



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

Report Nos.: 50-338/88-16 and 50-339/88-16

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: May 14 / June 10, 1988

Inspectors:	<u>Mike Scott</u>	<u>6-29-88</u>
	J. L. Caldwell, Senior Resident Inspector	Date Signed
	<u>Mike Scott</u>	<u>6-29-88</u>
	L. P. King, Resident Inspector	Date Signed
Approved by:	<u>F. Cantrell</u>	<u>6/30/88</u>
	F. Cantrell, Section Chief	Date Signed
	Division of Reactor Projects	

SUMMARY

Scope: This routine inspection by the resident inspectors involved the following areas: plant status, review of inspector follow-up items, monthly maintenance observation, monthly surveillance observation, ESF walkdown, and operator safety verification. During the performance of this inspection, the resident inspectors conducted reviews of the licensee's backshift operations on the following days - May 15, 16, 24, 26, June 1, 2, 3, 7, 8, 9 and 10.

Results: Two violations were identified: (1) failure to perform an adequate 10 CFR 50.59 safety evaluation before placing the Recirculation Spray Heat Exchangers (RSHXs) in wet layup conditions - paragraph 4; and, (2) violation of TS 3.8.1.1 for having two inoperable Emergency Diesel Generators (EDG) - paragraph 8.

REPORT DETAILS

1. Licensee Employees Contacted

- G. E. Kane, Station Manager
- *R. C. Driscoll, Quality Control (QC) Manager
- *R. O. Enfinger, Assistant Station Manager
- *M. L. Bowling, Assistant Station Manager
- *J. A. Stall, Superintendent, Operations
- *M. R. Kansler, Superintendent, Maintenance
- *A. H. Stafford, Superintendent, Health Physics
- *D. A. Heacock, Superintendent, Technical Services (Acting)
- J. L. Downs, Superintendent, Administrative Services
- J. R. Hayes, Operations Coordinator
- E. S. Hendrixson, Engineering Supervisor (Acting)
- 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
- *T. L. Potter, NSE Supervisor
- *D. E. Quartz, Associate Engineer

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

*Attended exit interview

2. Exit Interview (30703)

The inspection scope and findings were summarized on June 10, 1988, 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 338,339/88-16-01: Failure to perform an adequate 10 CFR 50.59 safety evaluation potentially resulting in all of the RSHXs being "inoperable" due to fouling of the heat transfer surface resulting from wet layup conditions - paragraph 4.

(Open) Violation 338,339/88-16-02: Violation of TS 3.8.1.1 for having 2H and 2J EDGs inoperable at the same time for approximately 38 hours. This resulted from an inadequate evaluation of an INPO SER 14-87 and IEIN 87-41 - paragraph 8.

3. Plant Status

Unit 1

Unit 1 began and ended the inspection period operating at approximately 100% power.

Unit 2

Unit 2 began the inspection period operating at approximately 100% power. On May 19, the licensee discovered that both the 2J and 2H Emergency Diesel Generators (EDG) had been inoperable for approximately 38 hours. At the time of discovery, the 2J EDG, which had been inoperable due to preplanned preventative maintenance, had just completed the surveillance test and was fully operable (see Section 8 for details). The unit continued to operate at approximately 100% power throughout the inspection period.

Both Units

On June 18, a meeting was conducted in Atlanta with the licensee concerning the recent discovery of the heat transfer problems associated with both Units 1 and 2 RSHXs. The meeting concluded with the NRC satisfied that the actions already performed and the ones committed to be performed by the licensee were sufficient to permit continued operation of both Units 1 and 2.

