U.S. NUCLEAR REGULATORY COMMISSION
REGION I

DOCKET/REPORT NO.	50-443/93-23
LICENSE NO.	NPF-86
LICENSEE:	North Atlantic Energy Service Corporation
FACILITY NAME:	Seabrook
INSPECTION AT:	Seabrook, New Hampshire
INSPECTION DATES:	November 29, 1993 to December 3, 1993

INSPECTOR: Robert A. McBrearty — Jan. 25, 1994
Robert A. McBrearty, Reactor Engineer — Date
Materials Section, EB, DRS

APPROVED BY: Michael C. Modes — 1/31/94
Michael C. Modes, Chief — Date
Materials Section, EB, DRS

Areas Inspected: An announced inspection was conducted of the licensee's erosion/corrosion (E/C) program and its implementation, and the activities related to the temporary, non-code repair of ASME Code Class 3 service water system piping with regard to Generic Letter 90-05. The inspection was conducted to ascertain whether the E/C program conformed to applicable requirements and whether the activities were performed in a way that confirmed the plant's acceptability to return to operation.

Results: The activities related to the temporary, non-code repair of service water system piping were conducted in compliance with the guidance of Generic Letter 90-05.

The erosion/corrosion program and its implementation are generally good. The staff responsible for the E/C program development and implementation are knowledgeable of the plant systems and the activities for which they are responsible. Documentation confirmed that the program implementation complied with applicable requirements, planning was completed in a timely manner, and examination results were appropriately evaluated and dispositioned.

DETAILS

1.0 TEMPORARY NON-CODE REPAIR OF ASME CODE CLASS 3 SERVICE WATER SYSTEM PIPING

A leak was detected on service water system (SW) line 1801-6-153-3, a Code Class 3 moderate energy system. The affected 3" line is one of three pressure sensing lines downstream of the two Train "A" ocean SW pumps. The leak location is at a weldolet to flange shop weld. The weldolet and flange are carbon steel with 1/8" thick cement lining. Ultrasonic thickness measurements were performed of the affected section of piping on November 11, 1993, to determine the extent of the through wall leak. Ultrasonic examination was completed of the similar shop welds at five additional locations and no wall loss was detected at any of those locations. The examination of the leaking pipe showed that the leak was confined to a 1/2" x 3/4" area. The minimum wall thickness adjacent to the leak is 0.330" and the code required minimum wall thickness is 0.015".

An evaluation of the defect was performed using the "Through-Wall Flaw" approach as described in NRC Generic Letter 90-05. The method considers a through wall defect and evaluates the defect stability by a linear elastic fracture mechanics methodology. The analysis was performed on November 11, 1993, and was submitted on November 12, 1993, to the NRC to justify performing a temporary, non-code repair in accordance with Generic Letter 90-05. The temporary repair was completed on November 11, 1993, and consists of a soft rubber gasket secured with a mechanical clamp. The inspector observed the repair on November 29, 1993, and noted that no evidence of new leakage was apparent. The pipe and adjacent area was observed to be dry and the repair appeared to be effective.

The North Atlantic Energy Service Corporation (the licensee) intends to perform a permanent code repair of the leak during the next outage exceeding 30 days, but not later than the next refueling outage, which is scheduled to begin in March 1994. Until the permanent repair is completed, a walkdown of the line will be performed for leak monitoring at least once per week, and follow-up NDE using radiography will be performed at least once every three months. Radiography will be used to preclude removing the clamp and gasket repair, as would be necessitated by the use of ultrasonic examination.

The inspector determined that the licensee's actions complied with the guidance of Generic Letter 90-05.

2.0 EROSION/CORROSION (E/C) EXAMINATION PROGRAM (IP 49001)

Concerns regarding erosion and corrosion in balance of plant systems has been heightened as a result of the December 9, 1986, feedwater line rupture that occurred at Surry Unit 2. That event was the subject of NRC Information Notice 86-106 (including Supplements 1, 2, and 3) 87-36, 88-17, Bulletin 87-01, and Generic Letter (GL) 89-08. The GL requires that all licensees provide assurances that a program, consisting of systematic measures to ensure that E/C does not lead to degradation of single and two-phase high energy carbon steel systems, has been implemented.

The inspector reviewed the licensee's actions regarding the detection of erosion/corrosion in plant components. The inspection was conducted to ascertain the scope of the licensee's program and its implementation.

The program is administered by the licensee's E/C Program Manager who is the lead engineer-inservice inspection (ISI) at Seabrook Station. The Program Manager's responsibilities are identified in the Erosion/Corrosion Program Manual and include the establishment and maintenance of inspection point selection, sample expansion, and acceptance criteria. Additionally, he is responsible for the coordination of pre-outage, outage, and post-outage activities such as the development of component inspection lists, initial review, and screening of inspection results and timely reporting to Mechanical Engineering of results, which do not satisfy screening and/or acceptance criteria, management of inspection data including inspection history, wear trending, repair/replacement activities and the maintenance of the EPRI CHECMATE model, and associated programs. The individual was interviewed by the inspector and demonstrated his familiarity with the various parameters necessary for the selection of an inspection sample including those necessary for the proper use of CHECMATE.

