



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

REGION II  
SAM NUNN ATLANTA FEDERAL CENTER  
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ATLANTA, GEORGIA 30303-8931

July 28, 2006

Virginia Electric and Power Company  
ATTN.: Mr. David A. Christian  
Sr. Vice President and  
Chief Nuclear Officer  
Innsbrook Technical Center - 2SW  
5000 Dominion Boulevard  
Glen Allen, VA 23060-6711

SUBJECT: NORTH ANNA POWER STATION - NRC INTEGRATED INSPECTION  
REPORT NOS. 05000338/2006003, 05000339/2006003, AND  
07200016/2006001 AND ANNUAL ASSESSMENT MEETING SUMMARY

Dear Mr. Christian:

On June 30, 2006, the United States Nuclear Regulatory Commission (NRC) completed an inspection at your North Anna Power Station, Units 1 and 2. The enclosed integrated inspection report documents the inspection findings, which were discussed on July 14, 2006, with Mr. Jack Davis and other members of your staff.

The inspections examined activities conducted under your licenses as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your licenses. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

Based upon the results of this inspection, one NRC-identified finding and two self-revealing findings of very low safety significance (Green) were identified. These three findings were determined to involve violations of NRC requirements. However, because of their very low safety significance and because they were entered into your corrective action program, the NRC is treating these three findings as non-cited violations (NCVs) consistent with Section VI.A of the NRC Enforcement Policy. In addition, three licensee-identified violations, which were determined to be of very low safety significance (Green), are listed in Section 4OA7 of this report. If you contest any non-cited violation in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the United States Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, D.C. 20555-0001; with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, D.C. 20555-0001; and the NRC Resident Inspector at the North Anna Power Station.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response, if any, will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's document system (ADAMS). ADAMS is accessible from the NRC Web site at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,

**/RA/**

Kerry D. Landis, Chief  
Reactor Projects Branch 5  
Division of Reactor Projects

Docket Nos.: 50-338, 50-339, 72-016  
License Nos.: NPF-4, NPF-7, SNM-2507

Enclosures: Inspection Reports 05000338/2006003, 05000339/2006003, and  
07200016/2006001 w/Attachment: Supplemental Information

cc w/encl: (See page 3)

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Sincerely,

**/RA/**

Kerry D. Landis, Chief  
Reactor Projects Branch 5  
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VEPCO

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Report to D. A. Christian from Kerry D. Landis dated July 28, 2006

SUBJECT: NORTH ANNA POWER STATION - NRC INTEGRATED INSPECTION  
REPORT NOS. 05000338/2006003, 05000339/2006003, AND  
07200016/2006001 AND ANNUAL ASSESSMENT MEETING SUMMARY

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REGION II

Docket Nos.: 50-338, 50-339, 72-016

License Nos.: NPF-4, NPF-7, SNM-2507

Report Nos.: 05000338/2006003, 05000339/2006003, 07200016/2006001

Licensee: Virginia Electric and Power Company (VEPCO)

Facilities: North Anna Power Station, Units 1 & 2  
North Anna Independent Spent Fuel Storage Installation

Location: 1022 Haley Drive  
Mineral, Virginia 23117

Dates: April 1, 2006 - June 30, 2006

Inspectors: J. Reece, Senior Resident Inspector  
G. Wilson, Resident Inspector  
M. Scott, Senior Reactor Inspector, Section 1R07  
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Approved by: K. Landis, Chief, Reactor Projects Branch 5  
Division of Reactor Projects

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## SUMMARY OF FINDINGS

IR 05000338/2006-003, IR 05000339/2006-003, IR 07200016/2006-001; 04/01/2006 - 06/30/2006; North Anna Power Station Units 1 & 2, and North Anna Independent Spent Fuel Storage Installation. Routine Integrated Resident and Regional Report. Inservice Inspection. 10 CFR 50.59 Modification Inspection. Biennial Heat Sink Performance Inspection.

The report covered a three-month period of inspection by the resident inspectors, senior reactor inspectors, and reactor inspectors from the region. One NRC-identified and two self-revealing Green findings were identified. These were determined to be Non-cited Violations (NCVs). The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 3, dated July 2000.

### A. NRC-Identified and Self-Revealing Findings

#### Cornerstone: Mitigating Systems

- Green. A self-revealing non-cited violation of 10 CFR 50 Appendix B Criterion XVI was identified for inadequate corrective action which resulted in an inoperable control room chiller. On May 16, 2006, the chiller failed to start due to a faulty chilled water flow switch. Previously, a work order was initiated as part of a corrective action document to replace the flow switch due to aging. However, the work order was completed without performing the switch replacement. The licensee documented this failure in their corrective action program.

The finding is more than minor due to the impact on the Mitigating Systems cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences and its attribute of procedure quality. The finding is of very low safety significance because it did not result in a loss of safety function of one or more trains and was not potentially risk-significant due to possible external events. The cause of this finding involved the problem identification and resolution cross-cutting area based on the failure of the work order to complete the actions of a corrective action document. (Section 1R12)

- Green. The inspectors identified a non-cited violation of Technical Specification (TS) 5.4.1a associated with the licensee's failure to correctly implement a maintenance procedure which resulted in a failure of a Unit 1 pressurizer power operated relief valve (PORV) on March 31, 2006. The inspectors' review of the root cause evaluation in conjunction with the associated work order and interview with plant personnel resulted in the conclusion that a critical cause of the degraded PORV was a failure to correctly implement the maintenance procedure by installing AC voltage versus the required DC voltage solenoid operated valves

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in the PORV control system. The licensee entered this problem into their corrective action program.

This finding is more than minor due to the impact on the Mitigating Systems cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences and its attribute of procedure quality. The finding is of very low safety significance because it did not result in a loss of safety function of one or more trains and was not potentially risk-significant due to possible external events. This finding involved the human performance cross-cutting area based on the failure to implement a procedure correctly. (Section 1R15)

- Green. A self-revealing non-cited violation of 10 CFR 50 Appendix B Criterion XVI was identified for the licensee's failure to properly identify and evaluate the extent of condition involving high cycle fatigue of components associated with Emergency Diesel Generators (EDGs). The failure to correct this condition adverse to quality resulted in a broken lube oil filter vent line and subsequent inoperability of the Unit 2 J EDG on October 16, 2005. The licensee repaired this problem through their corrective action program.

This finding is more than minor due to the impact on the Mitigating Systems cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences and its attribute of procedure quality. The finding is of very low safety significance because it did not result in a loss of safety function of one or more trains and was not potentially risk-significant due to possible external events. This finding impacts the cross-cutting area of problem identification and resolution, in that, the licensee failed to properly identify and evaluate the extent of condition involving high cycle fatigue of components associated with the EDGs. (Section 4OA2)

#### B. Licensee-Identified Violations

Three violations of very low safety significance were identified by the licensee, and have been reviewed by the inspectors. Corrective actions taken or planned by the licensee have been entered into the licensee's corrective action program. These violations and their corresponding corrective action tracking numbers are listed in Section 4OA7 of this report.

## REPORT DETAILS

### Summary of Plant Status

Unit 1 began the inspection period in a scheduled refueling outage that started on March 12, 2006, and was returned to service on April 10, 2006. Unit 1 continued the inspection period at or near 100 percent power for the rest of the reporting period except for minor power reductions as needed to perform required periodic testing.

Unit 2 began the inspection period at 100 percent power, and remained at or near full power for the entire reporting period except for minor power reductions to perform required periodic testing.

### 1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity

#### 1R01 Adverse Weather Protection

##### a. Inspection Scope

Seasonal Adverse Weather Preparation Reviews

The inspectors reviewed the licensee's adverse weather preparations for hot weather operations specified in 0-GOP-4.1, "Hot Weather Operations," and the licensee's correction action data base for hot weather related issues. The inspectors walked down the two risk-significant areas listed below to verify compliance with the procedural requirements and to verify that the specified actions provided the necessary protection for the structures, systems, or components.

- Unit 1 & 2 Service Water (SW) pump house components; and,
- Unit 1 & 2 Emergency Diesel Generator (EDG) Room components.

##### b. Findings

No findings of significance were identified.

#### 1R02 Evaluation of Changes, Tests or Experiments

##### a. Inspection Scope

The inspectors reviewed selected samples of evaluations to confirm that the licensee had appropriately considered the conditions under which changes to the facility, Updated Final Safety Analysis Report (UFSAR), or procedures may be made, and tests conducted, without prior NRC approval. The inspectors reviewed evaluations for six changes and additional information, such as calculations, supporting analyses, the UFSAR, and drawings to confirm that the licensee had appropriately concluded that the changes could be accomplished without obtaining a license amendment. The six evaluations reviewed are listed in the Attachment.

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The inspectors also reviewed samples of changes for which the licensee had determined that evaluations were not required, to confirm that the licensee's conclusions to "screen out" these changes were correct and consistent with 10CFR50.59. The fifteen "screened out" changes reviewed are listed in the Attachment.

