NORTHEAST UTILITIES

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

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November 18, 1992

Docket No. 50-423
B14296

Re: 10CFR50.90
10CFR50.91

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

Gentlemen:

Millstone Nuclear Power Station, Unit No. 3
Temporary Heating Source - Operability of the Charging Pump
Proposed Changes to Technical Specifications
Request for Additional Information

By letter dated November 12, 1992[1], Northeast Nuclear Energy Company (NNECO) proposed to amend its operating license, NPF-49, by incorporating changes into the Technical Specifications of Millstone Unit No. 3. NNECO requested that the NRC Staff process this license amendment on an exigent basis pursuant to 10CFR50.91(a)(6).

On November 17, 1992, the NRC Staff verbally requested further information in the form of three questions. The purpose of this submittal is to respond to those questions, as follows:

Question 1: What operator actions are required under the proposed change, and under what conditions do they act, i.e., what indications trigger these actions?

Answer 1:

Temperature alarms for auxiliary building area temperature are located in the ventilation panel (VP1) located in the control room. The auxiliary building area low temperature alarms when temperature in the duct goes below 69°F. This corresponds to a temperature of 65°F in the charging pump area. The operating procedure for auxiliary building ventilation (OP3314A) includes

(1) J. F. Opeka letter to the U. S. Nuclear Regulatory Commission, "Millstone Nuclear Power Station, Unit No. 3, Temporary Heating Source--Operability of the Charging Pump Proposed Changes to Technical Specifications," dated November 12, 1992.

A001

specific operator actions for these alarm responses. The operator actions for receipt of the low temperature alarm are as follows:

a. Verify operation of all local heaters (installed per bypass jumper).

b. Verify damper alignments (specified in the procedure).

c. If the temperature in the operating charging pump cubicle cannot be restored to greater than 65°F within thirty minutes of alarm receipt, start a second charging pump.

d. If the temperature in the "A" charging pump cubicle decreases below 59°F, tag closed (specified) boration valves. (This isolates this boration path for the boric acid storage tank. The refueling water storage tank (RWST) is still available.)

e. If the low temperature alarm is not cleared after 8 hours, establish a temporary log to check air temperature of each operating charging pump and reactor plant component cooling water pump (CCP) areas every four hours.

Emergency Operating Procedure (EOP) 35 FR-S.1, step 4, initiates immediate boration of reactor coolant system (RCS). EOP 35 FR-S.1 has been revised to align the RWST as the boration path. Similarly, Abnormal Operating Procedure (AOP) 3566, "Immediate Boration," has been revised to align the RWST as the boration path.

Question 2: Provide assurance that the charging pumps will operate under these temperature conditions.

Answer 2:

Westinghouse Electric Corporation was contracted to evaluate operation of the Millstone Unit No. 3 centrifugal charging pumps at reduced ambient temperatures down to 30°F. The evaluation addressed critical areas of the pump, including the mechanical seals, couplings, shaft alignment, motor bearings, gear box bearings and oil, and pump bearings and oil. The evaluation provides assurance that the Millstone Unit No. 3 charging pumps will run acceptably at reduced cubicle ambient temperatures down to 30°F for a period of at least 30 days without special maintenance or operations changes. A summary of the Westinghouse evaluation is attached (Attachment 1).

Westinghouse calculation P-EC-276, "Evaluation of the Millstone 3 Centrifugal Charging Pumps for Operation at Cold Ambient Temperatures," provided the basis for charging pump operability at low temperature. (This calculation is available for the NRC audit.) One aspect of this document requires clarification as follows. In Section 2 of this calculation (page 6, third paragraph), the following statement is made in relation to boron crystallization.

"...the charging pumps are first started in an ambient temperature of at least 55 deg. F. The pumps take a suction from the RWST which supplies non borated water at a minimum of 40 deg. F. Since the RWST water is not borated, boron crystallization is not a concern."

