**UNITED STATES**
**NUCLEAR REGULATORY COMMISSION**
REGION II
245 PEACHTREE CENTER AVENUE NE, SUITE 1200
ATLANTA, GEORGIA 30303-1257

February 13, 2012

Mr. David A. Heacock
President and Chief Nuclear Officer
Virginia Electric and Power Company
Innsbrook Technical Center
5000 Dominion Boulevard
Glen Allen, Virginia 23060-6711

SUBJECT: SURRY POWER STATION – NRC INTEGRATED INSPECTION REPORT 05000280/2011005, 05000281/2011005

Dear Mr. Heacock:

On December 31, 2011, the United States Nuclear Regulatory Commission (NRC) completed an inspection at your Surry Power Station Units 1 and 2. The enclosed inspection report documents the inspection findings which were discussed on January 24, 2012, with Mr. L. Lane and other members of your staff.

The inspection examined activities conducted under your licenses as they related 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.

The enclosed inspection report discusses one NRC-identified finding (FIN) of potentially greater than Green significance that requires further risk evaluation to determine significance and one NRC-identified finding of very low safety significance (Green). One of these findings was determined to involve a violation of NRC requirements. The report also documents one licensee-identified violation which was determined to be of very low safety significance (Green). However, because of the very low safety significance of these findings and because they have been entered into your corrective action program, the NRC is treating these violations as non-cited violations (NCVs) consistent with Section 2.3.2 of the Enforcement Policy. If you contest any NCV or FIN, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN.: Document Control Desk, Washington DC 20555-0001; with copies to the Regional Administrator Region II; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Surry Power Station.

Additionally, if you disagree with a cross-cutting aspect assignment in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region II, and the NRC Resident Inspector at the Surry 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 the NRC's Agencywide Document Access and management System (ADAMS). ADAMS is accessible from the NRC Website at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

***/RA/***

Gerald J. McCoy, Chief
Reactor Projects Branch 5
Division of Reactor Projects

Docket Nos.: 50-280, 50-281
License Nos.: DPR-32, DPR-37

Enclosure: Inspection Report 05000280/2011005, 05000281/2011005
w/Attachment: Supplemental Information

cc w/encl. (See next page)

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Letter to David A. Heacock from Gerald J. McCoy dated February 13, 2012

SUBJECT: SURRY POWER STATION – NRC INTEGRATED INSPECTION REPORT 05000280/2011005, 05000281/2011005

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**U.S. NUCLEAR REGULATORY COMMISSION**

REGION II

| | |
|---|---|
| Docket Nos. | 50-280, 50-281 |
| License Nos. | DPR-32, DPR-37 |
| Report No. | 05000280/2011005, 05000281/2011005 |
| Licensee: | Virginia Electric and Power Company (VEPCO) |
| Facility: | Surry Power Station, Units 1 and 2 |
| Location: | 5850 Hog Island Road<br>Surry, VA 23883 |
| Dates: | October 1, 2011 through December 31, 2011 |
| Inspectors: | S. Sanchez, Senior Resident Inspector<br>J. Nadel, Resident Inspector<br>R. Clagg, Resident Inspector<br>E. Lea, Senior Operations Engineer (1R11)<br>R. Hamilton, Senior Health Physicist (2RS1, 2RS8, 4OA1)<br>G. Kuzo, Senior Health Physicist (2RS4, 4OA7)<br>R. Kellner, Health Physicist (2RS5)<br>A. Nielsen, Senior Health Physicist (2RS6) |
| Approved by: | Gerald J. McCoy, Chief<br>Reactor Projects Branch 5<br>Division of Reactor Projects |

Enclosure

## SUMMARY OF FINDINGS

IR 05000280/2011005, 05000281/2011005; 10/01/2011–12/31/2011; Surry Power Station, Units 1 and 2; Identification and Resolution of Problems, Other Activities.

The report covered a 3 month period of inspection by resident inspectors and region based inspectors. One NRC-identified finding (FIN) of potentially greater than Green and one NRC-identified non-cited violation (NCV) were identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). The cross-cutting aspect was determined using IMC 0310, "Components Within The Cross-Cutting Areas." 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 4, dated December 2006.

A. NRC Identified and Self-Revealing Findings

**Cornerstone: Initiating Events**

- TBD. The inspectors identified a finding for the licensee's failure to comply with Dominion procedure VPAP 0602, "Vendor Technical Manual Control." Specifically, the licensee failed to review the Vendor Technical Manual (VTM) for the reactor coolant system (RCS) standpipe to determine conformance with established maintenance practices as required by VPAP 0602. As a result, the licensee did not evaluate the need for a periodic maintenance activity associated with the standpipe or if current maintenance practices were adequate in both scope and frequency. This contributed to both decreased standpipe reliability during a high risk reduced inventory configuration and the performance of multiple subsequent entries into that configuration. The licensee entered this issue into their corrective action program as condition report 460261.

  The inspectors determined that the failure to review the VTM as required by VPAP-0602 was a performance deficiency that was within the licensee's ability to foresee and correct and which should have been prevented. The inspectors reviewed IMC 0612, Appendix B, issued on 12/24/2009, and determined that the finding was more than minor because it adversely impacted the equipment performance attribute of the initiating events cornerstone objective to limit the likelihood of those events that upset plant stability and challenge critical safety functions during shutdown operations. Specifically, the performance deficiency led to the material degradation of the standpipe internals which contributed to both decreased standpipe reliability during a high risk reduced inventory configuration and the performance of multiple subsequent entries into that configuration. In accordance with NRC Inspection Manual Chapter (IMC) 0609, Att. 4, "Phase 1 - Initial Screening and Characterization of Findings," inspectors were directed to use IMC 0609 Appendix G, "Shutdown Operations Significance Determination Process," Attachment 1, Checklist 3 "PWR Cold Shutdown and Refueling Operation - RCS Open and Refueling

Cavity Level < 23' or RCS Closed and No Inventory in Pressurizer – Time to Boiling < 2 hours," and determined the finding required a Phase 3 analysis. Specifically, the inspectors concluded that, in accordance with checklist item II.A.(2), the licensee did not maintain two sources of continuous level instrumentation with the pressurizer empty at the times where the standpipe MCR indication became erratic and had to be declared nonfunctional. Thus, the finding resulted in an increase in the likelihood of a loss of RCS inventory and required a Phase 2/3 evaluation. Consequently, the significance of this finding is to be determined (TBD) pending the results of the significance evaluation. The cause of this finding did not involve a cross-cutting aspect because it is not indicative of current licensee performance because of the time period associated with the receipt of the VTM and its revisions (2002-2003). (Section 4OA5)

**Cornerstone: Mitigating Systems**

- Green. The inspectors identified a non-cited violation (NCV) of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," for the licensee failing to take any actions to correct a condition adverse to quality. Specifically, the licensee failed to correct a known degraded building seam which allowed rainwater into the Unit 1 Reactor Protection System (RPS) Relay Room on four separate occasions over a four year time period.

  The inspectors concluded that the failure to correct the known degraded building seam was a performance deficiency that was within the licensee's ability to foresee and correct and which should have been prevented. The finding was more than minor because it is associated with the Mitigating Systems cornerstone attribute of Protection Against External Factors - Weather (heavy rain), and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the potential existed that under heavy rainfall conditions the water would migrate to a point where RPS equipment would be impacted. The inspectors determined that this finding was of very low safety significance because the finding was not a design issue, did not result in a loss of a safety function of a mitigating system, and did not screen potentially risk significant due to a seismic, flooding, or severe weather initiating event. The cause of this finding involved the cross-cutting area of problem identification and resolution, the component of corrective action program, and the aspect of appropriate corrective actions [P.1(d)], because the licensee failed to take appropriate and timely corrective actions commensurate with the safety significance of the rainwater intrusion events. (Section 4OA2)

B. Licensee Identified Violations

One violation of very low safety significance, which was identified by the licensee, was 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 respective corrective actions are listed in Section 4OA7 of this report.

## REPORT DETAILS

Summary of Plant Status

Unit 1 operated at essentially full rated thermal power (RTP) until it was down powered to 90 percent RTP on November 21, for planned turbine valve testing. That same day the unit was returned to full RTP and operated at full power for the remainder of the inspection period.

Unit 2 operated at essentially full RTP until it was down powered to about 75 percent RTP on November 3 for planned replacement of a high pressure heater drain pump. The unit returned to full RTP on November 6 and operated at full power for the remainder of the inspection period.

1. REACTOR SAFETY

**Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity**

1R04 Equipment Alignment

.1 Partial Walkdown

a. Inspection Scope

The inspectors conducted two 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 (OOS). The inspectors reviewed the functional systems descriptions, Updated Final Safety Analysis Report (UFSAR), system operating procedures, valve alignment procedures, and Technical Specifications (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.

- Unit 2 Charging Component Cooling Water (CCW) System while the 1A Charging Pump was being Surveillance Tested
- Common Main Control Room Chiller 4C while 4A and 4B were OOS.

b. Findings

No findings were identified.

1R05 Fire Protection

.1 Quarterly Fire Protection Reviews

a. Inspection Scope

The inspectors conducted tours of the five areas listed below that are important to reactor safety to verify the licensee's implementation of fire protection requirements as described in fleet procedures CM-AA-FPA-100, "Fire Protection/Appendix R (Fire Safe Shutdown) Program," Revision 1, CM-AA-FPA-101, "Control of Combustible and Flammable Materials," Revision 2, and CM-AA-FPA-102, "Fire Protection and Fire Safe Shutdown Review and Preparation Process and Design Change Process," Revision 0. The reviews were performed to evaluate the fire protection program operational status and material condition and the adequacy of: (1) control of transient combustibles and ignition sources; (2) fire detection and suppression capability; (3) passive fire protection features; (4) compensatory measures established for out-of-service, degraded or inoperable fire protection equipment, systems, or features; and (5) procedures, equipment, fire barriers, and systems so that post-fire capability to safely shutdown the plant is ensured. The inspectors reviewed the corrective action program (CAP) to verify fire protection deficiencies were being identified and properly resolved.

- 2B Battery Room
- Mechanical Equipment Room (MER) #5
- MER #1
- Unit 1 Cable Spreading Room
- Alternate AC Diesel Building.

b. Findings

No findings were identified.

