May 26, 1995

Mr. John F. Opeka
Executive Vice President, Nuclear
Connecticut Yankee Atomic Power Company
Northeast Nuclear Energy Company
Post Office Box 270
Hartford, CT 06141-0270

SUBJECT: ISSUANCE OF AMENDMENT (TAC NO. M91462)

Dear Mr. Opeka:

The Commission has issued the enclosed Amendment No. 115 to Facility Operating License No. NPF-49 for the Millstone Nuclear Power Station, Unit No. 3, in response to your application dated January 23, 1995.

The amendment revises the Technical Specifications to modify the containment spray system by replacing the present sodium hydroxide spray additive with the trisodium phosphate dodecahydrate pH control agent.

A copy of the related Safety Evaluation is also enclosed. The notice of issuance will be included in the Commission's biweekly Federal Register notice.

Sincerely,

Original signed by:

Vernon L. Rooney, Senior Project Manager
Project Directorate I-3
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Docket No. 50-423

Enclosures: 1. Amendment No. 115 to NPF-49
2. Safety Evaluation

cc w/encls: See next page

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

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2. Safety Evaluation

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

NORTHEAST NUCLEAR ENERGY COMPANY, ET AL.

DOCKET NO. 50-423

MILLSTONE NUCLEAR POWER STATION, UNIT NO. 3

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 115
License No. NPF-49

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Northeast Nuclear Energy Company, et al. (the licensee), dated January 23, 1995, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

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2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. NPF-49 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 115 , and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of its issuance, to be implemented within 60 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Albert W. DeAgazio for

Phillip F. McKee, Director
Project Directorate I-3
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical Specifications

Date of Issuance: May 26, 1995

ATTACHMENT TO LICENSE AMENDMENT NO. 115

FACILITY OPERATING LICENSE NO. NPF-49

DOCKET NO. 50-423

Replace the following pages of the Appendix A Technical Specifications with the attached pages. The revised pages are identified by amendment number and contain vertical lines indicating the areas of change.

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xiv	xiv
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LIMITING CONDITION FOR OPERATION

3.5.5 The trisodium phosphate (TSP) dodecahydrate Storage Baskets shall be OPERABLE.

APPLICABILITY: MODES 1, 2, 3 and 4

ACTION:

With the TSP Storage Baskets inoperable, restore the system TSP Storage Baskets to OPERABLE status within 7 days or be in at least HOT STANDBY within the next 6 hours and in HOT SHUTDOWN the following 6 hours.

SURVEILLANCE REQUIREMENTS

4.5.5 The TSP Storage Baskets shall be demonstrated OPERABLE at least once each REFUELING INTERVAL by verifying that a minimum total of 974 cubic feet of TSP is contained in the TSP Storage Baskets.

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3/4.5.5 TRISODIUM PHOSPHATE STORAGE BASKETS

BASES

BACKGROUND

Trisodium phosphate (TSP) dodecahydrate is stored in porous wire mesh baskets on the floor or in the sump of the containment building to ensure that iodine, which may be dissolved in the recirculated reactor cooling water following a loss of coolant accident (LOCA), remains in solution. TSP also helps inhibit stress corrosion cracking (SCC) of austenitic stainless steel components in containment during the recirculation phase following an accident.

Fuel that is damaged during a LOCA will release iodine in several chemical forms to the reactor coolant and to the containment atmosphere. A portion of the iodine in the containment atmosphere is washed to the sump by containment sprays (i.e., Quench Spray and/or Containment Recirculation Spray). The emergency core cooling water is borated for reactivity control. This borated water causes the sump solution to be acidic. In a low pH (acidic) solution, dissolved iodine will be converted to a volatile form. The volatile iodine will evolve out of solution into the containment atmosphere, significantly increasing the levels of airborne iodine. The increased levels of airborne iodine in containment contribute to the radiological releases and increase the consequences from the accident due to containment atmosphere leakage.

After a LOCA, the components of the core cooling and containment spray systems will be exposed to high temperature borated water. Prolonged exposure to the core cooling water combined with stresses imposed on the components can cause SCC. The SCC is a function of stress, oxygen and chloride concentrations, pH, temperature, and alloy composition of the components. High temperatures and low pH, which would be present after a LOCA, tend to promote SCC. This can lead to the failure of necessary safety systems or components.

Adjusting the pH of the recirculation solution to levels above 7.0 prevents a significant fraction of the dissolved iodine from converting to a volatile form. The higher pH thus decreases the level of airborne iodine in containment and reduces the radiological consequences from containment atmosphere leakage following a LOCA. Maintaining the solution pH $\geq$ 7.0 also reduces the occurrence of SCC of austenitic stainless steel components in containment. Reducing SCC reduces the probability of failure of components.