This statement in calculation P-EC-276 is in error since the RWST has a concentration between 2700 and 2900 ppm of boric acid (per Technical Specification 3.5.4). However, from an analysis point of view, the conclusions of the calculation are not affected, since for this evaluation it makes no difference whether the charging pump is being supplied with pure water or water borated at 2900 ppm. There is sufficient margin between 3 weight % of boric acid (solubility limit at 40 deg. F) and 1.66 weight % boric acid (maximum concentration from the RWST) to consider water at any concentration of boric acid between 0 ppm and 2900 ppm to be equivalent to pure water, relative to the potential for boron crystallization.

Question 3: Will the charging pump be able to deliver credited boron for all design basis and regulatory required accidents at these temperatures?

Answer 3:

Under the proposed configuration, the charging system will provide a borated injection source that is explicitly addressed in the Millstone Unit No. 3 Technical Specifications. For boration, Technical Specification 3.1.2.2 requires at least two of three boron injection flow paths to be operable. These include the flow path from the boric acid storage system and the two flow paths from the RWST. In the event that the temperature in the auxiliary building drops below 67°F, the two flow paths from the RWST will be credited and, thus, the design basis requirements for boration will be met. In other words, subsection b of Technical Specification 3.1.2.2 is the option that will be utilized under the terms of this proposed change, and nothing is being proposed that would take us outside the envelope of what was previously evaluated as acceptable to the

NRC in this respect, as reflected in Technical Specification 3.1.2.2.

With the proposed modifications, two independent trains of heating will be added to provide assurance that adequate room temperatures will be maintained. The heating units will be powered from the emergency diesel generators in the event of a loss of offsite power. Even with a loss of offsite power and a single failure, the auxiliary building temperature will remain at or above 32°F at the minimum design outside ambient temperature of 0°F.

Our review of the past climatological data indicates that extreme low temperatures, (0°F or below), occur very infrequently at the Millstone site (i.e., during 1974–1981 the extreme minimum recorded temperature was -4.9°F). Analyses completed as part of this effort demonstrate that the charging pump area will be ≥ 32°F for an outside temperature down to -10.7°F. If the outside temperature falls below -10.7°F, NNECO will take appropriate action in accordance with the Millstone Unit No. 3 operating license requirements and the Technical Specification requirements.

Since the charging pump(s) will be started within thirty minutes of the temperature dropping below 65°F, the charging pump(s) would continue to remain operable even if the temperature in the auxiliary building dropped to 32°F. Thus, the charging system would be available for all design basis accidents and safe shutdown scenarios, with the following clarification.

The one potential exception is a seismic event (SSE). As indicated in the November 12, 1992, application, the added heating units are not seismically qualified. Thus, in the event of a seismic event coincident with a loss of offsite power, it can be conservatively postulated that no heating would be provided to the auxiliary building. In this event, backup injection capability is provided by the high pressure safety injection system, after an RCS depressurization has been performed. The heaters are installed so as to preclude seismic interaction between safety-related and nonsafety-related equipment.

Further, since the heaters are nonseismic, the current design basis would not allow credit for nonseismic equipment to mitigate design basis accidents. This is the reason that an application for a license amendment pursuant to 10CFR50.90 was made, as our 10CFR50.59 determination concluded that this feature represents an unreviewed safety question (but

acceptable from a safety standpoint). Thus, a Technical Specification change was requested that would temporarily modify the definition of what constitutes an operable charging pump crediting a nonseismic support system.

We trust that you find the above information responsive to your questions. We, of course, remain available to promptly respond to any further questions you may have to support issuance of the requested relief prior to ambient temperature dropping to 17°F or below. Our best estimate as to when ambient temperatures would drop to 17°F or below is December 1, although the actual date could be earlier or later.

