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May 27, 1994

Docket No. 50-245
B14843

Re: 10CFR50.90

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

Millstone Nuclear Power Station, Unit No. 1
Proposed Revision to Technical Specifications
Postaccident Sampling of Emergency Service Water Effluents

Pursuant to 10CFR50.90, Northeast Nuclear Energy Company (NNECO) hereby proposes to amend Operating License No. DPR-21 by incorporating the changes identified herein into the Technical Specifications of Millstone Unit No. 1.

Background

The Millstone Unit No. 1 emergency service water (ESW) system provides cooling water from Long Island Sound to the low pressure coolant injection (LPCI) system heat exchangers. ESW is maintained at least 15 psi greater than LPCI to ensure that any leakage between the two systems would be into the LPCI system. However, maintaining this differential pressure in postaccident conditions may create unacceptable consequences.

The ESW and LPCI systems together constitute the containment cooling subsystem. The ESW system consists of four pumps, two LPCI heat exchangers, piping, and control and support equipment. The four pumps are paired into two sets of pumps. Each set of pumps provides 5,000 gpm (2,500 gpm/pump) of seawater to one heat exchanger. Either set of pumps and heat exchanger is capable of handling the heat load of the LPCI system. Also, each set of pumps is individually piped to the respective heat exchanger, resulting in two completely segregated ESW systems. In the event of a loss of normal AC power, power for either set of ESW pumps can be supplied from emergency power sources. The ESW flow is discharged into Long Island Sound at the discharge canal. The current Millstone Unit No. 1 design does not provide for any radiation monitors in the ESW discharge piping or at the outfall.

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The LPCI system provides high volume emergency makeup to the reactor vessel from the torus in the event of a loss of coolant accident (LOCA). Electric motor-driven pumps are used to transfer water from the torus to the reactor vessel or to the containment spray headers. The LPCI system is a two-loop system. Each loop contains two LPCI pumps, and a LPCI heat exchanger. To initiate torus cooling, one LPCI pump in each loop is lined-up to provide flow through the corresponding heat exchanger.

The heat exchangers are vertically mounted, single-pass, shell-and-tube heat exchangers, each rated for a heat transfer capacity of 40 million BTUs/hr. LPCI system coolant flows through the shell side and gives up heat to ESW counterflow on the tube side. During operation, ESW pressure is maintained at least 15 psi greater than LPCI system pressure. The ESW pressure in the heat exchanger is maintained by throttling the ESW heat exchanger outlet valve and controlling the ESW flow rate. This prevents an unmonitored release of potentially radioactive water via the ESW system, in the unlikely event that a heat exchanger tube leak should develop.

Following a LOCA a slow but gradual heatup of the torus water will occur. Under design basis conditions (a single failure of one LPCI train and high Long Island Sound water temperatures), approximately six hours after the initiation of a LOCA, torus water temperatures will increase to the point where the emergency operating procedures direct the operators to manually throttle LPCI system flow to maintain the available net positive suction head (NPSH) above minimum limits. This action, while satisfying the NPSH requirements, causes LPCI system pressure to increase in the heat exchangers since the LPCI flow can only be throttled downstream of the heat exchangers. Correspondingly, in order to maintain the positive 15 psi differential pressure, ESW flow is also throttled. Decreasing ESW flow consequently reduces the heat removal capability of the system, exacerbating heat removal and NPSH problems.

Recent analysis of the ESW system, in accordance with Generic Letter 89-13,[1] determined that in some accident scenarios, 15 psid cannot be maintained without throttling ESW flow to a point where insufficient cooling may exist. The details of this determination were provided to the Staff in Licensee Event Report

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(1) J. G. Partlow letter to All Holders of Operating Licenses or Construction Permits for Nuclear Power Plants, "Service Water System Problems Affecting Safety Related Equipment (Generic Letter 89-13)," dated July 18, 1989.

(LER) 94-013.[2] Insufficient cooling may result in exceeding the currently predicted peak torus water temperature.

