

SAFETY EVALUATION

AMENDMENT NO. 11 TO LICENSE NPF-11

LA SALLE COUNTY STATION, UNIT NO. 1

DOCKET NO. 50-373

1.0 INTRODUCTION

The current La Salle County Station, Unit 1 Technical Specifications do not allow plant operation beyond 12 hours if an idle recirculation loop cannot be returned to service. The ability to operate at reduced power with a single loop is highly desirable from an availability outage planning standpoint in the event that maintenance or component unavailability rendered one loop inoperable.

By letter dated December 6, 1982, Commonwealth Edison Company (CECo) (the licensee) requested changes to the Technical Specification for Single Loop Operation of La Salle, Unit 1. The requested changes would permit Unit 1 to operate at up to 50 percent of rated power with one recirculation loop out of service for unlimited time. While analyses indicate that it may be safe to operate boiling water reactors on a single loop in the range higher than 50 percent of rated power, the experience (reference letter from L. M. Mills, TVA dated March 17, 1980 to H. Denton, NRC) at Browns Ferry, Unit 1 has caused concern about flow and power oscillations. However, because single loop operation at 50 percent of rated power at several plants, including Browns Ferry, Unit 1, has shown acceptable flow and power characteristics, we will permit La Salle, Unit 1 to operate at power levels up to 50 percent of rated power with one loop out of service during its initial fuel cycle. We will request from the licensee any additional information required for permanent approval for single loop operation. If requested, we will also consider operation at a higher power level for La Salle with one recirculation loop out of service after the staff concerns stemming from Browns Ferry, Unit 1 single loop operation, which showed unexpected variation in jet pump flow and neutron flux at power level of 59 percent but these variations stopped when the power level was reduced, are satisfied.

2.0 EVALUATION

2.1 Accidents (Other than Loss of Coolant Accident (LOCA)) and Transients Affected by One Recirculation Loop out of Service

2.1.1 One Pump Seizure Accidents

The licensee states that the one-pump seizure accident is a relatively mild event during two recirculation pump operations. Analyses were performed to determine the impact this accident would have on one recirculation pump operation. These analyses were performed using NRC staff approved models. The analyses were conservatively conducted from a steady-state operating condition of 78 percent of rated thermal power and 63 percent core flow. Pump seizure was simulated by setting the single operating pump speed to zero instantaneously.

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Results of the analyses indicate that neither pressure nor cladding thermal limits are exceeded during the event. Peak vessel pressure is calculated to be 1031 psig (ASME code limit is 1375 psig) and minimum critical power ratio (MCPR) is 1.17 (safety limit is 1.06).

2.1.2 Abnormal Operational Transients

The licensee discussed the effects of single loop operation on the course of abnormal operational transients. Pressurization and cold water increase events, as well as rod withdrawal error, were addressed. Flow decrease is covered by the pump seizure accident already described. The results of calculations for the limiting event for each category were also presented. Initial operating conditions were conservatively assumed to be 78 percent of rated thermal power and 63 percent core flow.

2.1.2.1 a) Pressurization Events

The limiting pressurization event is the generator load rejection without bypass transient. For single loop operation, the licensee has calculated that the maximum vessel pressure is 1128 psig and the MCPR is 1.29. Each of the values satisfies its respective safety limit.

b) Cold Water Increase

The limiting cold water increase event is the feedwater controller failure to maximum demand transient. The reactor is assumed to be in single loop operation at conservative initial operating conditions of 78 percent of rated power and 63 percent core flow when failure of the feedwater control system instantaneously increases the feedwater flow to the runout capacity of 160 percent of rated flow. The peak pressure is calculated to be 1126 psig and the MCPR is 1.26, each satisfying its respective safety limit.

c) Rod Withdrawal Error

The rod withdrawal error at rated power is given in the Final Safety Analysis Report for the initial core and in cycle dependent reload supplemental submittals. These analyses are performed to demonstrate that, even if the operator ignores all instrument indications and the alarms which could occur during the course of the transient, the rod block system will stop rod withdrawal at a minimum critical power ratio which is higher than the fuel cladding integrity safety limit. Correction of the rod block equation and lower initial power for single-loop operation in the Technical Specifications (see Section 5 of this safety evaluation) assures that the MCPR safety limit is not violated.