The Erosion/Corrosion Program Manual, Revision 0, dated November 24, 1993, provides details regarding the program including system selection criteria, selection methods, component examinations, inspection screening criteria, and structural evaluation for pipe wall thinning. Appendix C of the manual describes the method for selecting components and for expanding the inspection sample when that becomes necessary. Appendix D describes in detail, including sketches, how the inspection area layout and the application of grid patterns is accomplished. The sketches show how the grid must be applied to the various piping configurations. The manual, in Appendix E, describes the technique for wear rate determination and predicted wall thinning determination.

The E/C Program Manual requires that a master inspection list, which identifies all components selected for inspection, shall be developed and issued within 60 days preceding each refueling outage. The master inspection list for the March 1994 refueling outage OR03 had been prepared and was available for review during this inspection. The inspector confirmed that appropriate items were included based on OR02 and mid-cycle 3 inspection results.

Data representing wall thickness measurements of piping and components ranging in size from 1" diameter to 16" diameter were selected for inspection to determine whether the proper review, screening, evaluation, and disposition of the data was performed by the appropriate personnel. The thickness measurements were performed during the last refueling outage (OR02) and at the mid-cycle 3 outage subsequent to OR02. The mid-cycle 3 inspections were performed to obtain more accurate wear rate data regarding components that showed wall thinning when the OR02 measurements were performed.

The data selected for inspection included the following:

- Locations PE-14,-15,-16, and -17, steam generator blowdown system line SB-TK40
- Location IE-02, extraction steam system
- Location CM-35, moisture drain system
- Location PE-03, main steam system
- Location CM-82, main steam drain system
- Location CM-75, steam generator blowdown system

The mid-cycle 3 results were used to determine whether repair/replacement would be required during the March 1994 refueling outage (OR03), or whether further monitoring should be performed at that time. An example of the decision-making process and engineering disposition is steam generator blowdown system line SB-TK40, locations PE-14, -15, -16, and -17. A request for engineering services (RES) was initiated on June 19, 1993, subsequent to the mid-cycle 3 inspections. The RES, No. 93-246, Revision 0, requested that the E/C UT thickness data related to locations PE-14, -15, -16, and -17 be evaluated by engineering for potential minimum wall violation and expected service life. Locations PE-14, -15, and -17 were judged to be acceptable for the next fuel cycle (cycle 4), and PE-16 was dispositioned to be inspected during OR03 because the location showed a higher wear rate than the three other locations. The low area on PE-16 appeared to be an isolated spot and the licensee intends to make a further evaluation during the OR03 outage.

Erosion/corrosion inspections performed during OR02 resulted in additional locations being added to the inspection sample. The expansion sample locations were selected based on similar components in parallel trains to the original locations, the next component upstream or downstream of the component showing wall thinning, and the next most susceptible component on a particular line. For cases where replacement was deemed necessary, the licensee intends to use stainless steel as the replacement material.

The E/C database at Seabrook was developed in a commercially available computer program. Several fields in the Outage Data form are calculated from actual examination data input upon completion of examinations and may be used to determine if the examination results require further engineering review, or if additional components are required to be examined. Because of their critical use, the licensee established a process to verify the accuracy of the computer calculations. Eight test cases were developed and are presented in Appendix C of the document entitled, "Erosion/Corrosion Outage Data Database Controls and Verification." Each test case includes the tested input data and the expected results. The test cases check the proper calculation of results, given a variety of examination results for a common hypothetical component. The test data were input and the expected results were confirmed in each test case.

3.0 CONCLUSION

The licensee has established an erosion/corrosion (E/C) program that is based on industry and Electric Power Research Institute (EPRI) guidelines regarding sample selection and evaluation/analysis of inspection results. The program is effective in that problem areas are identified prior to complete failure. The licensee has assigned responsibility for the program to a staff member who is familiar with the plant and the EPRI E/C computer codes. The E/C Program Manual is a comprehensive document that provides detailed information regarding component selection, sample expansion, acceptance criteria, and the use of a grid pattern for laying out the inspection area. The disposition of inspection results was based on engineering evaluation of the data.

4.0 EXIT MEETING

The inspector met with licensee representatives (denotes in Attachment 1) at the conclusion of the inspection on December 3, 1993. The inspector summarized the scope and findings of the inspection. The licensee acknowledged the inspector's remarks.

ATTACHMENT 1

Persons Contacted

North Atlantic Energy Service Corporation

B. Brown, Mechanical Engineering Supervisor
J. Grille, Operations Manager
G. Kann, Program Support Manager
G. Kline, Technical Support Manager
R. McCormack, E/C Project Manager/Lead Engineer, Inservice Inspection
J. Petro, Licensing Engineer
H. Prabhakar, Resident Engineer
J. Sobotiea, NRC Coordinator
J. Vargas, Manager of Engineering

U.S. Nuclear Regulatory Commission

N. Dudley, Senior Resident Inspector
R. Laura, Resident Inspector

Those listed above were present at the exit meeting.