



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 61 TO FACILITY OPERATING LICENSE NO. NPF-58
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY, ET AL.
PERRY NUCLEAR POWER PLANT, UNIT NO. 1
DOCKET NO. 50-440

1.0 INTRODUCTION

By letter dated June 28, 1991, Centerior Energy (the licensee) requested changes to the Technical Specifications (TS) for the Perry Nuclear Power Plant (PNPP), Unit 1. The request would permit the unit to continue reactor operation with the reactor recirculation system in single loop operation (SLO).

2.0 EVALUATION

Changes to the Technical Specifications for PNPP, Unit 1, have been proposed in order to provide for implementation of SLO. Implementation of SLO requires modification of the Minimum Critical Power Ratio (MCPR) Safety Limit, Average Power Range Monitor (APRM) scram and rod block setpoints, the Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) for all fuel/lattice types through the addition of a SLO MAPLHGR reduction factor, and adjustment of the recirculation system specifications as discussed below. TS 3.4.1.1, "Recirculation Loops," acts as the governing specification and directs the actions necessary to operate in SLO. Certain specific actions are identified within the Recirculation Loops specification which must be followed when the single loop operation mode is entered such as imposing the limits and setpoints mentioned above, placing the active recirculation loop flow controller in the loop manual mode, and imposing certain flow rate and power restrictions to remain within the bounds of the safety analyses and for thermal stress considerations.

SLO is a highly desirable mode of operation in the event that a problem with a recirculation pump, or other component maintenance, renders a recirculation loop inoperative. The current TS (through TS 3.4.1.1, Action a) requires that reactor power to be reduced within two hours to below the value specified in TS Figure 3.4.1.1-1, and that the reactor be placed in at least Hot Shutdown within the following twelve hours. Therefore, the inoperability of a recirculation loop currently requires the plant to begin a rapid forced shutdown. As a consequence, there is a potential for a scram during this complex evolution, and hence the cycling of the plant components. SLO provides an alternative to this, and will allow the continued safe operation of the plant at reduced power while maintaining continued electrical generation.

An analysis of SLO has been performed by the licensee as presented in Reference 1. This analysis was submitted as Appendix 15F to the PNPP Final

Safety Analysis Report (FSAR) to present this mode of operation for NRC staff review, although the request to authorize operation in the single loop mode was not processed during the initial licensing proceedings. This safety analysis performed by the licensee forms the analytical basis for the TS changes proposed in this submittal. To justify SLO, potential transients and accidents associated with power operations, as presented in the PNPP Updated Final Safety Analysis Report (USAR) Section 6.3.3 and Chapter 15 (including Appendices) of the USAR, were reviewed and the limiting events reanalyzed at SLO conditions. Containment performance evaluation and reactor internals vibration analyses were also performed by the licensee. An updated Appendix 15F was submitted to reflect the current thermal hydraulic stability criteria (which has changed since the time of original plant licensing), the recirculation loop drive flow limit (determined from startup testing reactor internals vibration analysis results), and the potential for changes in the SLO MAPLHGR reduction factor.

Highlights of the licensee's safety analysis (Reference 1) are presented below:

- (1) The MCPR Safety Limit is increased during SLO primarily because of slightly increased uncertainties, but the MCPR Operating Limit does not change. The effect of transients during SLO are less severe than during two loop operation. These analyses demonstrate that even though the MCPR Safety Limit is higher, there is sufficient MCPR margin in the existing MCPR Operating Limit to ensure safe operation.
- (2) The Appendix K Loss of Coolant Accident (LOCA) analyses show that a LOCA during SLO could result in a higher Peak Cladding Temperature (PCT) than for two loop operation. Therefore, the MAPLHGR limits are adjusted through the addition of a SLO MAPLHGR reduction factor to maintain the PCT below 10 CFR 50.46 limits.
- (3) An allowable operating region had been previously incorporated into TS 3.4.1.1. The recommendations of General Electric (GE) Service and Information Letter (SIL) 380 Revision 1, 'BWR Core Thermal Hydraulic Stability,' (Reference 2) were previously incorporated into the TS, and the interim corrective actions developed by GE and endorsed by NRC Bulletin 811-07 and Supplement 1, 'Power Oscillations in BWRs,' (Reference 3) have been incorporated into plant operating procedures.
- (4) All applicable parameters of the containment analysis are below their design limits for SLO.
- (5) Reactor vessel internals vibration during SLO was examined. Analysis of startup test data defined a maximum recirculation loop drive flow for SLO that ensures vibration levels are within acceptable limits.

