U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-317/88-14

Docket No. 50-317

License No. DPR-53

Licensee: Baltimore Gas and Electric Company
Charles Center
P.O. Box 1475
Baltimore, Maryland 21203

Facility Name: Calvert Cliffs Nuclear Power Plant

Inspection At: Lusby, Maryland

Inspection Dates: June 13-24, 1988

Inspectors: Robert A. McBrearty — July 21, 1988
R. A. McBrearty, Reactor Engineer, MPS, EB, DRS, Region I — date

R. W. Winters — 7/21/88
R. W. Winters, Reactor Engineer, MPS, EB, DRS, Region I — date

Approved by: o/a for J. Strosnider — 7/21/88
J. Strosnider, Chief, Materials & Processes Section, Engineering Branch, DRS, R[illegible] — date

Inspection Summary: Routine unannounced inspection on June 13-24, 1988 (Report No. 50-317/88-14)

Areas Inspected: An inspection was conducted of inservice inspection and steam generator inspection activities to ascertain whether the licensee's activities were conducted in compliance with applicable ASME Code and regulatory requirements. Particular emphasis was placed on the tracking and disposition of licensee inservice inspection findings. Other areas of ISI activities which were inspected include the ten year program, implementing NDE procedures, NDE personnel qualification/certification records, steam generator eddy current test results, and Quality Assurance involvement in ISI activities. In addition the licensee's secondary side water chemistry and erosion/corrosion examination program was inspected.

Results: The inspectors concluded, based on the areas inspected, that the licensee's activities were performed in compliance with the applicable requirements of the Technical Specifications and the ASME Code, Section XI. No violations were identified. One unresolved item was identified regarding the completeness of the NDE personnel qualification/certification records.

DETAILS

1.0 Persons Contacted

Baltimore Gas and Electric Company

H. Brust, Associate Engineer
S. Bauxbaum, Supervisor, Nondestructive Examination
* J. Carroll, General Supervisor, Quality Assurance
* S. Cowne, Senior Engineer, Licensing
* P. Crinigan, General Supervisor Chemistry
L. Decker, ISI Engineer
* R. Douglass, Manager QASD
W. Evans, Warehouse Supervisor
* R. Heiber, General Supervisor, Operations
* K. Hoffman, Senior Engineer
* J. Lemons, Manager, NOD
* N. Millis, General Supervisor, Radiation Safety
* T. Pritchett, General Supervisor, Technical Services
E. Roche, Lead Auditor
* B. Rudell, Supervisor, Materials Engineering Nuclear
* L. Russell, Manager, Nuclear Maintenance
* D. Shaw, Licensing Engineer
* L. Smialek, Assistant General Supervisor, Radiation Control
* D. Van Petten, ISI Engineer
R. Wyvill, ALARA Engineer
* A. Zimmerman, Lead Auditor

United States Nuclear Regulatory Commission

* V. Pritchett, Resident Inspector
* D. Trimble, Senior Resident Inspector

* Denotes those attending one or both exit meetings.

The inspectors also contacted other administrative and technical personnel during the inspection.

2.0 Introduction

Calvert Cliffs Nuclear Power Plant, Unit 1, was licensed on July 31, 1974, and commenced commercial operation on May 8, 1975. The plant has a two loop Combustion Engineering designed reactor. May 8, 1975 was the commencement of the first ten year inservice inspection interval. The first inspection interval for Unit 1 was extended to April 1, 1987 so that the inservice inspection program of both units would be coincident regarding the edition and addenda of ASME Code, Section XI.

The licensee has performed Reactor Pressure Vessel (RPV) volumetric examinations in accordance with the ASME Code, Section XI, and in addition has used the automated computerized Ultrasonic Data Recording and Processing System (UDRPS) for collecting data related to RPV examinations. The UDRPS method has not yet been accepted by ASME, Section XI, and the licensee is involved in a program to qualify UDRPS for RPV examinations.

