Northeast Utilities System

107 Selden Street, Berlin, CT 06037

Northeast Utilities Service Company
P.O. Box 270
Hartford, CT 06141-0270
(203) 665-5000

July 3, 1996

Docket No. 50-336
B15782

Re: 10CFR50.90

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Millstone Nuclear Power Station, Unit No. 2
Proposed Revision to Technical Specification
Refueling Boron Concentration

In the letter of June 3, 1996,[1] Northeast Nuclear Energy Company (NNECO) proposed to amend Facility Operating License No. DPR-65 by incorporating a one-time change to Millstone Unit No. 2 Technical Specification 3.9.1, "Refueling Operations, Boron Concentration". The proposed change would remove the requirement that the boron concentration in all filled portions of the Reactor Coolant System be "uniform". This change would only be applicable during the MP2 Cycle 13 mid-cycle core off-load. This license amendment request was submitted pursuant to the requirements of 10CFR50.90.

NNECO's plan, upon which the submittal is based, was to reduce Reactor Coolant System (RCS) inventory to mid-loop and then refill and borate the active regions of the RCS to greater than 1820 ppm boron. Upon further consideration of the submittal, NNECO believes that an alternate approach - draining the RCS to a level above reduced inventory and then refilling and borating the active portion of the RCS to 1950 ppm boron may be more appropriate. This approach ensures that the core will remain at least 5% subcritical during refueling operations and eliminates the need to place the plant in a Reduced Inventory condition.

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1 T. C. Feigenbaum to U. S. Nuclear Regulatory Commission, "Millstone Nuclear Power Station, Unit No. 2, Proposed Revision to Technical Specification - Refueling Boron Concentration", dated June 3, 1996.

In support of this method of supporting the requirements of the previously proposed license amendment, NNECO is providing the following documentation:

- Attachment 1 provides a safety assessment for the proposed change based on the new methodology.

- Attachment 2 provides a determination of No Significant Hazards Consideration (SHC) for this methodology.

- Attachment 3 provides the marked-up version of the appropriate pages of the current Technical Specifications.

- Attachment 4 contains the retyped Technical Specification pages.

- Attachment 5 contains the QA Calculation which supports the proposed change.

As discussed in Attachment 2, the new methodology for the proposed license amendment has been determined not to involve a Significant Hazards Consideration (SHC) pursuant to 10CFR50.92, therefore, the Significant Hazards Consideration in Attachment 2 supercedes the previous Significant Hazards Consideration.

The Millstone Unit No. 2 Plant Operations Review Committee (PORC) has reviewed and concurred with the above determinations.

In accordance with 10CFR50.91 (b), a copy of this proposed amendment is being provided to the State of Connecticut State Liaison Officer.

If you have any questions, please contact Mr. Michael D. Ehredt at (860) 440-2142.

Very truly yours,
NORTHEAST NUCLEAR ENERGY COMPANY

FOR: T. C. Feigenbaum
Executive Vice President and
Chief Nuclear Officer

By: E. A. DeBarba
E. A. DeBarba
Vice President

Attachments (5)

cc: T. T. Martin, Region I Administrator
    D. G. McDonald, Jr., NRC Project Manager, Millstone Unit No. 2
    P. D. Swetland, Senior Resident Inspector, Millstone Unit No. 2
    K. T. McCarthy, Bureau of Air Management, Department of Environmental Protection

Subscribed and sworn to before me

this 3rd day of July, 1996

Kim Zeta Hannon

Date Commission Expires: March 31, 2001

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Attachment 1

Millstone Nuclear Power Station, Unit No. 2

Proposed Revision to Technical Specifications

Refueling Boron Concentration

Safety Assessment

Millstone Nuclear Power Station, Unit No. 2
Proposed Revision to Technical Specifications
Refueling Boron Concentration

Safety Assessment

Refueling Operations Technical Specification 3.9.1 requires that, with the reactor vessel head unbolted or removed, the boron concentration **of all filled portions** of the Reactor Coolant System (RCS) and the refueling canal shall be maintained **uniform and** sufficient to ensure that the more restrictive of the following conditions is met:

a. Either a K_{eff} of 0.95 or less, or

b. A boron concentration of greater than or equal to 1720 ppm.