The inspectors also reviewed plant issues to confirm that problems were identified at an appropriate threshold, were entered into the corrective action process, and appropriate corrective actions had been initiated.

b. Findings

No findings of significance were identified.

1R04 Equipment Alignment

.1 Partial System Walkdowns

a. Inspection Scope

The inspectors conducted four equipment alignment partial walkdowns to evaluate the operability of selected redundant trains or backup systems, listed below, with the other train or system inoperable or out of service. The inspectors reviewed the functional system descriptions, UFSAR, system operating procedures, and TS to determine correct system lineups for the current plant conditions. The inspectors performed walkdowns of the systems to verify that critical components were properly aligned and to identify any discrepancies which could affect operability of the redundant train or backup system. Documentation reviewed is listed in the Attachment.

- Unit 1 "B" Train Low Head Safety Injection System, during a licensee performed surveillance testing on 1-SI-P-A;
- Unit 1 "A" Casing Cooling walkdown performed during scheduled maintenance on 1-RS-P-3B;
- 2J EDG walkdown performed during scheduled maintenance on 2H EDG; and,
- 2H EDG walkdown performed during scheduled maintenance on 2J EDG.

b. Findings

No findings of significance were identified.

.2 Complete System Walkdown

a. Inspection Scope

The inspectors performed a detailed walkdown and inspection of the Unit 2 Casing Cooling Subsystem to assess properly alignment and to identify discrepancies that could impact its availability and functional capacity. The inspectors assessed the physical condition of the pumps, valves, pipe supports, and instrumentation. The inspection also

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included a review of the alignment and the condition of support systems including fire protection, room ventilation and emergency lighting. Equipment deficiency tags were reviewed and the condition of the system was discussed with engineering personnel. The operating procedures, drawings and other documents utilized and reviewed as part of the inspection are listed in the Attachment.

b. Findings

No findings of significance were identified.

1R05 Fire Protection

a. Inspection Scope

The inspectors conducted tours of the nine areas listed below and important to reactor safety to verify the licensee's implementation of fire protection requirements as described in Virginia Power Administrative Procedure (VPAP)-2401, "Fire Protection Program." The inspectors evaluated, as appropriate, conditions related to: (1) licensee control of transient combustibles and ignition sources; (2) the material condition, operational status, and operational lineup of fire protection systems, equipment, and features; and (3) the fire barriers used to prevent fire damage or fire propagation.

- Quench Spray Pump House and Safeguards Area Unit 1 (includes Z-16-1) (fire zone 15-1a / QSPH-1);
- Normal Switchgear Room Unit 2 (fire zone 5-2 / NSR-2);
- Battery Room 2 - I Unit 2 (fire zone 7A-2 / BR2- I);
- Battery Room 2 - II Unit 2 (fire zones 7B-2 / BR2-II);
- Battery Room 2 - III Unit 2 (fire zone 7C-2 / BR2-III);
- Casing Cooling Tank and Pump House Unit 2 (fire zone Z-41-2 / CCT&PH-2);
- Quench Spray Pump House and Safeguards Area Unit 2 (includes Z-16-2) (fire zone 15-2a / QSPH-2);
- Technical Support Center (fire zone 46b / TSC); and,
- Casing Cooling Tank & Pump House Unit 1 (fire zone Z-41-1 / CCT&PH-1).

b. Findings

No findings of significance were identified.

1R06 Flood Protection Measures

a. Inspection Scope

The inspectors reviewed internal flood protection measures associated with the Unit 1 and Unit 2 Quench Spray Pump House (QSPH) area. Flooding from a service water pipe rupture in the QSPH could impact risk-significant components in the auxiliary building and in the safeguards buildings. The inspectors reviewed the instrumentation and associated alarms for the rooms above to verify that the instrumentation was

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periodically calibrated and that the respective alarms were appropriately integrated into plant procedures. The inspectors also reviewed licensee instructions in the event of severe flooding and evaluated the availability of systems, structures and components for safe shutdown under worst case water levels. This inspection will continue into the next quarter to complete ongoing evaluations.

b. Findings

No findings of significance to date were identified.

1R07 Heat Sink Performance

Biennial Review

a. Inspection Scope

The inspectors reviewed inspection records, test results, maintenance work orders, and other documentation to ensure that heat exchanger (HX) deficiencies that could mask or degrade performance were identified and corrected. The test procedures and records were also reviewed to verify that these were consistent with Generic Letter (GL) 89-13 licensee commitments, and industry guidelines. Risk significant heat exchangers (HX) reviewed included the Component Cooling System (CC) HXs, and Control Room Chillers.

The inspectors reviewed HX inspection and cleaning work instructions, work maintenance history, and completed inspection records for all the safety related HXs selected. The documents were reviewed to verify inspection methods were consistent with industry standards, to verify HX design margins were being maintained, and to verify performance of the HXs under the current maintenance frequency was adequate.

The inspectors also reviewed general health of the service water system via review of design basis documents, system health reports, inservice testing requirements, heat exchanger performance testing calculations, and discussions with the HX and SW system engineers. These documents were reviewed to verify the design basis was being maintained and to verify adequate SW system performance under current preventive maintenance, chemical treatments, cleaning, inspections, and test frequencies. The inspectors physically walked down accessible portions of the SW system including the CC system, control room chillers, and the SW reservoir and Lake Anna dam. The inspectors reviewed the dam inspection reports and associated followup transmittals on the reservoir and the Lake Anna dam.

The inspectors also verified SW system corrosion and degradation were being monitored and addressed via review of corrosion control program procedures, SW pipe replacement and material condition action plans, and discussions of coatings and cathodic protection systems with applicable engineers. The inspectors reviewed the licensee's SW Project activities that are in progress for piping coating, man-way installation and cathodic protection over the next several years.

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Plant issues evaluation reports were reviewed for potential common cause problems and problems which could affect system performance to confirm that the licensee was entering problems into the corrective action program and initiating appropriate corrective actions. Documents reviewed are listed in the Attachment

b. Findings

No findings of significance were identified.

1R11 Licensed Operator Requalification Program

a. Inspection Scope

The inspectors observed an annual licensed operator requalification simulator examination on June 13, 2005. The scenario, Simulator Examination Guide SXG-61, involved a loss of service water pump, a letdown line leak, loss of a condensate pump, an Anticipated Transient Without Scram, and a fault of all three steam generators.

The scenario required classifications and notifications that were counted for NRC performance indicator input. The inspectors observed crew performance in terms of communications; ability to take timely and proper actions; prioritizing, interpreting, and verifying alarms; correct use and implementation of procedures, including the alarm response procedures; timely control board operation and manipulation, including high-risk operator actions; and oversight and direction provided by the shift supervisor, including the ability to identify and implement appropriate TS actions. The inspectors observed the post training critique to determine that weaknesses or improvement areas revealed by the training were captured by the instructors and reviewed with the operators.

b. Findings

No findings of significance were identified.

1R12 Maintenance Effectiveness

a. Inspection Scope

For the three equipment issues listed below, the inspectors evaluated the licensee's effectiveness of the corresponding preventive and corrective maintenance. The inspectors performed walkdowns of the accessible portions of the systems, performed in-office reviews of procedures and evaluations, and held discussions with system engineers. The inspectors compared the licensee's actions with the requirements of the Maintenance Rule (10 CFR 50.65) using VPAP 0815, "Maintenance Rule Program," and Engineering Transmittal CEP-97-0018, "North Anna Maintenance Rule Scoping and Performance Criteria Matrix." Other documents reviewed are listed in Attachment.

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- Mechanical issues concerning equipment that controls temperature and Pressure Differential Indicators for the Unit 2 Rod Drive Room;
- Maintenance issues concerning control room chiller 1-HV-E-4B chilled water flow switch; and,
- Maintenance issues concerning the auxiliary lube oil pump on 1-CH-P-1A.

b. Findings

Introduction: A Green self-revealing, Non-cited Violation (NCV) of 10 CFR 50 Appendix B Criterion XVI was identified as a result of the licensee's failure to adequately implement corrective action which resulted in an inoperable control room chiller.