The licensee's erosion - corrosion program was started in 1981 and is presently being reviewed to comply with Generic Letter 88-05. An innovation at Calvert Cliffs involves the Rad Waste Support Group which looks for evidence of boric acid leakage from bolted connections during plant walk through inspections. When evidence of leakage is noted the ISI group is notified so they can perform erosion - corrosion inspections.

The two Combustion Engineering Corporation designed steam generators (SG) in Unit 1 have an evaporator outside diameter of 165 inches, a steam drum outside diameter of 240 inches and an overall length of 749 inches. The design pressure on the primary side is 2500 psia at 650°F and on the secondary side is 1000 psia at 550°F. At 100% power the operating conditions are 2250 psia at 550°F on the primary side and 850 psia on the secondary side with a feedwater temperature of 432°F. The designed moisture content of the steam is 0.20%. The tube bundle consists of 8519 - 3/4 inch OD Inconel tubes with a nominal wall thickness of 0.048 in. The tube sheet is 21 1/2 in. thick clad with Inconel on the primary surface. The tubes are expanded full length in the tubesheet and welded on the primary face to the Inconel cladding. The tubesheet is reinforced with a forged stay cylinder that is welded between the tubesheet and primary head.

3.0 Scope

The licensee performed inservice inspection (ISI) during this outage to comply with requirements of the ASME, Boiler and Pressure Vessel Code, Section XI, and with its ISI schedule for the 1988 outage. The following areas were selected for inspection:

-- ISI Program

-- NDE implementing procedures

-- NDE personnel qualification and certification records

-- Quality Assurance involvement in ISI and steam generator inspection

-- Control of nonconforming items

-- Engineering involvement in ISI

-- Secondary water chemistry control and results

-- Radiation results from the steam generator inspection and repair

The licensee steam generator surveillance program and activities were reviewed by the inspector to determine that the licensee performed the inspection in accordance with the requirements of the plant Technical Specifications.

Secondary water chemistry results and radiation exposures received during the steam generator inspection also were reviewed during this inspection. These items were reviewed in an attempt to correlate the secondary water chemistry with the results of the steam generator eddy current inspection and radiation received during the inspection and repair of the steam generator tubes. During this inspection the results of the chemistry program were evaluated. The methods employed by the licensee for collecting these data were beyond the scope of the inspection.

4.0 Inservice Inspection Program Review

10 CFR 50.55a (g)(4)(i) identifies the applicable ASME Boiler and Pressure Vessel Code year and addenda that must be used by a licensee for ISI. The actual Code year and addenda is based on the issue date of the operating license. Code Editions and Addenda for subsequent inspection intervals are likewise based on the starting date of the next interval. The licensee initially identified the extent of Class 1 piping in accordance with the 1974 edition through the Summer 1975 addenda of this code. The second interval is based on the 1983 Edition through the Summer 1983 Addenda.

Calvert Cliffs Units 1 and 2 are in the second 10 year inspection interval at this time. The ISI program incorporates Section XI requirements of subsections IWB, IWC, IWD, and IWF for class 1, class 2, and class 3 systems and for component supports respectively. The initial interval of each unit was adjusted so that the ISI program of each unit for the second interval would be coincident. This adjustment was approved by the NRC.

ISI of the steam generator tubes is conducted in accordance with each unit's Technical Specifications and is a separate program designed for steam generator inspection.

