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

November 28, 1980

MEMORANDUM FOR: V. Panciera, Leader, Section B
Reactor Systems Branch
Division of Systems Integration

FROM: M. Williams, Project Manager
Operating Reactors Branch #2
Division of Licensing

SUBJECT: EMERGENCY TECHNICAL SPECIFICATION

Attached for your concurrence is the Safety Evaluation for a potential Emergency Technical Specification change for Pilgrim Nuclear Power Station Unit #1 which permits single loop operation.

Thank you for your cooperation in this regard.

Mark Williams, Project Manager
Operating Reactors Branch #2
Division of Licensing

Enclosure:
Safety Evaluation

cc: M. Mendonca
T. Speis
T. Ippolito

Single Loop

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

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(never issued)

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING THE MODIFICATION OF LICENSE DPR-35 - the BOSTON EDISON COMPANY - for PILGRIM NUCLEAR POWER STATION UNIT I

11-28-80

DOCKET 50-293

I. Introduction

By letter (BECo.# 80-295, November 21, 1980) the Boston Edison Company (the licensee) requested relief from the license condition and associated technical specifications which require that the plant be in hot shutdown within 24 hours if operating on one recirculation loop. The licensee stated that operational problems with one of the motor generator sets may result in single loop operations in the near future. On __ _____, the motor generator was taken out of service thereby resulting in the aforementioned mode of operation. This evaluation supports the emergency change to the PNPS-I license which permits operation on a single loop.

In order to assure adequate margin of safety, the licensee has committed to the following during such single loop operations.

A. The idle recirculation loop recirculation pump is electrically disarmed and the motor is inoperable precluding operation of the pump or injection of a cold slug into the vessel.

B. The recirculation controls will be placed in the manual mode, thereby eliminating the need for control system analyses.

C. The settings for the rod block monitor, APRM rod block trip, and flow bias scram will be modified as necessary to provide for single loop operation.

D. MAPLHGR restrictions will result in a 35 percent reduction for all fuel.

E. BECo will limit the power level to 50%.

II. Evaluation

A. Accidents (Other than LOCA) and Transients Affected by One Recirculation Loop Out of Service.

1. One Pump Seizure Accident

The licensee has qualitatively compared the consequences of a pump seizure accident during single loop operation with the consequences of a LOCA during full power operation with both loops in service. Previous analyses have demonstrated that the pump seizure accident is not as severe as a LOCA for two pump operation. The same conclusion can be made for the one pump case by analyzing the two events. In both

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addition, the reactor pressure does not decrease for a pump seizure event, whereas complete depressurization occurs for the LOCA. Since the potential effects of a pump seizure accident are bounded by the effects of a LOCA, the licensee has taken the position that specific pump seizure analyses for one loop operation are not necessary. Although this gives some assurance of acceptability of the pump seizure event, the staff notes that the acceptance criteria for pump seizure are more stringent than the criteria for a LOCA. Standard Review Plan 15.3.3 (Reactor Coolant Pump Rotor Seizure, and Reactor Coolant Pump Shaft Break) requires that for the pump seizure accident, the release of radioactivity should be a fraction of 10 CFR 100 guidelines. Only limited amounts of fuel failures are acceptable for pump seizures, whereas significantly more failures are acceptable for LOCA.

The licensee, however, will limit reactor power during single loop operation to 50% of rated power. As indicated on the PNPS-1 power/flow operating map, the natural circulation line intersects the 100% flow control line at 53% power. Thus, with power limited to 50%, reactor power is at a value where no fuel damage will occur even if pump seizure should occur.

The staff finds the power limit of 50% to be acceptable on the basis that the power limit will assure no significant fuel damage will result should the pump seizure event occur during one loop operation.

2. Abnormal Transients

a. Idle Loop Startup

The idle loop startup transient was analyzed, in the PNPS-1 FSAR with an initial power of 70%. The licensee has committed to operate at no greater than 50% power with one loop out of service. Additionally, the Technical Specifications are being modified to require that, during single loop operation, the idle recirculation pump be electrically disarmed. This measure is being taken to preclude startup of the idle loop.

b. Flow Increase

The Minimum Critical Power Ratios (MCPRs) in the present Technical Specifications for operation at full power have previously been reviewed and found to be acceptable. A large inadvertent flow increase could cause the MCPR to decrease below the Safety Limit MCPR 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 are derived assuming both recirculation loops increase speed to the maximum permitted by the scoop tube position set screws. This condition maximizes the power increase and hence the ΔMCPR for transients initiated from less than rated conditions. When operating on one loop the flow and power increase will be less than with two pumps increasing speed, therefore the K_f factors derived from the two-pump assumption are conservative for one loop operation.

