



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. _____

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 August 6, 1998, as supplemented September 3 and 21, 1998, the Northeast Nuclear Energy Company, et al. (the licensee), submitted a request for change to the Millstone Nuclear Power Station, Unit No. 3 Technical Specifications (TS). The latest Millstone Unit 3 steam generator tube inspection began on September 24, 1996, and was completed on October 1, 1996. The inspection results placed the steam generators in Category C-2. TS Surveillance Requirement 4.4.5.3.a establishes an allowable inspection interval of 24 calendar months for this category. Without an extension of the interval, Millstone Unit 3 must shut down prior to September 24, 1998, to perform the necessary inspections. The proposed amendment would allow a one-time extension to the surveillance interval until the next refueling outage or July 1, 1999, whichever date is earlier. The September 3 and 21, 1998, letters provided clarifying information that did not change the initial proposed no significant hazards consideration determination or expand the scope of the original Federal Register notice.

2.0 BACKGROUND

An inservice inspection of the Millstone Unit 3 steam generator tubes was completed in August 1993 during refueling outage 4 (RFO4). Approximately 72 percent of the tubes in steam generators A and C were inspected. Approximately 76% of the tubes in steam generators B and D were inspected in May 1995 during RFO5. The current operating cycle (Cycle 6) started in June of 1995. A brief outage (approximately 2 weeks) occurred in December 1995 and an extended mid-cycle maintenance outage occurred from April 1996 to June 1998. Steam generator C was completely (100 percent) inspected in September 1996 (completed in October 1996) during the mid-cycle maintenance outage. Millstone Unit 3 was restarted in June 1998 and the current schedule for the next refueling outage is May 1999.

On the basis of the surveillance test requirements of TS 3/4.4.5, the next Millstone Unit 3 steam generator tube inspection would be required to be performed not less than 12 nor more than 24 months after the previous inspection. This would require a steam generator tube inspection by September 24, 1998. Since the current Millstone Unit 3 fuel cycle is expected to end approximately May 1999, the current TS would require a mid-cycle outage solely to perform the steam generator tube inspection. The licensee proposed a one-time amendment to the

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Millstone Unit 3 TS to change the steam generator tube inspection schedule to require the next steam generator inspection during the next scheduled refueling outage or no later than July 1, 1999, whichever is earlier.

In its letter dated September 3, 1998, the licensee stated that two of four steam generators are recommended for inspection each outage, on a rotating basis. The schedule of inspections is based on the guidance and recommendations contained in Electric Power Research Institute (EPRI) "PWR [pressurized water reactor] Steam Generator Examination Guidelines" and Nuclear Energy Institute (NEI) 97-06, "Steam Generator Examination Guidelines."

The licensee stated that steam generators A and C are currently being recommended for inspection during RFO6 (approximately May 1999). Steam generators B and D would be recommended for inspection during RFO7 (approximately spring 2001). While this schedule results in almost 6 calendar years between inspections for steam generators A, B, and D, actual operational time for steam generators A, B, and D will be substantially less than 5 EFPY.

3.0 EVALUATION

3.1 Change to the Inspection Interval

The licensee addressed several technical areas in support of the proposed license amendment request. They are as follows: (1) past steam generator tube inspections; (2) steam generator layout in accordance with industry guidelines; and (3) leakage history, leakage monitoring, and leakage guidelines.

The licensee stated that six inservice inspections of the Millstone Unit 3 steam generator tubes have been performed to date. Wear adjacent to antivibration bars (AVB) in the u-bend region of the bundle, and foreign object-related wear are the only active damage mechanisms affecting the steam generator tubes. AVB wear is the result of tube/AVB impact caused by vibration of the u-bend portion of the tube bundle. Foreign object wear is the result of vibratory interaction between the tube and foreign object. The licensee stated that extending the calendar duration of Cycle 6 has no effect on the extent or severity of wear in the steam generators since the total operating time during Cycle 6 will not be extended by this proposed revision. In addition, the licensee performed an evaluation that provided the basis for the conclusion that, with a high level of confidence, no AVB flaws are expected to exceed structural tube integrity criteria prior to the next planned inspection. This evaluation took into consideration actual observed AVB wear rates that were applied over an operating period of two fuel cycles.

Additionally, the licensee considered the potential development of primary or secondary side corrosion as a result of the extended shutdown period. Secondary side intergranular attack (IGA), secondary side intergranular stress corrosion cracking (IGSCC), and primary side IGSCC and pitting were the principle damage mechanisms the licensee considered.