Review of NDE Implementing Procedures

The inspector reviewed selected procedures for compliance with the ASME Code and regulatory requirements, and for technical accuracy. The following procedures were included in the inspector's review:

-- SWRI-NDT-600-13, Revision 13 - Manual Ultrasonic Examination of the Reactor Pressure Vessel Flange to Shell Weld

-- SWRI-NDT-600-18, Revision 42 - Manual Ultrasonic Examination of Pressure Retaining Studs and Bolts Greater Than 2 inches in Diameter containing Access Holes

-- SWRI-NDT-600-41, Revision 18 - Manual Ultrasonic Examination of Ferritic Pressure Piping Welds

-- SWRI-NDT-800-36, Revision 40 - Manual Ultrasonic Examination of Austenitic Thin Wall Piping Welds

-- SWRI-NDT-800-109, Revision 1 - Inner Surface Examination of the Access Holes in Pressure Retaining Studs Greater Than 2 inches in Diameter

The inspector determined that the aforementioned procedures were in compliance with the ASME Code, Section XI, 1983 Edition through Summer 1983 Addenda regarding calibration, examination volume, acceptance criteria, and the reporting of examination results. These procedures were found to be in compliance with applicable requirements and were determined to be technically adequate for their intended use. All were approved by the licensee for use at Calvert Cliffs.

5.0 Steam Generator Eddy Current Inspection

Details of the Review

The inspector reviewed the results of the eddy current inspection with the licensee's ISI group, observed the videotape of the tube plugging operation, and reviewed the tube plugging work requests to verify that all tubes required to be plugged were plugged. In addition the inspector discussed the techniques employed for eddy current inspection, data analysis and repair of the defective tubes. Qualifications of the individuals performing the inspection also were reviewed.

Review of Eddy Current Inspection Procedures

The inspector reviewed the following procedures to determine compliance with the applicable Codes and requirements:

-- STP-M-574-1, Revision 2, - Eddy Current Examination of Calvert Cliffs Steam Generator Tubing

-- FSP-301-18, Revision 4 - Eddy Current Inspection of Nonferrous Tubing using MIZ-18 Multifrequency/Multiparameter Techniques

-- FSP-301-EVAL, Revision 3 - Eddy Current Data Analysis Procedure

-- Edition 18.2, Revision 1 - MIZ-18 Digital Data Analysis System DDA-4

-- MIZ-18 Data Acquisition Guide for use with the Zetec Motorized Rotating Probes

-- MIZ-18 System Disk Operating Guide for the U-bend Rotating Probe P/N B-*-MRPC/F-PH(#)

-- Revision 20, Operating Guide for the Computer Data Screening Software. Supplement C to MIZ-18 System Disk

Results

The eddy current examination was contracted to Zetec Corporation by the licensee. The initial Technical Specification examination of 9% of the tubes in each steam generator placed both steam generators in category C-3. As a result, the inspection was expanded to 100% of the tubes in each of the steam generators. The inspection was performed using the Zetec MIZ-18 digital data acquisition system. Frequencies selected were 400, 200, 100, and 30 KHz. All of these examinations were run in both the differential and absolute modes using a standard bobbin coil probe. All distorted and pluggable indications were retested.

In addition to the above tests selected tubes were examined using a motorized rotating pancake coil (MRPC). Fifty eight tubes were examined using the MRPC just above and below the secondary side of each steam generator tube sheet in the sludge pile area to quantify indications found by the bobbin probe. Profilometry was used to evaluate tube denting at the 9th and 10th solid support plates on both steam generators. Trending of the profilometry data showed no denting growth since the previous inspection. Special U-bend MRPC probes were used to inspect the short radius U-bends. Of the 315 U-bends inspected using the MRPC, no degradation was detected.

The inspector observed that the licensee's management was supporting the ISI group by investing in a MIZ-18 digital data system with the supporting computer systems for use by the ISI group during the planning and analysis phases of the eddy current inspections. The inspector also observed an informal training session given by one of the ISI engineers to a chemistry engineer on the use of this equipment. During this session both of these individuals were achieving a better understanding of the importance of their respective roles in the maintenance of the steam generators.

The inspector reviewed the videotapes of the steam generator tube plugging operation and the plugging lists generated from the eddy current data. The tubes that were found defective were plugged. During the previous inspection one tube that was to be plugged was erroneously plugged in only one end (the plug for the other end was placed in another tube) during this inspection. Prior to plugging this tube was

inspected and the defect was determined to have grown approximately 10%. The plug that was placed in the wrong tube was not removed. However, the licensee had the steam generator
manufacturer verify that this plug was designed to withstand the operating conditions and would not be dislodged to become a foreign object in the primary system.