NNECO believes that during accident scenarios where throttling may be required, relaxation of the provision to continuously maintain positive differential pressure is the appropriate safety based response. To prevent a potential unmonitored release, NNECO will require monitoring and sampling of the ESW discharge flow, if the positive differential pressure cannot be maintained, during postaccident conditions.

Description of the Proposed Changes

It is proposed that a new section be added to Technical Specification 6.17 on page 6-24. This section would require that procedures be in place to provide for monitoring and sampling of ESW discharge flow during accident conditions when a positive differential pressure cannot be maintained between ESW and LPCI in the LPCI heat exchangers.

Attachment 1 provides a markup of the proposed changes, whereas Attachment 2 provides a proposed retyped page of the Millstone Unit No. 1 Technical Specifications.

Safety Assessment

This proposed change to the Technical Specifications requires that radiological monitoring and sampling of the ESW discharge be performed whenever a positive pressure cannot be maintained between ESW and LPCI. This is a new requirement that is being added to the Technical Specifications. Monitoring and sampling would facilitate early detection and measurement of radioactive releases of any significance from an operating ESW system. Monitoring and sampling will be initiated whenever the positive differential is less than 15 psid. This would only occur during postaccident conditions when LPCI flow has been throttled.

Presently, there is a design provision that 15 psid be maintained across the LPCI heat exchangers. By removing this provision, ESW would be run at rated flow, which maximizes containment cooling. The proposed Technical Specification requires that a monitoring and sampling program be initiated before a release would occur. This will eliminate the conflict between maintaining torus water

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(2) D. B. Miller letter to U.S. Nuclear Regulatory Commission, "Licensee Event Report 94-013-00, LPCI Heat Exchanger 15 psid Differential Pressure May Not Be Achievable," dated April 28, 1994.

cooling and maintaining positive differential pressure to prevent an unmonitored release.

To initiate torus cooling, LPCI and ESW flows are established at 5000 gpm each. Due to the design of the ESW and LPCI systems, a differential pressure of at least 15 psi is automatically created. The loss of positive differential pressure would only occur during postaccident conditions when the LPCI flow is significantly throttled. Under limiting conditions, LPCI throttling is predicted to be initiated approximately six hours into a postulated accident. Initially, the heat removal capacity of the heat exchangers lags the decay heat being added to the torus and the torus continues to heat up. This requires increasingly more throttling of the LPCI pumps to maintain the NPSH limits. During the course of the postulated accident it may become necessary to either throttle the ESW flow to maintain the 15 psid, or to let the differential pressure decrease and maintain the 5000 gpm flow rate. A reduction in ESW flow results in the full heat removal capacity of the heat exchangers not being utilized. This reduction in cooling could eventually result in exceeding the currently predicted peak torus water temperatures, which may be unacceptable.

For design basis conditions, the peak torus water temperature occurs approximately 20 hours after the initiation of the event. At that point, the torus water temperature begins to decrease as the heat removal capacity exceeds the decay heat. Decreasing torus water temperature allows the operator to increase the LPCI pump flow as the available NPSH increases. Eventually, LPCI flow would increase to a point where the positive differential pressure is automatically re-established. Although not calculated, it is believed that the LPCI flow would be throttled for no more than several days (less than one week) out of the entire period of LPCI operation, which would most likely exceed 30 days.

The extended period of time prior to loss of the positive differential provides sufficient time to initiate survey metering and sampling. Use of a monitoring and sampling procedure is consistent with NRC Standard Review Plan 9.2.2 which states that either monitoring for a radioactive release or maintaining a positive differential pressure to prevent any out-leakage is acceptable.

NNECO has confidence that LPCI heat exchanger tube integrity will exist for the duration of the period when positive differential pressure may not be maintained. At Millstone Unit No. 1, the LPCI system is used exclusively for torus cooling. During normal operation this is generally limited to several hours per week during the warmer months of the year. The primary function of

LPCI is for accident mitigation. As such, the LPCI heat exchangers experience very little usage. This is significantly different than many other boiling water reactors which use the same heat exchangers for both shutdown cooling (i.e., residual heat removal) and LPCI functions.

