



UNITED STATES
 NUCLEAR REGULATORY COMMISSION
 REGION II
 101 MARIETTA STREET, N.W.
 ATLANTA, GEORGIA 30323

Report Nos.: 50-338/88-17 and 50-339/88-17

Licensee: Virginia Electric and Power Company
 Richmond, VA 23261

Docket Nos.: 50-338 and 50-339

License Nos.: NPF-4 and NPF-7

Facility Name: North Anna 1 and 2

Inspection Conducted: June 6-10, 1988

Inspector:

Nick Economos
 N. Economos

7/8/88
 Date Signed

Approved by:

J. J. Blake
 J. J. Blake, Section Chief
 Materials and Processes Section
 Engineering Branch
 Division of Reactor Safety

7/9/88
 Date Signed

SUMMARY

Scope: This routine, unannounced inspection was in the areas of review and evaluation of Inservice Inspection (ISI) data from Unit 2, 1987 refueling outage. Also maintenance records review of Reactor Coolant Pump (RCP), 1-A O-ring leak repair; Electro Hydraulic Control (EHC), system malfunction repair; Licensee Event Reports (LERs). Inspector identified open items were reviewed and closed as appropriate.

Results: The main activities inspected included a review of ISI nondestructive examination records, completed procedures of maintenance work on RC pump 1-A, O-ring and on EHC system valves. In both areas, the licensee's work procedures were adequate, problems which lead to the failure were adequately investigated and technical issues addressed.

No violations or deviations were identified.

REPORT DETAILS

1. Persons Contacted

Licensee Employees

- *M. L. Bowling, Jr., Assistant Station Manager
- *R. F. Driscoll, Manager, Quality Assurance
- *R. O. Enginger, Assistant Station Manager, Operations and Maintenance
E. Holloway, Level II NDE Examiner
- *J. Leberstien, Licensing Engineer
- *M. R. Kansler, Superintendent, Maintenance
- *P. S. Naughton, Engineering Supervisor, Inservice Inspection (ISI)
D. Quarz, Licensing Coordinators
F. Gowards, Mechanical Supervisor
J. L. Thomas, Systems Maintenance Support Supervisor

Other licensee employees contacted included QC/QA inspectors, engineers, security force members, technicians.

NRC Resident Inspectors

- J. Caldwell, Senior Resident Inspector
- L. King, Resident Inspector

*Attended exit interview

2. Unresolved Items

Unresolved items were not identified during this inspection.

3. Maintenance Program Implementation (62700) (Units 1 and 2)

The inspector examined the licensee's maintenance program as detailed below to determine whether the program was being implemented in accordance with regulatory requirements. Requirements are specified in various regulatory guides, Section 6 of the Technical Specifications, and ANSI N18.7-1976.

Based on interviews of plant personnel, the maintenance activities identified in Paragraphs A and B below were selected for review. Records associated with these activities were reviewed to determine whether:

- Cause of failure was evaluated and adequate corrective action was taken to reduce probability of recurrence.
- Procedure specified in maintenance package is adequate for scope of maintenance performance.

- Vendor technical manual for equipment under repair is controlled and kept up-to-date.
- Vendor maintenance recommendations are translated or referenced by maintenance procedures.
- Required administrative approvals were obtained before initiating the work.
- Limiting conditions for operation is met while equipment removed from service.
- Approved procedures were used where activity appeared to exceed normal skills of qualified maintenance personnel.
- Inspections made in accordance with licensee's requirements and quality control records are complete.
- Functional testing and calibrations, as necessary, were completed before returning equipment to service and personnel performing tests were properly qualified.
- Failures are evaluated and reported in accordance with requirements
- Corrective and preventative maintenance records are assembled and stored as part of maintenance history.
- Measuring and test equipment used were identified and in calibration.
- Parts and materials used were identified and at least met specifications of the original equipment.
- Special processes were controlled and documented.
- System lineups were made and verified prior to return to service.
- a. Safety-Related Equipment Failures Leading to a Plant Shutdown (Unit 1)
 - Repair O-Ring Leak Lower Seal Housing to Main Flange on 1A-RCP. On December 9, 1987, while the plant was starting up from a cold shut down condition the licensee discovered a leak at the lower seal housing main-flange O-ring joint. The leakage was estimated as approximately one to two gallons per minute (gpm). It flowed off the main flange, down over the pump casing. The licensee concluded that the apparent source of the leak was at the lower seal-housing main-flange o-ring joint. By review of licensee documents and through discussions with cognizant site personnel, the inspector ascertained that because of the leak, boric acid residue had accumulated around the coupling/lower motor area, the pump flange/casing area and on the motor air coolers. In