The proposed technical specification change to the limiting condition for operation would strike the words "of all filled portions" and "uniform and" and add a footnote indicating that for the Cycle 13 mid-cycle core offload activities, it is acceptable for the boron concentrations of the water volumes in the steam generators and connecting piping to be as low as 1300 ppm. In addition, a surveillance will be added to determine that the boron concentration is greater than or equal to 1300 ppm in the steam generators prior to entry into Mode 6.

Millstone 2 was shutdown in late-February 1996 due to a problem concerning the operability of the high pressure safety injection valves. Plant management decided to perform the planned mid-cycle surveillance outage at that time. On March 14, 1996 a problem was identified with low pressure injection valve 2-SI-645, which would not close. Over the next several weeks, attempts to close this valve were unsuccessful and it was decided to offload the reactor core.

When the plant was shutdown in late-February, the Reactor Coolant System (RCS) boron concentration was increased to approximately 1320 ppm to maintain shutdown margin for Mode 5. The shutdown cooling system was aligned and the reactor coolant pumps were shut off. With the shutdown cooling system aligned to remove decay heat, the water in steam generators, reactor vessel upper head, and connecting portions of the reactor coolant piping are stagnant. The water in the other regions of the RCS and shutdown cooling loop are active and boron mixing will occur. The shutdown cooling loop and reactor vessel core regions can be easily borated to that required for Mode 6 operation. However, as identified in INPO Significant Operating Experience Report 94-2, RCS boration while on shutdown cooling with no reactor coolant pumps operating is ineffective in borating the stagnant regions of the RCS to that required for mode 6 operation.

The proposed one-time technical specification change would require that the active regions of the RCS and shutdown cooling loop are borated to greater than 1950 ppm. To minimize the stagnant volume of water in the RCS prior to entry into Mode 6, the RCS level will be drained to approximately 36 inches below the reactor vessel flange, the active regions of the RCS will be borated to greater than 1950 ppm, and the RCS will be refilled. Reducing the RCS level to 36 inches below the reactor vessel flange precludes entry into reduced RCS inventory operations. A calculation has been performed that demonstrates that a boron concentration of 1950 ppm will be sufficient to ensure that, in the unlikely event in which the remaining water of lower boron concentration in stagnant regions of the RCS mixes uniformly with the water in the active regions of the RCS, the resulting boron concentration would remain greater than the required refueling concentration. The assumption of uniform mixing is reasonable since the shutdown cooling system will be in operation.

The only event presented in FSAR Chapter 14 that is potentially impacted by this technical specification change is the boron dilution accident. For the boron dilution accident, it must be demonstrated that the operator has 30 minutes from the initiation of the event to take action to preclude core criticality. None of the other accidents analyzed in the FSAR are affected by the non-uniformity of the boron concentration in the RCS. While an analysis of the loss of shutdown cooling flow is not presented in Chapter 14 of the FSAR, the impact of the technical specification change on a loss of shutdown cooling flow has also been evaluated.

The boron requirements of Technical Specification 3.9.1 ensure that the initial conditions assumed in the boron dilution accident analysis are preserved. The limiting boron dilution analysis in Mode 6 assumes a dilution rate of 88 gpm (two charging pumps) and an initial boron concentration corresponding to a K_{eff} of 0.95. The results of the boron dilution analysis ensures that there is at least 30 minutes for the operator to respond to a boron dilution in Mode 6 to prevent criticality. This boron dilution analysis in Mode 6 does not credit mixing of the water in the stagnant regions of the RCS to increase the time to criticality, as this would be non-conservative. Because the regions of the RCS are stagnant and do not mix with the shutdown cooling loop and reactor vessel core region, the compensatory measure of increasing the boron concentration in the shutdown cooling loop and reactor vessel core region to greater than 1950 ppm will actually increase the time to core criticality beyond 30 minutes.