Granular TSP dodecahydrate is employed as a passive form of pH control for post LOCA containment spray and core cooling water. Baskets of TSP are placed on the floor or in the sump of the containment building to dissolve

BACKGROUND (continued)

from released reactor coolant water and containment sprays after a LOCA. Recirculation of the water for core cooling and containment sprays then provides mixing to achieve a uniform solution pH. The dodecahydrate form of TSP is used because of the high humidity in the containment building during normal operation. Since the TSP is hydrated, it is less likely to absorb large amounts of water from the humid atmosphere and will undergo less physical and chemical change than the anhydrous form of TSP.

APPLICABLE SAFETY ANALYSES

The LOCA radiological consequences analysis takes credit for iodine retention in the sump solution based on the recirculation water pH being $\geq$ 7.0. The radionuclide releases from the containment atmosphere and the consequences of a LOCA would be increased if the pH of the recirculation water were not adjusted to 7.0 or above.

LIMITING CONDITION FOR OPERATION

The TSP is required to adjust the pH of the recirculation water to $\geq$ 7.0 after a LOCA. A pH $\geq$ 7.0 after a LOCA is necessary to prevent significant amounts of iodine released from fuel failures and dissolved in the recirculation water from converting to a volatile form and evolving into the containment atmosphere. Higher levels of airborne iodine in containment may increase the release of radionuclides and the consequences of the accident. A pH $\geq$ 7.0 is also necessary to prevent SCC of austenitic stainless steel components in containment. SCC increases the probability of failure of components.

The required amount of TSP is based upon the extreme cases of water volume and pH possible in the containment sump after a large break LOCA. The minimum required volume is the volume of TSP that will achieve a sump solution pH of $\geq$ 7.0 when taking into consideration the maximum possible sump water volume and the minimum possible pH. The amount of TSP needed in the containment building is based on the mass of TSP required to achieve the desired pH. However, a required volume is specified, rather than mass, since it is not feasible to weigh the entire amount of TSP in containment. The minimum required volume is based on the manufactured density of TSP dodecahydrate. Since TSP can have a tendency to agglomerate from high humidity in the containment building, the density may increase and the volume decrease during normal plant operation. Due to possible agglomeration and increase in density, estimating the minimum volume of TSP in containment is conservative with respect to achieving a minimum required pH.

APPLICABILITY

In MODES 1, 2, 3, and 4, a design basis accident (DBA) could lead to a fission product release to containment that leaks to the secondary containment boundary. The large break LOCA, on which this system's design is based, is a full-power event. Less severe LOCAs and leakage still require the system to be OPERABLE throughout these MODES. The probability and severity of a LOCA decrease as core power and reactor coolant system pressure decrease. With the reactor shut down, the probability of release of radioactivity resulting from such an accident is low.

In MODES 5 and 6, the probability and consequence of a DBA are low due to the pressure and temperature limitations in these MODES. Under these conditions, the SLCRS is not required to be OPERABLE.

ACTIONS

If it is discovered that the TSP in the containment building sump is not within limits, action must be taken to restore the TSP to within limits. During plant operation, the containment sump is not accessible and corrections may not be possible.

The 7-day Completion Time is based on the low probability of a DBA occurring during this period. The Completion Time is adequate to restore the volume of TSP to within the technical specification limits.

If the TSP cannot be restored within limits within the 7-day Completion Time, the plant must be brought to a MODE in which the LCO does not apply. The specified Completion Times for reaching MODES 3 and 4 are those used throughout the technical specifications; they were chosen to allow reaching the specified conditions from full power in an orderly manner and without challenging plant systems.

SURVEILLANCE REQUIREMENTS

Surveillance Requirement 4.5.5

Periodic determination of the volume of TSP in containment must be performed due to the possibility of leaking valves and components in the containment building that could cause dissolution of the TSP during normal operation. A Frequency of once each REFUELING INTERVAL is required to determine visually that a minimum of 974cubic feet is contained in the TSP Storage Baskets. This requirement ensures that there is an adequate volume of TSP to adjust the pH of the post LOCA sump solution to a value $\geq$ 7.0.

The periodic verification is required every refueling outage, since access to the TSP baskets is only feasible during outages. Operating experience has shown this Surveillance Frequency acceptable due to the margin in the volume of TSP placed in the containment building.

