



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

Report Nos.: 50-338/87-38 and 50-339/87-38

Licensee: Virginia Electric & Power Company  
Richmond, VA 23261

Docket Nos.: 50-338 and 50-339

Facility Name: North Anna 1 and 2

Inspection Conducted: November 20 - December 18, 1987

Inspectors:	<u><i>J. L. Caldwell</i></u>	<u>1/15/88</u>
	J. L. Caldwell, Senior Resident Inspector	Date Signed
	<u><i>L. P. King</i></u>	<u>1/15/88</u>
	L. P. King, Resident Inspector	Date Signed
Approved by:	<u><i>F. S. Cantrell</i></u>	<u>1/15/88</u>
	F. S. Cantrell, Section Chief	Date Signed
	Division of Reactor Projects	

SUMMARY

Scope: This routine inspection by the resident inspectors involved the following areas: plant status, licensee event report (LER followup), monthly maintenance observation, monthly surveillance observation, ESF walkdown, operator safety verification, operating reactor events, Temporary Instruction (TI) 2500/26, cold weather preparation, health physics, and instrumentation problems related to startup of Unit 2. During the performance of this inspection, the resident inspectors conducted reviews of the licensee's backshift operations on the following days - November 17, 18, 23, 24 and December 1, 2, 3, 4, 5, 7, 8, 14, 15, 16, 17 and 18, 1987.

Results: Three violations were identified: (1) Failure to follow the requirements of RWP-87-3156 (see paragraph 13); (2) Failure to perform adequate post maintenance testing on Unit 2 "A" Steam Generator Flow Channel III (see paragraph 14); (3) Violation of Technical Specifications (TS) 3.3.1.1 and 3.3.2.1 for failure to declare two steam flow channels inoperable (see paragraph 14).

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## REPORT DETAILS

### 1. Licensee Employees Contacted

- \*E. W. Harrell, Station Manager
- \*R. C. Driscoll, Quality Control (QC) Manager
- \*G. E. Kane, Assistant Station Manager
- \*M. L. Bowling, Assistant Station Manager
- R. O. Enfinger, Superintendent, Operations
- \*M. R. Kansler, Superintendent, Maintenance
- \*A. H. Stafford, Superintendent, Health Physics
- J. A. Stall, Superintendent, Technical Services
- \*J. L. Downs, Superintendent, Administrative Services
- J. R. Hayes, Operations Coordinator
- D. A. Heacock, Engineering Supervisor
- D. E. Thomas, Mechanical Maintenance Supervisor
- G. D. Gordon, Electrical Supervisor
- L. N. Hartz, Instrument Supervisor
- F. T. Terminella, QA Supervisor
- J. P. Smith, Superintendent, Engineering
- \*D. B. Roth, Nuclear Specialist
- J. H. Leberstein, Engineer
- \*G. G. Harkness, Licensing Coordinator
- \*L. L. Edmonds, Superintendent, Nuclear Training
- \*N. K. Martin, Security

Other licensee employees contacted include technicians, operators, mechanics, security force members, and office personnel.

The following members of the regional staff met with the North Anna staff on December 16, 1987, for a presentation of current plant initiatives and a plant tour:

- M. L. Ernst, Deputy Regional Administrator
- A. F. Gibson, Director, Division of Reactor Safety
- C. W. Hehl, Deputy Director, Division of Reactor Projects (DRP)
- F. S. Cantrell, Chief, Project Section 2A, DRP

\*Attended exit interview

### 2. Exit Interview (30703)

The inspection scope and findings were summarized on December 18, 1987, with those persons indicated in paragraph 1 above. The licensee acknowledged the inspectors findings. The licensee did not identify as proprietary any of the material provided to or reviewed by the inspectors during this inspection.

(Open) Violation 338/87-38-01: Failure to follow the requirements of RWP 87-3156 (see paragraph 13).

(Open) Violation 339/87-38-01: Failure to perform adequate post maintenance testing on Unit 2 "A" Steam Generator Steam Flow Channel III (FI-2474) (see paragraph 14).

