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MN-85-135 GDW-85-200

Director of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Mr. Hugh L. Thompson, Jr.
Director, Division of Licensing

References: (a) License No. DPR-36 (Docket No. 50-309)
(b) USNRC Letter to MYAPCo dated April 17, 1985 - Staff Recommended Actions Stemming from NRC Integrated Program for the Resolution of Unresolved Safety Issues Regarding Steam Generator Tube Integrity (Generic Letter 85-02)

Subject: Response to Generic Letter 85-02

Gentlemen:

In Generic Letter 85-02 you requested that we respond to several recommendations and questions regarding steam generator tube integrity, Reference (b). Maine Yankee has always recognized that the steam generators are important components with respect to the overall reliability of the plant. We have also recognized that strict chemistry control is necessary to ensure reliability of the steam generators.

Ever since Maine Yankee began operation, we have aggressively taken measures to limit the ingress of chemical contaminants to the steam generator. We were the first plant to commit to all volatile treatment. At the time, this was not fashionable with NSSS vendors and the AEC staff. We have pursued measures that provided early detection of condenser tube leakage and immediate corrective measures when they occurred. In addition, we have removed copper bearing materials from the more critical components including the condenser, 1st point feedwater heaters and the moisture separator reheaters. Over the last few years, we have stringently controlled air leakage into the condenser. We have resisted unproven (and suspect) recommendations such as full flow demineralization. But we have followed recommendations we felt prudent such as cutting certain S.G. tube supports to preclude failure and the use of boric acid as a buffer.

Our own program for non-destructive examination monitoring of our steam generator tubes is broader than that required by technical specifications.

We believe that the attention we have paid to our steam generators over the years has been rewarded: Maine Yankee has never had a steam generator tube leak and has only a small percentage of tubes which have been plugged.

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In addition, the minimal amount of tube denting experienced prior to the use of boric acid has been arrested. In spite of our past successes, we are always looking for areas for improvement.

We have reviewed your recommendations for improved steam generator tube integrity contained in Generic Letter 85-02. Our detailed responses are attached. In general, we are in agreement with your recommendations and we have already implemented many of them.

We do not agree, however, that more stringent technical specifications are required. Such controls may imply a "best treatment" criteria which may not prove out in time. If such controls (as were then proposed) had been applied on the early '70's when coordinated phosphate treatment was considered best, the industry would not have had the advantage of Maine Yankee experience with AVT as an alternative when the experts of the day found they were wrong. Although rigorous secondary chemistry controls are prudent from the standpoint of protection of investment, they are not necessary for protection of public health and safety and, therefore, are not appropriate topics for technical specifications.

Please contact me if you should have any questions in this matter.

Very truly yours,

MAINE YANKEE ATOMIC POWER COMPANY

G. D. Whittier

G. D. Whittier, Manager
Nuclear Engineering & Licensing

GDW/bjp
Enclosure: (13 Pages)

cc: Mr. Edward J. Butcher, Jr.
Dr. Thomas E. Murley
Mr. Cornelius F. Holden

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ENCLOSURE 1

STAFF RECOMMENDED ACTIONS AND REVIEW GUIDELINES STEMMING FROM NRC INTEGRATED PROGRAM FOR THE RESOLUTION OF UNRESOLVED SAFETY ISSUES REGARDING STEAM GENERATOR TUBE INTEGRITY

NRC Recommendation-1.a: PREVENTION AND DETECTION OF LOOSE PARTS (INSPECTIONS)

Maine Yankee Response:

Maine Yankee concurs with the NRC recommendation that visual inspections of the steam generator tube lane and outer annulus be performed for the identification of loose parts and external damage to peripheral tubes. The recommendations of INPO's Significant Operating Experience Report (SOER) 82-12 and the NRC's generic Letter 82-32, which are consistent with much of NRC Generic Letter 85-02, have been followed by Maine Yankee in performing steam generator tubesheet inspections following maintenance activities in each of Maine Yankee's three steam generators. The steam generator's tubesheets were visually inspected by a mini-TV camera in the Spring of 1983 and again in the spring of 1984. The past tubesheet inspections preclude the need to duplicate this inspection during the 1985 refueling outage.

Maine Yankee has procured its own mini-TV system suitable for steam generator tube lane and outer annulus inspections. It is Maine Yankee's intention to conduct inspections after any major steam generator secondary side modification/repairs, after steam generator tube eddy current indications are found between the tubesheet and the first support structure in peripheral steam generator tubes, and after indication of loose parts in the steam generator on the loose parts monitor.