3/4.6.1.6 CONTAINMENT STRUCTURAL INTEGRITY

This limitation ensures that the structural integrity of the containment will be maintained comparable to the original design standards for the life of the facility. Structural integrity is required to ensure that the containment will withstand the maximum pressure of 60 psia in the event of a LOCA. A visual inspection in conjunction with the Type A leakage tests is sufficient to demonstrate this capability.

3/4.6.1.7 CONTAINMENT VENTILATION SYSTEM

The 42-inch containment purge supply and exhaust isolation valves are required to be locked closed during plant operation since these valves have not been demonstrated capable of closing during a LOCA or steam line break accident. Maintaining these valves closed during plant operations ensures that excessive quantities of radioactive materials will not be released via the Containment Purge System. To provide assurance that these containment valves cannot be inadvertently opened, the valves are locked closed in accordance with Standard Review Plan 6.2.4 which includes mechanical devices to seal or lock the valve closed, or prevents power from being supplied to the valve operator.

The Type C testing frequency required by 4.6.1.2d is acceptable, provided that the resilient seats of these valves are replaced every other refueling outage.

3/4.6.2 DEPRESSURIZATION AND COOLING SYSTEMS

3/4.6.2.1 and 3/4.6.2.2 CONTAINMENT QUENCH SPRAY SYSTEM and RECIRCULATION SPRAY SYSTEM

The OPERABILITY of the Containment Spray Systems ensures that containment depressurization and iodine removal will occur in the event of a LOCA. The pressure reduction, iodine removal capabilities and resultant containment leakage are consistent with the assumptions used in the safety analyses.

UNITED STATES
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WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 115

TO FACILITY OPERATING LICENSE NO. NPF-49

NORTHEAST NUCLEAR ENERGY COMPANY, ET AL.

MILLSTONE NUCLEAR POWER STATION, UNIT NO. 3

DOCKET NO. 50-423

1.0 INTRODUCTION

By letter dated January 23, 1995, the Northeast Nuclear Energy Company (the licensee), submitted a request for changes to the Millstone Nuclear Power Station, Unit No. 3 Technical Specifications (TS). The requested changes would revise the TS to modify the containment spray system by replacing the present sodium hydroxide spray additive with the trisodium phosphate (TSP) dodecahydrate pH control agent.

2.0 EVALUATION

2.1 Environmental Qualification (EQ)

The proposed change was also evaluated for effects on EQ of electric equipment. Temperature, pressure, radiation, and chemical spray are parameters of EQ. Changes in the containment spray system could affect post-accident radiation levels and pH of the spray fluid. The licensee states that temperature, pressure, and radiation levels are not affected, but that pH of the containment quench spray system will vary during the first part of the design-basis event.

The current system at Millstone 3 mixes the boric acid solution from the refueling water storage tank with sodium hydroxide solution from the chemical additive tank to produce a neutralized solution for the containment quench spray system. The licensee proposed to replace the chemical additive tank with TSP baskets for pH control. The installation of the TSP baskets would provide a passive means of attaining an ultimate sump pH of about 7.1 following a LOCA. As a result of this change, the initial pH of spray flow will be acidic (pH = 4.4). After initiating the recirculation spray system (RSS), the RSS flow will reach a maximum pH of about 11.0. About 18 minutes after the start of the loss-of-coolant accident (LOCA) the pH of the RSS flow will be less than the current design limit of 10.5. After about 3 hours, when the quench spray system flow stops, the final pH of the containment sump water will be greater than or equal to 7.1.

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The proposed change would result in a change in the EQ design basis pH range from 5.0 to 10.5 to a range from 4.4 to 11.0. The majority of time during a design basis event is spent at neutral conditions and the time at the outer range is minimal in comparison. This short time (minutes) of exposure to a pH of 4.4 from the Refueling Water Storage Tank and a pH of 11.0 from Recirculation Spray will not be detrimental to the EQ components inside containment. The staff reviewed the change in containment spray pH and agrees that EQ will not be affected.

2.2 pH Control in the Containment Sump

The proposed modification of pH control in the containment sump consists of replacing the existing sodium hydroxide pH control additive with TSP, another type of pH control agent. The 12 baskets in the containment sump will hold the TSP. When the sprays are activated, the injected water will accumulate in the containment sump and when the water reaches the baskets, TSP will start to dissolve. The licensee calculated that 974 cubic feet of TSP would ensure that after a LOCA, when all the water from the quench spray system and from the pipe break collects in the containment sump, its pH will be equal to or higher than 7.1. In the calculation it was assumed that the quench water contains 2900 ppm of boron in the form of boric acid. During the quench phase, as the water accumulates in the containment sump and its level rises, the TSP will gradually dissolve. During this transient period, the pH of the sump water will continuously change, assuming different values which will be determined by the amount of TSP dissolved and the volume of water in the sump. At some period, the sump pH will be significantly higher than its equilibrium value; however, this transient will last for only a very short time and will not cause any damage to the components wetted by the spray water. The staff reviewed the licensee's calculations and performed its own independent verification. The results of the evaluation showed, as proposed by the licensee, that control of the containment sump pH by TSP will prevent reevolution of iodine during operation of the containment sprays in the recirculation mode and will not cause the components in the containment to corrode.