Conclusions

The licensee demonstrated a well balanced program for the inspection and repair of the steam generators. Management support was evident and communications between the various organizations was observed to be good.

Data Analysis

Details of the Review

The data from each tube's eddy current inspection was analyzed by two independent teams of qualified and certified individuals and by computer analysis. Additionally, all stored data was analytically processed by Zetec's Computer Data Screening (CDS) system using HP350 computers. After the data review was completed, the primary and secondary lead analysts compared results with the CDS results and a final report was prepared. Any resolution of differences that was required was performed by the licensee's qualified Level III individuals.

Results

Results of the eddy current testing are shown in Table 1.

TABLE 1

RESULTS OF THE INSPECTION

Steam Generator

	'11'	'12'
Tubes Inspected	8463	8482
Distorted Indications (tubes)	13	13
Less than 20% TW Indications	135	152
Tubes with 20-39% TW Indications	149	146
Greater than 39% TW Indications	21	17
Tubes plugged this inspection	42	27
Total tubes plugged	98	65

Conclusions

The three tiered approach for data analysis taken by the licensee is conservative. By using the computer to verify prior analyses the licensee has minimized the probability of errors through fatigue of the analysts. With fewer than 1% of the total tubes plugged in the thirteen years of plant operation the licensee has demonstrated that his overall program for the operation and care of the steam generators is working in a satisfactory manner.

6.0 Control of Nonconforming Items

Findings related to ISI which require work to render the item acceptable are controlled through the use of maintenance requests (MR), maintenance orders (MO) and nonconformance reports (NCR). Calvert Cliffs Instruction (CCI) 200J describes the use of the Nuclear Maintenance System for the use of MRs and MOs. CCI-116E controls deficiencies and nonconformance reports, and Quality Assurance Procedure (QAP) 26 controls conditions adverse to quality and includes the use of NCRs.

A MR is used to report a deficiency and contains the data necessary to initiate a MO which is a computer generated document used to give direction and to document the maintenance action. During outages priorities for MRs are established in part on whether the work must be completed prior to returning the unit to service. Tracking of the documents is done using the facility's computer tracking system.

To ascertain that corrective action and disposition was provided and that the close out was based on completion of the corrective action, the inspector reviewed selected ISI related MOs, and one NCR which was related to an ISI finding. The following were selected for review:

MO 208-124-200A	Initiated to control the removal of liquid penetrant indications detected on RCP suction weld #7. The work was complete as evidenced by NDE reports. The MO remained open pending review by ISI and the ANI.
MO 208-134-765A	Initiated to control the removal of liquid penetrant indications detected on the #11 RCP casing - Lug #3. All work and reviews were complete and the MO closed.
NCR #7464	Initiated to document end bracket cotter pins missing from snubbers. The discrepancy was detected during routine snubber inspections. Additional inspections (the sample was expanded per Section XI requirements) did not reveal any other missing pins. Corrective action required installation of cotter pins where needed, and additional training of snubber installers. The missing pins have been installed, and close out of the NCR is pending completion of the training and verification by QC that the training has been completed.

By tracking the above listed documents the inspector determined that the licensee documented the nonconforming condition, and provided technically correct disposition and corrective action. The licensee's processing of the documents was determined to comply with applicable requirements of the governing procedures and to permit trending analysis of the various nonconforming conditions. The inspector additionally determined that the licensee's system provided for review by the appropriate level of Management to ensure closeout of ISI findings prior to plant start up.