1R07 Heat Sink Performance

.1 Annual Review of Heat Sink Performance

a. Inspection Scope

The inspectors reviewed the licensee's heat exchanger program document, trending data maintained by the system engineer, maintenance rule information, and specific commitments. The inspectors selected CCW Heat Exchanger 1C due to an identified degrading trend in heat exchanger performance. The inspectors reviewed testing procedures and results to confirm that the component was still able to perform its function and that planned corrective actions were appropriate. The inspectors verified significant heat exchanger performance issues were being entered into the licensee's CAP and appropriately addressed.

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification Program

.1 Resident Inspector Quarterly Review

a. Inspection Scope

On November 30, 2011, the inspectors observed and evaluated licensed operator simulator training exercise RQ-11.7-ST-2. There were several training scenarios, including a simulated dual unit loss of offsite power with minimum shift staffing and a simulated 5.8 magnitude earthquake that led to a large unisolable pipe leak in the Turbine Building basement. This scenario was intended to exercise the entire operations crew and assess the ability of the operators to react correctly to multiple failures and the proper use of emergency classifications. The inspectors observed the crew's performance to determine whether the crew met the training objectives; accomplished the critical tasks; demonstrated the ability to take timely action in a safe direction and to prioritize, interpret, and verify alarms; demonstrated proper use of alarm response, abnormal, and emergency operating procedures; demonstrated proper command and control; communicated effectively; and appropriately classified events per the emergency plan. The inspectors observed the post training critiques to determine that weaknesses or improvement areas revealed by the training were captured by the instructor and reviewed with the operators.

b. Findings

No findings were identified.

.2 Annual Review of Licensee Requalification Examination Results

a. Inspection Scope

On February 14, 2011, the licensee completed the annual requalification operating test required to be administered to all licensed operators in accordance with 10 CFR 55.59(a)(2). The inspectors performed an in-office review of the overall pass/fail results of individual operating tests and the crew simulator operating tests. These results were compared to the thresholds established in Manual Chapter 609 Appendix I, Operator Requalification Human Performance Significance Determination Process.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness

a. Inspection Scope

For the two equipment issues described in the condition reports (CRs) listed below, the inspectors evaluated the effectiveness of the corresponding licensee's preventive and corrective maintenance. The inspectors performed a detailed review of the problem history and associated circumstances, evaluated the extent of condition reviews, as required, and reviewed the generic implications of the equipment and/or work practice problem(s). The inspectors performed walkdowns of the accessible portions of the system, performed in-office reviews of procedures and evaluations, and held discussions with system engineers. In addition, the inspectors compared the licensee's actions with the requirements of the Maintenance Rule (10 CFR 50.65), station procedures ER-AA-MRL-10, "Maintenance Rule Program," Revision 4, and ER-AA-MRL-100, "Implementing the Maintenance Rule," Revision 1.

- CR 449762 – Alternate AC Diesel functionality and Maintenance Rule availability when it was discovered that the fire water loop to the building had been isolated for over three weeks
- CR 452387 - Unit 2 Pressurizer vapor space sample containment isolation valve (2-SS-TV-201B) failure to close.

b. Findings

No findings were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control

a. Inspection Scope

The inspectors evaluated, as appropriate, the five activities listed below for the following: (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 Equipment Out of Service (EOOS) program associated with the risk profiles of Units 1 and 2. The inspectors reviewed the licensee's CAP to verify deficiencies in risk assessments were being identified and properly resolved.

- Green Risk during a partial loss of fire protection capability and an increased risk of trip due to switchyard conditions
- Green Risk while Emergency Diesel Generator (EDG) #3 is OOS for its 18 month Preventive Maintenance (PM) and increased risk of trip due to auxiliary building pipe tunnel modifications

- Green Risk while Emergency Switchgear Room (ESGR) and MER #3 flood dikes were removed during air bottle removal
- Yellow Risk while EDG #3 is OOS for its 18 month PM and a thunderstorm warning is in effect for Surry County
- Orange Risk while EDG #3 is OOS with Severe Weather Alert.

b. Findings

No findings were identified.

1R15 Operability Evaluations

a. Inspection Scope

The inspectors reviewed the seven operability evaluations listed below, affecting risk-significant mitigating systems, 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; (4) if compensatory measures were involved, whether the compensatory measures were in place, would work as intended, and were appropriately controlled; and (5) where continued operability was considered unjustified, the impact on TS Limiting Conditions for Operation and the risk significance. The inspectors' review included verification that operability determinations were made as specified in OP-AA-102, "Operability Determination," Revision 6. The inspectors reviewed the licensee's CAP to verify deficiencies in operability determinations were being identified and corrected.

- CR 450609, Alternate AC Diesel Damper Found Stuck Open
- CR 450856, Emergency Service Water Pump 1B (1-SW-P-1B) Suction Bowl Bolts Found Loose
- CR 450457, Pressurizer Master Pressure Controller Decreasing Output Transients
- CR 454999 - EDG #1 Failed As-Found Overspeed Trip Test.
- CR 449762 – Alternate AC Diesel Functionality With Fire Water Loop to the Building Isolated for Over Three Weeks
- CR 452387 – Pressurizer Vapor Space and Containment Isolation Trip Valve (2-SS-TV-201B) Failed to Close.
- CR 433473, Water Intrusion Into U1 Relay Room

b. Findings:

No findings were identified.

1R18 Plant Modifications

.1 Temporary Modifications

a. Inspection Scope

The inspectors reviewed temporary modification, S2-11-104, "Temporary Pump in Place of Failed Pump 2-SW-P-5C," to verify that the modification did not affect system operability or availability as described by the TS and UFSAR. In addition, the inspectors verified that the temporary modification was in accordance with CM-AA-TDC-204, "Temporary Modifications," Revision 0, and for the related work package, that adequate controls were in place, procedures and drawings were updated, and post-installation tests verified the operability of the affected systems.

b. Findings:

No findings were identified.

1R19 Post Maintenance Testing

a. Inspection Scope

The inspectors reviewed eight post maintenance test activities for the selected risk-significant mitigating system work orders (WOs) listed below, 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 in accordance with VPAP-2003, "Post Maintenance Testing Program," Revision 13.

- WO 38102837509, Unit 2 Turbine Driven Auxiliary Feedwater Pump Packing Adjustment Corrective Maintenance
- WO 38103123116, Unit 2 Reactor Protection Logic Testing After Replacement of Relay 2-RP-RLY-PRBXA
- WO 38103138446, Unit 1 'C' Loop Narrow Range Temperature Instrument Failure
- WO 38103058273, Charging Pump 2-CH-P-1B Maintenance Package
- WO 38103141050, EDG #3 PFD2 Relay Replacement
- WO 38102188840, EDG #3 18 Month Preventive Maintenance
- WO 38102758745, EDG #3 Fuel System Testing
- WO 38103149522, Unit 1 Charging Pump Service Water Pump 10B Thermal Overload Replacement

b. Findings

No findings were identified.

1R22 Surveillance Testing

a. Inspection Scope

For the five surveillance tests listed below, the inspectors examined the test procedures, witnessed testing, or 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 TS were met. The inspectors also determined whether the testing effectively demonstrated that the systems or components were operationally ready and capable of performing their intended safety functions.

In-Service Testing:

- 1/2-IPT-FT-CW-L-102/103/201/-203, Canal Level Probe Logic Testing

Surveillance Testing:

- 2-OPT-EG-001, #2 EDG Monthly Start Exercise Test
- 2-OPT-CH-001, 1A Charging Pump Surveillance Test
- 2-OPT-VS-002, Auxiliary Building Filter Exhaust Fan Surveillance Test
- 1-OSP-TM-004, Turbine Trip Test

b. Findings

No findings were identified.

2. RADIATION SAFETY (RS)

**Cornerstones: Occupational Radiation Safety and Public Radiation Safety**

2RS1 Radiological Hazard Assessment and Exposure Control

a. Inspection Scope

Hazard Assessment and Instructions to workers During facility tours, the inspectors directly observed labeling of radioactive material and postings for radiation areas, high radiation areas (HRAs), and airborne radioactivity areas established within the radiologically controlled area (RCA) of the Unit 1 (U1) and Unit 2 (U2) auxiliary building, and radioactive waste (radwaste) processing and storage locations. The inspectors independently measured radiation dose rates or directly observed conduct of licensee radiation surveys for selected RCA areas. The inspectors toured the independent spent

fuel storage installations reviewing posting and dosimetry placement and performed a general radiation survey of the area to identify if there were any unexpected results. The inspectors reviewed survey records for several plant areas including surveys for alpha emitters, hot particles, airborne radioactivity, and gamma surveys with a range of dose rate gradients. The inspectors also discussed changes to plant operations that could contribute to changing radiological conditions since the last inspection. For selected outage jobs, the inspectors attended pre-job briefings and reviewed radiation work permit (RWP) details to assess communication of radiological control requirements and current radiological conditions to workers.

Hazard Control and Work Practices The inspectors evaluated access barrier effectiveness for selected U1 and U2 Locked High Radiation Area (LHRA) and Very High Radiation Area (VHRA) locations. Changes to procedural guidance for LHRA and VHRA controls were discussed with health physics (HP) supervisors. Controls and their implementation for storage of irradiated material within the spent fuel pool (SFP) were reviewed and discussed. Established radiological controls (including airborne controls) were evaluated for selected tasks including work in auxiliary building HRAs, and radwaste processing and storage. In addition, licensee controls for areas where dose rates could change significantly as a result of various routine operations were reviewed and discussed. The expected response by backshift personnel upon discovery of unexpected changes in dose rate or other radiation protection parameters was discussed.

Occupational workers' adherence to selected RWPs and HP technician (HPT) proficiency in providing job coverage were evaluated through direct observations and interviews with licensee staff. Electronic dosimeter (ED) alarm set points and worker stay times were evaluated against area radiation survey results. ED alarm logs were reviewed and worker response to dose and dose rate alarms during selected work activities was evaluated.