2.3 Iodine Removal Coefficients

The licensee calculated iodine removal coefficients (λ) for TSP control of the spray water pH. These calculations were based on the methodology described in the Standard Review Plan. The calculated values are compared to the values previously specified by the licensee:

Iodine removal	λ per hour	
	Current	Previous
Elemental iodine removed by spray	20.0	28.1
Elemental iodine removed by plateout	3.1	0.176
Particulate iodine		
For DF<50	12.5	2.16
For DF>50	1.3	2.16

Although the currently calculated coefficient for elemental iodine removed by plateout and the coefficient for particulate iodine removal at decontamination factors (DFs) above 50 are higher than the previously calculated values, they are acceptable because the Standard Review Plan method used for their calculations has a significant safety margin.

2.4 Decontamination Factor for Elemental Iodine

The licensee specified the maximum value for elemental iodine decontamination factor of DF = 200. That value is significantly higher than the previously calculated value of DF = 12. The difference is due to a considerably higher iodine partition coefficient used in the calculations. The reported value of DF = 200 is a maximum value allowed by the Standard Review Plan. The actual value, calculated using the partition coefficient determined by the most up-to-date methods, is considerably higher.

2.5 Assessment of Radiological Consequences

In support of the proposed TS change, the licensee presented the results of a revised evaluation of a LOCA. This revised analysis accounted for changes to the spray removal coefficient for elemental and particulate forms of iodine and the overall decontamination factors for these two forms of iodine as a result of the replacement of NaOH as the spray additive and the utilization of Revision 2 of Standard Review Plan Section 6.5.2. The licensee presented the results of doses calculated at the Exclusion Area Boundary (EAB) and the Low Population Zone (LPZ) and for the control room operators in Unit 2 and Unit 3. In the calculation of the doses by the licensee, the calculations were based upon a containment leak rate of 0.65%/day. The licensee has proposed this leak rate in an amendment request to the staff dated December 14, 1994. The present TSs limit the leakage to 0.35%/day.

The NRC staff independently calculated the doses to the control room operators in Unit 3 and the doses at the EAB and LPZ. At the value (0.65%/day) proposed in the licensee's December 14, 1994, letter requesting a change in containment leak rate, the staff's calculations showed that the acceptance criteria of General Design Criteria (GDC) 19 would be exceeded but that the acceptance criteria of 10 CFR Part 100 would be met. However, the NRC staff concluded that the proposed changes would not result in doses exceeding the acceptance criteria of GDC when containment leakage rate was limited to the existing TS value. Therefore, our staff concluded that removal of the spray additive tank and its associated equipment and its replacement with TSP baskets in the containment sump meets acceptance criteria of Part 100 and the acceptance criteria of GDC 19. The issue of higher containment leak rates will be addressed in the safety evaluation covering the December 14, 1994, amendment request.

3.0 SUMMARY

The staff finds that changing the pH control of the containment spray from the sodium hydroxide additive to the TSP dodecahydrate will maintain the value of

pH needed for an effective removal of the iodine from the containment atmosphere and for a control of corrosion of the components in the containment. Also, the iodine removal coefficients and decontamination factor for elemental iodine, calculated by the licensee, will permit conservative estimates of the iodine removal rates. The staff concludes, therefore, that the modifications are acceptable because they meet General Design Criterion (GDC) 41 with respect to iodine removal function following a postulated LOCA, GDC 42 with respect to the capability for periodic inspection of the system, and Branch Technical Position MTEB 6-1 with respect to minimizing corrosion of the components in the containment.

The proposed change in the containment spray system affects chemical spray composition for EQ of electric equipment. The change in pH of the spray will not affect EQ of equipment. Therefore, the deletion of the chemical addition tank and replacement with the passive TSP baskets will not affect the qualification of electric equipment.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Connecticut State official was notified of the proposed issuance of the amendment. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes surveillance requirements. The NRC staff 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 the amendment involves no significant hazards consideration, and there has been no public comment on such finding (60 FR 11136). Accordingly, the 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 the amendment.

6.0 CONCLUSION

The Commission 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, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

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