7.0 Staffing and Personnel Qualification - Certification

The Nuclear Materials Engineering Unit (ISI) is comprised of ten staff members when the unit is at full complement. The unit supervisor reports to the Principal Metallurgist who heads the Materials Engineering and Analysis Master Unit. The Nondestructive Evaluation Unit has responsibility for UDRPS programs and also reports to the Principal Metallurgist. The responsibilities of the Nuclear Materials Engineering staff are divided in the following manner:

-- Supervisor

-- ISI Senior Engineer

-- Primary Systems Engineer

-- Steam Generator Engineer

-- Secondary Systems Engineer

-- Four ISI Technicians

At the time of this inspection an additional engineering position was unfilled.

In addition to the staff, contractors are used for various types of NDE associated with ASME Section XI, the erosion/corrosion program and steam generator eddy current inspections.

The licensee's staff was ascertained to be technically capable of performing their assigned duties, and staff size was adequate to meet the scheduled outage work load. The inspector selected staff NDE personnel qualification - certification records, and records related to contractor NDE personnel. The records of contractor personnel who had performed examinations at the site were reviewed and it was verified that the individuals were properly qualified and certified in accordance with the applicable requirements of ASME Section XI and SNT-TC-1A. The inspector also reviewed the qualifications - certifications for a representative sample (approximately 60%) of the individuals involved in the data analysis of the testing done on the steam generators. These individuals were highly qualified and properly certified.

Licensee personnel were certified in the visual, liquid penetrant, magnetic particle, ultrasonic and radiographic examination methods. Records of five individuals were reviewed by the inspector to ascertain that their certification was in accordance with the applicable requirements of ASME, Section XI, ANSI N45.2.6 - 1978, SNT-TC-1A and the licensee's program. The records packages were found to contain documentation of current visual acuity examinations, education, resumes, and various training records, but did not clearly show that the qualification experience and training requirements were met prior to certification. The inspector discussed the content of the records with the responsible licensee representative and was advised that the required information was available. The inspector stated that the matter would be considered unresolved pending inclusion of the required information in the record and subsequent NRC review of the complete record. (50-317/88-14-01).

8.0 Secondary Water Chemistry

Water chemistry data was reviewed as part of this steam generator inspection and maintenance inspection. The methods of collecting and verifying the accuracy of these data was not included in the scope of this inspection.

During original plant startup the licensee elected to use all volatile treatment (AVT) for control of secondary water chemistry. At the time (1975) this was a departure from the recommended practices of the steam generator manufacturer who recommended phosphate treatment. In addition the licensee initiated full flow condensate polishing and continuous blowdown with recovery at plant start up. Initial construction of the feedwater heaters included stainless steel tubing. The licensee has maintained a dedicated water treatment group since 1979. Also, one Quality Control individual working for the chemistry laboratory monitors operations of the equipment, trends results, verifies equipment calibrations, and performs interplant comparisons to monitor the results of the chemistry programs. In addition the licensee has improved the secondary system as follows:

-- The initial Cu-Ni (90-10) condenser tubes were replace in Unit 1 with stainless steel (AL-6X) tubes in May 1982, Unit 2 tubes were replaced with Titanium in December 1982.

-- Cu-Ni (70-30) moisture separator reheater tubes were changed to type 439 stainless steel for Unit 2 in 1984, and Unit 1 in 1986.

-- Nitrogen sparging and blanketing was added to the condensate make up in 1987.

-- Wet layup conditions have been emphasized since original operation.

-- Morpholine injection on Unit 1 was initiated in 1986 to reduce the sludge pile.

-- In-line monitors are scheduled to be replaced with new monitors with increased sensitivity and reliability in 1988.

Details of the Review

The inspector discussed the chemistry program with responsible licensee personnel and reviewed the operating results from September, 1987 through May 1988. Chemical samples are taken at locations as shown in Table 2. Chemical additions are made after the deep bed polishers and before the low pressure heat exchangers.