(Open) Violation 339/87-38-02: Violation of T.S. 3.3.1.1 and 3.3.2.1 for failure to declare "A" Steam Generator Steam Flow Channel III and "B" Steam Generator Steam Flow Channel IV inoperable. This is being considered for escalated enforcement (see paragraph 14).

(Open) Unresolved Item 339/87-38-03. Lack of overpressure protection for the B accumulator (see paragraph 9).

### 3. Plant Status

#### Unit 1

Unit 1 began the inspection period operating at 100% power. On November 23, the unit tripped due to a failed high level switch on the 5A feedwater heater (See paragraph 10 for details). The unit was back on line by November 24. On November 28, the "B" Reactor Coolant Pump (RCP) number one seal leak off went off scale high. This resulted in a forced reactor shutdown to replace the "B" RCP seal package. On December 8, the licensee restarted Unit 1, and the unit is presently operating at 100% power.

#### Unit 2

Unit 2 began and ended the inspection period operating at 100% power. However, on December 3, the Unit 2 "B" accumulator relief valve began lifting, making it difficult for the operators to maintain the required pressure in "B" accumulator. The licensee gagged the failed relief and installed one from Unit 1 in the vent line next to the original relief valve (See paragraph 9 for details).

### 4. Unresolved Items

An unresolved item is a matter about which more information is required to determine whether it is acceptable or may involve a violation or deviation.

One unresolved item was identified in this report and is discussed in paragraph 9.

### 5. Licensee Event Report (LER) Follow-up (90712 and 92700)

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 were 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 339/86-01 (Rev. 1): High Lift Setpoints on Main Steam Safety Valves. The valves have been tested at Wyle Laboratories and reset.

(Closed) LER 338/87-06: RCP Busses Undervoltage Relays Out of Tolerance: 1/2 PT-33.2A,B,C were revised to include the new dropout voltages.

(Closed) LER 338/87-16: Inoperable Turbine Overspeed Protection System Due to Incorrectly Reassembled Intercept and Reheat Stop Valves. A procedure has been developed to control maintenance on both Units 1 and 2 intercept and reheat stop valves. The procedure includes steps for proper identification of components. Each valve and actuator will be uniquely identified to preclude incorrect assembly.

(Closed) LER 338/87-19: Excessive Skin Exposure Due to Contamination From Hot Particle Transferred to Individual from Laundered Protective Clothing. The following actions have been taken by the licensee:

- a. An automatic laundry monitor has been installed.
- b. Four additional personnel contamination monitors have been purchased and placed into operation.
- c. A one hour session was developed and conducted for radiation workers at station. Hot particle information has been included with General Employee Training.
- d. A four hour session was developed and conducted 17 times to give special training to all Health Physics technicians.
- e. Radiological work practice #22C was developed to provide guidelines for establishing controls for hot particles.

(Closed) LER 338/87-09 (Rev. 0 and 1): Main Steam Safety Valves Setpoints Below TS Minimum. All 15 safety valves were sent to Wyle Labs for testings. Eleven safety valves had low setpoints and were readjusted to within specification. The safety analysis contained in Chapter 15 of the UFSAR was still bounding and there was no unreviewed safety question.

(Closed) LER 338/87-13: Loss of Normal Power Supply to Emergency Bus During Testing. The licensee determined the root cause was failure to follow procedure. The electrical maintenance procedure has been revised to emphasize the requirement that all wires need to be lifted prior to testing relays.

(Closed) LER 338/87-18 (Rev. 0 & 1): Non-Environmentally Qualified Motor As Required Had No Documentation. The licensee determined the root cause of the event. Present level of training should prevent reoccurrence.

(Closed) LER 338/87-03: Single Component Failure in Access Control Cardreaders/Failure Could Have Permitted Unauthorized/Undetected Access into Vital Areas. The licensee has taken corrective action.

(Closed) LER 339/87-03: Improper Determination of Quadrant Power Tilt Ratio. QPTR was determined by one set of four symmetric incore thimbles instead of two sets. The P-250 program was revised so that a tilt is only printed when eight of the symmetric thimbles are obtained and calibrated. The program has been implemented on both Units 1 and 2 P-250 computers.