order to facilitate disassembly and repair, the pump was decontaminated/washed from the main flange area down, to remove the boric acid residue. The seals were disassembled, cleaned and inspected. In addition, the following were visually inspected for damage: lower seal housing seating surface of main flange seating surface and o-ring groove lower seal housing and motor stand to main flange bolts and, main flange bolts. These inspections showed no indications of cutting/washing, or erosion on any of the subject seating surfaces or the o-ring groove. Surface corrosion was identified on the shank portion of two main flange Bolts Nos. 18 and 19. The corrosion attack was localized over an area of about 2x3 inches and had penetrated the material to a depth of about 0.015" to 0.030" maximum. These bolts will be re-examined during the next scheduled refueling outage. Records disclosed that Westinghouse (W) determined by chemical analysis that the failed o-ring had been sulfur cured during its manufacture as opposed to the preferred peroxide cure method. The W report indicated that the curing process accounted for the "permanent set" exhibited by the failed o-ring. Moreover, the report stated that the problem was plant specific and that the manufacturing specification has since been revised to preclude recurrence of this problem. Specific recommendations made by W included controlled storage conditions and the maintenance of identification numbers for traceability purposes. The inspector reviewed the following records and documents relative to the event and repair of the Reactor Coolant Pump "1A" o-ring leak.

- MMP-P-RC-1 Rev. 10 Mechanical Maintenance Procedure for RCP Seal Inspection
- MMP-P-MH-7 Mechanical Maintenance Procedure for Inspection and Repair of Reactor Vessel Component/RCP Lifting Devices
- EMP-C-RC-5 Electrical Maintenance Procedure for RCP Motor General Disconnect
- MMP-P-MH-1 Mechanical Maintenance Procedure for Reactor Containment Polar Crane Inspection
- NDE-MT-1, Rev. 4, 1-MH-CR-1- (1-15-87) Magnetic Particle Examination of Polar Crane Main Hooks and Two Auxiliary Hooks
- NSO-PMS-88-35 February 25, 1988, Repair O-Ring Leak, Lower Housing to Main Flange on 1A RCP
- Visual Examination Report on Main Flange Bolts #18 and #19 of RC-P-1A

b. Non-Safety-Related Equipment Failure Leading to Plant Shutdown

Electro-Hydraulic Fluid Control (EHC), System Malfunction, (Unit 1)

On March 19, 1988, Unit 1 experienced an automatic reactor trip from approximately 3.5 percent power. The trip occurred while the turbine was being placed in operation at a time when turbine speed control was being transferred from throttle valve to governor valve control. Through discussions, and by document review, the inspector ascertained that the throttle valves were observed to be fully open while the governor valves, reheat stops valves and intercept valves were closed and, turbine speed was decreasing. Following reactor trip and plant stabilization, the licensee tested the EHC system to determine the cause of the decrease in the EHC fluid pressure which ultimately caused the reactor trip.

Preliminary results of the investigation identified abnormal internal bypass leakage in two of the four servo control valves which control the position of the turbine governor valves. The increased bypass leakage, allowed the turbine governor valve to close and the resulting decrease in turbine impulse pressure. The licensee believes that internal bypass leakage within the control valve actuators may have contributed to the low EHC system fluid pressure. Following testing of the EHC system, the licensee replaced the servo control (moog) valves on each of the four governors control valves. The governor valves were subsequently stroked per special test procedure 1-ST-77 and -78 to observe EHC pressure. Results of these tests, indicated that although the moog valves were replaced because of suspected leakage, it was governor Valves #2 and #3 that leaked. Also by review of a memorandum to file entitled, Lessons Learned while Performing Special Procedure 1-ST-78, dated May 25, 1988, the inspector ascertained that the dump valves associated with the aforementioned governor valves would not reseal satisfactorily following valve actuation. Therefore, Work Requests 373176 and 373177 were submitted for assignment. To compensate for this loss of EHC fluid and because of the inability to assure nominal pressure for normal cycling with one pump, the licensee is currently utilizing two pumps. A directive was issued which allows operation to continue in this manner until directed otherwise by Station Management. Because of the pending maintenance work on the aforementioned valve, an Inspector Followup Item (IFI) was identified to assure review of the corrective actions and results achieved in this area at a later date. IFI 338/88-71-01, Rework Governor Valves #2 and #3 and Associated Dump Valves. The inspector reviewed the following records and documents relative to the investigation and repair of the problem.