TABLE 2

SECONDARY WATER CHEMISTRY SAMPLE POINTS

Sample Point	Element (1)						
	Cat Cond	Spec Cond	O_2	pH	Na	Cl	Sulfate
Condenser Hot Well	X	X					
Condensate Pump	X		X	X	X	X	X
After Polishers (2)	X	X	X		X		X
Before Steam Generator	X		X	X			
Steam Generator Blowdown	X	X		X			

(1) All samples are in-line except as noted
(2) Na, O_2, and Sulfates are grab samples taken before operation

Provisions are made for taking grab samples at each in-line monitor.

The licensee has initiated an elevated lithium program for treatment of primary side water. The elevated lithium has the effect of keeping magnetite in solution and subsequently removing it from the system by ion exchange and filtering. The licensee has changed the filters to lower the particle size filtered and has also increased the capacity of the filters. This has achieved a down trend for the dose rates in the steam generators, particularly in the channel heads.

Results

The inspector reviewed the secondary water chemistry results for the first four months of 1988 and observed that the the licensee was achieving water quality superior to the EPRI guidelines. The average results for this period are shown in Table 3.

TABLE 3

Secondary Water Chemistry History 1988

Blowdown Sample

Parameter	January	February	March	April	EPRI Guide
Cat Cond., umhos	0.2	0.14	0.17	0.2	0.8
Chloride, ppb	2.1	2.1	3.1	3.0	20
Sodium, ppb	2.7	2.8	3.5	4.4	20
Silica, ppb					300
pH					9.0 min

Single values are maximum except as noted

The morphaline treatment has reduced the sludge accumulation to approximately one inch on average. At this level the licensee did not perform a lancing operation.

Conclusions

The licensee has maintained the secondary water chemistry well within the EPRI guidelines and is trying to improve on the results achieved to date. Improvements in the secondary side equipment such as retubing the condensers and moisture separator reheaters has removed the sources of copper contamination. Improvements in the in-line monitoring instruments will assure that measurements are reliable and more accurate than those previously obtained.

9.0 Radiation Exposure

Radiation data was reviewed as part of this steam generator inspection and maintenance inspection. The methods of collecting and verifying the accuracy of these data was not included in the scope of this inspection.

The inspector observed the training facility and mock up of the steam generator and discussed the ALARA program with licensee personnel. A review of the exposures resulting from steam generator eddy current inspection was also conducted. From this review it is evident the licensee's efforts to reduce exposures through control of water chemistry both primary and secondary had greatly reduced exposures for the required inspections. Table 4 summarizes the exposures received during the last three steam generator inspections.

TABLE 4

TOTAL EXPOSURE BOTH GENERATORS

Units are Man-Rem

Operation	1985	1986	1988
Opening Generator/Initial Surveys	0.7	0.8	1.3
Nozzle Dam Installation/Removal	27.0	13.0	10.3
Eddy Current Testing/Tube Plugging	14.5	14.0 (1)	9.2
All Other Operations	6.3	27.8 (2)	4.0
Total	48.5	47.3	24.7

(1) Exposure for removing tubes for analysis
(2) Includes 16.5 rem for primary side support

The licensee has changed the water chemistry on the primary side by the addition of lithium as discussed above, and has purchased several eddy current manipulators to reduce the exposures during the eddy current testing. Two changes were made between the 1986 inspection and the 1988 inspection that significantly reduced exposures during the eddy current examination. These were:

(1) The drive on the eddy current probe insertion machine was changed from a belt drive to a rubber wheel drive.

(2) The temperature inside the steam generator was lowered from 160°F to 100°F.

From past experience the licensee determined that changing the drive belt on the drive machine caused multiple entries into a high radiation area to effect the change, also each time the belt broke the probe had to be changed. During the 1988 outage one drive wheel lasted through the entire inspection thus reducing exposures. The reduction in temperature allowed the probes to last significantly longer. These two changes reduced the number of probes used from 330 in 1986 to 190 in 1988 for a reduction in exposures due to probe changes.