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c. Rod Withdrawal Error

The rod withdrawal error at rated power analysis indicated that the rod block monitor (RBM) will stop rod withdrawal at a critical power ratio (CPR) which is higher than the safety limit. The minimum critical power ratio (MCPR) requirement for one loop operation will be equal to that for two loop operation because the nuclear characteristics are independent of whether core flow is attained by one or two pump operation, if flow asymmetries are not incurred with one-loop operation. Tests at Quad Cities have shown that flow is uniform across the core for one pump operation with the equalizer valve closed. The results of these tests are considered applicable and acceptable for PNPS - 1.

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 the present rod-block equation and APRM settings must be modified. The licensee has modified the two-pump rod block equation and APRM settings that exist in the Technical Specification, 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 analysis and are therefore acceptable.

3. Loss of Coolant Accident (LOCA)

The licensee has contracted General Electric Co. (GE) to perform single loop operation analysis for PNPS LOCA. The licensee states that preliminary evaluation of these calculations (that are performed according to the procedure outlined in NEDO-20566-2) indicates that a multiplier of .83 should be applied to the MAPLHGR limits for single loop operation of PNPS - 1. The licensee asserts further that GE has performed a large number of single loop analyses for similar plants; and, in no case has a multiplier of less than 0.70 been required. Additionally, because PNPS does not have the LPCI modification and because the limiting LOCA break is a suction line break, the single loop MAPLHGR multiplier is expected to be significantly larger than for most other BWRs. However, the licensee has proposed that, until the GE calculations can be verified, a multiplier of 0.65 be utilized. The staff's evaluation finds that value of the MAPLHGR reduction factor to be conservative and, therefore, acceptable.

Since PNPS-1 is one of the plants without the LPCI modification, the loop selection logic will work correctly and the discharge valve will automatically close in the unbroken loop. The licensee has committed to modify the plant operating procedures to shut the suction valve in the event that the discharge fails to close (or close fully). This will preclude the backup of LPCI flow through the recirculation pump into the downcomer resulting in a degradation LPCI performance. Procedure modification will be complete prior to entering single loop operations.

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4. Thermal - Hydraulics

The licensee has confirmed that analysis uncertainties are independent of whether flow is provided by two-loops or single-loop. The only exception to this are core total flow and T.I.P. reading. The effect of these uncertainties is an increase in the safety limit of about .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 K_f factor to the rated flow MCPR limit.

5. Stability Analysis

Single loop operation does not invalidate the previous reload analysis, and the results continue to be acceptable. The licensee has committed to operate in master manual to reduce the effects of instabilities.

III. Summary

For the reasons previously discussed, the staff finds acceptable the proposed single loop operation during the period necessary to effect repairs to the recirculation pump motor generator. Power is limited to no greater than 50% of rated power. Accordingly, License Condition 3.E. is hereby removed and the Technical Specifications are changed according to the attached pages.

IV. Environmental Considerations

We have determined that this 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 Section 51.5(d)(4) that an environmental impact statement, negative declaration, or environmental impact appraisal need not be prepared in connection with the issuance of this amendment.

V. 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 accidents previously considered 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.

Dated:

INITIAL

For Docket Only
8-15-83

NO SIGNIFICANT HAZARDS CONSIDERATION DETERMINATION

AND NOTICING ACTION

Docket No. 50-293 Facility: Pilgrim

Licensee: Boston Edison Company Date of application: May 12, 1981

Request for:

(See attached ~~notice or press release for more details~~)

Initial Determination:

( ) Proposed determination - amendment request involves no significant hazards considerations (NSHC).

(X) Final determination - amendment request involves significant hazards considerations (SHC).

Basis for Determination

( ) Licensee's NSHC discussion has been reviewed and is accepted. See attached amendment request.

(X) Basis for this determination is presented in the attached notice.