(Closed) LER 339/87-06: Reactor Trip Caused by a Failing Intermediate Range Detector. Detector replaced and calibrated. Also, replaced H.V. power supply, P-6 bistable board and spare bistable board.

(Closed) LER 339/87-08: Pressurizer Safety Valves Set Pressures Not Within TS Limits. The safety valves were repaired and readjusted at Wyle Labs to within the correct set pressure allowed by TS 3.4.3.

#### 6. Monthly Maintenance (62703)

Station maintenance activities affecting safety related systems and components were observed/reviewed, to ascertain that the activities were conducted in accordance with approved procedures, regulatory guides and industry codes or standards, and in conformance with TS.

The inspector attended several daily maintenance meetings during the outage to replace the radial motor bearings and the seal package on the Unit 1 "B" reactor coolant pump. The inspector made several tours of the containment and observed the work on the radial bearings for the "B" reactor coolant pump motor. The Westinghouse procedure for the repair was reviewed. Readings taken before the bearings were replaced indicated the tolerances were out of specification. It was not clear at this time if the seal failure was due to the problem with the radial bearing.

The inspector observed work on the replacement of a drain valve FW-69 on the 1-RC-E-1A main steam generator feed line.

Several valves were repacked on the "C" accumulator during this outage. The inspector noted during a walkdown of containment that the following additional accumulator valves appeared to need repacking based on boric acid buildup on valve stems. The licensee was informed of the inspectors' observations:

- a. Motor operated valve 1850 C
- b. "B" accumulator outlet
- c. All three accumulators makeup valves
- d. "A" accumulator lower level transmitter shutoff valve 1-S1-117

The inspector reviewed the work order and inspected the work on main feedwater valve FW-110. This is a pressure seal valve that was leaking badly before the outage. The manufacturer was contacted and a spacer ring was machined. The valve was reassembled.

No violations or deviations were identified.

7. Monthly Surveillance (61726)

The inspectors observed/reviewed technical specification required testing and verified that testing was performed in accordance with adequate procedures, that test instrumentation was calibrated, that limiting conditions for operation (LCO) were met and that any deficiencies identified were properly reviewed and resolved.

On November 25, 1987, the inspectors observed 2-PT-14.1 "Test of the Unit 2 "A" Charging Pump". No problems were identified.

On December 3, 1987, the inspectors observed containment air lock leak rate test 1-PT-62.4. The seal failed the test and needed to be replaced. The next test was performed satisfactorily on December 12, 1987.

On December 2, 1987, the inspectors observed the start of the security diesel using test 1-MISC-20. No problems were identified.

No violations or deviations were identified.

8. ESF System Walkdown (71710)

The following selected ESF system was verified operable by performing a walkdown of the accessible and essential portions of the system on December 15, 1987:

A check was made of the Unit 1 casing cooling system using operations checklist 1-OP-7.10A.

No violations or deviations were identified.

9. Operational Safety Verification (71707)

By observations during the inspection period, the inspectors verified that the control room manning requirements were being met. In addition, the inspectors observed shift turnover to verify that continuity of system status was maintained. The inspectors periodically questioned shift personnel relative to their awareness of plant conditions.

Through log review and plant tours, the inspectors verified compliance with selected TS and Limiting Conditions for Operations.

In the course of the monthly activities, the resident inspectors included a review of the licensee's physical security program. The performance of various shifts of the security force was observed in the conduct of

daily activities to include: protected and vital areas access controls, searching of personnel, packages and vehicles, badge issuance and retrieval, escorting of visitors, patrols and compensatory posts. In addition, the resident inspectors observed protected area lighting, protected and vital areas barrier integrity and verified an interface between the security organization and operations or maintenance.

On a regular basis, radiation work permits (RWP) were reviewed and the specific work activity was monitored to assure the activities were being conducted per the RWPs. Selected radiation protection instruments were periodically checked and equipment operability and calibration frequency was verified.

The inspectors kept informed, on a daily basis, of overall status of both units and of any significant safety matter related to plant operations. Discussions were held with plant management and various members of the operations staff on a regular basis. Selected portions of operating logs and data sheets were reviewed daily.

