U.S. NUCLEAR REGULATORY COMMISSION
REGION 1

DOCKET/REPORT NO.	50-309/94-04
LICENSE NO.	DPR-36
LICENSEE:	Yankee Atomic Electric Company 83 Edison Drive Augusta, Maine 04366
FACILITY NAME:	Maine Yankee
INSPECTION AT:	Wiscasset, Maine
INSPECTION DATES:	February 14-18, 1994

INSPECTOR: /s/ Carrasco — 02-28-94
Joseph E. Carrasco, Reactor Engineer — Date
Materials Section, EB, DRS

APPROVED BY: /s/ Michael C. Modes — 3/2/94
Michael C. Modes, Chief — Date
Materials Section, EB, DRS

Areas Inspected: A routine announced inspection was conducted at Maine Yankee Nuclear Power Station during the period February 14-18, 1994, to determine if activities in long-term erosion, corrosion (EC) monitoring program are being accomplished in accordance with NRC requirements and licensee commitments and procedures.

Results: The inspector was not able to verify the qualitative implementation of the EC program because, the licensee's database was not available. The licensee stated that due to a computer problem, the EC database was lost and it will require re-creation.

The EC database is an important tool used to control and monitor the entire EC program. It is an important commitment made to the NRC during the EC presentation held in the NRC Region I office on June 30, 1993. Considering all of the above, the inspector expressed a concern about this situation. In addition, it was noted that there is a lack of procedures to implement the secondary water chemistry. Therefore, pending a verification and a review of the EC database and site specific water chemistry procedure(s), this will remain an unresolved item (URI 309/94004-01).

DETAIL

1.0 MAINE YANKEE PIPING EROSION CORROSION PROGRAM (49001)

1.1 Background

Concerns regarding EC in the balance of plant piping systems at Maine Yankee has heightened as a result of the July 22, 1992, failure of an elbow on the scavenging vent line to the moisture separator reheater MSR E-18D. This event and subsequent communications with the licensee were formalized in the July 30, 1992, and June 30, 1993, licensee's presentation to the Region I staff.

2.0 PURPOSE

This safety inspection was conducted at Maine Yankee to determine whether licensee activities in long-term EC monitoring is being accomplished in accordance with NRC requirements and licensee commitments and procedures. To achieve this purpose, the inspector reviewed and discussed the EC program, including the workout of two randomly selected lines, in order to assess each element of the program.

3.0 UPDATE OF EC PROGRAM COMMITMENTS

Commitments presented to the NRC on July 30, 1992, subsequent to Maine Yankee's MSR scavenging vent failure are as follows:

1. Upgrade program description
2. Implement independent review of sample plan
3. Develop formal methods to capture industry experience
4. Incorporate CHECMATE into program
5. Incorporate permanent grids into program
6. Continue plans to increase pH
7. Continue plans to convert to morpholine
8. Continue resistant material as replacements

The licensee indicated, at the time of this inspection, that these commitments have been completed with the exception of items 4 and 5.

The licensee will continue to perform manual gridding and 100 percent scanning of each gridded area.

As part of its commitment to the NRC, the licensee stated that it is not their intention to incorporate CHECMATE without performing an evaluation for its effectiveness first. The inspector verified that this evaluation is ongoing. The inspector reviewed the licensee's CHECMATE evaluation consisting of five CHECMATE reports generated for each of the fifteen selected lines. The first report provides average and current erosion rates for each component. The second report lists initial, predicted and critical thickness values, and the

predicted time to reach the critical thickness. The third report gives measured and predicted wear and thickness values for all components with thickness data (TDAT) input. The fourth report lists values for several input parameters, providing a quick self-check of the credibility of the input. The last report includes replacement status information for all components and measured wear values for all components with TDAT input.

The licensee's intention is to perform continued CHECMATE analysis on these fifteen lines as well as additional lines over the next few operating cycles. The licensee added that the continued analysis will not necessarily be limited to high ranked lines.

