



UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 113 TO FACILITY OPERATING LICENSE NPF-35
AND AMENDMENT NO. 107 TO FACILITY OPERATING LICENSE NPF-52

DUKE POWER COMPANY, ET AL.

CATAWBA NUCLEAR STATION, UNITS 1 AND 2

DOCKET NOS. 50-413 AND 50-414

1.0 INTRODUCTION

By letter dated October 25, 1993, as supplemented December 3 and 6, 1993, Duke Power Company, et al. (the licensee), submitted a request for changes to the Catawba Nuclear Station, Units 1 and 2, Technical Specifications (TS). The requested changes would reduce the required minimum measured reactor coolant system (RCS) flow from 385,000 gallons per minute (gpm) to 382,000 gpm. The reasons for this request are that the degrading of the steam generator tubes in Catawba Unit 1 and McGuire Units 1 and 2 have necessitated that tubes be plugged or sleeved, which reduces the available flow area in the steam generators and consequently reduces flow through the core. In addition, a hot leg temperature streaming phenomenon has affected the ability to accurately measure flow. As a result of these effects, it was difficult to ensure meeting the TS minimum flow requirements to maintain 100% power operation. The December 3 and 6, 1993, letters provided clarifying information that did not change the scope of the October 25, 1993, application and the initial proposed no significant hazards consideration determination.

2.0 EVALUATION

The following TS were modified to reflect the reduction in RCS flow:

- 1) Figure 2.1-1, Reactor Core Safety Limits - Four Loops in Operation,
- 2) Figure 3.2-1, Reactor Coolant System Total Flow Rate Versus Rated Thermal Power - Four Loops in Operation, and
- 3) The overtemperature delta T (OT Δ T) and overpower delta T (OP Δ T) setpoint equation constants in Table 2.2-1, Reactor Trip System Instrumentation Trip Setpoints.

These revisions are applicable to McGuire Units 1 and 2 and to Catawba Unit 1. The TS changes for McGuire will be reflected in an amendment to the McGuire facility operating licenses. The TS changes discussed above are not applicable to Catawba Unit 2, because the steam generators in Unit 2 have not required tube plugging or sleeving to the extent of the other three units. However, a change was also made to Catawba Unit 2 relating to the OP Δ T allowable values due to a minor error discovered as stated in Section 2.1. In addition, there were editorial changes.

The NRC staff is continuing its review of the licensee's proposal to modify the Limiting Condition for Operation of TS 2.1-1 to make the DNBR and centerline fuel temperature (CFT) limits consistent with the Babcock and Wilcox Improved Standard Technical Specification. The licensee amended its submittal by letter dated December 6, 1993 (Reference 3), to address only the changes required by the reduction in the required measured minimum RCS flow for this amendment.

2.0 EVALUATION

2.1 Revision of OT Δ T and OT Δ P Parameters in Table 2.2-1

To support the reduction in measured minimum RCS flow (MMF), changes were required for the OP Δ T setpoints for McGuire Units 1 and 2 and Catawba Unit 1. These changes involved recalculation of the TS allowable values of the trip functions. The revised core thermal limits were generated to reflect the reduced MMF of 382,000 gpm. Based on these new protection limits, the OT Δ T setpoint constants (Note 1 of Table 2.2-1), and the OP Δ T setpoint equation constants (Notes 2 and 3 of Table 2.2-1 for McGuire and Catawba, respectively) were revised to reflect the necessary changes. The impact of the reduced flow on the coefficients was partially offset by a reduction in the margin assumed in the calculation of the coefficients.

The revised OP Δ T allowable values are more restrictive than the existing values. In the course of these calculations, a minor error was discovered by DPC that affected the existing allowable values for all four units. This resulted in a recalculation, of the allowable value for Catawba Unit 2, as well as the three units affected by the flow reduction.

The revision required for the McGuire OT Δ T allowable value is less restrictive than the existing value and the Catawba value is unchanged by the reduction in flow. To improve clarity, the maximum trip setpoint limit in Notes 2 and 4 of TS Table 2.2-1 will be expressed in percent of rated thermal power (RTP) instead of percent instrument span.

In response to a request for additional information, DPC responded (Reference 2) with information which provided the approved methodology (Reference 4) for the changes made relating to OP Δ T and OT Δ T. The staff, therefore, finds these changes to be acceptable.

2.2 The Effect of Reduced Flow on the Final Safety Analysis Report Analyses

Duke Power performed analyses to justify reduction in the minimum RCS flow to 382,000 gpm. These analyses were to show that the reduced flow rate will not have a significant impact on any accident analyses presented in the Final Safety Analysis Report (FSAR) Chapters 4, 6, or 15.