Very truly yours,

NORTHEAST NUCLEAR ENERGY COMPANY

FOR: J. F. Opeka
Executive Vice President

BY: W D R
W. D. Romberg
Vice President

cc: T. T. Martin, Region I Administrator
V. L. Rooney, NRC Project Manager, Millstone Unit No. 3
P. D. Swetland, Senior Resident Inspector, Millstone Unit Nos. 1, 2, and 3

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Attachment 1

Millstone Nuclear Power Station, Unit No. 3

Letter NEU-92-566
Charging Pump Temperature Evaluation

November 18, 1992

Westinghouse Electric Corporation
Power Systems

Wes inghouse Site Office
Millstone 3 Station
Box 128
Waterford Connecticut 06385

October 4, 1992

NEU-92-566

Mr. Clifford J. Ashton
Senior Engineer
NUSCO System Engineering
P.O. Box 270
Hartford, Ct 06141

S.O. 205

Charging Pump Cubicle Temperature Evaluation

Dear Mr. Ashton,

As requested on Friday afternoon (10/2/92), Westinghouse has completed an evaluation of the Millstone Unit 3 centrifugal charging/safety injection pumps for an ambient temperature of 30 degrees for 30 days during safety injection and recirculation operation. The evaluation addressed the critical areas of the pump including the mechanical seals, couplings, shaft alignment, motor bearings, gear box bearings/oil and pump bearings/oil. The evaluation demonstrated that the charging pump assemblies will operate successfully during these conditions with no effect on the pump performance. No special maintenance activities are necessary to support this operation for up to 30 days.

A summary of the charging pump evaluation is attached. This summary identifies the design inputs, assumptions, methodology, and results that support the acceptability of charging pumps for the reduced ambient temperature. For your information a copy of the engineering calculation, report P-EC-276 Rev. 0, will be transmitted under a separate cover. This report includes the same information as this summary plus the detailed calculations that were performed.

Please contact us if we can be of any further assistance.

Sincerely Yours,

Joe Moore for
Cheryl L. LaRue
District Manager

Cc: P.M. Austin, NUSCO 1L,1A
D.C. Gerber, NUSCO 1L,1A
C.H. Clement, MP3 1L,1A
D.M. McDaniel, MP3 1L,1A

MILLSTONE UNIT 3

CENTRIFUGAL CHARGING PUMP

OPERATION WITH REDUCED AMBIENT TEMPERATURES

Background:

The Millstone Unit 3 plant ventilation system normally maintains the ambient temperature in the centrifugal charging pump cubicles at an average of 65 degrees F. The coldest temperature at the pump outboard end, nearest to the air inlet, is a minimum of 55 degrees F and the hottest temperature at the motor, nearest to the air outlet, is a maximum of 74 degrees F.

During certain postulated accident conditions in the winter months, the ventilation system exchanges some inside plant air with the outside air and the temperature in the charging pump cubicle will be reduced. At the onset of the accident, the charging pump would start up with the normal average cubicle temperature of 65 degrees F. The cubicle temperature would then decrease to an average temperature of 36 degrees F. The temperature at the pump outboard end would be a minimum of 30 degrees F and the temperature at the motor end would be a minimum of 36 degrees F. The charging pump would then be required to run continuously for a period of up to 30 days with constant cubicle ambient temperatures.

Operation of the centrifugal charging pumps with the reduced ambient temperatures could potentially have an effect on the ability of the pump to perform its required safety function for the full 30 days. The critical areas of the pump that could be affected are the mechanical seals, shaft couplings, shaft alignment, motor bearings, gear box bearings/oil and the pump bearings/oil. These areas of the pump must be evaluated to ensure the acceptability of 30 days operation with the reduced ambient temperature.

Design Input and Assumptions:

The evaluation of the charging pump assemblies is based on the following design input and assumptions which are based on information from Millstone 3 site personnel:

The charging pump cubicle temperature at the initiation of the accident event is an average 65 degrees F (minimum inlet 55 degrees F, maximum outlet 74 degrees F).

The pumps start up for safety injection with a minimum suction temperature of 40 degrees based on the minimum RWST temperature.

The pump cubicle temperature drops to an average of 36 degrees F (minimum inlet 26 degrees F, pump outboard end 30 degrees F, motor end 36 degrees F, maximum outlet 45 degrees F).

After the RWST is drained, the pump switches to containment sump recirculation.

The cooling water (CCE) temperature will be a minimum of 60 degrees F throughout the event.