- LER 338-88-13-00 dated March 19, 1988
- Post Trip Review Report dated May 20, 1988
- Unit 1 Trip Report, E. W. Harrell to W. L. Stewart dated March 21, 1988

- Memorandum to File Lessons Learned while Performing 1-ST-78, E.S. Hendrixon March 25, 1988
- 88-SE-ST-002 Evaluation for Potential Unreviewed Safety Question
- 1-ST-78 EHC System Response March 19, 1988

Measuring and Test Equipment (M&TE) Calibration

M&TE records for the following equipment used in the maintenance activities above were reviewed for completeness, accuracy and compliance to programmatic requirements i.e. ADM-12.0 11/25/87 Control of Measuring and Test Equipment; and AMD-12.1 11/25/88 Measuring and Test Equipment Calibration Program

NQC-1473	Outside Micrometer
NQC-1489	Torque Wrench
NQC-1492	Depth Gage
NQC-1297	Torque Wrench
NQC-1224	Outside Micrometer
NQC-1204	Dial Indicator
NQC-1163	Torque Wrench
NQC-1036	Torque Wrench

Within the areas inspected, no violations or deviation were identified.

4. Licensee Event Report (LER) Followup (90712 and 92700) Units 1 and 2.

The following LERs were reviewed and closed. The inspector verified that reporting requirements had been met, that causes had been identified, that corrective actions appeared appropriate, that generic applicability had been considered, and that the LER forms are complete. Additionally, the inspectors confirmed that no unreviewed safety questions were involved and that violations of regulations or TS conditions had been identified.

(Closed) LER 338/87-020, Inadvertent Opening of a Pressurizer Power Operated Relief Valve.

On October 10, 1987, with Unit 1 in Mode 5, a control room operator performed Inservice Inspection Periodic Test Procedure 1-PT-212.12 to exercise Residual Heat Removal System (RHR) heat exchanger outlet valves HCB-1758 and heat exchanger bypass valve FCV-1605. This test requires the valves to be stroked throughout their full range of motion (cycle). When HCB-1758 was stroked, all of the RHR flow was directed through the RHR heat exchangers resulting in a brief reduction in "B" loop cold leg temperature. This, automatically reduced the set point of the overpressure protection system to its lower set point. The lower set point, was below the reactor coolant system pressure and at least one Power Operated Relief Valve (PORV) lifted.

The root cause of this event was attributed to a lack of hands-on operator experience when performing subject test with RCS temperature in the range of 185° - 200°F. To correct the problem, Periodic Test Procedures 1-PT-212.12 and 1-PT-78.1 have been revised to monitor more closely RCS temperature while returning the RHR system back to service.

(Closed) LER 338/88-009, Missed Surveillance on a Blowdown Isolation Trip Valve.

Procedure Q.C. ASME Section XI Pump and Valve Program dated May 25, 1988, has been revised to required acknowledgement when an ASME Section XI valve is placed in the Alert Status and to verify that the required surveillance has been completed.

(Closed) LER 339/88-019, Missed Surveillance on a Containment Isolation Valve.

The inspector reviewed operations direction issued to ensure that each affected valve was independently addressed before being returned to service. Additionally, the Stations Action Station Status Log was revised to include the periodic test required to restore the equipment back to service.

5. Inservice Inspection Data Review and Evaluation (Unit 2) (72755)

The inspector reviewed the ISI NDE records indicated below to determine whether the records were consistent with regulatory requirements and licensee procedures. The appreciable code is the ASME Boiler and Pressure Vessel (M&PV) Code, Section XI, 1974 Edition, Summer 1975 Addenda.

The Unit 2, Inservice Inspection Report Supplement Document No.88-046 and 046A, were submitted on January 28 and March 31, 1988. The report were reviewed for completeness, clarity and compliance with Article IWA-6000 of ASME B&PV Code Section XI.

