

NORTHEAST UTILITIES



THE CONNECTICUT LIGHT AND POWER COMPANY
WESTERN MASSACHUSETTS ELECTRIC COMPANY
HOLYOKE WATER POWER COMPANY
NORTHEAST UTILITIES SERVICE COMPANY
NORTHEAST NUCLEAR ENERGY COMPANY

General Offices • Selden Street, Berlin, Connecticut

P.O. BOX 270
HARTFORD, CONNECTICUT 06141-0270
(203) 665-5000

March 3, 1988

Docket No. 50-336
A06990

Re: NUREG-0737 Item II.K.3.5

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Gentlemen:

Millstone Nuclear Power Station, Unit No. 2
Additional Information on Reactor Coolant Pump Trip (TAC No. 49658)

In a January 9, 1987 letter to the U.S. Nuclear Regulatory Commission,⁽¹⁾ Northeast Nuclear Energy Company (NNECO) submitted information on manual trip of Reactor Coolant Pumps (RCPs) that had been requested by the Staff. In order to expedite the review of this item, the Staff requested additional information in a letter dated December 30, 1987.⁽²⁾ The purpose of this letter is to provide that information.

Question 1

In the response to Question 1,⁽³⁾ the Licensee chose subcooling margin as the single setpoint for tripping the last two of four RCPs. The Licensee intends to use radiation information during event diagnosis to select the appropriate recovery procedures. However, according to CEN-268⁽⁴⁾ and Generic Letter 86-06, the Combustion Engineering Owners Group (CEOG) uses a combination of subcooling margin and radiation alarms to identify loss of coolant accident

-
- (1) E J. Mrocza letter to U.S. Nuclear Regulatory Commission, "Manual Trip of Reactor Coolant Pumps - Response to Question 2," dated January 9, 1987.
 - (2) D.H. Jaffe letter to E.J. Mrocza, "Millstone Nuclear Power Station, Unit No. 2, Reactor Coolant Pump Trip (RCP)," dated December 30, 1987.
 - (3) J.F. Opeka letter to A.C. Thadani, "Manual Trip of Reactor Coolant Pumps," dated November 13, 1986.
 - (4) Combustion Engineering Report CEN-268, "Justification of Trip-Two/Leave-Two Reactor Coolant Pump Trip Strategy During Transients," dated March 1984.

8803080300 880303
PDR ADOCK 05000336
P DCD

Acab
1/10

(LOCA)/non-LOCA events. Depending upon event type the RCPs are tripped or left running. The Licensee shall:

- (a) Describe the technical basis for using a single setpoint to trip the RCPs.

Response

If the event is a small break LOCA, the decision to trip the last two RCPs is time critical. Using a single setpoint to determine if the last two pumps should be tripped avoids the unnecessary complexity of requiring the operator to look for secondary plant radiation indications. Time critical decisions should not require the operator to monitor and analyze multiple parameters. Thus, the single setpoint criterion is simple, straightforward, and conservative in that it will always result in RCP trip.

The last two operating RCPs are tripped when the Reactor Coolant System (RCS) subcooling margin has been lost. If subcooling has been lost and the RCS is at a saturated condition, the pumps will likely be tripped by the operator due to equipment integrity concerns. When these conditions are present, concerns related to pump NPSH requirements, vibration, cavitation, seal parameter limits, or motor faults may require that the RCPs be tripped regardless of the presence of secondary side radiation indications. Therefore, the use of a single setpoint and the decision not to include radiation monitoring information avoids unnecessary complexity and ensures that the RCPs will always be tripped when required (i.e. - small break LOCA) while still allowing for two pumps to continue operating when RCS conditions permit (i.e. - subcooled margin present).

- (b) Verify that the LOCA and non-LOCA events analyzed in CEN-268 can be positively identified in order to correctly assess the need to trip the pumps.