Description: On May 16, 2006, the licensee attempted to place 1-HV-E-4B, control room chiller, in service; however, the chiller failed to start and was declared inoperable per TS 3.7.11, Condition A, which requires restoration within 30 days. Troubleshooting by the licensee determined that a chilled water flow switch, 1-HV-FS-1213B was the cause of the failure to start and was subsequently replaced using a commercial grade dedication process. The inspectors performed a review of the work history associated with the aforementioned flow switch in addition to the similar flow switches on the other control room chillers, 1-HV-E-4A and 1-HV-E-4C, and identified the following information:

- May 1, 2001: The licensee performed preventive maintenance (PM) on flow switch, 1-HV-FS-1213A (control room chiller, 1HV-E-4A) and identified intermittent operation. Plant Issue N-2001-1327 was initiated due to the intermittent operation and the equipment age of about 25 years. This plant issue was closed to Work Order (WO) 00440514-01 which replaced the flow switch.
- June 24, 2003: The licensee performed a PM on flow switch, 1-HV-FS-1213A (control room chiller, 1HV-E-4A) and identified intermittent operation. Plant Issue N-2003-2482 was initiated due to the intermittent operation and the equipment age of about 25 years. This plant issue was also closed to a WO using the following statement, "WO 00493252 01 status 30 to replace flow switch due to age. PI is listed on WO. Current flow switch in the system is operable." However, the WO remained incomplete, and the switch was only adjusted.
- August 16, 2004: WO 00493252-01 was completed with the last work performed identified as "as left data sat. no adjustments. functioned sat." Flow switch, 1-HV-FS-1213B, was not replaced as noted as corrective action in Plant Issue N-2003-2482.
- January 25, 2005: WO 00526971-01, which was initiated to perform a calibration on flow switch, 1-HV-FS-1213B, as a routine PM was cancelled and noted that "flow switch was calibrated under WO 493242-01 on 08/16/04."
- May 16, 2006: After starting successfully for each quarter since closure of WO 00493242-01 in August, 2004, chiller 1-HV-E-4B failed to start. The previous failure was 'intermittent operation', and the previous switch adjustment apparently allowed some successful starts. Notwithstanding, the documented corrective action to replace the switch due to age was not performed; thus, the

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switch was unable to meet the expected performance requirements between the specified PM frequency.

The inspectors determined that the failure to replace flow switch, 1-HV-FS-1213B, as specified by WO 00493252-01 was contrary to the requirements of 10 CFR 50, Appendix B, Criterion XVI which requires in part that measures shall be established to assure that conditions adverse to quality are promptly identified and corrected.

Analysis: The failure to implement adequate corrective action had a credible impact on reactor safety because of the failure of the control room chiller to start on demand. The inspectors reviewed IMC 0612 and determined that the issue was more than minor due to the impact on the mitigating systems cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences and its attribute of procedure quality. The inspectors evaluated this finding using IMC 0609, Appendix A and determined that it was of very low safety significance (Green). Although it impacted the mitigating system cornerstone, the finding is of very low safety significance because it did not result in a loss of safety function of one or more trains and was not potentially risk-significant due to possible external events. The cause of this finding involved the problem identification and resolution cross-cutting area based on the failure of the work order to complete the actions of a corrective action document.

Enforcement: 10 CFR 50 Appendix B, Criterion XVI requires in part that measures shall be established to assure that conditions adverse to quality are promptly identified and corrected. Contrary to the above, on August 16, 2004, WO 00493252-01 was completed without performing the corrective actions documented in Plant Issue N-2003-2482. This finding is of very low safety significance and is in the licensee's corrective action program as Plant Issue N-2006-2683; therefore, this violation is characterized as a NCV, consistent with Section VI.A of the NRC Enforcement Policy: NCV-05000338, 339/2006003-01, Inadequate Corrective Action Results In Failure of Control Room Chiller to Start.

#### 1R13 Maintenance Risk Assessments and Emergent Work Evaluation

##### a. Inspection Scope

The inspectors evaluated, as appropriate, for the six activities listed below: (1) the effectiveness of the risk assessments performed before maintenance activities were conducted; (2) the management of risk; (3) that, upon identification of an unforeseen situation, necessary steps were taken to plan and control the resulting emergent work activities; and (4) that maintenance risk assessments and emergent work problems were adequately identified and resolved. The inspectors verified that the licensee was complying with the requirements of 10 CFR 50.65 (a)(4) and the data output from the licensee's safety monitor associated with the risk profile of Units 1 and 2.

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- Maintenance rule risk evaluation for unplanned work on April 7, 2006 while executing Procedure 0-AP-41, "Severe Weather Conditions," entered due to a tornado watch with 1-SW-P-4 unavailable due to a failed missile barrier;
- Maintenance rule risk evaluation for risk associated with trouble shooting –32 problems while performing rack work, switchyard and "C" Reserved Station Service Transformer (RSST) work on overhead lines on April 27, 2006;
- Emergent work on 2-BD-TV-200B during performance of work associated with 1-PT-36.1A instrument racks, switchyard, and "C" RSST on overhead lines;
- Emergent work on 1-CH-P-1A during the performance of work associated with instrument racks, "C" RSST on overhead lines, switchyard and 1-PT-82H;
- Emergent work associated with the Unit 1 main generator voltage regulator during performance of work involving 1-CH-P-1C, 1-FP-P-2, 2PT-36.1A, instrument racks, switchyard and "C" RSST work on overhead lines; and,
- Emergent work associated with 1B Feedwater Pump seal leak during performance of work involving instrument racks, 2-EE-EG-2J, and "C" RSST on overhead lines.

b. Findings

No findings of significance were identified.

1R15 Operability Evaluations

a. Inspection Scope

The inspectors reviewed six operability evaluations affecting risk-significant mitigating systems, listed below, to assess, as appropriate: (1) the technical adequacy of the evaluations; (2) whether continued system operability was warranted; (3) whether other existing degraded conditions were considered as compensating measures; (4) whether the compensatory measures, if involved, were in place, would work as intended, and were appropriately controlled; (5) where continued operability was considered unjustified, the impact on TS Limiting Conditions for Operation and the risk significance in accordance with the SDP. The inspectors' review included a verification that the operability determinations were made as specified by Procedure VPAP-1408, "System Operability." Documents reviewed by the inspectors are listed in the Attachment.

- Plant Issue N-2006-2320, during the performance of 2-PT-75.2A, the acceptance criteria for the discharge check valve (1-SW-10) on 1-SW-P-1B could not be met;
- Plant Issue N-2006-2358, discovered a Recirculation Spray (RS) pipe support with a loose pipe clamp bolt and a bent rod end;
- Plant Issue N-2006-2436, stainless steel tubing for the 1H EDG Lube Oil Filter and Strainer Constant Vent line was found with broken and loose support clips;
- Plant Issue N-2006-2676, 1-CH-RV-106A would not control pressure. The apparent failure of the valve to open caused 1-CH-P-1A1 to pull high amps;

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- Plant Issue N-2006-1905, Solenoid operated valves installed on 1-RC-SOV-1455C-1 and 1-RC-SOV-1455C-2 were identified as 120V/60 Hz versus the required 125V DC; and,
- Plant Issue N-2006-3458, unistrut for conduit support in 2H EDG room is not supported by the center hanger and a gap exists between unistrut and hanger washer.

b. Findings

Introduction: A Green, NCV of TS 5.4.1a was identified by the NRC as a result of the licensee's failure to implement a maintenance procedure which resulted in a degraded condition of a pressurizer PORV.

Description: On March 31, 2006, Unit 1 was in Mode 5 with both pressurizer PORVs open to comply with TS requirements for a vent path. At 0158 hours the licensee determined that pressurizer PORV 1-RC-PCV-1455C was closed with its respective switch in 'open' during evaluation of a ground alarm on the 1-I vital inverter. The PORV was reopened by using the nitrogen backup system at 0238 hours. During repairs the licensee discovered that the solenoid operated valves (SOV) 1-RC-SOV-1455C-1 & 2, used to stroke the valve on instrument air, were AC voltage as opposed to the required DC voltage. Separate SOVs are used to operate the PORV with the nitrogen backup system. The inspectors reviewed the licensee's past operability evaluation and noted that the impact on TS operability was not clearly identified. The inspectors also reviewed the licensee's root cause evaluation (RCE) and noted that it focused on warehouse parts issues concerning a transfer of SOVs between stock numbers without consideration of part descriptions. The inspectors also noted that subsequent evaluations of the RCE by station nuclear safety personnel and the corrective action review board had rejected the RCE due to no external operational experience review, no corrective actions relative to combining stock numbers, no organizational failure discussion, no repeat problem discussion, and why previous corrective actions did not prevent recurrence. The inspectors reviewed the work package, WO 00507310-01, that installed new SOVs as preventative maintenance in September, 2004. The inspectors identified that electrical maintenance procedure, 0-ECM-2101-01, "Trouble-Shooting, Testing, and Replacing ASCO Solenoid-Operated Valves," Revision 7, had the following caution statement, "Coil must be correct voltage type (AC or DC) and have correct voltage and current ratings." Additionally, the inspectors noted that the work package contained an electrical elementary diagram, 11715-ESK-6NR, which showed that the SOVs undergoing replacement were part of a 125 VDC circuit. The inspectors interviewed plant personnel and determined that compliance with the caution statement is performed by reviewing the nomenclature located on the SOV to ensure to correctness. The inspectors concluded that a critical cause of the event was a failure to implement the procedure correctly. This is contrary to the requirements of TS 5.4.1a which requires in part that written procedures shall be implemented covering the activities in the applicable procedures recommended by Regulatory Guide (RG) 1.33, Revision 2, Appendix A, February 1978, of which part 9.a. requires procedures for performing maintenance.

