



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

August 6, 1987

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
SUPPORTING AMENDMENT NO. 7 TO FACILITY OPERATING LICENSE NO. DPR-27

NORTHEAST NUCLEAR ENERGY COMPANY
MILLSTONE NUCLEAR POWER STATION, UNIT NO. 1

DOCKET NO. 50-245

1.0 INTRODUCTION

By letter dated July 23, 1987, and as supplemented by letter dated July 30, 1987, the Northeast Nuclear Energy Company (NNEEC) submitted a request for changes to the Millstone Nuclear Power Station, Unit No. 1, technical specifications (TS) regarding jet pump flow indication.

The amendment revises the technical specifications to allow start-up of Millstone Unit No. 1 with flow indication from 19 jet pumps, rather than the previously required 20. The amendment also revises jet pump surveillance provisions. The TS currently permit operation with flow indication from 19 jet pumps. This requirement is unchanged. This amendment is valid only through the end of Cycle 12 operation.

2.0 EVALUATION

In support of its application, the licensee, with the assistance of General Electric (the NSSS vendor), evaluated the potential implications on the safety of start-up and operation during Cycle 12 without flow indication from one of the 20 jet pumps. The staff review of the licensee submittal follows.

2.1 Visual Inspection of Vessel Internal Components

An ISI-grade visual examination of the jet pump and its plugged sensing line within the reactor vessel was performed to assure that the lack of flow indication was not due to damage of the inspected equipment. No indications were noted as a result of this examination.

2.2 Total Core Flow Measurement

Indicated total core flow is determined by summing individual jet pump flows from 20 jet pumps. To compensate for the error due to loss of Jet Pump K flow indication, the measured flow from Jet Pump J, which shares a common recirculation flow inlet riser with Jet Pump K, will be adjusted based on historical flow bias data between this jet pump pair and input to the flow summer to simulate the Jet Pump K flow indication. General Electric has calculated that the uncertainty in total core flow measurement using this technique increases only from 2.27 percent (with all flow indicators operable)

to 2.273-percent. This will not impact the existing safety limit minimum critical power ratio which is based on bounding statistical analyses for BWR/2-6 reload cycles assuming 2.5 percent uncertainty for total core flow. Therefore, the reload analyses performed for Cycle 12 remains valid.

2.3 Recirculation Flow Monitoring

The LPCI (low pressure coolant injection) loop selection logic monitors the delta P changes in the jet pump loops to determine which, if any, recirculation loop is broken in the event of a LOCA signal. The proposed operation will not impact this logic since it is not dependent on individual jet pump flow instrumentation.

Recirculation pump flow signals are input to the rod block monitor and to the flow biased APRM rod block and scram circuits. However, the recirculation pump flow measurement does not depend on individual jet pump flow instrumentation; therefore, this protection logic is not impacted by the proposed operation.

2.4 Loss of Jet Pump Operability

A loss of jet pump integrity can result in exceeding the allowable peak clad temperature (PCT) for the design basis LOCA. Hence, plant technical specifications incorporate surveillance requirements for daily monitoring of established flow relationships which can provide indication of jet pump failures. These technical specifications were developed as part of the generic resolution to a material failure problem with jet pump hold down beams, resulting in loose or displaced jet pump mixers. Diagnosis of jet pump problems based on change in operating characteristics is addressed in General Electric SIL No. 330. Because the capability for detection of malfunction in the jet pump with inoperable flow indication is somewhat diminished, the licensee has proposed revision of technical specifications surveillance requirements to strengthen the monitoring provisions. In addition, the licensee has proposed in Attachment 4 of July 23, 1987 submittal an extensive daily and weekly/monthly surveillance program to further enhance the capability to detect jet pump problems. The staff suggested a modification to the action levels proposed for this program to maintain consistency between the daily and weekly/monthly programs. The licensee has agreed and committed to such a change in its letter of July 30, 1987. We find this program acceptable to monitor jet pump operability during the Cycle 12 proposed operation.

3.0 EMERGENCY CIRCUMSTANCES

On June 5, 1987, Millstone Unit No. 1 started its scheduled refueling outage (Reload 11/Cycle 12). During this outage, the licensee replaced the two jet pump instrumentation nozzle assemblies with penetration seals fabricated of materials and welds resistant to intergranular stress corrosion cracking. The replacement began on June 23 and was completed on July 8.