Maine Yankee has instituted activities similar to those mentioned in generic Letter 85-02 to observe and prevent the introduction of loose parts in the steam generators. Our engineering personnel routinely enter the secondary side of each of the three steam generators during each refueling outage to visually note the general conditions and look for foreign objects on the top U-bends of the steam generator tubes, visible portions of support plates, steam generator separator cans, can deck, and steam dryers. In the spring of 1984 a strainer was installed on the discharge of the heater drain receiver such that all feedwater during normal operation must either have passed through a physical strainer or be effectively strained by passing through the tube side of the numerous condensate heaters. Before major changes or repairs are made to the secondary side of the steam generators, barriers are placed in the annulus between the steam generator tube shroud and external shell to prevent objects from falling into the tubesheet outer annulus.

With regard to the effect of exposure to air, Maine Yankee endeavors to minimize the amount of time that the secondary side of the steam generators are drained and open. Whenever practicable, Maine Yankee keeps the secondary side of the steam generator filled with hydrazine-treated primary grade water. We have also recently added recirculation taps in each generator and will complete installation of a wet-layup recirculation system at the next refueling to further improve our care of the secondary side. As noted in the answer to recommendation 3.b, Maine Yankee does not use condensate polishers. The addition of chemical species such as sulfer from this source, which may hasten corrosion during exposure to air, is eliminated.

Maine Yankee has a loose parts monitoring system sufficient to monitor the presence of loose parts on both the primary and secondary side of the steam generator tubesheet.

NRC Recommendation 1.b: PREVENTION AND DETECTION OF LOOSE PARTS (QUALITY ASSURANCE)

Maine Yankee Response:

In response to INPO's SOER 82-12 and NRC Generic Letter 82-32, Maine Yankee reviewed the primary and secondary steam generator maintenance procedures and added tool accountability provisions as well as Quality Control closeout inspections. Safety class pump and valve maintenance procedures have also been revised to ensure that mandatory Quality Control cleanliness inspections are performed prior to closures of the components to check for foreign debris. Maine Yankee's Quality Assurance Procedure "Inspection Program Procedures" Number 0-00-7 has been expanded to address inspections for debris in field closeout verification activities. Additionally, implementation instructions for Engineering Design Changes provide for accountability for components and parts removed from the steam generator.

NRC Recommendation 2.a: INSERVICE INSPECTION PROGRAM (FULL LENGTH TUBE INSPECTION)

Maine Yankee Response:

The majority of the steam generator U-tube inspections performed at Maine Yankee in the past have been performed considering a U-tube inspection as an inspection from the point of entry on the hot leg side completely around the U-bend to the top support of the cold leg side in accordance with Technical Specification 4.10. The inspection through to the top support on the cold leg has proved sufficient for Maine Yankee to identify degraded tubes before leakage was encountered in the past. For example, we identified degraded tubes in October of 1982 which were plugged. Maine Yankee has never had a primary to secondary leak.

Rather than a tubesheet-to-tubesheet inspection of all of the sample tubes, Maine Yankee believes that a representative subset, approximately 10% of the sample, should be a full length inspection to reveal any degradation occuring on the cold leg that is not present on the hot leg side of the tubes. Should the present condition of Maine Yankee's steam generator tubes deteriorate such that leakage is experienced or degradation is observed on the cold leg, the percentage of the tubes receiving full length inspections could be increased.

NRC Recommendation 2.b: INSERVICE INSPECTION PROGRAM (INSPECTION INTERVAL)

Maine Yankee Response:

The Maine Yankee Technical Specifications limit the maximum allowable time between eddy current inspections of an individual steam generator in a manner consistent with standard Technical Specification 4.4.5.3. Additionally, it is our practice to inspect each steam generator at least once every third refueling. We believe this practice meets the intent of your suggested 72 month limitation and that a change to the Technical Specifications is not necessary.

NRC Recommendation 3.a: SECONDARY WATER CHEMISTRY PROGRAM

Maine Yankee Response:

Maine Yankee has always recognized the importance of secondary water chemistry toward maintaining steam generator tube integrity. Maine Yankee was the first nuclear plant in the nation to employ all volatile chemistry treatment from initial startup. It has conscientiously instituted and adhered to, a secondary boric acid treatment program to combat tube denting. Condenser air in-leakage has been lowered to one of the lowest rates in the industry.