Conclusions

Through the use of lithium treatment of the primary side water and the changes to the eddy current equipment combined with the steam generator temperature temperature lowering the licensee significantly reduced exposures during this inspection.

10.0 Assurance of Quality

During outages when ISI activities are conducted, the licensee's QA Department performs audits of the licensee and contractor activities. In addition to internal audits the licensee performs QA audits of prospective vendors to determine the vendor's qualification to perform the required service. Once the vendor is placed on the licensee's qualified vendors list, repeat audits are performed periodically to assess the vendor's capability to continue the satisfactory performance of the required services.

The latest audit which was performed to retain Southwest Research Institute on the qualified vendors list, QA Audit QA G60-SWRI 87-Program 01 and internal audits 87-11, 87-19, and 88-19 were selected for inspection.

Audit 87-11 was performed to review selected operations of the plant Chemistry Department. The audit dates were March 3 through April 15, 1987. During this period the auditors reviewed the chemistry procedures and observed laboratory operations. No significant findings resulted from this audit.

Audit 87-19 - was performed to review selected operations of the ISI Group. The audit dates were April 27 through August 14, 1987. One finding was identified indicating that the withdrawal record for a calibration standard was not being accurately maintained. However, the audit report stated that the calibration standard was properly stored and maintained only the record for withdrawal was in error.

QA Audit 88-19 was performed to review selected activities of the ISI Group. The audit dates were April 20 through June 8, 1988. Three findings were identified. All of these findings concerned revision to licensee procedures in order to reflect the proper organizational structure and current responsibilities.

The inspector ascertained that the audited departments responded to each finding, provided corrective action and the estimated date when the corrective action would be completed. Audit 88-19 remains open pending completion of the corrective action.

Audit QA G60-SWRI-87-Program 01 - was performed to assess the capability of Southwest Research Institute to provide required ISI services at Calvert Cliffs. The audit was performed at the SWRI facility in San Antonio, Texas. The audit dates were October 20-21, 1987. The audit scope included a review of the following:

-- NDE personnel qualification and certification records

-- Changes to Calvert Cliffs 1987 Examination Plan to verify that inspections were performed in accordance with the licensee's Project Plan.

-- Control of measuring and test equipment

-- SWRI QA Program for compliance with 10 CFR 50, Appendix B, ANSI N45.2 and Sections V and XI of the ASME Code.

Two findings were identified as a result of the audit as follows:

-- F87-SWR-01 - The incorrect revision of Project Operating Procedure was listed on the final test report.

-- F87-SWR-01 - Open item sheets were not completed in accordance with the Nuclear Quality Assurance Manual and a corrective action log was not maintained as required.

The SWRI letter dated December 14, 1987 provided the SWRI response to both findings including the initiation of corrective action. Appropriate audit team members reviewed the SWRI corrective actions and found them to be acceptable. Licensee letter dated January 13, 1988 to the SWRI QA Manager notified SWRI that its response was

acceptable and that SWRI was reapproved as a qualified vendor to supply services to Calvert Cliffs. Based on the NRC inspectors review he concluded that the licensee's actions were correct.

During inspection 87-15 at Calvert Cliffs Unit 2 the inspector observed that QA staff performance would improve if personnel were trained and certified to the extent necessary to perform their assigned responsibilities in the area of ISI audits. The auditor responsible for performing QA Audit 88-19 has a welding and NDE background and the audit team member with responsibility for the technical evaluation function during audit QA G60-SWRI-87-Program-01 is a member of the ISI staff and knowledgeable in various NDE methods.

Both individuals were judged to be capable of performing their assigned responsibility.

11.0 Secondary Side Erosion - Corrosion Examination Program

Concern regarding erosion and corrosion in balance of plant piping systems has been heightened as a result of the December 9, 1986 feedwater line rupture that occurred at Surry Unit 2. This event was the subject of NRC Information Notice 86-106 issued December 16, 1986 and its supplement issued on February 13, 1987.