The pumps will run continuously for a period of 30 days with no standby conditions. The accident conditions will not allow maintenance of the pumps.

The pump and gear use Mobil DTE 797 oil. The motors use Mobil DTE Medium oil. The shaft couplings use Falk Long Term grease.

Mechanical Seal Evaluation:

The charging pump mechanical seals are an internally flushed design with carbon and tungsten carbide mating faces. These materials are well suited for the temperatures required. However, the carbon seal face is subject to scoring and wear if subjected to abrasive boric acid crystals. The charging pumps will be operating with RWST supply temperature and sump recirculation temperatures that are within the original plant design basis. The reduced pump cubicle temperature will have no affect on the temperature inside the pump seal housing due to the internal flushing configuration. Thus, the pump mechanical seals will be operating within their original design conditions and boric acid crystallization is not a concern.

Coupling and Shaft Alignment Evaluation:

The pump, gear and motor shafts are coupled with Zurn Amerigear flexible couplings. The couplings are lubricated with Falk Long Term grease. This type of grease will maintain adequate lubricating properties for temperatures below zero degrees F. Thus, the reduced ambient temperature will not present a problem for the shaft couplings.

The pump, gear and motor shafts are typically aligned during maintenance at normal room temperature. This initial cold alignment is confirmed by a hot alignment with the bearings and lube oil raised to normal operating temperatures. The pump by design is then capable of operating acceptably for ambient temperatures as high as 105 degrees and pump process temperatures of 250 degrees. The thermal growth resulting from these temperature changes is compensated for by the flexible couplings, which are capable of running with a 1.5 degree misalignment. The temperature differential between the reduced ambient temperature and the initial maintenance temperature is no more severe than

the temperature change during hot ambient and process conditions. Thus, shaft alignment is not a problem with the reduced ambient temperature.

Motor Evaluation:

The charging pump motors are horizontal motors with oil lubricated journal bearings. The only area of the motor that presents a concern with the reduced ambient temperature is the ability of the oil to properly lubricate the bearings. The Millstone charging pump motors were designed to the requirements of NEMA MG-1, which specifies a normal ambient temperature range of 32 degrees F to 105 degrees F. The temperature of the cubicle air will have increased to at least 36 degrees F when it reaches the motor end of the cubicle, thus it is within the design basis of the motors.

The ability of these motors to operate under the low temperature of 32 degrees F is also confirmed by the original Westinghouse instruction manual, which states that this ambient temperature is acceptable provided that a nominal 200 SSU (at 100 degrees F) is used. The Mobil DTE Medium (227 SSU) oil used at Millstone is essentially the same oil. Thus, the motor will operate acceptably with the reduced ambient temperature.

Pump/Gear Oil and Bearing Evaluation:

The charging pump assembly has a common pressurized oil system that lubricates the pump bearings and the gear box bearings and gear teeth. The system has a design heat load of 75,500 Btu/hour and a total oil capacity of 50 gallons. Under original design basis operating conditions with minimum cooling water (CCE) temperature of 60 degrees F, the oil will have a peak temperature of 85 degrees and a minimum oil cooler outlet temperature of 71.3 degrees. This is generally considered to be the minimum acceptable operating temperature range. Operation at lower oil temperatures results in reduced oil viscosity, which could impair the ability of the oil pump to deliver oil to the bearings and the ability of the oil to provide adequate lubrication.

Calculations of the lube oil system have demonstrated that the maximum heat loss to the ambient during the reduced ambient conditions is 8,506 Btu/hour. Subtracting this heat load from the internally generated heat load results in a system heat load of 66,994 Btu/hour. This heat load and the minimum cooling water temperature of 60 degrees F result in a maximum oil temperature of 83 degrees F and a minimum oil cooler outlet temperature of 71 degrees F. The 0.3 degree differential between the design minimum oil temperature and the minimum during reduced ambient conditions is insignificant and the oil system will operate acceptably, essentially within its original design basis. This conclusion is reinforced by test results obtained by Westinghouse and Dresser Pacific Pumps in the 1970's. The testing demonstrated that the charging pumps will operate acceptably with oil temperatures well below the design basis temperature of 71.3

degrees F. Thus, the reduced oil viscosity will not affect the pump operation.