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Analysis: The failure to implement 0-ECM-2101-01 correctly resulted in the installation of wrong SOVs in the control system for the respective PORV and the consequent impact on TS operability. The inspectors reviewed IMC 0612 and determined that the issue was more than minor due to the impact on the mitigating systems cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences and its attribute of procedure quality. The inspectors evaluated this finding using IMC 0609, Appendix A and determined that it was of very low safety significance (Green). Although it impacted the mitigating system cornerstone, the finding is of very low safety significance because it did not result in a loss of safety function of one or more trains and was not potentially risk-significant due to possible external events. The cause of this finding involved the human performance cross-cutting area based on the failure to implement a procedure correctly.

Enforcement: TS 5.4.1a requires in part that written procedures shall be implemented covering the activities in the applicable procedures recommended by Regulatory Guide 1.33, Revision 2, Appendix A, February 1978, of which part 9.a. requires procedures for performing maintenance. Contrary to the above, on September 26, 2004, 0-ECM-2101-01 was incorrectly implemented which subsequently impacted TS operability of pressurizer PORV, 1-RC-PCV-1455C. This finding is of very low safety significance and is in the licensee's corrective action program as Plant Issue N-2006-1905; therefore, this violation is characterized as a NCV, consistent with Section VI.A of the NRC Enforcement Policy: NCV 05000338/2006003-02, Failure to Implement a Maintenance Procedure Impacting Pressurizer PORV Operability.

## 1R17 Permanent Plant Modifications

### a. Inspection Scope

The inspectors evaluated engineering change packages for seven modifications to evaluate the modifications for adverse effects on system availability, reliability, and functional capability. The seven modifications and the associated attributes reviewed are as follows:

- DCP 03-168 Install Remote Closure SOVs for Pressurizer Spray Valves (Initiating Events)
  - Energy Needs (air, electricity)
  - Operations
  - Structural
  - Failure Modes
- DCP 03-108, MFRV Positioner Modification AV2 to AV1 (Mitigating Systems)
  - Materials/Replacement Components (material compatibility, environmental qualification, seismic qualification)
  - Timing (response time)
  - Process Medium (fluid pressures)
  - Licensing Basis

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- DCP 04-102, MOV Overall Gear Ratio Modification (Mitigating Systems)
  - Timing (response time)
  - Materials/Replacement Components (material compatibility, functional properties)
  - Energy Needs (electricity)
  - Operations
  - Licensing Basis
- DCP 96-237, Install Test Taps in HVAC Ducts (Mitigating Systems)
  - Ventilation Boundary
  - Operations
  - System Flow Requirements
- DCP 91-005, 3 SG Blowdown Tank Piping Rerouting (Mitigating Systems, Barrier Integrity)
  - Materials/Replacement Components
  - Flowpaths
  - Equipment Protection
  - Failure Modes
- DCP 03-133, Modify 2-HV-HV-2 Control Logic to Trip When 2-HV-F-16 Flow Stops (Mitigating Systems)
  - Control Signals
  - Ventilation Boundary
  - Timing
- DCP 01-162, Replacement of Vital Bus Inverters 2-III & 2-IV (Mitigating Systems)
  - Energy Needs (electricity)
  - Materials/Replacement Components (material compatibility, functional properties)

Documents reviewed included procedures, engineering calculations, modification design and implementation packages, work orders, site drawings, corrective action documents, applicable sections of the living UFSAR, supporting analyses, TS, and design basis information. Specific documents are listed in the Attachment.

The inspectors also reviewed selected plant issues and an audit associated with modifications to confirm that problems were identified at an appropriate threshold, were entered into the corrective action process, and appropriate corrective actions had been initiated.

b. Findings

No findings of significance were identified.

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1R19 Post Maintenance Testinga. Inspection Scope

The inspectors reviewed six post maintenance test procedures and/or test activities, as appropriate, for selected risk-significant mitigating systems to assess whether: (1) the effect of testing on the plant had been adequately addressed by control room and/or engineering personnel; (2) testing was adequate for the maintenance performed; (3) acceptance criteria were clear and adequately demonstrated operational readiness consistent with design and licensing basis documents; (4) test instrumentation had current calibrations, range, and accuracy consistent with the application; (5) tests were performed as written with applicable prerequisites satisfied; (6) jumpers installed or leads lifted were properly controlled; (7) test equipment was removed following testing; and (8) equipment was returned to the status required to perform its safety function. The inspectors verified that these activities were performed in accordance with licensee procedure VPAP-2003, "Post Maintenance Testing Program."

- Procedure 0-MCM-0650-0, "Disassembly Inspection and Repair of the Outside Recirculation Spray Pump Seal Accumulator," Revision 5, and Procedure 1-PT-64.1.1, "Outside Recirculation Spray Pump 1-RS-P-2A," Revision 21, per WO 740587-01;
- Procedures 0-ECM-0307-1, "Replacement of Thermal Overload Devices," Revision 13, and 0-ECM-0206-01, "Installation of Lugs," Revision 06, per WO 527389;
- Procedure 0-ECM-2102-01, "Trouble Shooting, Testing, and Replacing EQ-Related ASLO Solenoid Operator Valves," Revision 8, Procedure 0-ECM-02002-01, "Installation and Removal of EGS Bayonet Connector," Revision 10, and Procedure 0-ECM-0206-01, "Installation of Lugs," Revision 6, per WO 747758-01;
- Procedure 0-MCM-701-34, "Removal and Installation of Emergency Diesel Generator," and Procedure 2-PT-82.4A, "2H Emergency Diesel Generator Test (Start by ESF Actuation)," Revision 56, per WOs 730135 and 730659;
- Procedure 0-ICP-MIS-G-001, "Miscellaneous Instrumentation Calibration," Revision 8, per WO 127299; and,
- WO 00529611-03 to replace 1-CH-285 (cut out and weld in new valve).

b. Findings

No findings of significance were identified.

1R20 Refueling and Outage Activitiesa. Inspection Scope

The inspectors continued this inspection activity from the previous quarter and used inspection procedure 71111.20, "Refueling and Outage Activities," to observe portions of the maintenance and startup activities to verify that the licensee maintained

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defense-in-depth commensurate with the outage risk plan and applicable TS. The inspectors monitored licensee controls over the outage activities listed below.

- Licensee configuration management, including daily outage reports, to evaluate defense-in-depth commensurate with the outage safety plan and compliance with the applicable TS when taking equipment out of service.
- Controls over the status and configuration of electrical systems and switchyard to ensure that TS and outage safety plan requirements were met.
- Decay heat removal processes to verify proper operation and that steam generators, when relied upon, were a viable means of backup cooling.
- Controls to ensure that outage work was not impacting the ability to operate the spent fuel pool cooling system during and after-core offload.
- Reactor water inventory controls including flow paths, configurations, and alternative means for inventory addition, and controls to prevent inventory loss.
- Reactivity controls to verify compliance with TS and that activities which could affect reactivity were reviewed for proper control within the outage risk plan.
- Heatup and startup activities to verify that TS, license conditions, and other requirements, commitments, and administrative procedure prerequisites for mode changes were met prior to changing modes or plant conditions. Reactor Coolant System (RCS) integrity was verified by reviewing RCS leakage calculations and containment integrity was verified by reviewing the status of containment penetrations and containment isolation valves.
- Containment closure activities, including a detailed containment walkdown prior to startup, to verify no evidence of leakage and that debris had not been left which could affect the performance of the containment sump.

Specific documentation reviewed during the inspection processes are listed in the Attachment.

b. Findings

No findings of significance were identified.

1R22 Surveillance Testing

a. Inspection Scope

For the six surveillance tests listed below, the inspectors examined the test procedure, witnessed testing, and reviewed test records and data packages, to determine whether the scope of testing adequately demonstrated that the affected equipment was functional and operable, and that the surveillance requirements of the TS were met. Documentation reviewed is listed in the Attachment.

- 1-PT-61.3, "Operations Periodic Test - Containment Type C Test," Revision 26;
- 1-PT-52.2, "Reactor Coolant System Leak Rate (Hand Calculation);"
- 1-PT-63.1B, "Quench Spray System - 'B' Subsystem;"
- 2-PT-82H, "2H Emergency Diesel Generator Test Slow Start Test," Revision 40;

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- 1-PT-71.3Q, "1-FW-P-3B, "B" Motor-Driven AFW Pump and Valve Test," Revision 37; and,
- 2-PT-82.4A, "2H Diesel Generator Test (Start by ESF Actuation)," Revision 56.

b. Findings

No findings of significance were identified.

1R23 Temporary Plant Modifications

a. Inspection Scope

The inspectors reviewed one temporary plant modification to verify that the modifications did not affect system operability or availability as described by the TS and UFSAR. In addition, the inspectors verified that the installation of the temporary modification was in accordance with the work package, that adequate controls were in place, procedures and drawings were updated, and post-installation tests verified the operability of the affected systems.

The temporary plant modification reviewed was Temporary Modification 2006-1768, "Install a Temporary Manual/Auto Station for 1-MS-PC-1464B on Unit 1 MCR Bench-Board."

b. Findings

No findings of significance were identified.