The integrity of the heat exchangers is monitored through eddy current testing and LPCI side pressurization. Both LPCI heat exchangers were eddy current tested during the cycle 14 refueling outage, and both will be tested during each subsequent refueling outage. The results of the last tests show no measurable tube wall loss in one heat exchanger and minimal loss in the other. The integrity of the heat exchangers has been demonstrated by historical performance. In the 23 years of operation there has not been any leakage necessitating tube plugging.

A more frequent method for monitoring LPCI heat exchanger integrity is torus water chemistry sampling. During normal operation the LPCI and ESW systems are filled and pressurized, with the ESW system pressure at least 15 psi higher. As such, any degradation in heat exchanger tube integrity would result in ESW fluid entering the LPCI system. Consequently, during the LPCI system quarterly surveillance, the ESW fluid would end up in the torus. The torus water is sampled biweekly, and a high chloride level would be an indication that ESW water may have entered the LPCI system.

Therefore, it is reasonable to assume that the heat exchanger integrity will exist at the time of a postulated accident. Also, design pressure of either the tube or shell side of the heat exchanger will not be exceeded with a loss of differential pressure. Given this, it is very unlikely that the heat exchanger would develop leakage during the several day period following a postulated accident when the positive pressure differential may not exist.

In the unlikely event that a release through ESW were to occur, the potential public dose consequences would not be significant. Some noble gases dissolved in the water would come out of solution at the outfall. For normal coolant activity, the potential dose from noble gases released via this pathway would be undetectable. For core damage accidents, the dose may be in the 1-100 mrem range. This dose is a small fraction of the 10CFR100 limits. Because of the cool temperature of the ESW, no significant quantities of other nuclides are expected to become airborne.

The immediate liquid effluent dose pathways such as swimming, boating, and shoreline recreation would not result in significant doses because the Long Island Sound dilution and water shielding would minimize any direct dose. There is no drinking water pathway at Millstone Station. The other exposure pathway is fish and shellfish ingestion, as these organisms concentrate the radionuclides. This, however, is a longer term dose pathway which could be controlled via sampling and fishing controls established as part of the emergency response plan.

Monitoring of the ESW discharge will allow the appropriate actions to be taken as the situation requires. Actions could include the isolation of one heat exchanger, the throttling of ESW to restore the positive differential pressure with LPCI, or continued operation with the leakage monitored.

Elimination of the provision to maintain a 15 psid between LPCI and ESW is necessary to ensure that postaccident torus cooling is not compromised. The proposed Technical Specification change provides a new requirement to initiate monitoring and sampling prior to loss of the positive pressure differential in the LPCI heat exchanger. Therefore, this change is considered safe.

<u>Significant Hazards Consideration</u>

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

1. Involve a significant increase in the probability or consequences of an accident previously analyzed.

   The proposed change does not affect the probability of any previously evaluated accidents because the proposed change only affects postaccident operation. The consequences of an accident are possibly affected by the change since LPCI/torus fluid could enter the ESW system, and ultimately Long Island Sound, if a positive differential pressure is not maintained in the LPCI heat exchangers. There is not a significant increase in the probability of adverse consequences however, since a passive failure of the LPCI heat exchangers tubes would be required.

   Additionally, at Millstone Unit No. 1, the heat exchangers are only used for occasional torus cooling during the warmer months of the year. As such, they experience very little use. In addition, eddy current testing and shell side pressurization demonstrate tube integrity each refueling outage. During operation, quarterly surveillance testing of the LPCI system will identify if any leakage occurs.

Monitoring of the ESW discharge will allow timely detection of any radiological leakage. If a release is detected, the appropriate actions will be taken as the situation requires. Actions could include the isolation of one heat exchanger, the throttling of ESW to restore the positive differential pressure with LPCI, or continued operation with the leakage monitored.

Therefore, the proposed change does not involve a significant increase in the probability or consequence of a previously analyzed accident.