The inspectors conducted various plant tours and made frequent visits to the control room. Observations included: witnessing work activities in progress; verifying the status of operating and standby safety systems and equipment; confirming valve positions, instrument and recorder readings, annunciator alarms, and housekeeping.

On December 2, at 11:45 a.m., the Unit 2 operators commenced nitrogen makeup to the "B" accumulator in order to maintain the pressure within the TS limits. At 1:45 p.m., the licensee discovered that the relief valve was lifting on the "B" accumulator and at 3:38 p.m., the licensee gagged the relief valve. The following day at 3:51 a.m., the licensee successfully blocked open the nitrogen fill isolation valve to the "B" accumulator ensuring that the relief valve on the nitrogen fill header would not be isolated from the "B" accumulator. This nitrogen relief valve was exactly like the accumulator relief with the exception that the nitrogen relief has a carbon steel body and the accumulator relief had a stainless steel body.

On December 3, the inspectors questioned the licensee whether the relief setpoints and capacities for the nitrogen relief and the accumulator relief were the same and whether or not the nitrogen relief was in the Inservice Inspection (ISI) program (i.e., periodically setpoints tested). On December 4, the licensee informed the inspectors that at approximately 2:00 a.m., a Unit 1 relief valve was installed on a vent line next to the gagged Unit 2 "B" accumulator relief valve because with different piping configuration, they could not demonstrate equivalent relieving capability with the nitrogen relief valve. This vent line is the same size as the relief line and the vent line isolation valve was locked open. The reason for this installation was because the licensee could not demonstrate that the relief capabilities were the same between the nitrogen relief and the accumulator relief even though they were confident that the accumulator could not exceed pressures beyond which it had already been tested. Also,

even though the nitrogen relief valve had a listed setpoint of 700 psig, the same as the accumulator relief, this valve was not in the ISI program and had not been tested since it was installed. The valve had lifted in the recent past due to high pressures in the nitrogen system, but the licensee could not be sure what the setpoint was. Consequently, the licensee decided to install a qualified and tested relief valve obtained from Unit 1 which was in Mode 5, cold shutdown, at the time. This item is identified as Unresolved Item 339/87-38-03, pending NRC determination of the acceptability of the relief valve being downstream of a blocked open isolation valve.

On December 7, the inspectors witnessed portions of the Unit 1 startup per 1-OP-1.4, Unit Startup from Hot Shutdown Condition (Mode 4) to Hot Standby Condition (Mode 3) at 547 degrees F. Also, on December 7, the inspectors witnessed portions of 1-OP-1.5, Unit Startup from Hot Standby Condition (Mode 3) to Startup Condition (Mode 2) with Reactor Critical at Less Than or Equal to 5% Power, for Unit 1. During the performance of the procedure, the rod bottom light for rod B2 in Bank A failed to go out when the rods in Bank A were pulled past 35 steps. When the Instrumentation and Control (I&C) technicians could not quickly resolve the problem, the operators elected to drive the rods in Bank A back into the core. A bistable card was replaced to correct the problem.

No violations or deviations were identified.

#### 10. Operating Reactor Events (93702)

The inspectors reviewed activities associated with the below listed reactor events. The review included determination of cause, safety significance, performance of personnel and systems, and corrective action. The inspectors examined instrument recordings, computer printouts, operations journal entries, scram reports and had discussions with operations, maintenance and engineering support personnel as appropriate.

At 0009, on November 23, Unit 1 experienced a turbine trip and resulting reactor trip. The turbine trip was caused by a level switch in the number 5A feedwater heater which failed high. This failure of the level switch also tripped the condensate pumps which in turn caused the feedwater pumps to trip and the feedwater regulating valves to go shut. Steam generator level was restored and maintained by the auxiliary feedwater pumps until the condensate and feedwater pumps could be restarted. The reactor coolant system TAVE dropped to approximately 520 degrees F, pressure dropped to approximately 1860 psig and pressurizer level dropped to less than 15% at their lowest points.