Historically, the maintenance of proper chemistry specifications has been negatively impacted by sea water in-leakage. Maine Yankee has responded by retubing the condensers with improved alloy tubes. After tube failures continued with the present AL-6X alloy, we decided to replace the condensers (four water boxes), with titanium tubes and tubesheets during the Cycle 8/9 refueling outage beginning in August, 1985. As evidence of our desire to maintain steam generator integrity, Maine Yankee was one of the first plants in the country to develop on-site helium leak detection capability for the condensers. We also have developed specific action responses to condenser leaks, which includes power reductions and plant shutdown as directed by our Abnormal Operating Procedure 2-27. Maine Yankee procedures require that condenser tube leaks be vigorously pursued and isolated. Additionally, the procedures delineate steps to be taken to minimize chloride intrusion and buildup until the leak can be isolated. We have also extensively utilized eddy current examination of the condenser tubes to identify degraded tubes for plugging.

Materials in other components within the feedwater system have also been subjected to alloy replacement. To date, both high pressure feedwater heaters and all four moisture separator reheaters have been replaced with stainless steel components.

Plant secondary chemistry specifications and remedial actions are stated in procedure 3.7.4.2 (attached). These are not totally consistent with the EPRI SGOG PWR Secondary Water Chemistry Guidelines of October, 1982. Maine Yankee is not a participant in that owner's group, but understands these specifications to be guidelines, largely established on capabilities of state-of-the-art instrumentation, and are under review for probable revision. Maine Yankee's deviation from the guidelines can be explained by the following plant specific factors:

a. The guidelines do not recognize secondary boric acid treatment. This chemical addition affects pH, conductivity, ammonia and hydrazine parameters in attaining a balanced chemistry.

b. The physical behavior of Maine Yankee's condensers, both in the past and present, affect response options.

   - The guidelines impose an economic penalty through forced power reductions for failure to correct low concentrations of contaminants. Maine Yankee's condensers are extremely sensitive to a tubesheet flexing phenomenon, with gross in-leakage possible with only slight changes in temperature and pressure. Strict adherence to the guidelines can easily lead to worse chemistry conditions than the initiating event.

Maine Yankee Response (Continued)

- Contaminants return from hideout with any major power reductions. These act to mask the existing problem, and may unduly elevate the action level of response.

- The AL-6X condenser tubes are prone to developing microscopically small leaks. Experience has proved that it may be necessary to "Live-with" such small leaks for a period of time until they enlarge, countering their effect in the interim with blowdown. Until the leak fully develops, it is often impossible to even ascertain which waterbox is affected.

c. Maine Yankee does not have condensate polishers. The plant, therefore, has less concern for contaminants normally associated with originating from such beds, nor can it take advantage of the remedial actions they offer.

d. Maine Yankee has only limited on-line instrumentation and at present lacks some state-of-the-art laboratory instrumentation. Compliance with the guidelines would require backfitting and replacement instrumentation.

Maine Yankee is continuing its efforts to improve secondary water chemistry. During the Cycle 9 refueling outage, a steam generator wet layup recirculation system is to be completed on each of the three steam generators. On-line sodium monitoring of steam generator blowdown has received design approval. Improved laboratory instrumentation is being evaluated, with a total organic carbon analyzer on-site and in the process of being placed into use. Once the new condenser is in place and revised owner's group guidelines are final, Maine Yankee's program will again be evaluated.

NRC Recommendation 3b: CONDENSER INSERVICE INSPECTION PROGRAM

Maine Yankee Response:

Maine Yankee has a safety class procedure, AOP 2-27 "High Chlorides in the Steam Generators or Condenser", which directs immediate actions to mitigate the effects of steam generator chloride concentrations in excess of 0.1 PPM. Procedure AOP 2-27 indicates appropriate steps to identify the source of the chloride intrusion.

We believe that the safety aspects of chloride intrusion are properly addressed in this procedure. We disagree with the suggestion that testing or repair procedures should also be of the same class as AOP-2-27.

Except for extremely small leaks, as indicated in the answer to question 3a, the Maine Yankee condensers are sufficiently instrumented to identify which of the four condenser waterboxes are experiencing the leakage. Procedure, 7-305-14 "Condenser Leak Detection Using the Varian Helium Leak Detection System", is utilized to identify the leaking tubes in the condenser containing the leaks. The leak detection methodology exposes the water side of individual condenser tubes to gaseous helium. As the condenser is still under vacuum, the helium is drawn through the leaking tube(s) and discharges through that particular condenser's air ejector. A mass spectrometer capable of detecting minute concentrations of helium is positioned at the air ejector outlet. When a leaking tube is exposed to the helium, an increased helium indication will be noted on the spectrometer readout.

