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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 59

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 application for license amendment dated February 26, 1990, as supplemented April 30, December 6 and 19, 1990, Northeast Nuclear Energy Company, et al. (the licensee), requested changes to Millstone Unit 3 Technical Specifications (TS) regarding normal containment operating pressure. The current TS require that the containment pressure be maintained subatmospheric and be greater than 8.9 psia but less than or equal to 12 psia during operation Modes 1 through 4. The licensee proposed to change the containment operating pressure and associated TS to a new range between 10.6 psia and 14.0 psia.

2.0 DISCUSSION

Millstone Unit 3 is a dual-containment plant. The containment is comprised of a primary containment structure and a secondary containment enclosure building and an associated supplementary leak collection and release system (SLCRS). Containment entries are required for inspecting unidentified reactor coolant system leakage, investigating boron precipitation, and plant start-up surveillances or inspections. The risk of injury to plant personnel performing such physical labor in the subatomospheric containment has been found significant due to crossing the pressure boundary and also due to oxygen deficiency. Personnel are required to wear self-contained respirator (Rexnord "Bio-Packs") to supply supplemental oxygen but the environment of low pressure and high temperature in the containment causes significant potential for personnel injury during containment entries. The licensee stated that 38 personnel medical incidents had occurred due to containment entries during the past 4 years since the plant was licensed. In addition, the use of Bio-Packs cause personnel working in the containment to become less efficient.

In order to allow containment entry with a minimal pressure change and eliminate the need to carry heavy, awkward supplemental oxygen units (Bio-Packs), the licensee proposes to increase the containment operating pressure. In support of the TS change, the licensee performed safety analyses

to assess the impact on the accidents evaluated as the design basis, the potential for creation of a new unanalyzed event, and the impact on the margin of safety. The staff's evaluation of the licensee's submittals is described below.

3.0 EVALUATION

The current containment parameters and the licensee proposed changes are listed in Table 1. The licensee's revised safety analyses are based on the proposed parameters.

Table 1

Containment Parameter	Current	Proposed Change
Normal Operating Pressure	9.8 psia	14.0 psia
Design Pressure	45 psig	45 psig
Peak Pressure (Pa)	36.1 psig	38.57 psig
Containment Leak Rate (La)	2912.68 SCFH (0.9 wt% per day)	2206.33 SCFH (0.65 wt% per day)
Secondary Containment Bypass Leakage Fraction	0.01La (0.009 wt% per day)	0.042La (0.028 wt% per day)
Service Water Temperature	75°F	75°F

3.1 Containment Integrity Analysis

3.1.1 Containment Pressure and Temperature Responses

Two loss-of-coolant-accident (LOCA) cases for containment pressure/temperature responses were reanalyzed by the licensee using the same methods and computer models as described in Section 6.2.1 of the Final Safety Analysis Report (FSAR) except the initial containment pressure was increased to 14.2 psig. The licensee reanalyzed the hot leg double-ended rupture (DER) and the pump suction DER with failure of one engineering safety features (ESF) train. The limiting accident for peak containment pressure was found to be the hot leg DER at 38.57 psig which was below the containment design pressure of 45 psig. Since the staff has previously reviewed and approved the methodology and analytical model, the staff concludes that the licensee's LOCA analysis is acceptable.

The pump suction DER with failure of one ESF train was found to be the limiting accident for the long term containment pressure transient. The current analysis showed that the containment pressure depressurized to atmospheric pressure in 41.33 minutes after a LOCA and then the containment

pressure returned to subatmopheric. The licensee recalculated this pressure transient and the result showed that the containment pressure remains above atmospheric pressure for the duration of the accident. The staff's review found that containment pressure remaining above atmospheric would cause continued leakage from the containment. This will be further discussed in Section 3.3 of this evaluation.

3.1.2 Main Steam Line Break Analysis

The licensee recalculated the containment pressure response for a main steam line break (MSLB) for full DER at hot standby (zero power). The peak containment pressure based on a new containment operating pressure of 14.2 psia was calculated to be 34.5 psig which was below the peak containment pressure following a LOCA. The staff concludes that the MSLB reanalysis has a minor effect on the containment pressure responses.