The licensee is investigating the cause of the level switch failure. Also, during this event, the following problems occurred:

- a. With the steam dumps in the steam pressure mode below 547 degrees F, three dump valves came open. Only two dump valves are supposed to open; the third valve had to be de-energized shut.



- b. Two of the three main feedwater isolation valves failed to go fully closed when the operator manually closed the valves from the control room to reduce the leakage past the feedwater regulation valves.
- c. One of the turbine trip valves failed to provide a reactor protection trip signal or indicate a shut position in the control room following the turbine trip. The licensee discovered that the valve actually went shut, but the position indication linkage was broken.
- d. Two control rods, G-13 and B-6 did not indicate fully inserted following the trip. The licensee determined that the control rods were actually inserted and the problem was with the Individual Rod Position Indication for those two control rods.

The inspectors will follow the licensee's actions related to the above problems and review their corrective actions to ensure that they are adequate.

No violations or deviations were identified.

11. Compliance Bulletin No. 87-02

On December 3, 1987, the inspector participated in the selection of fasteners in accordance with the guidelines given in the subject bulletin. The licensee selected the fasteners by reviewing the usage rates from the storeroom and warehouse. Sections of threaded stock were also selected. The licensee site and corporate engineering staff as well as plant quality assurance group participated in the selection from the storeroom and warehouse. After the destructive testing is completed on the selected fasteners, the results of the test will be sent by the licensee to the NRC.

12. Cold Weather Preparation (71714) - Units 1 and 2

The inspectors reviewed the following preventative maintenance procedures which are performed prior to cold weather:

- a. PM-E-00-HT/A-1 - Heat Trace Verification
- b. PM-E-00-HV/A-1 - Heaters
- c. PM-M-00-SY/A-1 - Walkdown of Outdoor Areas
- d. PM-M-00-SY/A-2 - Plant Winterization Program, Storeroom
- e. PM-M-00-SY/A-3 - Plant Winterization Program, Mechanical Department
- f. PM-M-00-SY/A-4 - Installation of Thermal Barriers
- g. PM-M-00-FP/SA-1 - Fire Gate Valve Lubrication

No problems were identified.

## 13. Health Physics

On November 24, 1987, during the Unit 1 startup, auxiliary operators were throttling the feedwater outlet valve from the main feedwater regulator. This area was designated as a contaminated area by RWP 87-3156 due to leakage from FW-110. The inspector observed that the operators were not following the portion of the RWP that required them to obtain a whole body frisk.

Technical Specification 6.11 requires that procedures for personnel radiation protection shall be prepared consistent with the requirement of 10 CFR Part 20 and shall be approved, maintained and adhered to for all operations involving personnel radiation exposure. Licensee procedure HP 5.310 establishes a work permit program. Health Physics procedure 5.320, "Initiating, Using, Extending and Terminating a Radiation Work Permit (RWP)" is part of that program. It requires a radiation worker to comply with the requirements, instructions, and precautions of the RWP. The failure of the auxiliary operators to perform a whole body frisk constitutes a violation of TS. 6.11 and is identified as Violation 87-38-01.

## 14. Previous Inspection Followup

(Closed) Unresolved Item (338,339/87-36-03), Potential Inadequate Post Maintenance Testing. During a review of this item, that inspectors discovered several problems. The first deals with the discovery by the licensee on November 4, 1987, during the Unit 2 startup, the steam flow instrument FI-2474 was inoperable due to the instrument leads being reversed (LER 87-15). The inspector was informed by the licensee that maintenance had been performed on this steam flow instrument during the refueling outage in the form of replacement of the Raychem splices per Engineering Work Request (EWR) 87-206. The inspector reviewed the EWR 87-206 and discovered that for Steam Flow Instrument FI-2474, the signoffs for post maintenance testing were not completed. The inspector determined that this EWR had been reviewed by all the required personnel including the station safety committee without detecting that the proper signoffs had not been made for the post maintenance testing of FI-2474. A review by the inspector of the actual post maintenance test revealed that if the test had been performed on FI-2474 it would have detected the reversed leads.