4. Review of Inspector Follow-up Items (92701)

(Open) URI 338,339/88-11-02: Potential Inoperable Recirculation Spray Heat Exchangers. A review was conducted by the inspectors of 1-PT-210.1 and 2-PT-210.1 "Valve Inservice Inspection (Service Water MOVs to RSHX)". The inspectors reviewed the microfilm of the procedures back to 1985. The procedures had been deviated to allow the heat exchangers to remain full of water after the surveillance test contrary to the commitments of the UFSAR which required them drained and blown dry with air. The inspectors could not find any completed 10 CFR 50.59 safety evaluations that allowed deviation of the procedure until October 1987 when a 10 CFR 50.59 safety evaluation was performed to allow the deviation to PT-210.1. This safety evaluation was inadequate in that it did not address the fouling of the heat exchangers as a potential problem.

The licensee later provided the inspectors with a safety evaluation performed in 1980 which allowed the heat exchangers to be filled with primary grade water following the heat exchanger draining sequences. This safety evaluation also did not address the heat transfer capability reduction due to increased fouling from the heat exchanger being wet instead of dry.

In May 1988, following the partial CDA signal on Unit 2, (as discussed in Inspection Report 338,339/88-11, Section 10) which resulted in service

water flowing through the RSHXs, the inspectors requested a copy of the licensee's 10 CFR 50.59 safety evaluation to allow deviation from the FSAR commitments to maintain the RSHXs in dry layup. This safety evaluation concluded that the previous evaluations had been inadequate because they did not address the decrease in heat transfer capability due to the increase fouling from the heat exchangers being exposed to service water.

The May 1988, safety evaluation also determined that the design fouling factor for the RSHXs was zero and that based on the Tubular Exchanger Manufacturers Association (TEMA) manual the fouling factor was actually approximately 0.002 for the type of service water at North Anna. With this fouling factor, the licensee determined that the service water temperature could not exceed 84 degrees F and still have the heat transfer capability of the RSHXs comply with the design basis in that containment pressure would not necessarily be subatmospheric within an hour following a design based Loss of Coolant Accident (LOCA). An investigation of previous service water temperature records indicates that it is not uncommon for service water temperatures to exceed 84 degrees F during the hot summer months.

10 CFR 50.59 states in part that a licensee may make changes in the procedures as described in the safety analysis report without prior Commission approval unless the proposed change involves a change in the TSs incorporated in the license or an unreviewed safety question. A proposed change shall be deemed to involve an unreviewed safety question if the margin of safety as defined in the basis for a TS is reduced. Final Safety Analysis Report (FSAR), paragraph 6.2.2.2.5 states in part that in order to ensure long-term reliability of the recirculation spray heat exchangers, following each periodic test of the heat exchanger inlet and outlet valves (e.g. PT 210.1), the heat exchangers are put in dry layup by draining water through the heat exchanger drain valves and then purging the heat exchanger with compressed air until there is no visual indication of moisture from the drains. TS 3.6.2.2 states in part that the containment recirculation spray system shall be operable with four separate and independent containment recirculation spray subsystems, each composed of a spray pump, associated heat exchanger and flow path.

The failure of the licensee to perform an adequate 10 CFR 50.59 evaluation when periodic tests 1-PT-210.1 and 2-PT-210.1 were deviated to allow the heat exchangers to remain filled with service water constitutes a violation and is identified as violation 338,339/83-16-01.

The licensee has flowed each of the heat exchangers with service water and has completed a special procedure involving the heat exchangers being injected with chemicals to remove any biological fouling. The heat exchangers have been flushed, drained and blown down with service air.

The licensee power engineering services has written a letter to plant engineering stating that once the recirculation spray heat exchangers are placed in dry layup and the surveillance program is established to ensure they remain in dry layup, a service water temperature administrative limit of 92 degrees F. is applicable based on a dry fouling factor of .00075.

The licensee informed the inspector that based on chemical analysis of RSHX's flush water, the visual inspection of the RSHX, and calculation by their contractor, they will revise their previous evaluation of the worst case fouling factor and the maximum allowed service water temperature. This item will remain open pending the inspector's review of the reanalysis.

5. 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 Technical Specifications.

No violations or deviations were identified.

6. 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.