3.1.3 Subcompartment Pressurization Analysis

The initial atmospheric conditions within the subcompartment which can maximize the differential pressure across the walls are the maximum allowable temperature, minimum absolute pressure, and zero percent relative humidity. Increasing initial pressure will increase air mass in the compartment and reduce pressure difference across the walls. Therefore, the staff concludes that the proposed change has no effect on current containment subcompartment analysis.

3.1.4 Combustible Gas Concentration

The increased containment operating pressure will result in lower hydrogen concentration in the containment because the rate of hydrogen generation is unchanged but the mass of air in the containment is increased. Therefore, the staff concludes that the proposed change has no effect on current evaluation of hydrogen control.

3.2 Safety Systems Evaluation

3.2.1 Quench Spray System/Containment Recirculation System

The Quench Spray System (QSS) and the Containment Recirculation System (CRS) had previously been reviewed and approved by the NRC staff for their containment pressure reduction and core cooling roles, respectively. The licensee now proposes to credit the QSS and CRS for removal of post-LOCA fission products inside containment.

The NRC staff has reviewed the QSS and CRS against the criteria of Standard Review Plan (SRP) 6.5.2, Revision 2, "Containment Spray as a Fission Product Cleanup System." In a letter dated December 6, 1990, the licensee addressed the criteria of SRP 6.5.2, Revision 2 regarding the QSS and CRS.

The staff concludes that the containment spray system as a fission product cleanup system is acceptable and meets the relevant requirements of General Design Criterion 41, "Containment Atmosphere Cleanup," General Design Criterion 42, "Inspection of Containment Atmosphere Cleanup Systems," and General Design Criterion 43, "Testing of Containment Atmosphere Cleanup Systems." This conclusion is based on the following.

The concept upon which the proposed system is based has been demonstrated to be effective for iodine absorption and retention under post-accident conditions. The proposed system design is an acceptable application of this concept. The system provides suitable redundancy in components and features such that its safety function can be accomplished assuming a single failure. The staff concludes that the system meets the requirements of General Design Criterion 41.

The proposed pre-operational tests, post-operational testing and surveillance, and proposed limiting conditions of operation for the spray system provide adequate assurance that the iodine scrubbing function of the containment spray system will meet or exceed the effectiveness assumed in the accident evaluation and, therefore, meets the requirements of General Design Criteria 42 and 43.

3.2.2 Containment Air Recirculation System

The containment air recirculation (CAR) system is not designed to operate post-LOCA and is automatically shut down by a containment depressurization actuation signal. Therefore, the proposed change has no effect on the consequences of a DBA due to the CAR system performance.

3.2.3 Containment Vacuum System

The containment vacuum system reduces the containment pressure from atmospheric to subatmospheric using a vacuum ejector. The proposed change will result in less frequent operation of the vacuum pump in order to maintain the new subatmospheric pressure. The system is not safety related. Therefore, the staff concludes that the proposed change has no effect on the consequences of a DBA due to the containment vacuum system performance.

3.2.4 Containment Pressure Monitors

At the present time, there are two narrow range containment pressure transmitters (3LMS&PT43A and B) that provide indication in the control room for a containment pressure range of 8.5 to 13.5 psia during normal operation. These transmitters and associated instrumentation/displays will be modified prior to implementing the proposed changes to the TS to achieve a range of 8.5 to 14.5 psi as indicated in the licensee's letter dated December 19, 1990. We find this commitment to be acceptable.

3.3 Containment Leakage Evaluation

The current containment integrity analysis assumed that the containment pressure would drop to approximately 4 psig within 1 hour after a LOCA and then the containment would be maintained subatmospheric for 30 days. The current containment integrated leak rate was set at La, or 0.9% by weight of the containment air per day (0.9 wt%/day), for the first hour of a LOCA and zero leakage after the containment returned to subatmopheric. The proposed change in containment operating pressure will result in containment pressure remaining above atmospheric for the duration of the accident and, therefore, continued containment leakage is assumed.