The inspector found the licensee's CHECMATE as an on-going exercise to constantly verify the accuracy of their existing analysis. The inspector had no further questions in this regard.

3.1 Assessment of the Criteria for the EC Program

The inspector verified and reviewed the licensee's revised EC program. The areas reviewed are: screening, analysis, selection, data collection, disposition of data, experience, and long-term strategy.

3.1.1 Screening for susceptibility

To assure that all piping susceptible to EC is included in the program for monitoring, the licensee developed a criteria for lines being excluded from analysis. The inspector reviewed this exclusion criteria and found that the criteria was well thought out. It was also verified that the licensee exclusion criteria was developed in accordance with the Electric Power Research Institute (EPRI), NSAC/202L guidelines. The inspector had no further questions regarding the licensee's exclusion criteria.

3.1.2 Analysis

Analysis as defined by the licensee's EC program is the process of qualifying how susceptible a line may be. To accomplish this qualification, the licensee has performed a qualitative analysis to assign a relative rank to all susceptible lines.

The inspector reviewed the ranking guidelines that consists of eight screening attributes that are: risk of personnel injury, risk of plant reliability, insolubility, steam quality, fluid velocity, configuration, history and temperature. Each screening attribute can score a maximum of two points, for a total of 16. The greatest potential rank value is sixteen (16), which represents a highly susceptible line. The lines were grouped into three degrees of susceptibility/risk high, moderate, and low, with respective rank value ranges of 11-16, 5-10, and 0-4. The inspector found this ranking criteria efficient. The inspector noted that for the ranking of the lines, the licensee has been effectively utilizing existing data from previous inspections.

3.1.3 Selection

The effective use of the ranking criteria enables the licensee to have a selection of components to be inspected. The inspector noted that high ranked lines warrant a larger sample than the moderate and low category. Nevertheless, the licensee stated that it is important to perform exams on some of the low ranked lines to provide assurance that the lines are properly ranked. The inspector found the selection of lines to be inspected efficient.

3.1.4 Data Collection

The licensee uses ultrasonic testing (UT) for collecting wall thickness data. In their data collection criteria, the licensee emphasize that UT thickness measurements are to be performed on all components selected as well as upstream and downstream piping as applicable. The inspector found the data collection criteria acceptable. Scanning for the minimum thickness in each grid reduces the number of data points, increases the median error and decreases the repeatability.

3.1.5 Data Analysis

The inspector noted that the licensee's data analysis is purely an analysis of manually produced charts (thickness vs. time) and these trending charts are built on component historical data. These charts are utilized for trending wear and determining a wear rate. The inspector noted that for a component that has not been previously examined, the nominal wall thickness is assumed as the baseline value. The inspector had no further questions in this regard.

3.1.6 Disposition of Data

Disposition of data for the licensee is the process of determining what corrective action, if any, is necessary, including expanding the sample, repair or replace. The minimum wall determination is based on ANSI B31.1. Minimum wall is calculated using two different formulas, one based on internal pressure and the other based on sustained loads. The sample expansion is governed by a procedure and a well defined criteria. This criteria also offers a conservative guidance for repair/replace. The inspector had no further questions in regard the repair and or replacement criteria.

3.1.7 Conclusion

The inspector concluded that the method used by Maine Yankee is [illegible]ive, value based system and does not include the CHECMATE parameters of temper[illegible]loy content, mass transfer, oxygen effect pH, geometry and void fraction into an empirically derived, cohesive

system of uniform analysis. If the individuals responsible for the EC program are not familiar with the historical conditions of the system they are subjectively ranking, they will make error judgements similar to the ones that contributed to the catastrophic failure of the scavenging vent.

3.2 EC Industry Experience

The inspector noted that the licensee has a well organized and properly documented information to capture industry experience. In this case, the licensee satisfied one of the commitments made to the NRC.

