982.
4. Letter, J. R. Marshall to J. T. Collins, "ANO-2 Docket Number 50-368, License Number NPF-6 Information Update Relative to R. O. 50-368/82-001/OIT-0 (RTD Response Time Degradation)", dated April 2, 1982.