Control of Radioactive Material The inspectors observed surveys of material and personnel being released from the RCA using small article monitor, personnel contamination monitor, and portal monitor instruments. The inspectors compared recent 10 Code of Federal Regulations (CFR) Part 61 results for the Dry Active Waste radioactive waste stream with radionuclides used in calibration sources to evaluate the appropriateness and accuracy of release survey instrumentation. The inspectors also reviewed records of leak tests on selected sealed sources and discussed nationally tracked source transactions with licensee staff.

Problem Identification and Resolution Condition Reports (CR)s associated with radiological hazard assessment and control were reviewed and assessed. The inspectors evaluated the licensee's ability to identify and resolve the issues in accordance with procedure PI-AA-200, Corrective Action, Revision (Rev.) 17. The inspectors also evaluated the scope of the licensee's internal audit program and reviewed recent assessment results.

Radiation protection activities were evaluated against the requirements of Updated Final Safety Analysis Report (UFSAR) Section 11, Radioactive Wastes and Radiation Protection; Technical Specifications (TS) Section 6.4, Unit Operating Procedures and Programs; 10 CFR Parts 19 and 20; and approved licensee procedures. Licensee programs for monitoring materials and personnel released from the RCA were evaluated against 10 CFR Part 20 and IE Circular 81-07, Control of Radioactively Contaminated Material. Documents reviewed are listed in Section 2RS1 of the attachment to this report.

b. Findings

No findings were identified.

2RS4 Occupational Dose Assessment

a. Inspection Scope

The inspectors evaluated current Radiation Protection (RP) program guidance and its implementation for monitoring assessing occupational workers' internal and external radiation exposure. The review included recent changes to program guidance and equipment, as applicable; quality assurance activities, results, and responses to identified issues; and individual dose results for selected occupational workers.

External Dosimetry The inspectors reviewed and discussed RP program guidance for monitoring external and internal radiation exposures of occupational workers. The inspectors verified National Voluntary Laboratory Accreditation Program (NVLAP) certification data and discussed program guidance for storage, processing and results for active and passive personnel dosimeters currently in use. Electronic dosimeter (ED) and thermoluminescent dosimeter (TLD) data were reviewed and discussed.

Internal Dosimetry Program guidance, instrument detection capabilities, and select results for the internally deposited radionuclides were reviewed in detail. The inspectors reviewed dose assessments for declared pregnant workers and worker event follow-up *in vivo* (Whole Body Count) analyses for calendar year 2010 and year-to-date for CY 2011. Data associated with a November 13, 2010, worker intake event, and subsequent licensee actions, resultant intake assessments, and final dose assignments were reviewed and discussed in detail. Detection capabilities for passive monitoring equipment were review and discussed. Guidance for initiating tritium monitoring and bioassays for selected work activities were reviewed and discussed.

Special Dosimetric Situations The inspectors reviewed monitoring conducted and results for special dosimetric situations. The methodology and results of monitoring occupational workers within non-uniform external dose fields and assignment of effective dose equivalent results for selected activities during previous outages were discussed in detail. In addition, the adequacy of dosimetry program guidance and its implementation for shallow dose assessments and supporting calculations for personnel involved in selected personnel contamination events were evaluated. Neutron monitoring guidance

and results for ISFSI activities were reviewed and discussed. The inspectors discussed and reviewed program guidance, monitoring activities, and results for declared pregnant workers documented in licensee records since January 1, 2010. Radiation Protection program staff proficiency involved in conducting skin dose assessments, neutron monitoring, and WBC equipment operations were evaluated through direct interviews, onsite observations, and review and discussions of completed records and supporting data.

Corrective Action Program (CAP) Review The inspectors reviewed and discussed selected Corrective Action Program (CAP) documents associated with occupational dose assessment. The reviewed items included Condition Report (CR) documents, self-assessments, and quality assurance audit documents. The inspectors evaluated the licensee's ability to identify, characterize, prioritize, and resolve the identified issues in accordance with licensee Administrative Procedure PI-AA-200, Corrective Action, Rev. 17.

RP program occupational dose assessment guidance and activities were evaluated against the requirements of the Updated Final Safety Analysis Report (UFSAR) Section 11; Technical Specification (TS) Section 6.4.B, Unit Operating Procedures and Programs (Personnel Radiation Protection); 10 Code of Federal Regulations (CFR) Parts 19 and 20; and approved licensee procedures. Records reviewed are listed in Sections 2RS1, 2RS4, and 4OA1 of the report Attachment.

The inspectors completed all specified line-items detailed in Inspection Procedure (IP) 71124.04.

b. Findings

No findings were identified.

2RS5 Radiation Monitoring Instrumentation

a. Inspection Scope

Radiation Monitoring Instrumentation During tours of the auxiliary building, and RCA exit point, the inspectors observed installed radiation detection equipment including the following instrument types: area radiation monitors (ARM), continuous air monitors (CAM), liquid and gaseous effluent monitors, personnel contamination monitors (PCM), small article monitors (SAM), and portal monitors (PM). The inspectors observed the physical location of the components, noted the material condition, and compared sensitivity ranges with UFSAR requirements.

In addition to equipment walk-downs, the inspectors observed or reviewed source checks and alarm setpoint testing of various portable and fixed detection instruments, including ion chambers, telepoles, PCM, SAM, and PM, and a whole body counter (WBC). For the portable instruments, the inspectors observed the use of a high-range calibrator and discussed periodic output value testing with a radiation protection

technician. The inspectors reviewed calibration records and evaluated alarm setpoint values for selected ARM, PCM, PM, SAM, effluent monitors, laboratory counting systems, and WBC systems. This included a sampling of instruments used for post-accident monitoring such as containment high-range ARMs, and effluent monitor high-range noble gas and iodine channels. The radioactive source used to calibrate an effluent monitor was evaluated for traceability to national standards. Calibration stickers on portable survey instruments and air samplers were noted during inspection of storage areas for ready-to-use equipment and instruments located throughout the plant. The most recent 10 CFR Part 61 analysis for DAW was reviewed to determine if calibration and check sources are representative of the plant source term. The inspectors also reviewed countroom quality assurance records for gamma spectroscopy germanium detectors and a liquid scintillation detector.

Effectiveness and reliability of selected radiation detection instruments were reviewed against details documented in the following: 10 CFR Part 20; NUREG-0737, Clarification of TMI Action Plan Requirements; TS Section 3.3 and 3.7; UFSAR Chapter 11; and applicable licensee procedures. Documents reviewed during the inspection are listed in section 2RS5 of the report Attachment.

Problem Identification and Resolution The inspectors reviewed and discussed selected Corrective Action Program (CAP) documents associated with radiological instrumentation. The reviewed items included CRs, self-assessment, and quality assurance audit documents. The inspectors evaluated the licensee's ability to identify, characterize, prioritize, and resolve identified issues in accordance with licensee procedure PI-AA-200, Corrective Action, Rev. 17. Documents reviewed are listed in section 2RS5 of the Attachment to this report.

The inspectors completed 1 sample as required by IP 71124.05 (sample size of 1).

b. Findings:

No findings were identified.

2RS6 Radioactive Gaseous and Liquid Effluent Treatment

a. Inspection Scope:

Radioactive Waste Treatment Systems The inspectors walked-down selected components of the gaseous and liquid radioactive waste (radwaste) processing and discharge systems. To the extent practical, the inspectors observed and evaluated the material condition of in-place waste processing equipment for indications of degradation or leakage that could constitute a possible release pathway to the environment. Inspected components included waste monitor tanks, laundry waste tanks, evaporation equipment, waste gas decay tanks, ventilation filtration systems, vendor-supplied liquid waste processing equipment, and associated piping and valves. The inspectors interviewed licensee staff regarding radwaste equipment configuration and effluent monitor operation. The inspectors also reviewed surveillance testing records for

auxiliary building ventilation filtration systems and for effluent flow rate measuring devices.

Effluents The inspectors observed the collection of airborne and liquid effluent samples from the radwaste facility vent and Liquid Waste Monitoring Tank A. Technician proficiency in collecting, processing, and counting the samples, as well as preparing the applicable release permits was evaluated. The inspectors reviewed recent liquid and gaseous release permits including pre-release sampling results, effluent monitor setpoints, and public dose calculations. The inspectors reviewed the 2009 and 2010 annual effluent reports to evaluate reported doses to the public, review any anomalous events, evaluate groundwater sampling results, and to review Offsite Dose Calculation Manual (ODCM) changes. The inspectors also reviewed compensatory sampling data for time periods when selected radiation monitors were out of service. Quality control activities for count room equipment were discussed with HP technicians and results of the 2009 and 2010 radiochemistry cross-check program were reviewed. The inspectors discussed effluent source term evaluation and changes to effluent release points with licensee staff. Recent land use census results and meteorological data used to calculate doses to the public were evaluated as part of IP 71124.07.

Ground Water Protection The inspectors reviewed the licensee's continued implementation of the industry's Ground Water Protection Initiative (NEI 07-07) and discussed any changes to the program. The inspectors discussed program guidance for dealing with spills, leaks, and unexpected discharges with licensee staff and reviewed recent entries into the 10 CFR 50.75(g) decommissioning file. The inspectors reviewed and discussed the licensee's program for monitoring of structures, systems, and components with the potential to release radioactive material to the environment including the liquid radwaste system, boron recovery system, and containment spray system. Potential effluent release points due to onsite surface water bodies were also evaluated.

Radwaste system operation, effluent processing activities, and groundwater protection efforts were evaluated against requirements and guidance documented in the following: 10 CFR 20; 10 CFR 50 Appendix I; ODCM; UFSAR Section 11; RG 1.21, Measuring, Evaluating, and Reporting Radioactivity in Solid Wastes and Releases of Radioactive Materials in Liquid and Gaseous Effluents from Light-Water-Cooled Nuclear Power Plants ; RG 1.109, Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50 Appendix I ; and TS Section 6. Procedures and records reviewed during the inspection are listed in Sections 2RS5, 2RS6, and 2RS7 of the report Attachment.

Problem Identification and Resolution The inspectors reviewed selected Corrective Action Program (CAP) documents in the areas of gaseous and liquid effluent processing and release activities. The inspectors evaluated the licensee's ability to identify and resolve the identified issues in accordance with procedure PI-AA-200, Corrective Action, Rev. 17. The inspectors also discussed the scope of the licensee's internal audit program and reviewed recent assessment results.

b. Findings

No findings were identified.