( ) Other (state):

(Attach additional sheets as needed.)

Initial Noticing Action: (Attach appropriate notice or input for monthly FRN)

1. ( ) Monthly FRN. Notice of opportunity for hearing (30 days) and request for comments on proposed NSHC determination - monthly FRN input is attached (Attachment 8).

2. ( ) Individual FRN (30 days). Same notice matter as above. Time does not allow waiting for next monthly FRN (Attachments 9a and 9b).

(THIS FORM SHOULD BE TYPED EXCEPT FOR UNUSUAL, URGENT CIRCUMSTANCES.)

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3. ( ) Local media notice. Valid exigent circumstances exist (evaluated below). Local media notice requesting public comments on proposed NSHC determination is attached (Attachment 10).

4. ( ) No notice. A valid emergency situation exists (evaluated below) and there is no time for public notice on proposed NSHC determination. (No attachment.)

5. ( ) Individual FRN (30-days). Licensee's claim of exigent or emergency circumstances is invalid (evaluated below). Notice of opportunity for hearing (30 days) and request for comments on proposed NSHC determination is attached (Attachments 9a and 9b). Letter of explanation to licensee is also attached.

6. (X) Individual FRN (30-days). The amendment request involves SHC. Notice of opportunity for prior hearing is attached (Attachment 8). Letter to licensee also attached.

7. ( ) Individual Short FRN. Valid emergency circumstances exist (evaluated below). There is no time for the usual 30-day FRN. (Attachment 16).

Evaluation of exigent or emergency circumstances (if applicable):

(attach additional sheets as needed)

Approvals: Date:

1. Kenneth T. Eccleston (Project Manager) 8/8/83

2. Robert A. Clark for John Zwolinski (Branch Chief) 8/3/83

3. [illegible] (Assistant Director) 8/8/83

4. Katherine G. Wright (OELD) 8/15/83

Additional approval (for noticing action types 4 and 5):

5. _____ (Director, Division of Licensing) _____

Attachment: as indicated.

cc: Original - Docket File (with note "Docket File only")

Request for:

Technical Specification changes and a license change to permit reactor operation at power levels in excess of 70% of rated power with one recirculation loop out of service. Presently, the Pilgrim operating license requires plant shutdown if an idle recirculation loop cannot be returned to service within 24 hours. The change proposed by the licensee would delete this license condition and modify the Technical Specifications (TSs) as necessary to provide for appropriate Average Power Range Monitor (APRM) flux scram trip and rod block settings, an increase in the safety limit Minimum Critical Power Ratio (MCPR) value and revisions to the allowable Average Planar Linear Heat Generation Rate (APLHR) values suitable for use with an idle recirculation loop.

Basis:

The Commission has provided guidance for the application of the standards for determining whether a significant hazards consideration exists by providing examples of amendments that are considered not likely to involve significant hazards considerations (48 FR 14870). One such amendment involves a relief granted upon demonstration of acceptable operation from an operating restriction that was imposed because acceptable operation was not yet demonstrated. This assumes that the operating restriction and the criteria to be applied to a request for relief have been established in a prior review and that it is justified in a satisfactory way that the criteria have been met.

The Pilgrim license presently requires plant shutdown if an idle recirculation loop cannot be returned to service within 24 hours. This restriction was imposed because insufficient information existed to enable the staff to establish criteria for operation with an idle recirculation loop. Although such criteria have since been established, and analyses have indicated that it should be safe to operate BWRs on a single loop in the range of 85% power, operating experience with an idle recirculation loop at Browns Ferry 1 (BF-1) in late 1979 raised concerns about authorizing single loop operation for BWRs. When the Tennessee Valley Authority (TVA) tried to increase power at BF-1 above about 59% of rated power while operating on a single loop, variations in jet pump flow, neutron flux, and related parameters were noted. Neither the causes nor the potential effects of these variations have been determined or reviewed by the staff for operation with a single recirculation loop. Thus, it has not been justified in a satisfactory way that the criteria for operation with a single loop have been met.

The application for amendment involves changes which do not satisfy the criteria of the applicable example of an amendment which would likely be found not to involve a significant hazards consideration. Therefore, the staff has made a determination that the application for amendment may involve a significant hazards consideration.