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

   This change only affects the use of the ESW system under postaccident conditions. The LPCI system will continue to function as credited in the accident analyses. No other systems or components are affected by this proposed Technical Specification change. Therefore, this change cannot create a new or different kind of accident.

3. Involve a significant reduction in the margin of safety.

   This proposed Technical Specification does not affect normal LPCI operation for torus cooling. This Specification establishes controls which ensure that an unmonitored release does not occur, even if the positive differential pressure does not exist in the LPCI heat exchanger due to the throttling of LPCI.

   Removal of the differential pressure by itself does not promote failure of the LPCI heat exchanger. For a release to occur, the heat exchanger has to fail by an independent method. Both heat exchangers will be eddy current tested each refueling outage to ensure integrity. Also, routine surveillance of the torus water would detect any leakage in the heat exchangers during the operating cycle. These measures provide confidence that the integrity of the heat exchangers will exist at the time of the postulated accident.

   The period of time when ESW pressure may be lower than LPCI pressure is limited to several days. Considering the integrity of the heat exchangers, it is very unlikely that they would develop a leak during this period.

   Although unlikely, if a leak were to develop, it will be detected by the monitoring and sampling. Survey monitoring would be initiated prior to loss of positive differential pressure. Sampling ensures that any release lower than the sensitivity of the survey meter would also be detected and quanitified. The quantity of the release can be estimated by assuming that any measured release existed continuously from the time that the positive differential pressure was lost.

Although not relied upon for maintaining system integrity, the positive differential pressure does provide an additional layer of defense in depth. In some accident scenarios, it may be replaced by a monitoring and sampling program. If a release is detected, appropriate action will be taken as the situation requires. Considering the small likelihood of a release, the small consequences of such a release, and the compensatory measures available, the proposed change does not involve a significant reduction in the margin of safety.

The Commission has provided guidance concerning the application of the standards of 10CFR50.92 by providing certain examples (51 FR 7751, March 6, 1986) of amendments that are not considered likely to involve an SHC. The changes proposed herein are enveloped by example (ii), a change that constitutes an additional limitation, restriction, or control not presently included in the technical specifications. NNECO is adding a new requirement to ensure that necessary actions to control containment temperatures in some accident scenarios do not result in an unmonitored release to Long Island Sound.

Environmental Considerations

NNECO has reviewed the proposed licensed amendment against the criteria of 10CFR51.22 for environmental considerations. The proposed change does not significantly increase the types and amounts of effluents that may be released offsite, nor significantly increase individual or cumulative occupational radiation exposures. Based on the foregoing, NNECO concludes that the proposed change meets the criteria delineated in 10CFR51.22(c)(9) for a categorical exclusion from the requirements for an environmental impact statement.

The Millstone Unit No. 1 Nuclear Review Board and the Millstone Site Nuclear Review Board have reviewed the proposed changes and concur with the above determinations.

In accordance with 10CFR50.91(b), we are providing the State of Connecticut with a copy of this proposed license amendment request.

As discussed in LER 94-013, sufficient containment cooling would be available, even with the ESW flow throttled to maintain 15 psid, while Long Island Sound water temperature is below 60°F. This is a conservative analysis, and as such, a more detailed analysis is being performed which may increase the 60°F limit. The water temperature, on average, reaches 60°F by the end of June each year. Therefore, we request NRC Staff approval of this proposed change by June 30, 1994.

To support the accelerated review, NNECO is available to discuss this license amendment request at your convenience. If you have any questions, please contact Mr. Thomas B. Silko at (203) 665-5241.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

FOR: J. F. Opeka
Executive Vice President

BY: S. E. Scace (signature)
S. E. Scace
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cc: T. T. Martin, Region I Administrator
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Subscribed and sworn to before me

this 27th day of May, 1994

Ruth J. Dietrich

Date Commission Expires: 3/31/95

<u>Docket No. 50-245</u>
<u>B14843</u>

Attachment 1

Millstone Nuclear Power Station, Unit No. 1

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