The inspectors reviewed portions of 2-PT-213.1 for the in-service inspection of containment isolation valves. The following valves failed to indicate shut:

- 2-TV-SS-206B (Hot Leg Sample Valve)
- 2-TV-SS-212B (Steam Generator Surface Sample)
- 2-TV-SS-203A (RHR Sample Header Inside Containment)
- 2-TV-SS-200B (Pressurizer Liquid Space)

In all cases, the action required by TS 3.6.3.1 was taken. The other valve in the line was closed and de-energized and a work request was written to perform necessary corrective action on the valve. The licensee will be evaluating the operation and maintenance of these valves to determine the root cause.

The inspectors also reviewed 1-PT-24.1, Calorimetric. No problems were identified.

On May 24, the inspectors witnessed portions of the Unit 2 surveillance test 2-PT-34.3, Turbine Valve Freedom Test. This procedure verifies that each of the turbine isolation valves will go shut when the auto stop oil is bled off of the valve. This ensures that steam will be isolated to the turbine following a trip signal which bleeds off the auto stop oil pressure, to prevent turbine overspeed. During the test, two of the low pressure turbine isolation valves failed to go shut when the test solenoid was de-energized. The licensee determined that the test solenoid had

stuck in the closed position. The test solenoids were unstuck and the valves were successfully stroked. The inspector was able to determine, based on discussions with the licensee, that the test solenoid failure has no effect on the normal flow path for the auto stop oil during an actual overspeed trip signal. Consequently, a failure of a test solenoid will not prevent or hinder an actual overspeed protection isolation.

No violations or deviations were identified.

7. ESF System Walkdown (71710)

The following selected ESF systems were verified operable by performing a walkdown of the accessible and essential portions of the systems on June 7, 1988. The inspectors performed a walkdown of Chemical and Volume Control System using 1-OP-8.1A.

No violations or deviations were identified.

8. 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 Technical Specification (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.

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.

The following comment was noted:

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The following comment was noted:

On May 19, 1988, while testing the 2J Emergency Diesel Generator (EDG) following preventative maintenance (PM), the licensee discovered an oil leak in the governor servo booster and a lagging interference with the governor linkage. Both contributed to the EDG failure to operate properly. Consequently, the licensee shutdown the 2J EDG and commenced unplanned corrective maintenance to correct the problems. The maintenance was completed and the 2J EDG satisfactorily tested on the same day.

Technical Specification (TS) 3.8.1.1.b requires, with one EDG inoperable, the operable EDG be tested within 24 hours if the inoperable EDG is inoperable due to any cause other than preplanned PM or testing. Since the 2J EDG PM had changed to unplanned corrective maintenance, then the 2H EDG was required to be tested within 24 hours. On May 19, following the satisfactory testing of the 2J EDG, an attempt was made to test the 2H EDG. The attempt was unsuccessful due to a failure of the 2H EDG output breaker to close. The licensee determined that the breaker closing spring had not been charged due to a failure of the charging motor. The failure of the charging motor resulted from mounting bolts becoming loose allowing the motor to become unmounted from the breaker frame rendering it unable to charge the closing spring. The licensee determined that the last time the EDG output breaker had been closed was May 6 and that procedures did not require the operator to verify the closing spring had recharged. Consequently, following the breaker manipulation on May 6 the charging motor failed to recharge the closing spring and the 2H EDG was inoperable until discovered and repaired on May 19. Also, with the PM commencing on the 2J EDG on May 18, rendering it inoperable, the licensee had both Unit 2 diesels inoperable for approximately 38 hours.