Response

Events are diagnosed as part of Emergency Operating Procedure 2525 (EOP-2525), "Standard Post-Trip Actions," and are confirmed in each of the event-oriented EOPs. To assist in this, both containment radiation and secondary plant radiation (the "second setpoint" parameter in CEN-268) are used to diagnose and confirm the event type. Event diagnosis is independent of RCP trip criteria, and the Millstone Unit No. 2 EOPs are adequate to diagnose these events and determine the need to trip the RCPs.

- (c) Verify that any differences from the RCP trip strategy of CEN-268 are conservative or are technically justified.

Response

The appropriate standard by which to judge the adequacy of the Millstone Unit No. 2 RCP trip strategy is the CEQG Emergency Procedure Guidelines. The Millstone Unit No. 2 EOPs are written to the CEQG Emergency Procedure Guidelines (EPGs) and not to CEN-268. The RCP trip

strategy from CEN-268 has been considered in the latest revision of the CEOG EPGs.⁽⁵⁾ The Millstone Unit No. 2 EOPs are in compliance with the RCP trip strategy included in CEN-152, revision 3.

The RCP trip strategy as implemented in the Millstone Unit No. 2 EOPs is conservative in that the RCPs will always be tripped when required. This strategy may also result in tripping of the last 2 operating RCPs for other events (e.g. - steam generator tube rupture) where continued operation of the RCPs is desirable. In these events, leaving two RCPs running will improve operator control and assist in mitigating the event, however, continued RCP operation is not required in order to respond to these events. Thus, the single setpoint strategy is judged as conservative in that it assumes that all events which result in a decrease in RCS subcooling to $\leq 30^{\circ}\text{F}$ are LOCAs which require pump trip. If the event is then diagnosed as a non-LOCA event, the RCPs can be restarted (see response to question 2, below) to assist in recovery.

Question 2

The Licensee intends to trip the last two pumps based on loss of subcooling margin (30°F). However, loss of subcooling can occur for a LOCA (pump trip is required) or a steam generator tube rupture (two pumps are required to keep running). It appears that the Licensee would be required to restart the pumps if the event was diagnosed to be a steam generator tube rupture (SGTR). Neither CEN-268 nor G.L. 86-06 address the scenario of tripping the last two pumps to be followed shortly by a pump restart. If the pump trip/restart scenario is intended to address TMI Action Item II.K.3.5, the Licensee needs to describe the basis for acceptance.

Response

This question implies that continued RCP operation is required in order to mitigate a steam generator tube rupture. This is not the case. Continued RCP operation is not required in order to adequately mitigate any design basis event. On the other hand, tripping of the RCPs during a small break LOCA is required in order to meet the 10CFR50 Appendix K licensing criteria. Thus, criteria which will result in tripping of the RCPs more often (as will occur with the "single setpoint" approach) are conservative with respect to the design basis analyses. Since it is not required in order to adequately mitigate non-LOCA transients, continued RCP operation for non-LOCA events is best characterized as "desirable," as it provides "the operator maximum flexibility in plant control."⁽⁶⁾

Not all SGTR events will result in a loss of RCS subcooling. For a range of break sizes, the charging pumps will be adequate to maintain primary system inventory and pressure. For these breaks, RCS subcooling will not be lost and the last two pumps will not be tripped. Thus, pump restart

(5) CEN-152, Emergency Procedure Guidelines, Revision 3.

(6) CEN-152, p. 6-54.

would not be required. For tube ruptures which are larger than the make up capacity of the charging pumps, RCS subcooling will eventually be lost and the RCPs tripped because of the concerns discussed in the response to Question 1, above, related to RCP operation under saturated conditions. In this case, equipment integrity concerns would take precedence over the desire to keep the pumps running for better control. A natural circulation cooldown would be used until subcooling could be restored, at which time the pumps could be restarted.

The concept of RCP restart and restart criteria has been in the CEQG EPGs⁽⁷⁾ and the Millstone Unit No. 2 EOPs since their inception.