2RS7 Radiological Environmental Monitoring Program

a. Inspection Scope

REMP Status and Results The inspectors reviewed and discussed recent and proposed changes applicable to Radiological Environmental and Meteorological Monitoring program activities detailed in the Updated Final Safety Analysis Report (UFSAR), and Offsite Dose Calculation Manual (ODCM). Environmental monitoring sample results presented in the Annual Environmental Radiological Environmental Operating Report (AREOR) documents issued for calendar year (CY) 2009, and CY 2010 were reviewed and discussed. REMP vendor laboratory cross-check program results were reviewed and discussed. Select procedural guidance for collection, processing and analysis of airborne charcoal and particulate samples, and for iodine in water, milk, and broadleaf vegetation samples were reviewed and discussed with knowledgeable personnel. Detection level sensitivities for determination of iodine concentrations in water and charcoal sampling media analyzed by the site's vendor laboratory were compared with ODCM requirements. The CY 2010 and 2011 AREOR environmental measurement results were reviewed for consistency with licensee Annual Effluent Release Report data and evaluated for radionuclide concentration trends. Licensee actions for missed environmental monitoring samples were reviewed and discussed.

Site Inspection The inspectors observed implementation of selected REMP monitoring and sample collection activities for direct radiation, atmospheric particulates, charcoal cartridge, and milk samples as specified in the current ODCM and applicable procedures. The inspectors observed equipment material condition and verified operability, including verification of flow rates and total sample volume results for the weekly airborne particulate filter and iodine cartridge change-outs at four atmospheric sampling stations. Location of air sampling equipment locations were compared against current and historical meteorological wind dispersion and deposition data. In addition, the inspectors observed and discussed milk and well water sampling preparation for iodine monitoring and detection sensitivities, chain of custody activities, and analysis specifications for selected ODCM locations. Thermoluminescent dosimeter material condition and placement were verified by direct verification at ten locations identified in the ODCM. Land use census results, actions for missed samples including compensatory measures and/or availability of replacement equipment were discussed with knowledgeable licensee staff. In addition, sample pump calibration and maintenance records for the installed environmental air monitoring equipment were reviewed.

The inspectors toured the primary meteorological tower and observed local data collection equipment readouts. The inspectors observed the physical condition of the tower and associated instruments and discussed equipment operability, maintenance history, and backup power supplies with responsible licensee staff. For the

meteorological measurements of wind speed, wind direction, and temperature, the inspectors reviewed applicable primary meteorological tower instrumentation calibration records and evaluated meteorological measurement data trends for CY 2009 and CY 2010.

Corrective Action Program (CAP) Review The inspectors reviewed and discussed selected Corrective Action Program (CAP) documents associated with environmental monitoring program implementation and results. The reviewed items included Condition Report (CR) documents, self-assessments, and quality assurance audit documents. The inspectors evaluated the licensee's ability to identify, characterize, prioritize, and resolve the identified issues in accordance with licensee procedure PI-AA-200, Corrective Action, Rev. 17.

Procedural guidance, program implementation, quantitative analysis sensitivities, and environmental monitoring results were reviewed against 10 CFR Part 20; 10 CFR Part 50, and Appendix I to 10 CFR Part 50; TS Sections 6.4 A.4, Unit Operating Procedures and Programs (Monitoring Radiation and Radionuclides in the Environment); ODCM, Rev 15; RG 4.15, Quality Assurance for Radiological Monitoring Programs (Normal Operation) - Effluent Streams and the Environment; and the Branch Technical Position, An Acceptable Radiological Environmental Monitoring Program - 1979. Licensee procedures and activities related to meteorological monitoring were evaluated against: ODCM; RG 1.23, Meteorological Monitoring Programs for Nuclear Power Plants, and ANSI/ANS-2.5-1984, Standard for Determining Meteorological Information at Nuclear Power Sites. Documents reviewed are listed in Sections 2RS6, 2RS7 and 4OA1 of the report Attachment

The inspectors completed all specified line-items detailed in Inspection Procedure (IP) 71124.04. Review of the licensee's groundwater protection program activities and decommissioning file data are documented in Section 2RS6 of the report.

b. Findings

No findings were identified.

2RS8 Radioactive Solid Waste Processing and Radioactive Material Handling, Storage, and Transportation

a. Inspection Scope

Waste Processing and Characterization During inspector walk-downs, accessible sections of the liquid and solid radioactive waste (radwaste) processing systems were assessed for material condition and conformance with system design diagrams. Inspected equipment included radwaste storage tanks, resin transfer piping, resin and filter packaging components, and abandoned deborating equipment. The inspectors discussed component function, processing system changes, and radwaste program implementation with licensee staff.

The 2010 Radioactive Effluent Report and radionuclide characterizations from 2009 - 2010 for each major waste stream were reviewed and discussed with radwaste staff. For primary resin, primary filters, and Dry Active Waste (DAW) the inspectors evaluated analyses for hard-to-detect nuclides, reviewed the use of scaling factors, and examined quality assurance comparison results between licensee waste stream characterizations and outside laboratory data. Waste stream sampling, mixing, concentration averaging, and stabilization methodology for resins and filters was evaluated and discussed with radwaste staff. The inspector reviewed a listing of radwaste characterization samples that started in 1983 and continued up to 2011 for periodicity of sampling. The inspectors also reviewed the licensee's procedural guidance for monitoring changes in waste stream isotopic mixtures.

Radioactive Material Storage During walk-downs of indoor and outdoor radioactive material storage areas, the inspectors observed the physical condition and labeling of storage containers and the posting of Radioactive Material Areas. The inspectors also reviewed licensee procedural guidance for long-term storage and monitoring of radioactive material.

Transportation The inspectors observed preparation activities for a shipment of a reactor coolant pump motor. The inspectors observed licensee surveys of the shipping packages, and interviewed shipping technicians regarding Department of Transportation (DOT) regulations.

Selected shipping records were reviewed for consistency with licensee procedures and compliance with NRC and Department of Transportation (DOT) regulations. The inspectors reviewed emergency response information, DOT shipping package classification, waste classification, radiation survey results, and evaluated whether receiving licensees were authorized to accept the packages. Licensee procedures for opening and closing Type A containers and Type B shipping casks were compared to recommended vendor protocols and Certificate of Compliance (CoC) requirements. In addition, training records for selected individuals currently qualified to ship radioactive material were reviewed.

Problem Identification and Resolution The inspectors reviewed CRs in the area of radwaste/shipping. The inspectors evaluated the licensee's ability to identify and resolve the issues in accordance with procedure PI-AA-200, Corrective Action, Rev. 17. The inspectors also evaluated the scope of the licensee's internal audit program and reviewed recent assessment results.

Radwaste processing, radioactive material handling, and transportation activities were reviewed against the requirements contained in the licensee's Process Control Program, UFSAR Chapter 11 Radioactive Wastes and Radiation Protection, 10 CFR Part 20, 10 CFR Part 61, 10 CFR Part 71, and 49 CFR Parts 172-178. Licensee activities were also evaluated against guidance provided in the Branch Technical Position on Waste Classification (1983) and NUREG-1608. Documents reviewed during the inspection are listed in Section 2RS8 of the report Attachment.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator (PI) Verification

.1 Quarterly Resident Inspector Performance Indicator Verification

a. Inspection Scope

The inspectors performed a periodic review of the following three Unit 1 and 2 PIs to assess the accuracy and completeness of the submitted data and whether the PIs were calculated in accordance with the guidance contained in NEI 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 6. The inspection was conducted in accordance with NRC Inspection Procedure 71151, "Performance Indicator Verification." Specifically, the inspectors reviewed the Unit 1 and Unit 2 data reported to the NRC for the period October 1, 2010, through September 30, 2011. Documents reviewed included applicable NRC inspection reports, licensee event reports, operator logs, system engineering accumulated data, station performance indicators, and related CRs.

- Unit 1 and 2 High Pressure Safety Injection Systems
- Unit 1 and 2 Residual Heat Removal Systems
- Unit 1 and 2 Support Cooling Water Systems.

b. Findings

No findings were identified.

.2 Radiation Protection Performance Indicator (PI) Verification

a. Inspection Scope

Occupational Radiation Safety Cornerstone The inspectors reviewed the Occupational Exposure Control Effectiveness PI results for the Occupational Radiation Safety Cornerstone from January 2010 through September 2011. For the assessment period, the inspectors reviewed ED alarm logs and selected CRs related to controls for exposure significant areas. The inspectors also reviewed licensee procedural guidance for collecting and documenting PI data. Documents reviewed are listed in sections 2RS1 and 4OA1 of the report Attachment.

Public Radiation Safety Cornerstone The inspectors reviewed the Radiological Control Effluent Release Occurrences PI results for the Public Radiation Safety Cornerstone from January, 2010 through September, 2011. For the assessment period, the

inspectors reviewed cumulative and projected doses to the public and CRs related to Radiological Effluent Technical Specifications/Offsite Dose Calculation Manual issues. The inspectors also reviewed licensee procedural guidance for collecting and documenting PI data. Documents reviewed are listed in sections 2RS6 and 4OA1 of the report Attachment.

The inspectors completed two of the required samples specified in Inspection Procedure (IP) 71151.

b. Findings

No findings were identified.

4OA2 Identification and Resolution of Problems

.1 Daily Reviews of Items Entered Into the Corrective Action Program

As required by NRC Inspection Procedure 71152, "Identification and Resolution of Problems," and 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 CAP. This review was accomplished by reviewing daily CR report summaries and periodically attending daily CR Review Team meetings.

.2 Annual Sample: Review of CRs 433473, 433905, 438774, 439777, "Emergency Switchgear Room Water Instrusion Events"

a. Inspection Scope

The inspectors performed a review regarding the licensee's assessments and corrective actions for CRs 433473, 433905, 438774, 439777, which were written as a result of three instances of rainwater intrusion into the Unit 1 ESGR and the contiguous Unit 1 Reactor Protection System (RPS) Relay Room in different locations over the course of approximately two months. The inspectors reviewed the CRs to ensure that the full extent of the issue was identified, an appropriate evaluation was performed, and appropriate corrective actions were specified and prioritized. The inspectors also evaluated the CRs against the requirements of the licensee's Correction Action Program as specified in procedure, PI-AA-200, "Corrective Action Program," and 10 CFR 50, Appendix B.

b. Findings

Introduction: The inspectors identified a non-cited violation (NCV) of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," for the licensee failing to take any actions to correct a condition adverse to quality. Specifically, the licensee failed to correct a known degraded building seam which allowed rainwater into the Unit 1 Reactor

Protection System (RPS) Relay Room on four separate occasions over a three year time period.