One-pump operation results in backflow through 10 of the 20 jet pumps while flow is being supplied to the lower plenum from the active jet pumps. Because of this backflow through the inactive jet pumps, present rod-block equation and APRM settings must be modified. The licensee has modified the two-pump rod block equation and average power range monitor (APRM) settings that exist in the Technical Specifications for one-pump operation and the staff has found them acceptable.

The staff finds that one loop transients and accidents other than LOCA, which is discussed below, are bounded by the two loop operation analyses and are therefore acceptable.

2.1.3 Minimum Critical Power Ratio (MCPR) Uncertainties

For single-loop operation, the rated condition steady-state MCPR limit is increased by 0.01 to account for increased uncertainties in the core total flow and traversing in-core probe (TIP) readings. The MCPR will vary depending on flow conditions. This leads to the possibility of a large inadvertent flow increase which would cause the MCPR to decrease below the safety limit for a low initial MCPR at reduced flow conditions. Therefore, the required MCPR must be increased at reduced core flow by a flow factor K_f . The K_f factors for two loop operation are derived assuming both recirculation loop controllers fail. This condition of both recirculation loop controllers failing maximizes the power increase and hence bounds the maximum delta MCPR for single loop operation transients. When operating on one loop, the flow and power increase will be less than that associated with two loops at full flow. The K_f factors derived from the two-loop assumptions are therefore conservative for single loop operation.

2.2 Loss of Coolant Accident (LOCA)

The licensee has performed analyses of a spectrum of recirculation suction line breaks under single loop operation conditions. The licensee states that evaluation of these calculations which are performed according to the procedure outlined in NEDO-20556-2, Rev. 1, "General Electric Company Analytical Model for Loss-of-Coolant Analysis in Accordance with 10 CFR 50 Appendix K - Amendment No. 2 One Recirculation Loop out of Service," indicates that a multiplier of 0.87 should be applied to the maximum average planar linear heat generation rate (MAPLHGR) limits for single loop operation of La Salle, Unit 1. Other plants using 8 x 8R fuel have been required to use a reduction factor of 0.85. We require that La Salle, Unit 1 likewise reduce its MAPLHGR by 0.85.

3.0 THERMAL HYDRAULICS

The licensee has confirmed that analysis uncertainties are independent of whether flow is provided by two loops or a single loop. The only exceptions to this are core total flow and TIP reading. The effect of these uncertainties is an increase in the MCPR by .01, which is more than offset by the K_f factor required at low flows. The steady state operating MCPR with single-loop operation will be conservatively established by multiplying the rated flow MCPR limit by the K_f factor.

4.0 STABILITY ANALYSIS

As indicated in the applicant's submittal, operating along the minimum forced recirculation line with one pump running at minimum speed is more stable than operating with both pumps operating at minimum speed.

The licensee will be required to operate in master manual to reduce the effects of instabilities due to controller feedback. The staff has accepted previous stability analyses results as evidence that the core can be operated safely while our generic evaluation of boiling water reactor stability characteristics and analysis methods continues. The previous stability analysis results include natural circulation conditions and thus bound the single loop operation. In addition, the decay ratio (0.50) predicted for initial cycle for Unit 1 shows margin relative to Browns Ferry, Unit 1 (.83) which had the flow noise oscillations during single recirculation loop operation. We conclude that with appropriate limitations to recognize and avoid operating instabilities, that the reactor can be operated safely in the single loop mode. Our evaluation of the flow/power oscillations evidenced in Browns Ferry will continue and any pertinent conclusions resulting from this study will be applied to La Salle, Unit 1.

5.0 SUMMARY ON SINGLE LOOP OPERATION

5.1 Steady State Thermal Power Level will not exceed 50 percent of Rated Power

Operating at 50 percent of rated power with appropriate Technical Specification (TS) changes has been approved on a cycle basis for several operating plants. It is concluded for La Salle, Unit 1 that for operation at 50 percent of rated power, consistent with the provisions of item h below, that transient and accident bounds will not be exceeded.

5.2 Minimum Critical Power Ratio (MCPR) Safety Limit Will Be Increased by 0.01 to 1.07

The MCPR Safety Limit will be increased by 0.01 to account for increased (TIP) readings. The licensee has determined that the change conservatively bounds the uncertainties introduced by single loop operation.