Cornerstone: Emergency Preparedness

1EP6 Drill Evaluation

a. Inspection Scope

On May 23, 2006, the inspectors reviewed and observed the performance of an emergency planning drill that involved an earthquake, loss of cooling accident, and equipment failures resulting in a Site Area Emergency and subsequent General Emergency. The inspectors assessed emergency procedure usage, emergency plan classification, notifications, and the licensee's identification and entrance of any problems into their corrective action program. This inspection evaluated the adequacy of the licensee's conduct of the drill and critique performance. Drill issues were captured by the licensee in their corrective action program and were reviewed by the inspectors.

b. Findings

No findings of significance were identified.



#### 4. OTHER ACTIVITIES

##### 4AO1 Performance Indicator (PI) Verification

###### a. Inspection Scope

###### Cornerstones: Initiating Event, Mitigating Systems, and Barrier Integrity

The inspectors sampled licensee submittals of performance indicator data reported to the NRC for the three Performance Indicators listed below for Unit 1 and Unit 2:

- Unplanned Power Changes;
- Safety System Functional Failures, and,
- Reactor Coolant System Leakage.

The inspectors reviewed data from the licensee's corrective action program, maintenance rule records, operating logs and maintenance work orders for the period covering the second quarter 2005 through the first quarter 2006. The data was compared with that displayed on the NRC's public web site. The performance indicator method of assessment was compared with the guidelines contained in Nuclear Energy Institute (NEI) 99-02, "Regulatory Assessment Performance Indicator Guidelines."

During plant tours the inspectors also periodically assessed the Occupational Exposure Control Effectiveness and the RETS/ODCM Radiological Effluent Occurrence Performance Indicators by determining if high radiation areas (>1R/hr) were properly secured, and looking for unmonitored radiation release pathways.

###### b. Findings

No findings of significance were identified. The performance indicators all remained in the licensee response band (Green).

##### 4OA2 Identification and Resolution of Problems

###### .1 Daily Review

As required by Inspection Procedure 71152, "Identification and Resolution of Problems," and in order to help identify repetitive equipment failures or specific human performance issues for follow-up, the inspectors performed a daily screening of items entered into the licensee's corrective action program. This review was accomplished by reviewing daily Plant Issues summary reports and periodically attending daily Plant Issue Review Team meetings.



## .2 Annual Sample Review

### a. Inspection Scope

The inspectors reviewed the licensee's assessments and corrective actions for Plant Issue N-2005-4494, "At approx. 10 hours into 2-PT-83.12J the 2J emergency diesel generator lube oil filter vent line pulled from its union connector which cause the engine to be shut down as several gallons of oil sprayed from the line," and Plant Issue N-2006-1578, "RS Sump Inspection - inspected the top cover plates of the "B" RS Sump ... to confirm the size of the two small openings (one of 2" X 1 " and another of 2" X 1 1/8") next to the containment line (back of sump cover) found during 1-PT-57.3." The plant issues were reviewed to ensure that the full extent of the issue was identified, appropriate evaluations were performed, and appropriate corrective actions were specified and prioritized. The inspectors also evaluated the plant issues against the requirements of the licensee's corrective action program as specified in VPAP-1601, "Corrective Action Program," VPAP-1501, "Deviations," and 10 CFR 50, Appendix B.

### b. Findings and Observations

#### EDG Lube Oil Filter Vent Line

Introduction: A Green non-cited violation (NCV) was identified for failure to correct a condition adverse to quality associated with the broken lube oil filter vent line on the 2J EDG.

Description: On October 16, 2005, the licensee initiated Plant Issue N-2005-4494 in response to the failure of the lube oil filter vent line on the Unit 2J EDG identified during 2-PT-83.12J, "2J Diesel Generator Test (Start by ESF Actuation) Followed by 24-Hour Run and Hot Restart Test." The 2J EDG was previously removed from service to complete maintenance for leaking water bypass gaskets and to replace control relays, but the licensee failed to complete WO 720789-01 to repair a broken U-bolt support for a main lube oil line. Plant Issue N-2005-3166 documented the licensee's functional evaluation for this broken U-bolt support and determined that it did not present an operability issue at that time. However, during 2-PT-83.12J on October 16, 2005, operators identified an increase in vibrations on the diesel and alerted engineers who concluded that the overall vibrations were normal. Shortly thereafter, the lube oil filter vent line ruptured at its ferrule connection rendering the diesel inoperable. After replacement of this vent line, the diesel was restarted for a post maintenance test and to complete 2-PT-83.12J; however, the lube oil filter vent line failed again at the same location causing operators to shut down the diesel. The inspectors reviewed the licensee's functional evaluation for the cracked U-bolt support, the planned EDG outage work order package (WO 725645-01), and the following plant issue reports:

- Plant Issue N-2005-1522, licensee identified a cracked support bracket on the 1J EDG;
- Plant Issue N-2005-4578, NRC inspectors identified a cracked support bracket on the 1J EDG;

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- Plant Issue N-2005-0660, licensee identified a cracked weld support on the 1H & 2H EDG;
- Plant Issue N-2005-3166, licensee identified a cracked U-bolt support on the 2J EDG; and,
- Plant Issue N-2004-1925, corrective actions established a process to review outstanding work orders before and following each EDG maintenance period to ensure proper maintenance was completed and that no outstanding work existed that would challenge the EDG operability until the next maintenance period.

The inspectors noted that the licensee had previously taken some corrective actions to repair the support bracket weld cracks due to high cycle fatigue, but failed to adequately address the lube oil filter vent line. Additionally, the inspectors noted that the cracked U-bolt support was inadequately evaluated as not an immediate impact and was scheduled for repair 10 months later. The inspectors concluded that the failure of the licensee to assess the high cycle fatigue conditions involving the lube oil filter vent line lead to its subsequent failure. The inspectors also independently reviewed and verified that the licensee's evaluation had determined similar findings. The inspectors concluded that the failure to properly identify and correct the high cycle fatigue problem is contrary to 10 CFR 50 Appendix B, Criterion XVI, which requires in part that measures shall be established to assure that conditions adverse to quality, such as deficiencies and defective material and equipment are promptly identified and corrected.

Analysis: The inspectors determined the finding is more than minor because it affected the mitigating systems cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences and its attribute of equipment performance. This had a credible impact on safety because it affected the availability of the emergency diesel generator. The inspectors further referenced IMC 0609 for the SDP review and determined the finding was of very low safety significance. Although it affected the mitigating system cornerstone, the finding is of very low safety significance because it did not result in a loss of safety function of one or more trains and was not potentially risk-significant due to possible external events. This finding impacts the cross-cutting area of problem identification and resolution, in that, the licensee failed to properly identify and evaluate the extent of condition involving high cycle fatigue of components associated with the EDGs.

Enforcement: 10 CFR, Appendix B, Criterion XVI states in part, "Measures shall be established to assure that conditions adverse to quality, such as deficiencies, defective material and equipment are promptly identified and corrected." Contrary to this on October 16, 2005, the licensee failed to properly identify and correct a high cycle fatigue problem impacting the lube oil filter vent line which subsequently rendered the 2J EDG inoperable. This finding is of very low safety significance and is entered into the licensee's corrective action program as Plant Issue N-2005-4494; therefore, this violation is characterized as a NCV, consistent with Section VI.A of the NRC Enforcement Policy: NCV 05000339/2006003-03, Failure to Correct a Condition Adverse to Quality Regarding High Cycle Fatigue Failure of the 2J EDG Lube Oil Filter Vent Line.

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### Containment Recirculation Spray Sump Pump

A licensee identified violation associated with this review is documented in section 4OA7 of this report. On March 23, 2006, during the cycle 18 refueling outage the licensee identified two openings (2" x 1" and 2" x 1 1/8") in the RS sump enclosure during performance of 1-PT-57.3, "Containment Recirculation Spray Sump Visual Examination," and initiated Plant Issue N-2006-1578 for an evaluation. The inspectors reviewed the licensee's evaluation and subsequent corrective actions and noted that additional plant issues were initiated as a result of more openings found during an extent of condition review:

- N-2006-1595, "A 1-1/4" diameter hole in each RS pump baseplate was open to the inside of the IRS A and B circular screens (elevation 222' - 11-3/4");"
- N-2006-1637, "An opening (1/2" x 1-1/2") in IRS A pump circular screen lower flange that provided a direct path to the pump well (elevation 214' - 7-3/8");"
- N-2006-1819, "Gaps larger than 1/4" in top cover of RS sump (elevation 221' - 9-3/8");" and,
- N-2006-1938, "Two gaps larger than 1/4" in top cover plate of the sump (elevation 221' - 9-3/8)".