Description: On August 27, 2011, during the heavy rains from Hurricane Irene, water intrusion into the Unit 1 Relay Room was identified. Water was leaking from multiple locations, including an approximately 25 foot seam in the ceiling. Water was splashing on containment sump level instrumentation, RWST level transmitter heater circuit instrumentation, pooling on the floor, dripping on cable trays and insulated cables near a wall penetration, and dripping from a ventilation duct. Inspectors noted that the arrangement of the overhead cable trays allows for the possibility of a cascading effect where water could migrate from the leak location to the top of the RPS relay cabinet. The top of the RPS relay cabinets was found to have multiple unsealed cable penetrations and other openings that would allow water to enter and affect the RPS system. The licensee took immediate actions to protect plant equipment from the dripping water and to contain the water pooling on the floor. No water was believed to have migrated to the top of the RPS relay racks during the August event. However, based on the location of cabling that was impacted by the water intrusion, it is likely that a heavy rainfall could result in water intrusion into the RPS cabinets.

The inspectors reviewed the licensee's corrective action program and found that three previous instances of rainwater leakage through the same degraded seam in the Unit 1 Relay Room had been identified. CR 111232 documented the leak in September of 2008, CR 357660 documented the leak in November of 2009 and CR 397180 documented the leak in September of 2010. The inspectors agreed that the water intrusion in 2008 and 2009 was likely minor in nature based on CR descriptions. However, by 2010 the degradation had worsened and the leak was significantly more severe; requiring timely corrective actions to fix the degradation. The following table is a synopsis of the corrective actions from the above mentioned CRs.

| CR# | Date | Corrective Actions | Results |
|---|---|---|---|
| 111232 | 9/26/2008 | Close to Work Order (WO) # 38102420802 | WO cancelled on 1/06/2011 with no documented justification. |
| 357660 | 11/11/2009 | Close to WO# 38102420802 | See above. |
| 397180 | 9/30/2010 | Close to WO# 38102864548 | The WO was created but no work had started as of 8/27/2011 |
| 439777 | 8/27/2011 | Close to WO# 38103107540 | The WO to seal an external building joint and the degraded ceiling seam was completed on 9/28/2011 |

No corrective actions from past leaks had been effective in correcting the problem because no work had been started.

Analysis: The inspectors concluded that the failure to correct the known degraded building seam was a performance deficiency that was within the licensee's ability to foresee and correct and which should have been prevented. The finding was more than minor because it is associated with the Mitigating Systems cornerstone attribute of Protection Against External Factors - Weather (heavy rain), and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the potential existed that under heavy rainfall conditions the water would migrate to a point where the Reactor Protection System equipment would be impacted. The inspectors screened this finding in accordance with IMC 0609, "Significance Determination Process," Attachment 4, "Phase 1 - Initial Screening and Characterization of Findings," and determined that this was a finding of very low safety significance (Green) because the finding was not a design issue, did not result in a loss of a safety function of a mitigating system, and did not screen potentially risk significant due to a seismic, flooding, or severe weather initiating event. The cause of this finding involved the cross-cutting area of problem identification and resolution, the component of corrective action program and the aspect of appropriate corrective actions [P.1(d)], because the licensee failed to take appropriate and timely corrective actions commensurate with the safety significance of the rainwater intrusion events.

Enforcement: 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," 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 27, 2011, the inspectors identified that a known degraded building seam, which had allowed rainwater intrusion into the Unit 1 RPS Relay Room on four separate occasions, had never been adequately corrected. Because this finding has very low safety significance (Green), and has been entered into the licensee's CAP as CR439777, it is identified as NCV 05000280/2011005-01, Inadequate Corrective Actions to Address Rainwater Intrusion into the Unit 1 RPS Relay Room.

.3 Annual Sample: Review of Operator Workarounds

a. Inspection Scope

The inspectors performed a review regarding the licensee's assessments and corrective actions for operator workarounds (OWAs). The inspectors reviewed the cumulative effects of the licensee's OWAs and licensee procedure OP-AA-1700, "Operations Aggregate Impact." The inspectors attended meetings were the Operations Aggregate Impact data were reviewed and corrective actions discussed. The inspectors also reviewed the Main Control Room Deficiency Log to ensure that no deficiencies were impacting the operator's ability to safely operate the plant and effectively respond to abnormal and emergency plant conditions. The inspectors reviewed and monitored licensee planned and completed corrective actions to address underlying equipment issues causing the OWAs and deficiencies. The inspectors also evaluated OWAs against the requirements of the licensee's CAP as specified in PI-AA-200, "Corrective Action," 10 CFR 50, Appendix B, and OP-AA-100, "Conduct of Operations."

b. Findings

No findings were identified.

4OA5 Other Activities

.1 Quarterly Resident Inspector Observations of Security Personnel and Activities

a. Inspection Scope

During the inspection period, the inspectors conducted observations of security force personnel and activities to ensure that the activities were consistent with the licensee security procedures and regulatory requirements relating to nuclear plant security. These observations took place during both normal and off-normal plant working hours.

These quarterly resident inspector observations of security force personnel and activities did not constitute any additional inspection samples. Rather, they were considered an integral part of the inspectors' normal plant status review and inspection activities.

b. Findings

No findings were identified.

.2 Closed: URI 05000281/2011002-01, Reactor Coolant System Instrumentation Erratic Level Indication

Introduction: The inspectors identified a finding for the licensee's failure to comply with Dominion procedure VPAP 0602, "Vendor Technical Manual Control." Specifically, the licensee failed to review the Vendor Technical Manual (VTM) for the reactor coolant system (RCS) standpipe to determine conformance with established maintenance practices as required by VPAP 0602. As a result, the licensee did not evaluate the need for a periodic maintenance activity associated with the standpipe or if current maintenance practices were adequate in both scope and frequency. This contributed to both decreased standpipe reliability during a high risk reduced inventory configuration and the performance of multiple subsequent entries into that configuration.

Description: On February 2, 2011, Surry Unit 2 tripped due to a C reactor coolant loop isolation valve (RCLIV) failure which partially blocked reactor coolant system (RCS) flow. Subsequently, the licensee drained the reactor coolant system to reduced inventory conditions, defined as less than 15.7 feet above the top of active fuel, and into the coolant loop itself (mid-loop) in order to repair the valve. The RCS standpipe is relied upon to provide two of the Generic Letter 88-17 committed indications of RCS level during reduced inventory and mid-loop conditions.

The standpipe instrument consists of a stainless steel pipe with an internal magnetic float. The bottom of the standpipe is connected to the RCS cold leg and the top is vented to containment atmosphere through the pressurizer. The standpipe has a

column of magnetic flag indicators (2-RC-LI-200B) that react with the float to provide a local indication of level. A remote indication transmitter (2-RC-LT-200) is installed on the standpipe exterior oriented 125 degrees circumferentially from the magnetic flags. The transmitter is a voltage divider with reed switches. As the magnetic float rises in the column, reed switches are closed changing the voltage drop across the voltage divider linearly from the minimum indicated level (10.5 feet or 0 VDC) to the maximum indicated level (24 feet or 12 VDC). The transmitter feeds both a digital level recorder (2-RC-LR-200) and a LED bar graph level indicator (2-RC-LI-200A) with digital display, both of which are located on the main control room (MCR) vertical board. After flushing the standpipe with clean water and placing it in service in accordance with procedure 2-OP-RC-013, "Reactor Head Vent and Standpipe Operation," the licensee commenced draining to reduced inventory and began experiencing erratic indications on level indicators 2-RC-LR-200 and 2-RC-LI-200A. After the erratic indications failed to subside and resulted in sustained channel disagreement, the operators commenced a re-fill to greater than 5% RCS level in the pressurizer as required by procedure.

Initial troubleshooting on the MCR level indicator and associated circuitry identified a loose connection which was believed to be responsible for the erratic indication. After correcting the loose connection, calibrating the standpipe, and placing it back in service per procedure, but without further troubleshooting, the licensee began draining to reduced inventory for a second time. Similar erratic indications recurred and the licensee was again required by procedure to leave the reduced inventory configuration and return to greater than 5% RCS level in the pressurizer. This time, after verifying all the electrical instrumentation was operating satisfactorily, the decision was made to disassemble the standpipe and inspect the condition of the magnetic float and pipe interior. The float was found to be rusted and bent, with wear spots present on some surfaces. The standpipe interior was found to have a layer of boric acid covering 20% of the inside circumference along the entire vertical length of the standpipe.

The licensee replaced the float with a new one and attempted to pressure wash the boric acid off the standpipe interior. The pressure washing was not fully successful at removing all the boric acid. The standpipe was then reassembled and a third draining evolution to reduced inventory was commenced. The licensee successfully reached mid-loop inventory without issue and began the valve repairs. However, while relying on the MCR standpipe level indicator at mid-loop inventory with the RCS open and vented, the licensee experienced two separate erratic indication events.

Testing by the Instrumentation and Controls Department, which was discussed with the inspectors, determined that 2-RC-LT-200, which feeds a common signal to 2-RC-LR-200 and 2-RC-LI-200A, was very sensitive to the orientation of the magnetic float within the standpipe. Slight deviations in the preferred magnetic axis alignment of the float as it moved up and down in the standpipe were seen to cause magnetic flux coupling loss with 2-RC-LT-200, which produced similar erratic indications on the recorder and the indicator. Interference in the standpipe due to rust, boric acid, and deformations in the float can cause such deviations. The troubleshooting section of the VTM lists a "damaged float" as a possible cause of incorrect level indication.