The following NDE records for the 1987 outage were reviewed:

	<u>Weld No.</u>
Ultrasonic Examination (UT):	#1 - DM RC Loop-3 27.5" diameter
	#25 - Loop-1 Feedwater 16" diameter
	#1 - 88" to 93"-Volume Control Tank
	#2 - 88" to 93"-Volume Control Tank
	#1 - 0" to 12" and Boron Injection Tank
	#2 - 24" to 49" Boron Injection Tank
	#3 - Nozzle - Boron Injection Tank

Flywheel, Loop-A

Visual Examination

24 Flange bolts, 4.35" diameter RC
Pump "B"
24 Flange bolts, 4.35" diameter RC
Pump "B"

These records were reviewed to ascertain whether NDE records contained or provided reference to:

- Examination results and data sheets
- Examination equipment data
- Calibration data sheet
- Examination evaluation data
- Records on extent of examination
- Records on deviation from program and procedures including justification for deviation, if applicable
- Re-examination data after repair work, if applicable
- Identification of NDE materials such as penetrant, penetrant cleaner, couplant, films, tapes, etc.

The most recent code repair selected for record review was as follows: 2 inch diameter pipe on Line #2" RC-457-102-Q1, Drawing Number RC-208A Rev.25. The controlling code(s) for fabrication inspection and testing were ANSI B31.7-69, and ASME Section XI (74W75). The licensee's records were reviewed to verify that the following requirements were met:

- Method, extent and technique of examination comply with licensee's Code repair/replacement procedures
- Examination data are within the acceptance criteria as outlined in the applicable Code repair/replacement procedures and applicable Code requirements.
- Recording, evaluating, and dispositioning of findings are in compliance with the applicable code repair/replacement procedures and applicable code requirements.
- Method used for NDE was sufficient to determine the full extent of indication or acceptance.

Within the areas inspected, no violations or deviations were identified.

Inspector Followup Item (92701) Units 1 & 2

- a. (Closed) UNR 338,339/87-41-01, Maximum Limiting Stroke Time on IWV Valve

This item was identified when the inspector ascertained that limiting stroke time for valves was not commensurate with the capabilities of the valves tested. Instead, limiting times of full stroke time, in the applicable performance procedures, were related to the particular system response time specified by the station's TS.

ISI Procedure 2.0 dated March 25, 1988, address the concern in a satisfactory manner and this matter is resolved.

- b. (Closed) IFI 338/87-41-02, High Ampere Values on Inside Recirculation, Spray Pump "B".

This item pertained to a motor ampere test that read 3x higher than those recorded on two other similar tests. The test was performed on the inside recirculation spray pump B' on March 7, 1987. Because at the time, the licensee could not account for this phenomenon, the licensee agreed to look further into the matter. The licensee's report dated January 25, 1988, states that the investigation found no evidence to indicate a pump problem. Rather the conclusion was that the reading was most likely recorded prior to the amps returning to normal operating range following start-up. As a result of this investigation, the licensee has placed administrative limits on all ASME XI IWP pumps for Units 1 and 2. The applicable test procedures will include an acceptance range for each pump motor amps on the next revision.

- c. (Closed) IFI 338/87-41-03, Documentation of Pump and Valve Testing Commitments.

This item was identified when the inspector learned through discussions with the resident NRC inspectors that because of a code relief granted by the Commission, inside recirculation pumps A and B would be dry tested after servicing rather than the wet test required to establish a baseline reference point following major maintenance. Because this exception had not been documented in the North Anna pump and valve program, the inspector requested the licensee to perform a document search i.e., license condition/NRC commitments etc., to determine what other pumps and valve tests a requirements may exist that are not delineated in the North Anna Pump and Valve Program. By memorandum from M. F. Walker to P. J. Naughton dated January 15, 1988, the licensee has indicated that containment isolation valves TV-2204 A and B are not currently included in the pump and valve program. Valve TV-2204A was recently installed and is addressed in Technical Specification Change/Ammendment #63. The memo states that the next revision of the Pump and Valve Program will contain updates for both valves. Both valves are currently being tested per code requirements.

5. Exit Interview

The inspection scope and results were summarized on June 10, 1988, with those persons indicated in paragraph 1. The inspector described the areas inspected and discussed in detail the inspection results listed below.

333/88-17-01 Open Inspector Followup Item (IFI) Rework Governor Valves
#2 and #3 and Associated Dump Valve (Paragraph 3)

Dissenting comments were not received from the licensee. Proprietary
information is not contained in this report.