On July 9, testing of the instrumentation lines revealed that one of the lines was blocked. For several days, the licensee tried to remove the blockage by applying pressure and a vacuum to the line. These attempts were unsuccessful.

By letter dated July 23, 1987, the licensee requested the issuance of an emergency technical specification change that would allow startup of Millstone Unit No. 1 with only 19 of 20 jet pump instrumentation lines operable. After discussion with the staff, the licensee provided further information in a letter dated July 30, 1987.

The planned start-up date for Millstone Unit No. 1 is August 10, 1987. The licensee has determined that it would be impossible to clear the blocked line by this date. The licensee has supplied an evaluation by the reactor vendor and an augmented surveillance program to justify plant start-up with a blocked line. The licensee has noted that power demand in Connecticut and in all of New England was approaching a peak and that power shortages were predicted. Currently, the Haddam Neck Plant is in a refueling outage and the Vermont Yankee Plant is scheduled for a refueling outage starting August 8, 1987. In addition, Maine Yankee is shut down until September 1987 and Pilgrim is in an extended shutdown. The restart of Millstone Unit No. 1 is necessary to help prevent a critical power shortage.

3.1 No significant Hazards Consideration Determination

The Commission's regulations in 10 CFR 50.92 state that the Commission may make a final determination that a license amendment involves no significant hazards considerations if operation of the facility in accordance with the amendment would not:

- (1) Involve a significant increase in the probability or consequences of an accident previously evaluated; or
- (2) Create the possibility of a new or different kind of accident from any accident previously evaluated; or
- (3) Involve a significant reduction in a margin of safety.

The information in Section 2.0 above provides the basis for evaluating this license amendment against these criteria. Since the requested operational mode is acceptable and the plant operating conditions, the physical status of the plant, and dose consequences of potential accidents are the same as without the requested change, the staff concludes that:

- (1) The proposed change does not involve a significant increase in the probability or consequences of an accident previously evaluated. Significantly, the Millstone Unit No. 1 operating license, through the technical specifications, already permits operation with jet pump instrumentation from 19 jet pumps. Thus, this change does not alter the existing design basis for plant operation. Nevertheless, as

summarized below, the licensee reviewed existing design basis accident scenarios to confirm that no such implication exists and to bound potential implications for start-up which is the actual focus of this amendment request.

Recirculation Flow Monitoring--The licensee assessed the potential impacts of operation with the requested amendment on various analyses for which credit is taken for recirculation system instrumentation. The licensee determined, as discussed below, that this instrumentation is unaffected by the proposed change:

LPCI (Low Pressure Coolant Injection) Loop Selection Logic--This logic looks at delta P changes in the jet pump loops in order to determine which, if any, recirculation loop is broken in the event of an accident signal. This logic does not depend on individual jet pump flow instrumentation. Thus, there is not impact on the consequences of a LOCA for which this logic is utilized.

Rod Block Monitor, Flow Biased Average Power Range Monitor (APRM) Rod Block and Scram--This logic uses recirculation pump flow as an input. It does not depend on individual jet pump flow instrumentation. Thus, there is no impact on the consequences of the rod withdrawal error event, the postulated accident for which this logic is utilized.

Recirculation System Failures--Although the jet pump instrumentation serves no independent safety-related function in monitoring or responding to a LOCA or any design basis event, the jet pump instrumentation is employed as an indication of reactor recirculation loop and core flow. The licensee assessed the potential impact on postulated reactor recirculation system failures of having instrumentation for 19 jet pumps even though the specific change request does not affect already approved conditions for reactor operation. This review was performed as a conservative and bounding measure to provide added assurance of safe plant start-up and operation. These specific events and the potential impact of the absence of jet pump instrumentation for one jet pump are presented below:

Jet Pump Instrumentation Line Failure--Although a blocked jet pump instrument line does not itself increase the probability of this failure, it could affect the capability of detecting such a failure. However, even were such a failure to occur coincident with a postulated design basis LOCA, the loss of emergency core cooling system (ECCS) flow would be minimal, i.e., less than 10 gpm, and would not significantly affect LOCA response capabilities.

Displaced Jet Pump Mixer--Absence of jet pump instrument indication could affect the ability to detect this event.