In addition to the concern with oil viscosity, there is also a concern with condensation in the lube oil system. Because of the temperature differential between the warm oil in the reservoir and the cubicle air at the pump outboard, there is a potential for condensation of moisture on the inside of the oil reservoir cover plate. This condensation would occur upon start up as the room temperature drops and the air temperature inside the reservoir rises. However, once the pump and cubicle reach steady-state conditions, there will be essentially no air exchange between the outside air and the inside of the reservoir. Thus, there will not be a continuous source of moisture entering the oil reservoir. Condensation would only be a problem under these type of conditions if the pumps were required to operate through a number of starts and stops, where the air exchange process could allow more significant amounts of moisture to enter the lube oil system.

The initial amount of moisture that may condense in the reservoir is negligible compared to the 50 gallons of oil in the system. The lack of air exchange will prevent the continuous condensation that could lead to long-term lubrication problems. Thus, condensation is not a critical issue with the reduced ambient conditions based on continuous pump operation for 30 days.

Final Conclusion:

The Millstone Unit 3 charging pumps will run acceptably for a period of 30 days with the reduced cubicle ambient temperatures as identified and the minimum design cooling water (CCE) temperature of 60 degrees F. The pump assemblies will experience no degradation mechanisms and the pumps will have full capability to perform the required safety injection and containment sump recirculation functions. No special maintenance or operations changes are necessary to support successful operation under the reduced ambient conditions.

Docket No. 50-423
B14296

Attachment 2

Millstone Nuclear Power Station, Unit No. 3

Letter NEU-92-594
Clarification of Calculation for Charging Pump
Evaluation

November 18 1992

Westinghouse
Electric Corporation

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Wethersfield, CT 06109
(203) 258-2660

November 17, 1992

NEU-92-594

Mr. Clifford J. Ashton
Senior Engineer
NUSCO System Engineering
P.O. Box 270
Hartford, Ct 06141

S.O. 205

Ref: NEU-92-566

Clarification of Calculation for Charging Pump Evaluation

Dear Mr. Ashton,

As requested by Mr. Don Gerber of NUSCO PSD this letter is being written to clarify a statement made in Westinghouse calculation P-EC-276 (CH/SI PUMP OPERATION WITH COLD AMBIENT CONDITIONS). In Section 2 of this calculation (Page 6, third paragraph), the following statement is made in relation to boron crystallization.

> ... the charging pumps are first started in an ambient temperature of at least 55 deg. F. The pumps take a suction from the RWST which supplies non borated water at a minimum of 40 deg. F. Since the RWST water is not borated, boron crystallization is not a concern.

This statement is not factual, since the Refueling Water Storage Tank (RWST) may have a concentration of up to 2900 ppm of boric acid. However, from an analysis point of view the conclusions of the calculation are not effected, since for this evaluation it makes no difference whether the charging pump is being supplied with pure water or water borated to 2900 ppm.

As can be seen from the boric acid solubility curve in Westinghouse System Standard Design Criterion 1.13, Rev 2 - page 5 of 13, at 40 deg. F the solubility of boric acid is about 3 Wt %. To obtain Wt % of boric acid from ppm of boron, the ppm number is divided by a conversion factor of 1748.4. For a 2900 ppm solution this results in 1.66 Wt % of boric acid.

Therefore, there is sufficient margin between 3 Wt % of boric acid (solubility limit at 40 deg.F) and 1.66 Wt % boric acid (maximum concentration from the RWST) to consider water at any concentration of boric acid between 0 ppm and 2900 ppm to be equivalent to pure water, relative to boron crystallization.

Please contact us if we can be of any further assistance.

Sincerely Yours,

Joe B. Moore for

Cheryl L. LaRue
District Manager

Cc: P.M. Austin, NUSCO 1L,1A
D.C. Gerber, NUSCO 1L,1A
C.H. Clement, MP3 1L,1A
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