To compensate for the increased time in leakage release, the licensee proposed to reduce the TS allowable leak rate from 0.9 wt%/day to 0.65 wt%/day for the first 24 hours and 0.325 wt%/day after 24 hours until 30 days. The licensee stated that the proposed limit of 0.65 wt%/day represents the maximum containment allowable leakage in compliance with 10 CFR Part 100 requirements. The licensee provided containment integrated leak rate test (CILRT) results for the second refueling outage. The as-left containment leakage rate was 0.2919 wt%/day or 641 SCFH. The current acceptable leakage for the CILRT is 0.75La(0.9), or 0.675 wt%/day, which corresponds to an allowable leakage rate of 1428 SCFH. The proposed containment leakage rate is 0.75La(0.65), or 0.488 wt%/day, which corresponds to an allowable leakage rate of 1076 SCFH. The staff finds that the proposed containment leakage rate is equivalent to 0.52La which is less than 0.75La required by Appendix J to 10 CFR Part 50. Furthermore, the CILRTs were performed at Pa of 39.4 psig which was higher than the proposed new test pressure of 38.6 psig. The CILRT result would be lower if the tests were performed with the new test pressure. Based on the licensee provided information, the staff concludes that the proposed containment leakage rate is conservative and acceptable.

The licensee proposed to increase the secondary containment bypass leakage rate from 0.01La to 0.042La or 0.009 wt%/day to 0.028 wt%/day. The licensee performed a containment radiological leakage analysis to provide the maximum value achievable for bypass leakage and found that the increased bypass leakage still meets the 10 CFR Part 100 dose limit. The staff concludes that the proposed bypass leakage rate is acceptable.

3.4 Electric Equipment Qualification for Service Conditions

The current electric equipment qualification (EEQ) was based on a normal containment pressure range of 9.5 to 14.7 psia. The proposed containment operation pressure 14.2 psia falls within this range, and therefore, will not impact current EEQ. The licensee stated that the proposed increase in containment pressure would result in some increase in the radiation consequences following a DBA, but would not impact the existing accident radiation qualification of EEQ equipment. The staff confirmed the results of the radiation qualification and found that the calculated maximum radiation

level was lower than the electric equipment tested values by more than 10%. This provided an acceptable margin for the radiation qualification of EEQ equipment. Therefore, the staff concludes that the current EEQ is acceptable.

4.0 POST LOCA DOSE ASSESSMENT

The original and current radiological consequence analyses were based on the sub-atmospheric design which terminates all primary containment leakage within 1 hour. Consequently, the proposed change in the containment pressure in itself, without modifying any other requirements, would result in an increase in calculated offsite radiological consequences in an event of a LOCA.

Therefore, in order to compensate for the potential increase in the post-LOCA offsite doses, the licensee claimed full credit for the iodine removal capabilities of the containment chemical spray in accordance with SRP Section 6.5.2, Revision 1. The licensee stated that such credit is not claimed for the original and current LOCA analysis since the radiological consequences were acceptable without the spray. The staff found in the Millstone Unit 3 Safety Evaluation Report (NUREG-1031) dated July 1984 that the radiological consequences were also acceptable without the containment spray credit for iodine removal.

In addition, the licensee also proposed to change the allowable containment leak rates as follows:

Allowable Leak Rates (volume percent per day)
TS Sections 3.1.6.2 and 3.1.5.4)

	0 to 1.0 (hours)	1 to 24 (hours)	24 to 720 (hours)
Primary Containment Leak Rate (La)			
Current	0.9	0	0
Proposed	0.65	0.325	0.325
Bypass Leakage			
Current	0.009	0.009	0.009
Proposed	0.042	0.042	0.042

Using the above proposed leak rates with a full credit allowed for iodine removal by the containment spray and the assumptions and parameters in Table 15.2 of Millstone Unit 3 SER, the staff computed the offsite doses for the

Millstone 3 Exclusion Area (EAB) and Low Population Zone (LPZ) boundaries. The computed offsite doses are listed in Table 2, are within the acceptance criteria given in Section 15.7.5 of the SRP and the exposure guidelines of 10 CFR Part 100 and are therefore acceptable.