The licensee stated that the initiation and advancement of IGA and IGSCC are strongly dependent upon temperature and typically develop after many years at operating temperatures. At shutdown temperatures, no initiation or advancement of these mechanisms is expected to occur. There has been no indication of tube corrosion during the steam generator tube

inspections conducted to date, including the most recent inspection completed in October 1996 after approximately 6 months in layup. Pitting is generally considered to be a high temperature phenomenon, although laboratory data has shown that pitting can initiate at low temperatures in the presence of faulted water conditions.

Secondary chemistry layup guidelines have been established by the industry to minimize the potential for corrosion of steam generator tubes and support structures during nonoperational periods. The licensee stated that controlled wet layup chemistry was maintained in accordance with these guidelines throughout the prolonged mid-cycle maintenance outage. Although valve repair work did not allow the unit to consistently maintain nitrogen overpressure within the steam generators, the tube bundles were continuously covered with wet layup solution with the exception of a 3-month period in the fall of 1996. During the 3-month period, the water level in steam generator C was lowered, exposing the u-bend region of the tube bundle. It is known that nitrogen overpressure was maintained during a portion of this period, but it could not be confirmed that it was present during the entire period. In spite of this, the licensee stated that tube pitting is very unlikely to have developed either at the vapor/water interface or in free spans and crevices above the interface under these conditions. In the region adjacent to the vapor/water interface, the presence of controlled layup solution, with its high pH and hydrazine content, is expected to prevent the development of pitting. Similarly, any moisture present above the interface would be residual controlled layup solution, providing protection for these regions. Once dry, there is no potential for pitting in these areas. In summary, the licensee concluded that pitting is very unlikely to have developed in any region of the tube bundles during the extended shutdown period.

Should unforeseen circumstances cause steam generator tube leakage, the licensee stated that Procedure SP 3861 identifies methods of determining the primary-to-secondary leakrate. These methods include steam generator blowdown analysis, condenser air ejector analysis, and tritium analysis. Each method has its own minimum detectable leakrate that is determined by the lower limit of detectability associated with the target nuclide used for the analysis and the counting method. The results of the leakage rate determination are used to document satisfaction of TS 3.4.6.2.c. Under this TS, primary-to-secondary leakage in excess of 1 gallon per minute (gpm) combined, or 500 gallons per day (gpd) to any one steam generator requires a plant shutdown. Procedure SP 3861 also specifies a sampling frequency of 24 hours for leak rates exceeding 5 gpd and 8 hours for leakrates exceeding 30 gpd. In addition, the licensee stated that steam generator tube leakage resulting in a detectable loss of primary coolant would be addressed under Abnormal Operating Procedure (AOP) 3555, "Reactor Coolant Leak." As documented there, sampling frequencies and remedial action are based on leakage rates that are more conservative than those allowed under TS 3.4.6.2.c. For example, the licensee stated that a plant shutdown is required if primary-to-secondary leakage exceeds 150 gpd or if an increasing trend (i.e., greater than or equal to 75 gpd over three consecutive samples) is identified.

Historically, the licensee stated that the recorded leakage has been less than the minimum detectable levels (i.e., in the range of 0.1 gpd to 0.3 gpd). Further, the licensee stated that as of September 3, 1998, there was no detectable primary-to-secondary side leakage.

Typically, the amount of time between the completion of a tube inspection and plant startup is negligible. Therefore, the 24-month TS inspection interval mainly transpires during the period of full power operation. In the case of Millstone Unit 3, the time between RFO5 and RFO6 will be approximately 4 years. Assuming appropriate wet layup conditions are maintained, tube degradation is not expected to occur during the approximately 2-year, mid-cycle maintenance outage. On the basis of the results of the past examinations and the structural and leakage integrity assessment, the Millstone Unit 3 steam generators are expected to operate satisfactorily until the next scheduled inspection period (tentatively planned for steam generators A and C - RFO6, steam generators B and D - RFO7). Because of the wet layup program and the operating cycle leakage history, it does not appear that the steam generators degraded during the extended shutdown period. Lastly, if leakage were to occur, the leakage monitoring capability and leakage guidelines would enable operators to take necessary actions within an acceptable time frame. Therefore, the proposed change should not impact the Millstone Unit 3 steam generator's ability to safely and reliably operate.

3.2 Summary

On the basis of the preceding evaluation, the NRC staff concludes that the licensee's proposed one-time change to the steam generator tube inspection interval is acceptable. The associated proposed TS 4.4.5.3.a is changed to add a footnote that reads:

- * Except the surveillance related to Steam Generator Inspections, due no later than September 24, 1998, may be deferred until the next refueling outage or no later than July 1, 1999, whichever is earlier.

The staff has reviewed the TS change discussed above and finds that it is acceptable.

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 surveillance requirements. The NRC staff has 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 (63 FR 43964 dated August 17, 1998). 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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Date: September 23, 1998