Procedure, 17-100-1 "Detection of Condenser Air In-Leakage" is used to identify condenser air in-leakage. Both ultrasonic listening and helium leak test methods are addressed. When using the ultrasonic listening device the condenser vacuum boundaries are walked down while listening for high pitched sounds representative of air leaks. The helium leak test involves spraying helium around the condenser vacuum boundaries and detecting the presence of helium by the mass spectrometer positioned at the condenser's air ejector discharge.

Other activities are not under specific procedural control, nor do we believe they need to be. Standard industry practices for condenser tube plugging, valve packing adjustments and the like, are sufficient since AOP 2-27 controls resumption of operation after repairs have been made.

Leaking tubes have been plugged by using commercially available expansion plugs. Air in-leakage passages are generally plugged using routine mechanical repair methods.

The performance group of the Plant Engineering Department maintains a running count of plugged condenser tubes and reviews the results of any eddy current examination. Such record keeping ensures that trends in any tube degradation are observed. The trending initiates investigations into the repetitive causes of leaks.

Maine Yankee's condenser maintenance program is based on monitoring performance and initiating appropriate action. The most recent commitment to maintaining excellent condenser performance is the purchase of new titanium tubes and tubesheet modules for each of Maine Yankee's four condenser waterboxes. The modules will be installed in the 1985 refueling outage. We believe that our present monitoring methodology and commitment to maintain condenser integrity has proved satisfactory in the past and will continue to do so without the use of additional safety-related procedures.

NRC Recommendation 4: PRIMARY TO SECONDARY LEAKAGE LIMIT

Maine Yankee Response:

Maine Yankee's Technical Specifications are equivalent to Standard Technical Specifications with the exception of a 500 gallons per day per generator limit. We concur with the staff conclusion stated in the introduction the the draft NUREG-0844:

> "In view of the relatively low generic risk estimates associated with steam generator tube rupture events, none of the potential industry actions ... would be expected to provide a significant and demonstratable reduction in risk...."

Hence, more stringent leakage limits are not in keeping with the requirements of 10 CFR 50.109.

Saying that Technical Specification changes are not appropriate should not be construed to mean that Maine Yankee would be tolerant of primary to secondary leakage. Indeed, as noted in the cover letter, it is in our own best interest to vigorously pursue and correct degradation promptly.

NRC Recommendation 5: COOLANT IODINE ACTIVITY LIMIT

Maine Yankee Response:

The iodine activity limits in current Maine Yankee Technical Specifications are identical to those in the Standard Technical Specifications. The remainder of this recommendation is not applicable to Maine Yankee.

NRC Recommendation 6: SAFETY INJECTION SIGNAL RESET

Maine Yankee Response:

The current design of the Maine Yankee plant is such that the intake to both the High and Low Pressure Safety Injection pumps are from the Refueling Water Storage Tank (RWST), not the Boric Acid Storage Tank. Therefore, this recommendation is not applicable to Maine Yankee.

ENCLOSURE 2

REQUEST FOR INFORMATION CONCERNING CATEGORY C-2
STEAM GENERATOR TUBE INSPECTIONS

NRC Question 1:

What factors do, or would, the licensee or applicant consider in determining (a) whether additional tubes should be inspected beyond what is required by the Technical Specifications, (b) whether all steam generators should be included in the inspection program, and (c) when the steam generators should be reinspected.

NRC Question 2:

To what extent do these factors include consideration of the degradation mechanism itself and its potential for causing a tube to be vulnerable to rupture during severe transients or postulated accident before rupture or leakage of that tube occurs during normal operation.

Maine Yankee Response (combined):

Maine Yankee views the integrity of steam generator tubes to be of great importance. Because of this we have adopted a conservative approach to steam generator tube inspections.

In general, we believe that the graded response of three categories is reasonable and prudent. We feel that little benefit and significant expense would accrue if a C-2 conditions (as proposed) were to lead immediately to a 100% inspection of a particular generator.

When and whether we would extend tube inspections depends upon our understanding of the underlying cause of the apparent problem. Such an approach is consistent with good engineering and prudent management.