2.2.1 Thermal Hydraulic Design, FSAR Section 4.4

The thermal hydraulic design for the McGuire and Catawba units was analyzed by DPC with the reduction in RCS MMF to 382,000 gpm. The reduced flow rate resulted in a slight reduction of the margin in the core DNB limits. TS Figure 3.2-1, Reactor Coolant System Total Flow Rate Versus Rated Thermal Power - Four Loops in Operation, was revised to reflect the lower allowable flow rate. For the changes made in RCS flow at reduced power, DPC stated (Reference 2) that the RCS flow values were determined using the same 2% power per 1% flow reduction factor used in the existing TS figure. The axial Flux Difference Limits, TS Section 3.2.1, are unchanged and all the current thermal hydraulic design criteria are satisfied at the reduced flow conditions.

2.2.2 Mass and Energy Releases for Containment Analyses, FSAR Chapter 6

Duke Power stated that the reduction in MMF flow affects the mass and energy releases for containment analysis only through a change in the RCS temperature input assumption. As the RCS average temperature will remain unchanged with the change in MMF, the RCS initial fluid and metal stored energy will remain unchanged. Also, a constant RCS average temperature implies that the driving temperature difference for primary to secondary heat transfer will remain unchanged. These two parameters, initial energy content and rate of energy transfer, are the means by which mass and energy releases influence containment response for the transients analyzed in Chapter 6 of the FSAR. Since the reduction in MMF is being made with a negligible change in RCS temperature, DPC stated that the mass and energy releases calculated in FSAR Chapter 6 will not be affected.

2.2.3 Accident Analyses, FSAR Chapter 15

All of the FSAR Chapter 15 accident analyses which are applicable to the McGuire and Catawba Nuclear Stations were explicitly analyzed by DPC with an initial RCS flow assumption which corresponds to an MMF of 382,000 gpm, or have been evaluated to determine the impact of a reduction in MMF of 3,000 gpm.

The following analyses were reanalyzed by DPC with an initial RCS flow assumption which is less than or equal to an MMF flow of 382,000 gpm.

- 15.1.5 Steam System Piping Failure
- 15.2.3b Turbine Trip - Peak Primary Pressure
- 15.2.6 Loss of Non-emergency AC Power
- 15.2.7 Loss of Normal Feedwater Flow
- 15.2.8 Feedwater System Pipe Break

- 15.3.1 Partial Loss of Reactor Coolant System Flow
- 15.3.2 Complete Loss of Reactor Coolant System Flow
- 15.3.3 Locked Rotor
- 15.4.1 Uncontrolled Bank Withdrawal from Subcritical
- 15.4.2 Uncontrolled Bank Withdrawal at Power
- 15.4.3 Rod Assembly Misoperation
- 15.4.8 Rod Ejection
- 15.6.3 Steam Generator Tube Rupture
- 15.6.5 Loss of Coolant Accident

Events that were not reanalyzed included those that are bounded by other more limiting events as stated in DPC topical report DPC-NE-3002-A and events which are analyzed with the acceptance criteria of no departure from nucleate boiling.

As noted above, DPC has performed reanalyses or has made evaluations that determine that the reduction in MMF will not adversely affect the steady state or transient analyses documented in Chapters 4, 6, and 15 of the Catawba and McGuire FSARs. Duke Power stated (Reference 2) that the reanalyses used approved codes (References 5 to 9). Therefore, the staff finds the decrease in the MMF from 385,000 gpm to 382,000 gpm in the Catawba and McGuire TS to be acceptable.

The staff has reviewed the licensee's submittal to support the reduction in the required minimum measured reactor coolant system flow and finds the TS changes to be acceptable.

3.0 STATE CONSULTATION

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

4.0 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. 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 (58 FR 59747 dated November 10, 1993). 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.

5.0 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 amendments will not be inimical to the common defense and security or to the health and safety of the public.

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REFERENCES

1. Letter from M. S. Tuckman, DPC, to USNRC, dated October 25, 1993.
2. Letter from M. S. Tuckman, DPC, to USNRC, dated December 3, 1993.
3. Letter from M. S. Tuckman, DPC, to USNRC, dated December 6, 1993.
4. Letter from T. C. McMeekin, DPC, to USNRC, dated April 26, 1993.
5. Kabadi, J. N., et al., "The 1981 Version of the Westinghouse ECCS Evaluation Model Using the BASH Code," WCAP-10266P-A, Rev. 2, March 1987.
6. N. Lee, et al., "Westinghouse Small Break ECCS Evaluation Model Using the NOTRUMP Code," WCAP-10054P-A, August 1985.
7. DPC-NE-3000P-A, Rev. 1, "Thermal-Hydraulic Transient Analysis Methodology," November 1991.
8. DPC-NE-3001P-A, "Multidimensional Reactor Transients and Safety Analysis Physics Parameter Methodology," November 1991.
9. DPC-NE-3002-A, "FSAR Chapter 15 System Transient Analysis Methodology," November 1991.