The inspectors reviewed the vendor technical manual (VTM) for the RCS standpipe (VTM-000-38-G492-00004) and found that it stated the only maintenance typically required on the standpipe and magnetic float assembly was to "ensure the internal walls of the weldment and the float are free of foreign matter." This may be accomplished by "removing the float assembly from the unit and wiping both the float and the inside wall of the float chamber." At the time of the valve failure in 2011, the maintenance organization had no periodic maintenance (PM) activity to wipe down the float and float chamber of the standpipe and had never previously disassembled it for internal inspection to check for foreign matter. Additionally, the licensee concluded that the float damage was likely due to years of normal standpipe operation where the float would frequently impact the top of the standpipe whenever the RCS was filled above the level of the standpipe while it was in service. Since there was no PM to check the standpipe internals, the float was never previously inspected.

The inspectors reviewed Dominion procedure VPAP-0602, "Vendor Technical Manual Control," Revision 5 and identified that steps 6.1.8 and 6.1.9 required the VTM coordinator to route the VTM and all revisions for review in accordance with section 6.4, which required review of maintenance procedures to ensure consistency with the VTM and all VTM revisions. A search of licensee records showed that no documented review had been performed on the VTM or any of its revisions when they were officially received and entered into the licensee's system in 2002-2003. The inspectors also noted that VPAP 0602 requires such documentation to be retained for the life of the plant.

The inspectors concluded that the failure to review the VTM to determine conformance with established maintenance practices was a performance deficiency which represented a missed opportunity to evaluate the adequacy of standpipe PM practices. This led to the material degradation of the standpipe internals which contributed to both decreased standpipe reliability during a high risk reduced inventory configuration and the performance of multiple subsequent entries into that configuration.

The licensee also concluded, in their Apparent Cause Evaluation (ACE 18543), that the PM scope and frequency for the RCS standpipe was inadequate to ensure component reliability. As a result, a corrective action was created to "establish a PM to clean the standpipe on a periodic basis as stated in the vendor manual."

Analysis: The inspectors determined that the failure to review the VTM as required by VPAP-0602 was a performance deficiency that was within the licensee's ability to foresee and correct and which should have been prevented. The inspectors reviewed IMC 0612, Appendix B, issued on 12/24/2009, and determined that the finding was more than minor because it adversely impacted the equipment performance attribute of the initiating events cornerstone objective to limit the likelihood of those events that upset plant stability and challenge critical safety functions during shutdown operations. Specifically, the performance deficiency led to the material degradation of the standpipe internals which contributed to both decreased standpipe reliability during a high risk reduced inventory configuration and the performance of multiple subsequent entries into that configuration. In accordance with NRC Inspection Manual Chapter (IMC) 0609, Att.

4, “Phase 1 - Initial Screening and Characterization of Findings,” inspectors were directed to use IMC 0609 Appendix G, “Shutdown Operations Significance Determination Process,” Attachment 1, Checklist 3 “PWR Cold Shutdown and Refueling Operation - RCS Open and Refueling Cavity Level < 23’ or RCS Closed and No Inventory in Pressurizer – Time to Boiling < 2 hours”, and determined the finding required a Phase 3 analysis. Specifically, the inspectors concluded that, in accordance with checklist item II.A.(2), the licensee did not maintain two sources of continuous level instrumentation with the pressurizer empty at the times where the standpipe MCR indication became erratic and had to be declared nonfunctional. Thus, the finding resulted in an increase in the likelihood of a loss of RCS inventory and required a Phase 2/3 evaluation.

Consequently, the significance of this finding is to be determined (TBD) pending the results of the phase 3 risk evaluation. The cause of this finding did not involve a cross-cutting aspect because it is not indicative of current licensee performance because of the time period associated with the receipt of the VTM and its revisions (2002-2003).

Enforcement: Enforcement action does not apply because the finding did not involve a violation of regulatory requirements. The licensee has entered this issue into their corrective action program as CR 460261. Pending determination of safety significance this finding is being identified as FIN-TBD 05000281/2011005-02, Failure to Conduct Reviews of the Vendor Technical Manual for the RCS Standpipe.

## 4OA6 Meetings, Including Exit

### Exit Meeting Summary

On January 24, 2012, the inspection results were presented to Mr. Lane and other members of his staff, who acknowledged the findings. The inspectors asked the licensee whether any of the material examined during the inspection should be considered proprietary. No proprietary information was identified.

On October 13, 2011, the inspectors discussed the results of the onsite radiation protection inspection with Mr. Stanley, Director Nuclear Safety and Licensing, and other members of his staff. The inspectors noted that no personally identifiable information or proprietary information had been provided and if any was identified in subsequent document review that it would be properly destroyed.

## 4OA7 Licensee-Identified Violation

The following violation of very low safety significance (Green) was identified by the licensee and is a violation of NRC requirements which meet the criteria of Section 2.3.2 of the NRC Enforcement Policy for characterization as a NCV:

Dominion procedure 0-MCM-0402-01, “Grinnell Diaphragm Valve Maintenance,” step 6.7.9, requires valve travel stops be set by turning a Nylock nut until contact with the spacer on the seal collar is made. Contrary to this, on May 22, 2011, a supplemental

worker under Dominion supervision failed to correctly set the travel stop for 2-CH-19, a demineralizer Primary Grade (PG) water header isolation valve. As a result, on May 28, 2011, control room operators discovered that PG water had been leaking past 2-CH-19, which was closed, and diluting the RCS since the start of a demineralizer flushing activity approximately 21 hours earlier. Operators took immediate actions including securing the PG pumps and two emergency borations of the RCS. A review of RCS boron concentration samples taken during this time period revealed that minimum shutdown margin boron concentration was maintained with 80 pcm of margin at the lowest point during the event. The inspectors determined the finding was more than minor because it adversely impacted the Initiating Events cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown operations. In accordance with NRC Inspection Manual Chapter (IMC) 0609, Att. 4, "Phase 1 - Initial Screening and Characterization of Findings," the inspectors were directed to use IMC 0609 Appendix G, "Shutdown Operations Significance Determination Process," Attachment 1, Checklist 2, PWR Cold Shutdown Operation: RCS Closed And SGs Available for DHR Removal (Loops Filled and Inventory in Pressurizer) Time to Boiling Less than 2 Hour, and determined the finding screened out as Green because reactivity TS was not violated. The licensee documented this issue in their CAP as CR422769 and Root Cause 1054.

ATTACHMENT: SUPPPLEMENTAL INFORMATION

## SUPPLEMENTAL INFORMATION

## KEY POINTS OF CONTACT

Licensee Personnel

M. Adams, Director, Station Engineering
J. Ashley, Licensing Engineer
L. Lane, Site Vice President
P. Blasioli, Director, Nuclear Protection Services & Emergency Preparedness
E. Collins, Manager, Emergency Preparedness
J. Eggart, Manager, Radiation Protection & Chemistry
B. Garber, Supervisor, Station Licensing
L. Hilbert , Manager, Outage and Planning
B. Hoffner, Manager, Nuclear Fleet Emergency Preparedness
R. Johnson, Manager, Operations
C. Olsen, Manager, Site Engineering
L. Ragland, HP Operations Supervisor
K. Sloane, Plant Manager (Nuclear)
M. Smith, Manager, Nuclear Oversight
B. Stanley, Director, Station Safety and Licensing
W. Terry, HP Technical Services Supervisor
N. Turner, Supervisor, Emergency Preparedness
M. Wilda, Supervisor, Auxiliary Systems

## LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened

| | | |
|---|---|---|
| 05000281/2011005-02 | FIN | Failure to Conduct Reviews of the Vendor Technical Manual for the RCS Standpipe (Section 4OA5.2) |

Opened and Closed

| | | |
|---|---|---|
| 05000280/2011005-01 | NCV | Inadequate Corrective Actions to Address Rainwater Intrusion into the Unit 1 RPS Relay Room (4OA2.2) |

Closed

| | | |
|---|---|---|
| 05000281/2011002-01 | URI | Reactor Coolant System Instrumentation Erratic Level Indication (4OA5.2) |

Discussed

None

## LIST OF DOCUMENTS REVIEWED

**Section 2RS1: Radiological Hazard Assessment and Exposure Controls**

Procedures, Guidance Documents, and Manuals

C-HP-1081.012, Radiation Work Permits: Preparing and Approving, Rev. 7
C-HP-1081-040, Radiation Work Permits: Providing HP Coverage during Work, Rev.7
RP-AA-106, Radiological Work Control Program, Rev. 1
RP-AA-108, Radioactive Material Control Program, Rev. 0
RP-AA-109, Radiological Survey Program, Rev. 0
RP-AA-201, Access Controls for High and Very High Radiation Areas, Rev. 6
RP-AA-202, Radiological Posting, Rev. 5
RP-AA-203, Radiological Labeling and Marking, Rev. 1
RP-AA-221, Radiological Survey Records, Rev. 0
RP-AA-222, Radiation Surveys, Rev. 1
RP-AA-232, Radioactive Material (RAM) Control, Rev. 2
RP-AA-240, Discrete Radioactive Particle Control, Rev. 0
RP-AA-260, Control of Radiography, Rev. 3
RP-AA-261, Control of Radiological Diving Activities, Rev. 1
RP-AA-262, Steam Generator Primary Side Work Controls, Rev.0
UFSAR Chapter 11, Radioactive Wastes and Radiation Protection, Rev. 43

Records and Data Reviewed

0-HPT-TRKSOURCE-001, PT: Inventory of Nationally Tracked Sources by Health Physics, 1/5/2011
RWP11-0-1001, Walkdowns, Inspections, and Observations by Security, Management, Corporate, NRC, INPO and other Supporting Organizations, Rev.1
RWP11-0-1102, Radiological Protection Support, Rev.1
RWP11-0-1003, Operations Station and SRF Support, Rev.1
RWP11-0-1501, Containment Subatmospheric Entries, Rev.0
RWP 11-0-1502, Primary and RO Filter Replacements, Rev.1
RWP11-0-1503, Primary and Associated System Resin Processing, Rev.0
RWP11-0-1506, Unit 2 Containment Subatmospheric Entries, Rev.0