Considering the fact that there is no complete documentation of a post maintenance testing being conducted on FI-2474, that if the test had been performed the problem of the reversed leads would have been detected and finally that steam flow channel FI-2474 instrument leads were in fact reversed without being detected indicates that a proper post maintenance test was not conducted on FI-2474 following maintenance. The result of this lack of post maintenance testing was that the licensee operated Unit 2 from Mode 3 through Mode 1 up to 27 percent without having the Reactor Protection System (RPS) and Engineering Safety Feature (ESF) trip signal associated with FI-2474 operable.

Technical Specification 6.8.1.c requires written procedures be established, implemented and maintained covering surveillance and test actuators of safety related equipment. The failure of the licensee to conduct a proper post maintenance test of steam flow instrument FI-2474 following maintenance which resulted in a degraded RPS and ESF system trip protection will be identified as violation (339/87-38-01).

The second problem involves the delay by the operators in declaring steam flow instruments FI-2474 ("A" Steam Flow Channel III) and FI-2485 ("B" Steam Flow Channel IV) inoperable. During the review of the unresolved item the inspectors reviewed the operator's (both SRO and CRO) shift logs and the operator's Technical Specification (TS) required channel check logs. This review revealed that as early as 1200 noon on November 4, 1987, the operators had enough information to declare the steam flow channels FI-2474 and FI-2485 inoperable and place them in the trip condition as required by TS. The 1200 noon channel check logs indicated that both the above channels were essentially reading zero steam flow while their redundant steam flow channels as well as both the C loop steam flow channels were indicating approximately  $0.5 \times 10^6$  pounds mass per hour. The licensee's acceptance criteria for a proper channel check is a maximum of  $\pm 0.25 \times 10^6$  pounds mass per hour difference between redundant channels on a steam line. The licensee's operations standard which addresses channel check criteria states in part that an instrument channel shall be declared inoperable when the stated acceptance criterial tolerances are exceeded and the applicable actions of TS shall be implemented. At this point, the operators failed to declare the steam flow channels inoperable and to place them in a trip condition for both RPS and ESF trip signals as required by TS.

On November 4, 1987, Unit 2 which was in Mode 2 continued with the startup. At approximately 17:54 on November 4, Unit 2 was placed on line and per the SRP log entry at 1816 on November 4, with the unit at 24 percent power, the steam flow channels FI-2474 and FI-2485 were reading zero steam flow. Also a review of the channel check logs revealed that the 2000 channel check stated that both FI-2474 and FI-2485 were pegged low with the redundant steam flow channels reading approximately  $1 \times 10^6$  pounds mass per hour. The operators again failed to comply with TS channel check criteria and place these steam flow channels in the trip condition.

It was not until 2153, approximately 4 hours after Unit 2 achieved greater than 20 percent reactor power, that steam flow channels FI-2474 and FI-2485 which were still reading zero (ie, failed flow) steam flow were declared inoperable. It was later discovered that the reason for FI-2474 being inoperable was due to the instrument leads being reversed and for FI-2485 mechanical agitation conducted on the instrument in containment caused the channel to indicate properly. Therefore it is clear that the steam flow channel FI-2474 was inoperable and would not have provided its RPS or ESF trip signals from the time Unit 2 was in Mode 3 up through Mode 1 at approximately 27 percent power and should have been placed in the trip condition as soon as the operators had indication of a problem. Also the

steam flow channel FI-2485 which required mechanical agitation to become operable appeared to have been inoperable for Mode 3 through Mode 1 and again should have been placed in the trip condition as soon as the operators had an indication of a problem.

TS 3.3.1.1 and 3.3.2.1 requires that all of the steam flow channels be operable with the Unit in Modes 1, 2, and 3 and Action Statement 7 and 14 respectively state that operation may proceed until the performance of the next required channel functional test provided the inoperable channel is placed in the tripped condition within 1 hour. The failure of the licensee to comply with TS 3.3.1.1 and 3.3.2.1 and place steam flow channels FI-2474 and FI-2485 in the tripped condition within 1 hour resulting in degraded RPS and ESF trip protection will be identified as a Violation (339/87-38-02).