To assure detection if this event were to occur in Jet Pump K, the licensee will institute augmented surveillance measures to assure detection through other operable jet pump instrumentation.

Loose Jet pump Mixer--As with the displaced jet pump mixer, absence of jet pump instrument indication for one jet pump impacts only the ability to detect this condition. Again, existing and augmented surveillance measures provide adequate means by which this condition may nonetheless be detected.

Loose/Cracked/Failed Diffuser--The diffusers, along with the core shroud, are low-stress components with no postulated failure modes. Further, so long as the mixer remains within the diffuser slip joint, sufficient jet pump integrity is maintained to provide adequate core coverage following a LOCA. In this regard, the licensee noted that it previously installed BWR-4 design jet pump beam bolts, which are designed to assure the mixer cannot come out of the diffuser slip joint prior to beam bolt failure. In addition, the augmented surveillance program provides the same ability to detect degradation which would precede such failure, event assuming only 19 jet pump instrument lines are operable.

Plugged Jet Pump--The presence of instrumentation from 19 jet pumps provides the capability of detecting this condition. Further, it would be necessary to plug a jet pump completely before LPCI flow would be significantly affected. Surveillance measures to be employed will be adequate to detect this condition.

- (2) The amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated. The proposed amendment does not alter the current licensing basis for operation in that operation for an indefinite period is already permitted under the conditions now sought with respect to start-up. Nonetheless, in order to bound potential conditions which may be observed during start-up, the licensee assessed implications of operation with flow indication from 19 jet pumps.

As noted above, the principal impact of the absence of flow indication for a single jet pump concerns only the ability to monitor core flow through the recirculation loops, whether during start-up, operation, or accident conditions. A blocked instrumentation line itself creates no new or different accident scenarios. As discussed above, existing and augmented surveillance measures provide assurance of the ability to adequately detect and/or monitor start-up, operation, and postulated failure conditions. Thus, no new or different conditions would be expected to occur which are attributable to the detection and monitoring capabilities that will exist following issuance of the requested amendment.

- (3) The amendment does not involve a significant reduction in safety margin. The licensee noted that the amendment affects only a start-up related technical specification and does not affect the licensing basis for plant operation. Nevertheless, as a bounding assessment, the licensee evaluated operation with flow indication from 19 jet pumps with respect to the margin of safety for plant operation.

* For this purpose, General Electric (GE) evaluated whether such operation would alter the bounding statistical analysis performed to provide conservative safety-limit minimum critical power ratios (MCPRs) applicable to all GE 8 x 8 fuel designs in BWR/2-6 reload cycles.

The uncertainty inputs used in the bounding analyses include an assumed 2.5 percent uncertainty for total core flow. The plant-specific value for Millstone Unit No. 1 is 2.27 percent with instrumentation for all 20 jet pumps operable. Based upon historical data for Jet Pump K (inoperable instrumentation) and Jet Pump J (paired jet pump) flows, GE recalculated Millstone Unit No. 1 uncertainty assuming Jet Pump J flow is also used to simulate Jet Pump K, adjusted to reflect known historic biases in flow between the two jet pumps.

General Electric derived a recalculated uncertainty of 2.273 percent for Millstone Unit No. 1. This uncertainty is well within the bounding analyses assumption of 2.5 percent. Thus, the margin of safety inherent in accident and core analyses, including the reload analyses performed in support of Cycle 12, is not significantly altered by the increased uncertainty in total core flow.

Accordingly, we conclude that the amendment to Facility Operating License No. DPR-21, permitting start-up of Millstone Unit No. 1 during Cycle 12, involves no significant hazards consideration.

3.2 State Consultation

In accordance with the Commission's regulations, consultation was held with the State of Connecticut by telephone. The state expressed no concern either from the standpoint of safety or of no significant hazards determination, in view of the interim nature of the amendment.

4.0 ENVIRONMENTAL CONSIDERATION

This amendment involves a change to a requirement with respect to the installation or use of facility components located within the restricted area as defined in 10 CFR Part 20 and changes to the surveillance requirements. The staff has determined that the amendment involves 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 this amendment involves no significant hazards consideration and there has been no public comment on such finding. Accordingly, this amendment meets 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 this amendment.

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, and (2) 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.

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