The licensee's diesel output breaker is a 4160 volt breaker manufactured by ITE. This breaker failure and problem associated with the loose mounting bolts was identified in NRC Information Notice Number 87-41 dated August 1987 and INPO SER 14-87 dated May 1987. However, the Information Notice and SER discussed failures associated with Brown Boveri breakers and the licensee has ITE breakers. This resulted in some confusion even though the licensee eventually realized that Brown Boveri had purchased ITE. The INPO SER 14-87 made the following recommendations:

- a. Breaker receipt and preventive maintenance inspections should include a tightness check of charging motor mounting bolts. When loose or missing mounting bolts are found during preventive maintenance inspections, the interval between inspections should be decreased, and the breaker should be tested to verify operability.
- b. Plants with Brown Boveri Type HK circuit breakers that find loose charging motor mounting bolts should consider the use of a thread adhesive and consult with Brown Boveri to determine torquing requirements for the bolts. If thread adhesive is to be used, the manufacturer recommends Loc-Tite number 242 or equivalent.
- c. Operations personnel daily rounds should include a check of charging motor mechanical indicators where available on safety-related

breakers. These indicators should also be checked following scheduled maintenance or testing.

The licensee informed the inspectors that their response to the INPO SER involved an undocumented visual inspection of approximately ten non-safety related and four safety related 4160v AC breakers. This visual inspection as reported to the inspectors did not identify any problems with the charging motors. However, no wrenches were actually placed on the charging motor mounting bolts to verify tightness. Also, the licensee informed the inspectors that they felt that the present PM procedure EMP-P-PH-01, Electrical Checkout of 4160 Volt Load Center Air Circuit Breaker, had sufficient instructions to verify the tightness of the charging motor mounting bolts. The inspectors review of EMP-P-PH-01 revealed that the only step that would perform this check was step 7.7 which simply states "check mechanical tightness of breaker". This step would not require a technician to specifically check the tightness of the charging motor mounting bolts. Recommendation "C" of the INPO SER was not addressed at all by the licensee. Implementation of this recommendation would have prevented the 2H EDG from being inoperable for several weeks without the licensee's knowledge. A requirement to check that the closing springs were charged following each operation or a requirement to check that the breakers are charged on the daily rounds would have identified the inoperable 2H EDG output breaker on May 6. This would have prevented the licensee from operating Unit 2 at 100% power for 38 hours on May 18 and 19 with two inoperable EDGs.

The licensee's response to Information Notice 87-41 ranged from not applicable to North Anna, to, verify if North Anna's ITE breakers are the same as Brown Boveri breakers. However, the only action that was taken was to contact Brown Boveri. This discussion with Brown Boveri is documented by memo from K. S. Berger, VEPCO, to F. C. Prince, VEPCO, both of the corporate office, dated January 4, 1988. The memo states that Mr. Roland Wintenberger of Brown Boveri (BB) informed the licensee that no potentially defective breakers have been supplied to North Anna. Therefore, the memo concluded that the Information Notice was not applicable to North Anna. The licensee also informed the inspectors that BB stated that these breakers are good for 1000 cycles and none of the licensee's safety related breakers are close to 1000 cycles. Based on the above paragraph, it is clear that the licensee's response to the INPO SER and NRC Information Notice was not adequate to address the problem.

Following the 2H EDG output breaker failure, all the emergency 4160 volt breakers for both units were verified to be charged. The licensee is presently developing a program for future surveillances and inspections of the breakers including checking for tightness of the charging motor mounting bolts.

The licensee is presently in the process of inspecting as many 4160 volt AC breakers as allowed with the units operations. Of the 137 total safety

and non-safety related breakers, 22 have been inspected and four have been identified with loose mounting bolts. One of the four defective breakers had one of the three mounting bolts which no longer made thread engagement with the breaker frame. A second bolt was loose but the charging motor was still firmly mounted with the third bolt. This breaker was associated with the Unit 1A low head safety injection pump.

T.S. 3.8.1.1 states in part as a minimum, the following AC electrical power sources shall be operable; two separate and independent diesel generators. The failure of the licensee to take the necessary corrective action to prevent failure of the EDG output breaker resulting in both EDGs being inoperable for approximately 38 hours will be identified as a Violation 339/88-16-02.

No other violations or deviations were identified.