The inspectors also reviewed plant issues related to the RS system from the 2004 cycle 17 refueling outage and noted the following plant issues:

- N-2004-3605, "Openings larger than .12 inch were found: a) in the top plate of the RS sump; b) between several vertical screen panels; and c) on the top of several panels connection to the sump structure. These openings allow for a bypass around the vertical fine mesh screens for both the 'A' and 'B' sides of the sump;"
- N-2004-3744, "Subsequent to the evaluation for IPR 04-314 and N-2004-3605, additional gaps were identified under the two screen panels (horizontal bottom) on each end of the sump (screen panels 1B, 2B, and 1A, 2A). The gaps varied from 1/4" to 1/2" in height and were 35" long;"
- N-2004-4186, "Additional gaps were found in the front of the "A" side of the sump in the tube steel above the vertical screen panels and the corners of the "A" side of the sump. During investigation into N-2004-4186, another potential gap was located on the "B" side corner of the sump in the tube steel above the vertical screen panels;" and,
- N-2004-4011, "Debris was found in the shell (RS) side of the RS heat exchangers. ET-NAF-04-0099 concluded that the RS system had been operable but degraded prior to Fall 2004."

The inspectors concluded that the licensee's failure to implement adequate corrective actions for the plant issues in 2004 to preclude the RS sump deficiencies identified during the 2006 refueling outage is a violation of 10 CFR 50, Appendix B, Criterion XVI, which requires in part that in the case of significant conditions adverse to quality, measures shall assure that the cause of the condition is determined and corrective

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action taken to preclude repetition. The enforcement aspects are discussed in Section 4OA7.

### .3 Semi-Annual Review to Identify Trends

#### a. Inspection Scope

As required by Inspection Procedure 71152, "Identification and Resolution of Problems," the inspectors performed a review of the licensee's corrective action program through the plant issue reports to identify trends that could indicate the existence of a more significant safety issue. The inspectors' review considered the results of daily inspector plant issue item screening discussed in section 4OA2.1 above, licensee trending efforts, and licensee human performance results. The inspector's review nominally considered the six-month period of January through June 2006, although some examples expanded beyond those dates when the scope of the trend warranted. The review also covered areas not documented in plant issues reports such as: departmental problem/challenges lists, system health reports, quality assurance audit/surveillance reports, self assessment reports, and maintenance rule assessments. The inspectors compared and contrasted their results with the results contained in the licensee's latest quarterly trend reports. Corrective actions associated with a sample of the issues identified in the licensee's trend report were reviewed for adequacy.

#### b. Assessment and Observations

No findings of significance were identified. The inspectors evaluated the licensee trending methodology and observed that the licensee had performed reviews as directed by VPAP-1601, "Corrective Action," and the "Dominion Trend Analysis Manual" The inspectors compared the licensee process results with the results of the inspectors' daily screening and did not identify a discrepancy or potential trend in the plant issue report data that the licensee had failed to identify by a unique plant issue document.

The inspectors performed a review of plant issues associated with control room differential pressure problems and specifically those that involved entry into TS 3.7.10, "Main Control Room/Emergency Switchgear Room (MCR/ESGR) Emergency Ventilation System (EVS), and/or TS 3.7.13, "Main Control Room/Emergency Switchgear Room (MCR/ESGR) Bottled Air System." The inspectors found that from the period of January 1, 2006 through June 6, 2006, the licensee initiated Plant Issues N-2006-2937, N-2006-3029, and N-2006-3068. The inspectors also noted that from June 14, 2005 until end of the year, the licensee initiated ten plant issues for MCR/ESGR differential pressure problems requiring entry into the applicable TS. On June 22, 2006, the licensee again entered TS 3.7.10/3.7.13 due to low differential pressure and initiated Plant Issue N-2006-3388. Based on testing performed and documented under ET-SE-97-0162, Revision 7, "Control Room Positive Pressure Indications," new procedural limits for MCR/ESGR were introduced that allowed exit of the TS LCOs. However, following the introduction of the new limits the licensee encountered more ventilation problems resulting in an additional three Plant Issues, N-2006-3587, N-2006-3630, and N-2006-3639 between July 3, 2006 and July 6, 2006. The inspectors

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reviewed the licensee's trend results and noted that the control room differential pressure problems were captured in a category for unplanned TS LCO entries and highlighted by comments noting that the problems constituted more than half of the issues within this category. The licensee is continuing to trend this issue.

#### 4OA3 Event Followup

##### (Closed) Licensee Event Report (LER) 05000338/2006001-00: Manual Reactor Trip Due to Shutdown Bank "A" Group 2 Step Counter Inoperable

On April 7, 2006, Unit 1 was in Mode 3, zero percent power, preparing for restart following a refueling outage. As part of the performance for rod drop time measurement, Shutdown Bank "A" Groups 1 and 2 control rods were being withdrawn from the core. Group 2 step counter stopped at 215 steps, while Group 1 and individual rod position indicators showed continued motion to 225 steps. The Shutdown Bank Group 2 step counters were declared inoperable and a manual reactor trip was initiated by opening the reactor trip breakers in accordance with Technical Requirement 3.1.3 due to a mismatch of the Shutdown Bank "A" Group step counters. This was a valid actuation of the Reactor Protection System. The failed digital step counter for Shutdown Bank "A" Group 2 was evaluated, and the internal connections were noted to be inadequate due to a problem with the manufacturing process. The failed digital step counter was replaced on April 8, 2006, and rod drop time measurement testing was subsequently completed satisfactorily. The applicable maintenance procedure was revised to include steps directing pre-installation testing and inspection. This LER is closed.

#### 4OA5 Other Activities

##### .1 (Closed) NRC Temporary Instruction (TI) 2515/165 "Operational Readiness of Offsite Power and Impact on Plant Risk"

The inspectors reviewed licensee procedures and controls, and interviewed operations and maintenance personnel to verify these documents contained specific attributes delineated in the TI to ensure the operational readiness of offsite power systems in accordance with plant TS; the design requirements provided in 10 CFR 50, Appendix A, General Design Criterion 17, "Electric Power Systems;" and the impact of maintenance on plant risk in accordance with 10 CFR 50.65(a)(4), "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." Documents reviewed are listed in the Attachment. Appropriate documentation of the results of this inspection was provided to NRC headquarters staff for further analysis, as required by the TI. This completes the Region II inspection TI requirements for North Anna Power Station.

##### .2 Review of the Operation of an Independent Spent Fuel Storage Installation (60855)

###### a. Inspection Scope

The inspectors observed: loading spent fuel assemblies into the spent fuel dry storage cask TN-32-41; verification of assemblies being loaded into the cask; setting the lid on the top of canister; verification of positive engagement of lifting devices being positioned; lifting of the loaded cask above the water surface; draining a small portion of water from the cask for the lid bolting; removing water from bolt holes; hand tightening lid bolts; draining the water from the cask; moving the loaded cask to the cask setting area by following the heavy load lifting path; drying the cask; and backfill with helium. Observations were compared to the licensee's procedures to ensure compliance. The inspectors also observed radiation protection controls and monitoring.

The inspectors reviewed required records and data contained in the working copy of the procedure. The inspectors reviewed TN-32-41 Independent Spent Fuel Storage Installation (ISFSI) Fuel Assembly and Insert Component Certification and Cask Loading Map to verify that the loaded assemblies met the Technical Specification TN-32 Cask Operating Limits. This documents contained the description and limits of the spent fuel assemblies to be placed in the canister, such as initial fuel enrichment, fuel burnup, decay heat, time discharged, fuel assembly design, time since discharged for burnable poison rods, and uranium content. The inspectors reviewed training certificates and qualification records for crane operators and cask loading operators. The inspectors reviewed spent fuel cask crane periodic inspection, function test, and maintenance records. Documents reviewed are listed in the Attachment.

b. Findings

No findings of significance were identified.

4OA6 Meetings, including Exit

.1 Exit Meeting

On July 14, 2006, the resident inspectors presented the inspection results to Mr. Jack Davis and other members of the staff. The licensee acknowledged the findings. The inspectors confirmed that proprietary information was not provided or examined during the inspection.

.2 Annual Assessment Meeting

On April 18, 2006, the NRC Chief of Reactor Projects Branch 5 met with Virginia Electric and Power Company to discuss the NRC's Reactor Oversight Process (ROP) and the North Anna Power Station annual assessment of safety performance for the period of January 1, 2005 - December 31, 2005. Attendees included licensee corporate and site management, licensee site staff and members of the local news media.

This meeting was open to the public. The presentation material used for the discussion is available from the NRC's document system (ADAMS) as accession number *ML051030203*. ADAMS is accessible from the NRC Web site as <http://www.nrc.gov/reading-rm/adams.html> (the Public Reading Room).

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4OA7 Licensee-Identified Violations

The following findings of very low significance (Green) were identified by the licensee and are violations of NRC requirements which meet the criteria of Section VI of the NRC Enforcement Policy, NUREG-1600, for being characterized as NCVs.