TABLE 2
POST-LOCA OFFSITE DOSES
(rem)

	Original(1)	Revised(2)	Limit(3)
Exclusion Area Boundary			
Thyroid	158	265	300
Whole Body	21	24	25
Low Population Zone			
Thyroid	8	180	300
Whole Body	1.1	5.6	25

(1) Table 15.1 of Millstone 3 SER dated July 1984
(2) Staff recalculated values
(3) 10 CFR Part 100

5.0 PROPOSED CHANGES TO THE TS

The licensee has proposed the following changes to the TS:

1. The peak calculated containment pressure (P_a) would be changed to 53.27 psia (38.57 psig) in Sections 4.6.1.1.c, 3.6.1.2.a, 4.6.1.2.a, 4.6.1.2.d, 4.6.1.2.e, 3.6.1.3.b, 4.6.1.3.a.1 and a.2, 4.6.1.3.b.

2. The integrated leak rate at P_a, containment leak rate (L_a) would be changed from 0.9 weight percent per day to 0.65 weight percent per day in Section 3.6.1.2.a.

3. The combined bypass leakage rate would be changed from 0.01 L_a to 0.042 L_a in Sections 3.6.1.2 and 4.6.1.2.e.

4. The operating containment pressure of 14.0 psia would be specified in Section 3.6.1.4. In addition, the maximum and minimum limit for the containment pressure would be specified as total containment pressure instead of air partial pressure.

5. Figure 3.6.1 would be deleted as the containment pressure will be read directly from the main control board indicators.

6. TS Table 3.6-1 would be changed as follows:

   a. Penetrations Z-28 and Z-29 (aerated drains and gaseous vents) would be deleted.

   b. Penetrations Z-59, Z-60, and Z-124 (fuel pool purification and nitrogen supply to containment) would be added.

   c. Table 3.6.1 would be revised to include description for each penetration.

The proposed changes to the TS associated with the operating containment pressure and the associated peak calculated containment pressure (Pa), containment leak rate (La) and bypass leakage rates are supported by the analysis presented in Section 3, herein. The results of the analyses indicated that the potential post-LOCA off-site radiological consequences are within the limits of 10 CFR Part 100. Accordingly, the proposed changes to the TS are acceptable.

With regard to TS Table 3.6-1, "Enclosure Building Bypass Leakage Paths," the licensee has performed a review of the penetrations specified in this table whose combined leakage must be less than .01 La per TS 3.6.1.2. The licensee has determined that two penetrations, Nos. 28 and 29, do not represent potential leakage paths. Since potential leakage would occur within the Auxiliary Buildings, for these penetrations, the liquid would be maintained within the building while gaseous releases would be processed by the safety-grade ventilation systems. Accordingly, penetrations 28 and 29 should be deleted from TS Table 3.6-1. Conversely, the licensee has identified three penetrations, Nos. 59, 60 and 124, whose leakage could bypass the Enclosure Building and thus are appropriately added to TS Table 3.6-1. Finally, adding the proposed penetration descriptions to TS Table 3.6-1 does not effect either the associated Limiting Conditions for Operation or the Surveillance Requirements and is, thus, acceptable.

6.0 ENVIRONMENTAL CONSIDERATIONS

Pursuant to 10 CFR 51.21 and 51.35, an environmental assessment and finding of no significant impact was prepared and published in the Federal Register on December 20, 1990 (55 FR 52228). Accordingly, based upon the environmental assessment, we have determined that the issuance of the amendment will not have a significant effect on the quality of the human environment.

7.0 CONCLUSION

We have 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, and (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.

Dated: January 25, 1991

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