CAP Documents

Condition Report (CR) 378610
CR402427
CR404969
CR410305
CR 413515
CR422023

CR424163
CR431634

**Section 2RS4: Occupational Dose Assessment**

Procedures and Guidance Documents
Nuclear Health Physics, Health Physics Procedure (HP)-1031.124 Performing Effective Dose Equivalent (EDE) Calculations, Revision (Rev.) 0
C-HP-1041.011, Evaluating and Tracking Intakes of Radioactive Material, Rev. 6
C-HP-1041.021, Radionuclide Intake Determination Based on Bioassay Results, Rev. 7
C-HP-1041.022, Internal Dose Calculation Based on DAC-Hour Exposure, Rev. 6
C-HP-1041.023, Internal Dose Calculation Based on Radionuclide Intake, Rev. 9
C-HP-1041.025, Declared or Expected Pregnant Woman, Rev. 3
C-HP-1042.230, Airborne Radioactivity Exposure Tracking, Rev. 4
Nuclear Fleet Administrative Radiation Protection Administrative Procedure (RP-AA)-104, Internal Radiation Exposure Control Program
RP-AA-105, External Radiation Exposure Control Program Rev. 0
RP-AA-121, Manual Skin Dose Assessment, Rev. 1
RP-AA-122, Skin Dose Assessment, Rev. 1
RP-AA-123, Effective Dose Equivalent, (EDE), Rev. 1
RP-AA-261, Control of Radiological Diving Activities, Rev. 1
Nuclear Fleet Administrative Procedure, PI-AA-200, Corrective Action, Rev. 17

Records and Data Reviewed
Radiation Work Permit 10-01-2117, U1 RFO: Pressurizer Spray Valve Maintenance 1 RC-PCV-1455A/1455B, Revision (Rev. 1)
Unit 2 Containment Air Sample Results, Jan 1, 2010 through October 10, 2011
Surry Power Station, Personnel Contamination Report, End of Year Analysis 2010, May 6, 2011
Personnel Contamination Data, January 1, 2011, through October 6, 2011
National Voluntary Laboratory Accreditation Program (NVLAP), Certificate of Accreditation to ISO/IEC 17025:2005, Mirion Technologies, Inc., 7/1/2011 through 6/30/2012
C-HP-1041.011, Attachment 9 Initial Whole Body Counts Exceeding 1 WBC Action Level, 01/03/11

Corrective Action Program (CAP) Documents
Corrective Action (CA) 184677
CR 403613
CR 403746
CR 410470
CR428530
CR 425519
CR 427945

**Section 2RS5: Radiation Monitoring Instrumentation**

Procedures, Guidance Documents, and Manuals

C-HP-1033.401, Nuclear Health Physics Procedure, Eberline RM-14: Calibration and Operation, Rev. 4
C-HP-1033.440, Nuclear Health Physics Procedure, NE Technology SAM-9/11 Calibration and Operation, Rev. 7
C-HP-1033.540, Nuclear Health Physics Procedure, Eberline RO-2, RO-2A, RO-20, and Thermo Scientific RO-20AA: Calibration and Operation, Rev. 5
C-HP-1033.610, Nuclear Health Physics Procedure, Eberline Ari Monitor AMS-4 Calibration and Operation, Rev. 5
HP-1033.020, Surry Power Station Procedure, Radiation Protection Instrument Calibration Facility Use, Rev. 3
HP-1033.711, Surry Power Station Procedure, Eberline Personnel Monitor Model PM-7, Calibration and Operation, Rev. 4
HP-1033.721, Surry Power Station Procedure, Calibration and Operation of Eberline Model PCM-1C, Rev. 4
HP-1041.065, Surry Power Station Procedure, Whole Body Counter: Calibration, Rev. 1
HP-3010.040, Surry Power Station Procedure, Radiation Monitoring System Setpoint Determination, Rev. 26
PI-AA-200, Nuclear Fleet Administrative Procedure, Corrective Action, Rev. 17
RP-AA-400, Nuclear Fleet Administrative Procedure, Portable Survey Instrumentation, Rev. 2
RP-SU-401, Nuclear Fleet Administrative Procedure, Non-Portable Contamination Monitors, Rev. 2
Surry Power Station Technical Requirements Manual, Rev. 18
VPAP-2103S, Station Administrative Procedure, Offsite Dose Calculation Manual (Surry), Rev 15
0-IPM-CC-RRM-VENT-001, Surry Power Station Instrument Preventive Maintenance Procedure, Radwaste Facility Vent Stack Effluent Monitor Calibration, Rev. 7
0-IPM-CC-RRM-LIQD-001, Surry Power Station Instrument Preventive Maintenance Procedure, Radwaste Facility Liquid Effluent Monitor Calibration, Rev. 5
CAL-189, Surry Power Station Calibration Procedure, Containment High Range Radiation Monitor Calibration, Rev. 9-OTO1

Records and Data

C-HP-1033.440, Attachment 4, SPS Calibration Certificate-NE Technology SAM-9/SAM-11, SAM-11 Serial # 149, 8/26/09
C-HP-1033.440, Attachment 4, SPS Calibration Certificate-NE Technology SAM-9/SAM-11, SAM-11 Serial # 149, 8/24/10
Calibration Certificate – Canberra Genie/CAS, Detector 1, Serial # 3953493, 9/22/09
Calibration Certificate – Canberra Genie/CAS, Detector 1, Serial # 3953493, 9/16/10
GEL Laboratories, LLC, 10 CFR Part 50/61 Isotope Abundance Report and Certificate of Analysis, GEL Sample Number 228955001, 6/11/09

HP-1033.711, Attachment 4, Calibration Certificate-Eberline PM-7, PM-7 Serial # 390, 7/9/09
HP-1033.711, Attachment 4, Calibration Certificate-Eberline PM-7, PM-7 Serial # 390, 10/19/09
HP-1033.711, Attachment 4, Calibration Certificate-Eberline PM-7, PM-7 Serial # 390, 9/30/10
HP-1033.721, Attachment 7, Calibration Certificate-Eberline PCM-1C, PCM-1C Serial # 126, 7/30/09
HP-1033.721, Attachment 7, Calibration Certificate-Eberline PCM-1C, PCM-1C Serial # 126, 7/28/10
HP-3010.040, Attachment 4, Process Radiation Monitor Setpoint Record, 1-RM-RMS-159, Unit 1 Containment Particulate, 11/18/10
HP-3010.040, Attachment 4, Process Radiation Monitor Setpoint Record, 1-RM-RMS-160, Unit 1 Containment Noble Gas, 11/18/10
HP-3010.040, Attachment 4, Process Radiation Monitor Setpoint Record, 2-RM-RMS-259, Unit 1 Containment Particulate, 5/19/11
HP-3010.040, Attachment 4, Process Radiation Monitor Setpoint Record, 2-RM-RMS-260, Unit 1 Containment Noble Gas, 5/19/11
HP-3010.040, Attachment 4, Process Radiation Monitor Setpoint Record, 1-RM-RMS-159, Unit 1 Containment Particulate, 11/18/10
HP-3010.040, Attachment 4, Process Radiation Monitor Setpoint Record, 1-GW-RM-130A, Process Vent Particulate, 10/22/07
HP-3010.040, Attachment 4, Process Radiation Monitor Setpoint Record, 1-GW-RM-130B, Process Vent MGPI Normal Range Gaseous, 12/23/08
HP-3010.040, Attachment 4, Process Radiation Monitor Setpoint Record, 1-GW-RM-130C, Process Vent MGPI High Range Gaseous, 3/31/11
HP-3010.040, Attachment 4, Process Radiation Monitor Setpoint Record, 1-VG-RM-131A, Ventilation Vent # 2 Particulate, 11/01/06
HP-3010.040, Attachment 4, Process Radiation Monitor Setpoint Record, 1-VG-RM-131B, Ventilation Stack #2 MGPI Normal Range Gaseous, 8/18/11
HP-3010.040, Attachment 4, Process Radiation Monitor Setpoint Record, 1-VG-RM-131C, Process Vent MGPI High Range Gaseous, 3/31/11
HP-3010.040, Attachment 3, Area Radiation Monitor Setpoint Record, 1-RM-RMS-127, Unit 1 Containment High Range Area Monitor, 12/23/08
HP-3010.040, Attachment 3, Area Radiation Monitor Setpoint Record, 1-RM-RMS-128, Unit 1 Containment High Range Area Monitor, 12/23/08
HP-3010.040, Attachment 3, Area Radiation Monitor Setpoint Record, 1-RM-RMS-227, Unit 2 Containment High Range Area Monitor, 12/23/08
HP-3010.040, Attachment 3, Area Radiation Monitor Setpoint Record, 1-RM-RMS-228, Unit 2 Containment High Range Area Monitor, 12/23/08
J.L Shepherd Model 89 Irradiator, Calibration Curve Data, Serial Number 8183, 3/22/10
J.L Shepherd Model 89 Irradiator, Calibration Curve Data, Serial Number 8283, 3/22/10
Surry RP Task 980226, Evaluation for Using PM-7s as Passive Internal Monitors at Surry Power Station, 2/26/99
Teledyne Brown Engineering, Inc., Report of Analysis, LIMS Number L38695-4, 10/14/09
Teledyne Brown Engineering, Inc., Report of Analysis, LIMS Number L45366-1, 4/22/11
TRI-CARB 3100TR Liquid Scintillation Counter Calibration Form, Serial # 433977, 10/18/10
Virginia Power – Surry Power Station, List of 10CFR61 Samples, 6/14/11
Work Order 00513985, Unit 2 Process Vents Rad Monitor Cal, 1-GW-RM-101, Serial # 115, 7/27/04

Work Order 00512320, Unit 2 Process Vents Rad Monitor Cal, 1-GW-RM-102, Serial # 114, 7/27/04
Work Order 00722094, Unit 2 Process Vents Rad Monitor Cal, 1-GW-RM-101, Serial # 115, 2/4/06
Work Order 00721620, Unit 2 Process Vents Rad Monitor Cal, 1-GW-RM-102, Serial # 114, 2/4/06
Work Order 38102532283, Cal. Rad Waste RMS, Radwaste Facility Vent Stack Effluent Monitor Calibration, Stack Particulate Monitor RRM-100 and Stack Noble Gas Monitor RRM-101, 3/18/10
Work Order 38102578194, PM/CAL Radwaste Rad Monitor, Radwaste Facility Liquid Effluent Monitor Calibration, Liquid Effluent Monitor 1-RRM-RE -131, 4/28/10
Work Order 38102782973, PM/CAL Radwaste Rad Monitor, Radwaste Facility Liquid Effluent Monitor Calibration, Liquid Effluent Monitor 1-RRM-RE-131, 3/23/11
Work Order 38102633453, Cont High Range Area Rad Mon 1-RM-RMS-127 Channel Calib, 11/20/10
Work Order 38102119152, Cont High Range Area Rad Mon 1-RM-RMS-128 Channel Calib, 4/28/09
Work Order 38102633455, Cont High Range Area Rad Mon 1-RM-RMS-128 Channel Calib, 11/13/10
Work Order 38102674654, Cont High Range Area Rad Mon 2-RM-RMS-227 Channel Calib, 5/8/2011
Work Order 38102674651, Cont High Range Area Rad Mon 2-RM-RMS-228 Channel Calib, 5/8/2011