Question 3

CEQG Report CEN-268 evaluated the effectiveness of the RCP trip setpoints for an increased heat removal (IHR) event (Section 5.4 of CEN-268), namely the inadvertent increase in turbine power from zero load to full power. The results of the analysis indicated that the pressurizer pressure decreased to 1700 psig. Since the 1300 psia trip setpoint used in the generic analysis is below this value, no reactor coolant pumps were tripped for the analyzed case.

However, the 1700 psig value predicted by the CEQG analysis does approach the Millstone Unit No. 2 setpoint (1600 psia) when it is combined with the worst case RCS pressure error (153.6 psig). Describe the consequences on operation of the plant, if RCP trip indication is reached. Also, confirm that the CEQG evaluation of trip setpoints for the other sample transients (see Section 5 of CEN-268) is conservative compared to Millstone Unit No. 2.

Response

The worst case RCS pressure error of 153.6 psig quoted above is associated with a harsh containment environment that would result from a LOCA or steam line break inside containment. For the IHR event, the normal instrument uncertainty for pressurizer pressure would be less than 50 psig. Applying this uncertainty to the minimum pressurizer pressure for the IHR event given in CEN-268 of 1700 psig, the Millstone Unit No. 2 RCP trip setpoint of 1600 psig would not be reached. Thus, no RCP trip would be expected.

Even if a trip of the first two RCPs were to occur during this event, there would be no adverse consequences. Tripping of two RCPs would reduce the effects of the increase in secondary side heat removal on the primary system due to the lower RCS flow rate. This would result in a more mild plant response. The two RCPs left running would provide the operator with adequate forced coolant flow to respond to the event. With respect to the CEQG evaluation of trip setpoints for other sample transients in Section 5 of CEN-268, it is noted again that continued RCP operation is never required in order to adequately mitigate any design basis accident. Thus, premature tripping of any number of operating RCPs

(7) CEN-152, p. 1-54.

due to instrument uncertainties (or due to any other reason) will not result in consequences more severe than the design basis analysis nor result in violation of any regulatory acceptance criteria.

Question 4

In response to Question 4 (E. J. Mroczka letter to USNRC, B12395, dated January 9, 1987) it is not clear that the Licensee has described the "training and procedures which provide direction for use of individual steam generators with and without operating RCPs." This information was originally requested in Generic Letter 86-06 Section 4 Item 4. The Licensee should identify the appropriate procedures that involve use of single steam generators and confirm that the necessary classroom and simulator training is being implemented.

In addition, the Licensee identified training and revisions to emergency operating procedures that were scheduled for completion by June 1987. Verify that this commitment has been fulfilled.

Response

There are two Millstone Unit No. 2 EOPs which describe plant operation with a faulted steam generator. These are EOP-2534, "Steam Generator Tube Rupture," and EOP-2536, "Excess Steam Demand."

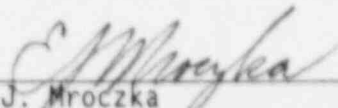
All of the Millstone Unit No. 2 EOPs were the subject of extensive training prior to implementation in January 1984, and are the subject of recurring Licensed Operator Requalification Training in accordance with the applicable regulations (10CFR55) and the Millstone Unit No. 2 Licensed Operator Requalification Training program description. This training includes both classroom and simulator training.

Specific training on the Trip 2/Leave 2 RCP strategy was completed in December 1987, prior to implementation of the EOP revisions incorporating Trip 2/Leave 2, as committed to by letter dated June 15, 1987.⁽⁸⁾ This training also included both classroom and simulator training.

NNECO believes this information is fully responsive to Staff concerns. Please contact us if you have any further questions.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY



E. J. Mroczka
Senior Vice President

(8) E. J. Mroczka letter to USNRC, "Response to Generic Letter 86-06," dated June 15, 1987.

U.S. Nuclear Regulatory Commission
A06990/Page 6
March 3, 1988

cc: W. T. Russell, Region I Administrator
D. H. Jaffe, NRC Project Manager, Millstone Unit No. 2
W. J. Raymond, Senior Resident Inspector, Millstone Unit Nos. 1, 2, and 3