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TECHNICAL EVALUATION OF THE PROPOSED DELETION OF A
REACTOR TRIP ON A TURBINE TRIP BELOW 50-PERCENT POWER
FOR THE JOSEPH M. FARLEY NUCLEAR POWER PLANT

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December 1979

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This work was supported by the United States Nuclear Regulatory Commission under a Memorandum of Understanding with the United States Department of Energy.

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ABSTRACT

This report documents the Alabama Power Company's proposed license amendment for the deletion of a reactor trip () a turbine trip below 50-percent power for the Joseph M. Farley nuclear power plant. This report is supplied as part of the Selected Electrical, Instrumentation, and Control Systems Issues Program being conducted for the U. S. Nuclear Regulatory Commission by Lawrence Livermore laboratory.

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FOREWORD

This report is supplied as part of the Selected Electrical, Instrumentation, and Control Systems Issues (SEICSI) Program being conducted for the U. S. Nuclear Regulatory Commission, Office of Nuclear Reactor Regulation, Division of Operating Reactors, by Lawrence Livermore Laboratory, Field Test Systems Division of the Electronics Engineering Department.

The U. S. Nuclear Regulatory Commission funded the work under the authorization entitled "Electrical, Instrumentation and Control System Support," B&R 20 19 04 031, FIN A-0231.

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1. INTRODUCTION

In a letter¹ dated November 15, 1978, the Alabama Power Company, the holder of license #NPF-2, submitted a license amendment request to the U. S. Nuclear Regulatory Commission (NRC) for the deletion of a reactor trip on a turbine trip below 50-percent power for the Joseph M. Farley nuclear power plant. The licensee's present criteria state that they will trip the reactor any time the power turbine trips when the plant is operating above 10 percent of rated power.

The purpose of this report is to review and evaluate the technical aspects of the licensee's submittal² and to determine if it meets the criteria established by the NRC.

2. EVALUATION OF THE JOSEPH M. FARLEY NUCLEAR POWER PLANT

2.1 INTRODUCTION

In its submittal, the licensee stated that the Joseph M. Farley nuclear power plant reactor protection system (RPS) currently provides for a direct reactor trip following a turbine trip when the plant is above 10-percent power. Since the plant is designed for a 50-percent load rejection capability, a reactor trip following a turbine trip below 50-percent power can be eliminated without compromising adequate safety margins. Deletion of a reactor trip following a turbine trip would significantly reduce the down-time required if the cause of the turbine trip is readily correctable.

2.2 LICENSEE'S PROPOSED CHANGES

Pursuant to the Code of Federal Regulations, Title 10, Part 50.59 (10 CFR 50.59),³ the licensee proposes the following changes to Appendix A of its technical specifications:

- (1) Add the following to Table 3.3-1:

"P-9- With 2 of 4 power range neutron flux channels >50% of rated thermal power, P-9 defeats the automatic block of reactor trip on turbine trip."

- (2) Add limiting safety system settings B2-7, which read

Turbine Trip

"A Turbine Trip causes a direct reactor trip when operating above P-9. Each of the turbine trips provide turbine protection and reduce the severity of the ensuing transient. No credit was taken in the accident analyses for operation of these trips. Their functional capability at the specified trip settings is required to enhance the overall reliability of the Reactor Protection System."

2.3 REVIEW OF THE LICENSEE'S SUBMITTAL

A review was made of the licensee's submittal, and the following technical aspects were presented:

- (1) The licensee stated that "The Plant Operations Review Committee and the Nuclear Operations Review Board have reviewed the above proposed changes and have determined that the changes do not involve an unreviewed safety question."
- (2) An evaluation and analysis have been performed to ensure that the deletion of a reactor trip following a turbine trip from 50-percent power or less has no adverse effect on plant safety. The evaluation consisted of the following:
 - (a) Verification of the worst-case transient with respect to core limits in the 10- to 50-percent power range as acceptable (i.e., minimum departure from nucleate boiling ratio (DNBR) >1.30).
 - (b) Consideration of the worst single active failure (i.e., unsuccessful reactor coolant pump bus transfer 30 seconds after turbine trip).
 - (c) Acceptability of potential offsite doses resulting from the loss of the condenser and consequential atmospheric dumping of steam through the main steam line safety valve.

The results of the analysis show that the plant design is such that a turbine trip without a direct or immediate reactor trip from 50-percent power or less presents no hazard to the integrity of the reactor coolant system (RCS), the main steam system, or the general public. Pressure-relieving devices incorporated in the two systems are adequate to keep maximum pressures within the design limits.

The analysis also demonstrates that for a complete loss of forced reactor coolant flow initiated from the most adverse preconditions of a turbine trip, the DNBR is well above 1.30 at any time during the transient. Thus, no fuel or clad damage is predicted, and all of the applicable acceptance criteria are met. In addition, the potential offsite doses associated with the

loss of the condenser and consequential atmospheric dumping of steam through the main steam safety valves were found to be well within the limits set by Appendix I of the Code of Federal Regulations, Title 10, Part 50 (CFR 50).

3. CONCLUSIONS

The technical aspects of the Alabama Power Company's submittal for the Joseph M. Farley nuclear power plant license amendment were reviewed. Based on this review, we conclude the following:

- (1) No degradation of the engineered safety features occurs due to this proposed change.
- (2) The system has the capability to bypass 50 percent of rated power steam around the turbine.
- (3) No credit is taken for the steam dump system in the Final Safety Analysis Report (FSAR).⁵

We recommend that the NRC approve this proposed change for the deletion of a reactor trip on a turbine trip below 50-percent power.

REFERENCES

1. APC letter (F. L. Clayton, Jr.) to NRC/DOR (A. Schwencer), dated November 15, 1978.
2. APC submittal for license amendment:
 - (a) Safety evaluation of reactor trip following turbine trip below 50-percent power.
 - (b) Technical specifications, Table 3.3-1.
 - (c) Limiting safety system settings B2-7.
3. Code of Federal Regulations, Title 10, Part 50.59 (10 CFR 50.59).
4. Code of Federal Regulations, Title 10, Part 50 (10 CFR 50), Appendix I.
5. APC, Joseph M. Farley Nuclear Power Plant, Final Safety Analysis Report (FSAR), Section 15.2.7 (n.d.).

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