5.3 Minimum Critical Power Ratio (MCPR) Limiting Condition for Operation (LCO) will be increased by 0.01

The staff requires that the operating limit MCPR be increased by 0.01 and multiplied by the appropriate two loop K_f factors that are in the La Salle, Unit 1 TS. This will preclude an inadvertent flow increase from causing the MCPR to drop below the safety limit MCPR.

5.4 The Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) Limits will be Reduced by Appropriate Multipliers

The licensee proposed reducing the TS MAPLHGR by 0.87 for Single Loop Operation. These reductions were based on an analysis method proposed by General Electric in NEDE-20566-2. We require a reduction factor of 0.85 consistent with previous single recirculation loop operation approvals for plants with 8 x 8R fuel. This change has been discussed with and agreed to by licensee.

5.5 The APRM Scram and Rod Block Setpoints will be Reduced

The licensee proposed to modify the two loop APRM Scram, Rod Block and Rod Block Monitor (RBM) setpoints to account for back flow through half the jet pumps. These setpoint equations will be changed in the La Salle, Unit 1 TS. The above changes are similar to other plant TS changes and are acceptable to the staff.

5.6 The Recirculation Control will be in Manual Control

The staff requires that the licensee operate the recirculation system in the manual mode to eliminate the need for control system analyses and to reduce the effects of potential flow instabilities.

5.7 Surveillance Requirements

The staff requires that the licensee perform daily surveillance on the jet pumps to ensure that the pressure drop for one jet pump in a loop does not vary from the mean of all jet pumps in that loop by more than 5 percent.

5.8 Provisions to Allow Operation with One Recirculation Loop Out of Service

- a. The steady-state thermal power level will not exceed 50 percent of rated power.
- b. The Minimum Critical Power Ratio (MCPR) Safety Limit will be increased by .01 to 1.07.

- c. The MCPR Limiting Condition for Operation (LCO) will be increased by 0.01.
- d. The Maximum Average Planar Linear Heat Generation Rate (MAPLHGR) Limit will be reduced by 0.85.
- e. Technical Specification Setpoints shall read as follows:
 - T. S. 2.2.1 $S \leq 0.66W + 45.7$ (Trip Setpoint)
 $S \leq 0.66W + 48.7$ (Allowable)
 - T. S. 3.2.2 $S \leq (0.66W + 45.7) T^*$
 $S \leq (0.66W + 36.7) T^*$
RB
 T^* as defined in T. S. 3.2:2
 - T. S. 3.3.6 APRM Upscale $\leq 0.66W + 36.7$ (Trip Setpoint)
 $\leq 0.66W + 39.7$ (Allowable)
RBM Upscale $\leq 0.66W + 34.7$ (Trip Setpoint)
 $\leq 0.66W + 37.7$ (Allowable)
- f. APRM flux noise will be measured once per shift; and the recirculation loop flow will be reduced if the flux noise average over 1/2 hour exceeds 5 percent peak to peak, as measured by the APRM chart recorder.
- g. The core plate delta P noise be measured once per shift, and the recirculation loop flow will be reduced if the noise exceeds 1 psi peak-to-peak.

6.0 AUTHORIZATION FOR SINGLE LOOP OPERATION FOR FUEL CYCLE 1

Based upon the above evaluation and a history of successful operation of other boiling water reactors, we conclude that single loop operation of La Salle, Unit 1 up to a power level of 50 percent and in accordance with the proposed Technical Specification changes, will not exceed the accident and transient bounds previously found acceptable by the NRC staff and is therefore acceptable. The approval for single loop operation up to power level of 50 percent is authorized during cycle 1 until the staff concerns stemming from Browns Ferry, Unit 1 single loop operation are satisfied.

7.0 ENVIRONMENTAL CONSIDERATION

We have determined that this Amendment does not authorize a change in effluent types of total amount nor an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that this Amendment involves action which is insignificant from the standpoint of environmental impact, and, pursuant to 10 CFR Section 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 statement.

8.0 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 or accidents previously considered, does not create the possibility of an accident of a type different from any evaluated previously, and does not involve a significant decrease in a safety margin, 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: DEC 16 1982