- TS 5.4.1 requires that written procedures shall be established, implemented, and maintained covering the activities in the applicable procedures recommended by Regulatory Guide 1.33, Revision 2, Appendix A, February 1978, of which part 9.a. requires procedures for performing maintenance. Contrary to the above, on March 13, 2006, the licensee failed to establish adequate procedure steps in maintenance procedure 0-ECM-0706-01, "Woodward Governor Adjustment." This resulted in inadequate tuning of the 1J EDG Woodward governor which subsequently resulted in 1J EDG frequency outside of the allowable TS band and a declaration of inoperability. The inspectors reviewed IMCs 0612 and 0609 and determined that the finding was of very low safety significance given that only one train was affected for less than the TS allowed outage time. The licensee has this finding documented in their corrective action program as Plant Issue N-2006-1056.
- TS 5.4.1 requires that written procedures shall be established, implemented, and maintained covering the activities in the applicable procedures recommended by Regulatory Guide 1.33, Revision 2, Appendix A, February 1978, of which part 9.b. requires the development of procedures to perform preventative maintenance. Contrary to the above, on March 14, 2006, the licensee failed to establish a preventative maintenance procedure that would inspect, clean and test the K relays on the 1H EDG. This resulted in high resistance readings on the relays due to dirt buildup and oxidation residue which rendered the diesel inoperable due to the output breaker closing greater than time allowed by TS. The inspectors reviewed IMCs 0612 and 0609 and determined that the finding was of very low safety significance given that only one train was affected for less than the TS allowed outage time. The licensee has this finding documented in their corrective action program as Plant Issue N-2006-1112.
- 10 CFR 50, Appendix B, Criterion XVI requires in part that in significant cases of conditions adverse to quality, measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition. Contrary to this on March 23, 2006, the licensee identified that corrective actions taken for Plant Issue N-2004-3605 did not identify all breeches in the Unit 1 containment sump enclosure. The finding had a credible impact on safety based on the dimensions of the breeches which were greater than the analyzed values. The inspectors reviewed IMCs 0612 and 0609 and determined that the finding was of very low safety significance. Although it impacted the mitigating system cornerstone, the finding is of very low safety significance because it did not result in a loss of safety function of one or more trains and was not potentially risk-significant due to possible external events. The licensee has this finding documented in their corrective action program as Plant Issue N-2006-1578.

Enclosure

## **SUPPLEMENTAL INFORMATION**

### **KEY POINTS OF CONTACT**

#### **Licensee personnel**

W. Anthes, Assistant Manager, Maintenance  
G. Bischof, Director (former), Nuclear Safety and Licensing  
J. Breeden, Supervisor, Radioactive Analysis and Material Control  
W. Corbin, Director, Nuclear Engineering  
J. Costello, Supervisor, Nuclear Emergency Preparedness (Virginia)  
J. Crossman, Assistant Manager, Nuclear Operations  
T. Clune, Supervisor, Electrical Maintenance  
J. Davis, Site Vice President  
R. Evans, Manager, Radiological Protection  
R. Foster, Supply Chain Manager  
S. Hughes, Manager, Nuclear Operations  
P. Kemp, Supervisor, Nuclear Safety & Licensing  
J. Kirkpatrick, Manager, Maintenance  
L. Lane, Director, Operations and Maintenance  
G. Lear, Manager, Organizational Effectiveness  
J. Leberstien, Licensing Technical Advisor  
T. Maddy, Manager, Nuclear Protection Services  
C. McClain, Manager, Nuclear Training  
F. Mladen, Manager, Nuclear Site Services  
J. Rayman, Emergency Planning Supervisor  
G. Salomone, Licensing  
M. Sartain, Manager, Nuclear Engineering  
J. Scott, Supervisor, Nuclear Training (operations)  
B. Standley, Nuclear Site Engineering Assistant Manager  
D. Stoddard, Director (new), Nuclear Safety and Licensing  
M. Whalen, Station Licensing

### **LIST OF ITEMS OPENED, CLOSED AND DISCUSSED**

#### **Opened and Closed**

05000338, 339/2006003-01	NCV	Inadequate Corrective Action Results in Failure of Control Room Chiller to Start (Section 1R12)
05000338/2006003-02	NCV	Failure to Implement a Maintenance Procedure Impacting Pressurizer PORV Operability (Section 1R15)
05000339/2006003-03	NCV	Failure to Correct a Condition Adverse to Quality Regarding High Cycle Fatigue Failure of the 2J EDG Lube Oil Filter Vent Line (Section 4OA2)

Attachment



Closed

05000338/2006001-00	LER	Manual Reactor Trip Due to Shutdown Bank "A" Group 2 Step Counter Inoperable (Section 4OA3)
2515/165	TI	Operational Readiness of Offsite Power and Impact on Plant Risk (Section 4OA5)

**LIST OF DOCUMENTS REVIEWED**

**Section 1R01: Adverse Weather Protection**

- Plant Issue N-2006-3007, Based on inspector identified elevated EDG room temperatures, the following issues need to be addressed: Critical equipment affected by high temperature, tracking hours of equipment that exceed its design rating, appropriate monitoring of local temperature indicators (TI) to determine required actions; current method of averaging of local TIs to determine actions, adequacy of procedure for taking action on elevated room temperatures.
- Calculation 14937.75-E-18, "Analysis of Operation of Overload Relays in MCCs During Station Blackout"
- 0-GOP-5.5, "EDG Hot Weather Operations"

**Section 1R02: Evaluation of Changes, Tests, and Experiments**

Full Evaluations

- 2000-SE-MOD-02, Charging Pump Upgrades
- 2000-SE-MOD-11, Remove Upper Disc Pressurization Connection Valves and Flanges
- 2005-SE-OT-01 Isolation of Component Cooling to Containment Penetrations
- 1997-SE-MOD-07, Install Test Taps in HVAC Ducts
- 1991-SE-MOD-076, 3 SG Blowdown Tank Piping Rerouting
- 2004-SE-OT-03, Incorporate Reactor Coolant Environmental Effects in the Calculation of Safety Injection Accumulator and Charging Line Nozzle Cumulative Usage Factors for Safety Injection and Charging Line Nozzles Connected to the Reactor Coolant System

Screened Out Items

- DCP 03-108, MFRV Positioner Modification AV2 to AV1
- DCP 04-102, MOV Overall Gear Ratio Modification
- DCP 03-150, 2-FW-62 Replacement
- DCP 02-803 Scaling Change for Delta Flux Input to OTΔT Function for Framatome Fuel Load
- DCP 04-135, Pressurizer Safety Valve Inlet Nozzle Material Reconciliation

- DCP 04-149, Alternate Containment Temporary Equipment Hatch Cover Penetrations for Framatome Use
- DCP 03-168, Install Remote Closure SOV's for Pressurizer Spray Valves
- DCP 01-121, Replace 2" Nozzles on the SI Accumulators
- DCP 03-154, Secondary Side Piping Program - Pipe Replacement
- DCP 04-136, Modify Unit 2 MS H-43 Support
- DCP 03-122, Replace the Agastat Timing Relays in the EDG Load Sequencing Circuits in Order to Reduce the Frequency of Out of Tolerance Discoveries
- DCP 03-146, Replace 2J EDG Temperature Switches
- DCP 03-133, Modify 2-HV-HV-2 Control Logic to Trip When 2-HV-F-16 Flow Stops
- DCP 04-100, Change the Control Method for two MOVs (2-RS-MOV-200A and 2-RS-MOV-200B) by Modifying the Torque Switch Bypass to Cover the Entire Close Stroke
- DCP 01-162, Replacement of Vital Bus Inverters 2-III & 2-IV

#### Procedures

- VPAP-3001, Safety Evaluations, Revision 6
- VPAP-3001, Safety and Regulatory Reviews, Revision 12

#### Plant Issues

- N-2002-0166, MOV Dynamic Test Data Obtained During GL 96-05 Testing Indicates Non-Conservative Valve Factors
- N-2004-3249, The Safety Review/Regulatory Screen for DC 03-172 was Found In Error During Preparation of Field Change 2

### **Section 1R04: Equipment Alignment**

#### Partial Walkdown

- Procedure 1-OP-7.1A, Valve Checkoff - Low Head Safety Injection System
- Procedure 2-PT-57.1B, Emergency Core Cooling Subsystem - Low Head Safety Injection Pump (2-SI-P-B)
- Plant Drawing 12050-FM-096A, Flow Diagram - Safety Injection System
- Plant Issue N-2006-2428, during 1-PT-213.8A noticed "banging or clanging" sound from rod connecting 1-SI-MOV-1860A Valve Motor

#### Complete Walkdown

- List of open work orders for Unit 2 Recirculation Spray System
- Procedure 2-OP-7.10, "Operation of Casing Cooling Subsystem of the Recirculation Spray System"
- UFSAR 6.2.2, "Containment Heat Removal Systems - Containment Depressurization System"
- Plant Issue N-2006-2312, During NRC walkdown Eberline hand and foot monitor does not meet seismic housekeeping requirements of VPAP-0312.
- Plant Issue N-2006-2313, Boric acid packing leak discovered on 2-RS-ICV-3077 by NRC Resident Inspector