The inspector reviewed the licensee's actions with regard to the detection of erosion - corrosion in plant components. The inspection was conducted to ascertain the scope of the licensee's program and the results to date.

The licensee's initial program for monitoring corrosion was started in 1981 as a result of corrosion found on several carbon steel components due to boric acid attack. The licensee has expanded the scope of its original program and has documented inspection results from examinations which were performed prior to the Surry incident in 1986. The inspection program entitled "Secondary System Piping Erosion/Corrosion Inspection Program," is a sampling plan in which the included systems are prioritized into categories A, B, and C. Category 'A' being considered the most susceptible to erosion - corrosion, and category 'C' considered being least susceptible.

Components are selected for inspection prior to a scheduled outage based on previous inspection results and/or system susceptibility. Emphasis is placed on choosing components with geometries most susceptible to erosion - corrosion. The selected components are ultrasonically or visually inspected. If ultrasonic examination is used the lowest reading found is compared to a calculated minimum wall value, and if the component is below the minimum wall value, or will reach the minimum value before the next scheduled outage, the component is rejected. The equation used to calculate the minimum wall value is from USAS B31.1, 1967 edition, and includes a tolerance of 1/16". The program is computerized, and the

inspection results are entered into the computer which is programmed to calculate the corrosion rate based on when the item was placed in service or on the results of the last inspection.

The licensee has established the following three categories for the disposition of inspection findings:

-- Reject: The component is below the minimum wall value, or will reach the minimum wall value before the next scheduled outage.

-- Red Alert: Based on corrosion rate, the component will reach the minimum wall within 18 to 36 months.

-- Yellow Alert: Based on corrosion rate, the component will reach the minimum wall within the next 36 to 54 months.

Red alert items are scheduled for reinspection during the next refueling outage. Yellow alert items are scheduled for reinspection no later than the second refueling outage after the present outage.

A total of 250 piping areas were examined during the present refueling outage. The inspections resulted in 38 areas which were scheduled for replacement, 44 areas were categorized as red alert, and 19 areas were classified as yellow alert. The inspection results were found to be clearly documented and readily retrievable.

The licensee is considering the following for future use:

-- EPRI-CHEC computer program on single phase piping, this will be evaluated by the licensee based on inspections done in the plant.

-- CHEC-MATE computer program for two phase piping

-- The use of chrome molybdenum material for piping replacement

-- Use of a different computer data base to enhance trending and planning capabilities.

The licensee is evaluating CHEC-MATE and EPRI-CHEC in conjunction with EPRI personnel.

12.0 Licensee's Actions on Previous NRC Concerns

(Closed) Violation (50-317/86-10-01 and50-318/86-10-01) Failure to include certain Class 1E equipment on the "Q" list and failure to identify this equipment on Maintenance Orders.

The inspector verified that the appropriate procedures have been revised to include the equipment status on the Field Test Instruction Datasheet and that the technicians performing maintenance on Class 1E equipment have been retrained to assure they include this information. The "Q" List has also been revised to include these items.

This violation is closed.

(Closed) Unresolved Item (50-317/86-10-02 and 50-318/86-10-02) Failure to include assemblies with internal nonmetallic parts in the shelf life program.

The inspector verified that assemblies having nonmetallic parts have been included in the maintenance preventative program by observation of selected items in the store room, and review of the appropriate preventive maintenance procedures.

This item is closed.

12.0 Unresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable items or violations. Unresolved items are discussed in paragraph 7.0

13.0 Management Meetings

Licensee management was informed of the scope and purpose of the inspection at the entrance interviews on June 13 and June 20, 1988. The findings of the inspection were discussed with licensee representatives during the course of the inspection and presented to licensee management at the June 17 and June 24, 1988 exit interviews (see paragraph 1 for attendees).

At no time during the inspection was written material provided to the licensee by the inspector. The licensee did not indicate that proprietary information was involved within the scope of this inspection.