In the event of a loss of shutdown cooling flow, it is possible that some of the lesser borated water from the stagnant regions of the RCS could reach the core. With the loss of shutdown cooling flow, the RCS temperatures would increase, and eventually, the RCS would begin to boil. As the RCS inventory boils off, the level in the RCS would decrease, and the lesser borated water in the stagnant regions of the RCS could reach the reactor vessel core region. If we conservatively postulate that the less borated water in the stagnant regions of the RCS were to reach the reactor vessel core region unmixed, a minimum core boron concentration of 1300 ppm would still be sufficient to maintain the core greater than 5 percent subcritical (all control element assemblies inserted) without operator intervention.

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Attachment 2

Millstone Nuclear Power Station, Unit No. 2

Proposed Revision to Technical Specifications

Refueling Boron Concentration

No Significant Hazards Consideration (SHC)

Millstone Nuclear Power Station, Unit No. 2
Proposed Revision to Technical Specifications
Refueling Boron Concentration

<u>No Significant Hazards Consideration Determination</u>

In accordance with 10CFR50.92, NNECO has reviewed the proposed changes and has concluded that they do not involve a significant hazards consideration (SHC). The basis for this conclusion is that the three criteria of 10CFR50.92(c) are not comprised. The proposed changes do not involve an SHC because the changes would not:

2.1 Involve a significant increase in the probability or consequence of an accident previously evaluated.

Refueling Operations Technical Specification 3.9.1 requires that, with the reactor vessel head unbolted or removed, the boron concentration **of all filled portions** of the Reactor Coolant System and the refueling canal shall be maintained **uniform and** sufficient to ensure that the more restrictive of the following conditions is met:

a. Either a K_{eff} of 0.95 or less, or

b. A boron concentration of greater than or equal to 1720 ppm.

The proposed technical specification change would strike the words "of all filled portions" and "uniform and" and add a footnote indicating that for the Cycle 13 mid-cycle core offload activities, it is acceptable for the boron concentrations of the water volumes in the steam generators and connecting piping to be as low as 1300 ppm. In addition, a surveillance will be added to determine that the boron concentration in the steam generators is greater than or equal to 1300 ppm prior to entry into Mode 6.

The impact of the change on the boron dilution accident and the loss of shutdown cooling flow has been evaluated. Based upon this evaluation, the proposed change to Technical Specification 3.9.1 does not involve a significant increase in the probability or consequences of these accidents. The probability of a boron dilution accident or a loss of shutdown cooling event is not increased by allowing the RCS boron concentration in the stagnant regions of the RCS to be less than the previously required concentration since this is compensated by increasing the boron concentration requirement of the shutdown cooling loop in Mode 6. The consequences of a boron dilution accident would not be increased. In fact, the compensatory measure of increasing the RCS boron concentration in the shutdown cooling loops and reactor vessel core regions will result in a higher initial boron concentration for the boron dilution accident, which would actually increase the time to core criticality, ensuring that the operator has at least 30 minutes to intervene. The consequences of a loss of shutdown cooling flow are not increased, as the core would continue to remain greater than 5% subcritical (assuming all the control element assemblies remain inserted) without operator intervention even if the less borated water in the stagnant regions of the RCS reached the core region without mixing.

2.2 Create the possibility of a new or different kind of accident from any previously analyzed.

By maintaining 1950 ppm in the active region of the RCS, the required shutdown margin is assured, even in the unlikely event that the stagnant regions of the RCS mix with the active regions. Thus, the proposed technical specification change would not create the possibility of a new or different type of accident than previously evaluated. Further, the proposed change has no impact on the mitigation of a boron dilution accident or a loss of shutdown cooling event.

2.3 Involve a significant reduction in the margin of safety.

The proposed technical specification change will not result in a significant reduction in the margin of safety. The results of the boron dilution accident, and the loss of shutdown cooling event are not adversely impacted by the modification to the RCS boration technical specification. In the event of a boron dilution accident, the operator will continue to have at least 30 minutes to prevent core criticality. Without crediting operator intervention, the potential core boron reduction associated with loss of shutdown cooling event will not result in core criticality. As such, there is no reduction in the margin of safety.