The proposed TS changes for implementing SLO are as follows:

- (1) SAFETY LIMITS: Specification 2.1.2 - THERMAL POWER, High Pressure and High Flow: The licensee proposes to increase the MCPR Safety Limit from

- 1.07 to 1.08 to account for additional uncertainties in establishing the safety limit for one recirculation loop operation. This change is acceptable.
- (2) Table 2.2.1-1, Item 2.b.: The licensee proposes to add new flow biased scram trip setpoint and allowable value equations for SLO to the Specification 2.2.1, "Limiting Safety System Settings - Reactor Protection System Instrumentation Setpoints" table under the Average Power Range Monitor (APRM): Flow Biased Simulated Thermal Power-High, Functional Unit heading. This change is acceptable.
 - (3) Table 3.3.6-2, Item 2.a.: The licensee proposes to add new flow biased rod block trip setpoint and allowable value equations for SLO to the Specification 3.3.6, "Control Rod Block Instrumentation Setpoints" table under the APRM: Flow Biased Neutron Flux-Upscale, Trip Function heading. This change is acceptable.
 - (4) Table 2.2.1-1 Note b, Table 3.3.6-2 Note c, and Table 4.3.1.1-1 Note d: The licensee would add footnotes to the above two tables, and a statement to the existing note in Table 4.3.1.1-1, "Reactor Protection System Instrumentation Surveillance Requirements" explaining that temporary APRM gain adjustments may be made in lieu of adjusting the APRM flow biased trip setpoint and allowable value equations discussed above to functionally implement SLO while the flow biased equations are being changed. This change is acceptable.
 - (5) LCO 3.2.1 - Average Planar Linear Heat Generation Rate and the COLR: The licensee proposes to modify the Maximum Average Planar Linear Heat Generation Rate Power and Flow Factor parametric curves (MAPFAC-p and MAPFAC-f) to reflect the limit for the current cycle for SLO. These curves are located in the Core Operating Limits Report (COLR). These changes are acceptable.
 - (6) LCO 3.4.1.1 - Recirculation Loops: The licensee proposes to revise the Recirculation Loops specification Limiting Condition for Operation (LCO) and Action statements, and add Surveillance Requirements to allow recirculation loop operation with only one loop in service. Surveillance Requirements and Action statements are being added to verify the new conditions and to direct the actions to take if the conditions are exceeded. This change is acceptable.
 - (7) LCO 3.4.1.2 - Jet Pumps: The licensee proposes to clarify the Surveillance Requirements of the Jet Pumps specification to provide consistency between specifications, eliminate confusion in the applicability of an exception to Specification 4.0.4, eliminate a redundant requirement for matching recirculation loop flows, clarify terms, and provide revised limits for jet pump diffuser-to-lower plenum differential pressure, and add a limit for jet pump flow. These changes are acceptable.

- (8) LCO 3.4.1.3 - Recirculation Loop Flow: The licensee proposes to modify the Applicability statement of the Recirculation Loop Flow specification to indicate that the recirculation flow mismatch limits are only applicable during two loop operation. Revise the Action statement to allow for single recirculation loop operation, and add a 4.0.4 exception to the Surveillance Requirements to allow restart of an idle recirculation loop. This change is acceptable.

The incorporation of the above changes resulted in renumbering or shifting of the location of various table footnotes and Action statements. Several references were added to the Bases discussions, and a number of editorial changes were made. The staff finds these changes to be acceptable.

3.0 STATE CONSULTATION

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

4.0 ENVIRONMENTAL CONSIDERATION

Pursuant to 10 CFR 51.21, 51.32, and 51.35, an environmental assessment and finding of no significant impact has been prepared and published in the Federal Register on December 13, 1993 (58 FR 65197). Accordingly, based upon the environmental assessment, the Commission has determined that the issuance of this amendment will not have a significant effect on the quality of the human environment.

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.

Principal Contributor: M. Razzaque

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6.0 REFERENCES

- (1) Updated Safety Analysis Report, Appendix 15F, Single Loop Operation Analysis for the Perry Nuclear Power Plant, Unit 1.
- (2) General Electric (GE) Service Information Letter (SIL) No. 380, Revision 1, "BWR Core Thermal Hydraulic Stability," February 10, 1984.
- (3) NRC Bulletin 88-07 and Supplement 1, "Power Oscillations in Boiling Water Reactors," 1988.