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CR376174
CR386969
CR369628
CR369629
CR372261
CR374064
CR387702
CR388954
CR388919
CR392634
CR403927
CR407149
CR423117
CR446431

Excel Spreadsheet Listing of Condition Reports for the period 1/01/10 to Present, 9/27/11
Informal Self Assessment Plan for SAR001595, Perform an Informal Self Assessment of the Radiological Instrumentation Program per C-HP-1091.233, 10/4/11

**Section 2RS6: Radioactive Gaseous and Liquid Effluent Treatment**

Procedures and Manuals
VPAP-2103S, Offsite Dose Calculation Manual , Rev. 15
0-HSP-RM-002, Monitoring Normally Non-radioactive Systems for Radioactive Contamination, Rev. 9
RP-AA-524, Performing Source Term Estimates and Dose Calculations for C-14 Effluents, Rev. 2
RP-AA-503, Radiological Decommissioning Records – 10 CFR 50.75(g) Program, Rev. 0
HP-3010.030, Radioactive Gaseous Waste Release Permits, Rev. 8
HP-3010.020, Radioactive Liquid Waste Release Permits, Rev. 3
HP-3010.040, Radiation Monitoring System Setpoint Determination, Rev. 26
HP-1033.263, Perkin Elmer Tri-Carb 3100TR Liquid Scintillation System: Operation, Rev. 4
HP-3051.020, Groundwater Protection Program, Rev. 3
PI-AA-200, Corrective Action, Rev. 17

Records and Data
Annual Radioactive Effluent Release Reports, 2009 and 2010
Work Order 38102441315, 1-VS-FL-3B In-place Testing for Ventilation Systems, 8/25/10
Work Order 38102243337, 1-VS-FL-3B In-place Testing for Ventilation Systems, 10/29/08
1-VS-FL-3B Radioiodine Test Report, 7/13/11
1-VS-FL-3B Radioiodine Test Report, 4/7/10
Work Order 38102448586, 1-VS-FL-3A In-place Testing for Ventilation Systems, 8/24/10
Work Order 38102243323, 1-VS-FL-3A In-place Testing for Ventilation Systems, 11/7/08
1-VS-FL-3A Radioiodine Test Report, 1/30/10
1-VS-FL-3A Radioiodine Test Report, 9/6/11
Gaseous Radioactive Waste Release Permits, 110341.006.040.G, 110332.001.039.G, 110336.003.039.G
Liquid Radioactive Waste Release Permits, 110324.030.054.L, 110311.031.051.L, 110312.030.053.L
WO 38102861995, 90-Day Frequency: Monitoring Normally Non-Radioactive Systems, 7/20/11
Results of Radiochemistry Cross-Check Program, 2010
Loss of Radioactive Effluent Monitoring Instrumentation Sampling Schedule, 6/7/10 – 6/15/10
Count Room Quality Assurance Records, Germanium Detector No. 2 and Liquid Scintillation Counter No. 1, August 2011
10 CFR 50.75(g) Decommissioning Records
Groundwater Monitoring Well Sample Results, January 2010 – July 2011

CAP Documents
Audit 10-07: Radiological Protection and Process Control Program, 9/23/10
CR 365348
CR 357072
CR 365731
CR 385246
CR 406197

**Section 2RS7: Radiological Environmental Monitoring Program**

Procedures and Guidance Documents

Procedure VPAP-2103S, Offsite Dose Calculation Manual (Surry), Revision 15
Health Physics Procedure (HP) – 3051.010, Radiological Environmental Monitoring Program,Rev. 17
Health Physics Surveillance Procedure (0-HPS)-REMP-002, Environmental Radiation Monitors, Rev.1
C-HP-1033.620, Portable Air Samplers Calibration and Operation, Rev. 8

Records and Data Reviewed

Virginia Electric and Power Company Surry Power Station Units 1 and 2 Independent Spent Fuel Storage Installation Annual Radiological Environmental Operating Report, April 29, 2011
Virginia Electric and Power Company Surry Power Station Units 1 and 2 Independent Spent Fuel Storage Installation Annual Radiological Environmental Operating Report, April 30, 2010
Work Order (WO) 38102802598, Preventative Maintenance / Calibration Primary Meteorological Tower Recorder and Instrumentation, 03/03/11
WO 38102915374, Preventative Maintenance / Calibration Primary Meteorological Tower Recorder and Instrumentation, 08/24/11
Calibration Certificates – Portable Air Sampler Serial Number (S/N) 7133, [01/11/11]; S/N 2185-1, [12/07/2010]; S/N 21058 [05/10/2011]
Project Identification Number (No.) DO001-3EREMPSURRY-09, Report of Analysis/Certificate of Conformance Data, 09/11/2011

Corrective Action Program (CAP) Documents

NUPIC Audit of Teledyne Brown Engineering Environmental Services, Knoxville, TN, NUPICJoint Utility Audit Number 22937
Condition Report (CR) 364281
CR 378595
CR 406690
CR 424598
CR 440884

**2RS8: Radioactive Solid Waste Processing and Radioactive Material Handling, Storage, and Transportation**

Procedures, Manuals, and Guides

C-HP-1071.040, Packaging and Shipment of Radioactive Material, Rev. 8
C-HP-1072.050, Radioactive Waste Transfer to Licensed Waste Processors, Rev. 8
HP-1072.020, Sampling, Analyzing, and Classifying Solid Radioactive Waste, Rev. 5
VPAP-2104, Radioactive Waste Process Control Program, Rev. 8
PI-AA-200, Corrective Action, Rev. 17
UFSAR Chapter 11, Radioactive Wastes and Radiation Protection, Rev. 43

Shipping Records and Radwaste Data
Surry Shipment Log 2010 and 2011
Shipment SV2010-4, Type B, Resin Cask
Shipment D-2010-5, LSA, Sealand
Shipment SH-2011-019, SCO, Metal Box
Shipment D2011-12, LSA, Evaporator/RO Brine in Metal Cask
Shipment SH-2011-030, SCO, 5 metal boxes
List of 10CFR61 Analysis Samples 1983 to 2011
10CFR 61 Analysis Report SRCT-B Resins 4/14/2010
10CFR 61 Analysis Report Zeolite 5/5/2010
10CFR61 Analysis Report Sponge Blast Media, 5/26/2010
10CFR61 Analysis Report Condensate Polisher Resin, 5/4/2010
10CFR61 Analysis Report PT Sludge, 5/19/2010
10CFR61 Analysis Report Bead Ion Exchange Resin, 12/113/2011
10CFR61 Analysis Report Evaporator Bottoms Liquid, 12/8/2010
10CFR61 Analysis Report Smears, 10/27/2010
Annual Radioactive Effluent Release Report January 1, 2010 through December 31, 2010

CAP Documents
CR398039

## LIST OF ACRONYMS

| | |
|---|---|
| ADAMS | Agencywide Document Access and Management System |
| ALARA | As Low As Reasonably Achievable |
| ANS | Alert and Notification System Testing |
| AREOR | Annual Radiological Environmental Operating Report |
| ARERR | Annual Radiological Effluent Release Report |
| ARM | Area Radiation Monitor |
| CA | Corrective Action |
| CAM | Continuous Air Monitor |
| CAP | Corrective Action Program |
| CFR | Code of Federal Regulations |
| CR | Condition Report |
| DEP | Emergency Response Organization Drill/Exercise Performance |
| DAW | Dry Active Waste |
| DOT | Department of Transportation |
| EAL | Emergency Action Level |
| EDG | Emergency Diesel Generator |
| ERO | Emergency Response Organization |
| HP | Health Physics |
| HPT | Health Physics Technician |
| HPAP | Health Physics Administrative Procedure |
| HRA | High Radiation Area |
| IMC | Inspection Manual Chapter |
| ISFSI | Independent Spent Fuel Storage Installation |
| JPM | Job Performance Measures |
| LHSI | Low Head Safety Injection |
| NCV | Non-cited Violation |
| NEI | Nuclear Energy Institute |
| NOD | Nuclear Oversight |
| NRC | Nuclear Regulatory Commission |
| NVLAP | National Voluntary Laboratory Accreditation Program |
| OD | Operability Determination |
| ODCM | Offsite Dose Calculation Manual |
| PA | Protected Area |
| PARS | Publicly Available Records |
| PCM | Personnel Contamination Monitor |
| PCP | Process Control Program |
| PI | Performance Indicator |
| PS | Planning Standard |
| QS | Quench Spray |
| RAB | Reactor Auxiliary Building |
| RCE | Root Cause Evaluation |
| RCP | Reactor Coolant Pump |
| RCS | Reactor Coolant System |
| REMP | Radiological Environmental Monitoring Program |

| | |
|---|---|
| RS | Radiation Safety |
| RFO | Refueling Outage |
| RG | Regulatory Guide |
| RP | Radiation Protection |
| RTP | Rated Thermal Power |
| RW | Radioactive Waste |
| RWP | Radiation Work Permit |
| SAM | Small Article Monitor |
| SDP | Significance Determination Process |
| SPS | Surry Power Station |
| SR | Surveillance Requirements |
| TDAFWP | Turbine Driven Auxiliary Feedwater Pump |
| TS | Technical Specifications |
| UFSAR | Updated Final Safety Analysis Report |
| U1 | Unit 1 |
| U2 | Unit 2 |
| URI | Unresolved Item |
| VEPCO | Virginia Electric and Power Company |
| VHRA | Very High Radiation Area |
| VPAP | Virginia Power Administrative Procedure |
| WBC | Whole Body Counter |
| WO | Work Order |