3.3 EC Water Chemistry

The licensee stated that their secondary water chemistry corrosion control is primarily accomplished by oxygen and pH control. The licensee water chemistry's goal is to maintain the system integrity and to reduce sludge accumulation and fouling in the steam generators. Condensate dissolved oxygen is routinely maintained at less than five parts per billions (ppb). Hydrazine is injected into the condensate pump discharge as a scavenger. With cooper components in the feedtrain the condensate pH was maintained at less than 9.2 in order to minimize copper corrosion. With subsequent removal of copper from the feedtrain, the pH has been increased to greater than 9.2 to provide a more favorable pH for reduction of iron corrosion.

The licensee identified Morpholine as an alternative amine that is less volatile than ammonia and, therefore, provided better protection of the wet steam areas. Although Maine Yankee had used morpholine in the secondary system since original startup, it had been at only trace levels under the assumption it was a carbon dioxide scavenger. The licensee stated that during cycle 13 (April 20, 1992 to July 30, 1993), the licensee increased and has maintained morpholine at those required levels.

The licensee stated that hydrazine is used to reduce the electrochemical potential (ECP) when oxidants such as oxygen or copper oxides are present. In 1993, EPRI recommended that higher hydrazine concentrations provided better assurance that reducing conditions are maintained. The licensee has been slowly increasing hydrazine concentrations.

Although, the licensee's theoretical overview of the secondary water chemistry appeared to be adequate and it is in accordance with commitments made to the NRC, the inspector found that there is no clear mechanism to assure that this theoretical criteria and the EPRI recommendations are properly implemented. More specifically, the licensee has no site specific procedures in-place to assure the proper balance of secondary water chemistry. The inspector expressed concerns in this regard and the licensee acknowledged the inspector's concern and stated that a proper corrective action will be implemented to correct this deficiency.

3.4 EC Long-Term Strategy

The inspector verified and reviewed part of the EC long-term strategy which replaces selected lines with Chome-Moly. The inspector found it properly controlled and documented through the use of as-built isometrics.

4.0 PROGRAM IMPLEMENTATION

The inspector selected for review, two lines, one in the condensate system, extending from the second point heater to pipe segment WCPD-31-301 and the other in the feedwater system extending from the steam generator feed pump to the first point heater E-11B.

The licensee indicated that the EC Program has reviewed the susceptibility of all 3,549 lines. This resulted in 376 susceptible lines with 131, 143, and 102 of the lines being ranked high, moderate, and low, respectively. The inspector was not able to verify these figures because the licensee's database was not available. The licensee stated that, due to a computer problem, the EC database was lost and it will require re-creation.

The EC database is an important tool to control and monitor the entire EC program, and it is one of the licensee's important commitments to the NRC made during the presentation held in Region I on June 30, 1993. Considering all of the above, the inspector expressed a concern regarding this situation, and the lack of procedures to implement the secondary water chemistry. Pending a verification and a review of the licensee's EC database and site specific water chemistry procedure(s), this will remain an unresolved item URI 309/94004-01.

5.0 MANAGEMENT MEETINGS

Licensee management was informed of the scope and purpose of the inspection at the beginning of the inspection. The findings of the inspection were discussed with the licensee management at the February 14-18, 1994, exit meeting. See Attachment 1 for attendees.

ATTACHMENT 1

Persons Contacted

Maine Yankee Atomic Power Company

*	D. Whittier	V.P. Engineering
*	G. M. Leitch	V.P. Operations
*	J. Weast	Licensing Engineer
	C. R. Shaw	Manager of Operations
*	P. Melhorn	Senior EC Engineer
*	J. Crofton	Materials Engineer (YNSD)
*	B. Blackmore	Plant Engineer
*	P. Dostie	State Inspector
*	P.Radsky	Chemistry Section Head
*	M. Veilleux	Manager PED
*	B. Schubert	PED Section Head

U.S. Nuclear Regulatory Commission

*	J. Yerokun	Sr. Resident Inspector, Maine Yankee
*	W. Olsen	Resident Inspector, Maine Yankee

* Denote those attending entrance and exit meeting.

The above listed personnel were present at the exit meeting. The inspector also contacted other administrative and technical personnel during the inspection. The licensee voiced no objections to the findings of this inspection.