## **Section 1R07: Heat Sink Performance**

### **Procedures**

- 0-PT-75.15, Generic Letter 89-13 Service Water System Testing Requirements Coordination, Revision 5, dated 08/30/04
- 2-PT-77.13B, Control Room Chiller Equipment Performance Test (2-HV-E-4B), Revision 10, dated 05/5/04
- 0-PT- 75.22, Service Water System Reservoir Sludge Depth Measurement, Revision 4, dated 01/17/06
- 0-PT-75.7, Service Water Reservoir-Ground Water Level, Revision 7, dated 12/14/05
- 1-PT-9.2, Service Water Reservoir ISI, Revision 3, dated 08/17/04
- 0-PT-75.6.2, Service Water Pump House Drain System: Flow Rate and Clarity, Revision 7, dated 09/14/05
- 0-PT-75.12, Visual Inspection of the Service Water Reservoir Dike Crest and Toe, Revision 3, dated 11/17/05
- 0-PT-115, Survey of Settlement Monitoring Points, Revision 5, dated 03/27/06
- 2-PT-74B, Component Cooling Heat Exchanger 2-CC-E-1B Performance Test, Revision 008, dated 06/24/06
- 2-PT-74A, Component Cooling Heat Exchanger 2-CC-E-1A Performance Test, Revision 007, dated 02/03/04
- 0-PT-75.8, Service Water Reservoir Loss Monitoring Procedure, Revision 003, dated 07/07/04
- NASES-3.20, Generic Letter 89-13 Programs, Revision 2, dated 10/05/05

### **Calculations**

- MAT-0002, Wall Thickness Measurements of Selected Service Water Spray Array Piping Lines at North Anna, Revision 3
- MAT-0003, Wall Thickness Measurements of Selected Service Water Piping Lines at North Anna, Revision 2
- CE-1386, Stability of SWR Dike, Revision 0

### **Drawings**

- 11715-FM- 078A, Sheet 1, Flow/Valve Operating Numbers Diagram Service Water System, Revision 63
- 11715-FM-078A, Sheet 4, Flow/Valve Operating Numbers Diagram Service Water System, Revision 94
- 11715-FP-5AL, Sheet 1, Buried Return Headers Service Water Piping, Revision 1
- 11715-FC-38D-13, Sheet 4, Service Water Pump House Outline
- 11715-FP-5A, Sheet 1, Service Water Lines Yard, Revision 19

### **Miscellaneous**

- Inservice SW pump performance data for last two years
- NRC letter to Mr Michael P. Whalen, North Anna Licensing, Summary of Dam Safety Inspection for the Service Water Reservoir Dam at North Anna Power Station, dated 09/08/04

- VEPCO letter to the NRC, Ms. Caverly, VEPCO North Anna Power Station Unit 1 & 2 Dam Safety Inspection Response for the Service Water Reservoir, dated 12/10/04
- VEPCO letter to the NRC, Ms. Caverly, VEPCO North Anna Power Station Unit 1 & 2 Dam Safety Inspection Response for the Service Water Reservoir, dated 01/25/05
- VEPCO letter to the NRC, Serial 89-572H, Consolidated Response to Generic Letter 89-13 Service Water Problems Affecting Safety-Related Equipment
- FERC letter to North Anna Power Station (P-6335- VA), dated 02/09/06
- Engineering Transmittal No. N02-073, Revision 0, Monitoring of Structures, Report of 5 Year Periodic Inspection, dated 10/30/02 [reviewed SW only]
- Engineering Transmittal CME 99-0039, Revision 0, Component Cooling Heat Exchanger Periodic Test 2-PT-74A, Revision 5 06/14/99, dated 06/23/99
- Engineering Transmittal CME 98-0017, Revision 0, Component Cooling Heat Exchanger, 2-CC-E-1B Post Installation Performance Test, dated 03/18/98
- Final Safety Analysis Report Table 3.9-1, Revision 39 [SW Valve list]
- Inservice Testing Basis, Section 6.20, Service Water, Revision 7
- North Anna Power Station Updated Final Safety Analysis Report, Section 9.2.1 Service Water System, dated 02/15/06
- MR PI Evaluation Response N-2002-0129-E2, Service Water Spray 1A2 Crack
- PM Task Evaluation N-PMTE-2004-0232, Change Frequency of Inspection and Cleaning of Unit 2 CC Heat Exchangers from Annual to Two Years, dated 11/18/04
- ITC-SA-04-29, Dominion GL 89-13 Program Service Water System Problems Affecting Safety-Related Equipment
- Plant Issue N-2002-0066-B, Heat exchanger inspections
- System Design Basis Document, Section 9, SW Design Requirements, Revision 9
- 2006 Quarter 1, SW Health Report
- Work Order 5900063688, Unit 2, 1B Component Cooling Heat Exchanger Inspection/Cleaning /Plugging, 02/13/06
- Work Request 00102667, 1A Service Water Traveling Screen Chain Thickness Below 20%, 06/15/05

#### **Section 1R12: Maintenance Effectiveness**

- N-2003-2665, Cannot maintain Unit 2 rod drive room temperature below the backboards log spec of 85 F.
- N-2006-1021, Due to PCS high temperature alarm (85 deg F) in U2 Rod Drive placed 2-HV-HV-2 (rod drive supply) in auto
- N-2006-1956, Noted during Unit 2 safeguards logs that both Rod Drive MG set output voltages had decreased below the minimum value of 250-270 volts
- N-2006-1959, During performance of 1-PT-212.9, "A" main steam trip valve failed to close in the required time using the "A" SOV
- N-2006-1965, During UT examination of Base Metal Excavation 1 Repair 4 on Penetration #74 a ID connected flaw was found

- N-2006-2361, 2-HV-MOD-2227 Cable Vault Supply Damper is not opening fully with 2-HV-HV-2 in SLOW
- N-2006-2553, found 1-CH-P-1A1 ("A" charging pump aux oil pump) not running and both lights off locally
- N-2006-2574, 01-CH-P-1A1 WO 745597-02, upon disassembly found that one of the shaft bushings on the idle gear had severe wear
- N-2006-2583, cleared tags on 1-CH-P-1A1 to allow electricians to take amps
- N-2006-2584, lifted tag and ran 1-CH-P-1A1, A CH pump auxiliary oil pump for rotation check, amps and vibes
- N-2006-2586, from OPS logs (5/7/06@1145): performed test run of 1-CH-P-1A1 following pump work, amps initially at 9 amps with 12 PSIG discharge pressure
- Engineering Transmittal SE-97-025, Rod Drive Room Temperature Monitoring North Anna Power Station Units 1 & 2, Revision 0

### **Section 1R15: Operabiity Evaluations**

- Drawing 11715-FM-078A, "Service Water System Flow/Valve Operating Numbers," Revision 35
- Procedure 2-PT-75.2A, "Service Water Pump (2-SW-P-1A) Quarterly Test," Revision 45
- Procedure 2-PT-75.2A.1, "Service Water Pump (2-SW-P-1A) Head Curve Verification," Revision 21
- ET: N-06-0031
- ET: SE 95-009
- Plant Drawing 11715-PSSK-107L.3, "Vertical Constraint 6" RS-E15-153A-Q3 Casing Cooling Pump House
- Work Request WR 208706

### **Section 1R17: Permanent Plant Modifications**

#### **Procedures**

- VPAP-0301, Design Change Process, Revision 24
- STD-GN-001, Instructions DCP Preparation, Revision 34
- 0-DRP-01, Motor Operated Valve Operating Bands, Revision 13

#### **Self Assessment**

- ITC-SA-04-42, Design Issues

#### **Plant Issues**

- N-2001-1407, "A" Main Feed Reg Valve Went Through Oscillation
- N-2001-1704, "C" Main Feed Reg Valve Was Manually Overridden Due to Erratic Operation
- N-2004-4127, 1-RS-MOV-100B Overthrust/Overtorqued During Setup per DCP 04-103
- N-2005-4550, Implementation of DCP 04-126 for 2-CH-TCV-2143 was not Performed in Accordance with the DCP

Plant Issue Generated as part of the Inspection

- N-2006-3253, A Weakness in the Commercial Dedication Program has been Identified

**Section 1R20: Refueling and Other Outages**

- VPAP-2805, "Shutdown Risk Program"
- Dominion Memorandum dated 03/06/06, 2006 Outage Plan Safety Review North Anna Unit 1
- 1-OP-1.4, "Unit Startup from Mode 4 to Mode 3"
- 1-OP-1.7, "Unit Startup from Mode 3 to Mode 2 following Refueling"
- 1-OP-2.1, "Unit Startup from Mode 2 to Mode 1"

**Section 1R22: Surveillance Testing**

- Part 9900: Technical Guidance
- Information Notice 97-16, Preconditioning of Plant Structures, Systems, and Components Before ASME Code Inservice Testing or Technical Specification Surveillance Testing
- Plant Issue N-2006-0864-E1, NRC inspector inquired if step 6.5.3 of 2-PT-71.1Q was evaluated for preconditioning

**Section 4OA5: Other Activities**

- Procedure 0-OP-4.35, TN-32 Cask Loading and Handling, Revision 28
- Procedure 0-OP-4.36, Cask Transport from Crane Bay to ISFSI, Revision 10
- Procedure C-HP-1032.010, Radiological Survey Records, Revision 5