



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

May 5, 2011

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

**SUBJECT: SURRY POWER STATION – NRC INTEGRATED INSPECTION REPORT
05000280/2011002 AND 05000281/2011002**

Dear Mr. Heacock:

On March 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 April 26, 2011, with Mr. G. Bischof 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.

This report documents two findings of very low safety significance (Green), one of which was determined to be a violation of NRC requirements. Additionally, two licensee-identified violations which were determined to be of very low safety significance are listed in this report. However, because of the very low safety significance and because they were entered into your corrective action program, the NRC is treating these as non-cited violations (NCV) consistent with Section 2.3.2 of the NRC Enforcement Policy. If you contest any NCV, 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.

In addition, if you disagree with the characterization of any finding 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. The information you provide will be considered in accordance with Inspection Manual Chapter 0305.

VEPCO

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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 document 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 05000280/2011002, 05000281/2011002
w/Attachment: Supplemental Information

cc w/encl. (See next page)

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Letter to David A. Heacock from Gerald J. McCoy dated May 5, 2011

SUBJECT: SURREY POWER STATION – NRC INTEGRATED INSPECTION REPORT
05000280/2011002 AND 05000281/2011002

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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: 05000280/2011002, 05000281/2011002

Licensee: Virginia Electric and Power Company (VEPCO)

Facility: Surry Power Station, Units 1 and 2

Location: 5850 Hog Island Road
Surry, VA 23883

Dates: January 1, 2011 through March 31, 2011

Inspectors: R. Clagg, Acting Senior Resident Inspector
G. Kolcum, Acting Senior Resident Inspector
D. Mills, Acting Resident Inspector
J. Nadel, Resident Inspector
T. Kolb, Senior Operations Engineer (1R11.2, 1R11.3, 4OA2.3)
M. Riches, Operations Engineer (1R11.2, 1R11.3, 4OA2.3)

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

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SUMMARY OF FINDINGS

IR 05000280/2011002, 05000281/2011002; 01/01/2011–03/31/2011; 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. Two findings were identified of which one was determined to be a non-cited violation (NCV). 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

- Green. A Green, self-revealing finding was identified for the licensee's failure to comply with the standards established in their corrective action program (CAP) to determine the correct cause and take corrective action to prevent recurrence (CAPR) for a significant event, specifically, an automatic reactor trip following the failure of a Unit 2 'C' reactor coolant loop isolation valve. The licensee entered this issue into their CAP as condition report 412345.

The inspectors determined that the failure to determine the correct cause and take corrective action to prevent recurrence for a significant event was contrary to the requirements of the licensee's CAP procedures and was, therefore, a performance deficiency. The inspectors reviewed IMC 0612, Appendix B, and determined the performance deficiency was more than minor because it adversely affected 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 as well as power operations. The inspectors reviewed IMC 0609, Attachment 4 and determined that the finding was of very low safety significance, or Green, because it did not contribute to both the likelihood of a reactor trip and the likelihood that mitigation equipment or functions will not be available. The cause of this finding involved the cross-cutting area of problem identification and resolution, the component of operating experience, and the aspect of implementing operating experience, P.2(b), because the licensee failed to implement and institutionalize operating experience. (Section 40A2.2)

Cornerstone: Mitigating Systems

- Green. A Green, self-revealing non-cited violation of Condition 3.1 to the Surry Unit 1 and Unit 2 Updated Facility Operating Licenses, DPR-32 and DPR-37, was identified for the licensee's failure to take corrective action for degraded conditions adverse to the

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fire protection program. The licensee entered this issue into their corrective action program as condition report 398628.

The inspectors found that the failure to take action to correct multiple oversized breakers constituted a performance deficiency. The finding is more than minor because it adversely affected the external factors attribute (fire) of the Mitigating Systems Cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the Unit 2 '1B' RWST chiller motor and the Unit '2B' hydrogen recombiner breakers were the most susceptible to fire due to their size; also a cable fault could potentially damage safety related cables routed nearby. In addition, the Unit 1 '2B' charging component cooling water pump is safety related and its cable was also unprotected. The inspectors reviewed IMC 0609, Appendix F, Attachment 1, and determined the category of post fire safe shutdown was affected and the finding required a phase 3 analysis. A phase 3 risk analysis was performed by a regional SRA in accordance with IMC 0609 Appendix F, NUREG/CR6850, NUREG/CR 6850 supplement 1, and utilizing the latest NRC Surry SPAR probabilistic risk analysis model and determined that the risk increase in core damage frequency was $<1E-6$, a finding of very low risk significance, Green. The cause of this finding involved the cross-cutting area of human performance, the component of work control, and the aspect of work planning, H.3(a), because the licensee failed to appropriately prioritize, schedule, and complete work activities consistent with risk insights and the safety significance of the equipment. (Section 4OA5.2)

B. Licensee Identified Violations

Two violations of very low safety significance, which were identified by the licensee, were 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 or near full rated thermal power (RTP) throughout the inspection period.

Unit 2 operated at 98% power until February 2, 2011, when the unit experienced an automatic reactor trip due to a low flow condition in the 'C' reactor coolant system (RCS) loop. The unit entered a forced outage and subsequently returned to 98% power on February 18, 2011, and remained in this condition through the end of the report period.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R01 Adverse Weather Protection

.1 Site Specific Weather

a. Inspection Scope

The inspectors performed a site specific weather related inspection due to anticipated adverse weather conditions, specifically predicted wind speeds in excess of 30 mph on March 2, 2011. The inspectors reviewed the licensee's preparations for potential severe weather as well as severe weather procedures Operations Check List (OC) 21, "Severe Weather," and 0-AP-37.01, "Abnormal Environmental Conditions," Revision 54. The inspectors walked down site areas which included the electrical switchyard, emergency diesel generators, emergency switchgear rooms, emergency service water pump house, and the turbine, safeguards, and auxiliary buildings. During the walkdown, the inspectors looked for loose items and / or debris that could become a missile hazard during high winds, verified flooding barriers were available and / or in place, and verified that the emergency equipment was available and in the required standby mode.

b. Findings

No findings were identified.

1R04 Equipment Alignment

.1 Partial Walkdown

a. Inspection Scope

The inspectors conducted four equipment alignment partial walkdowns to evaluate the operability of selected redundant trains or backup systems, listed below, with the other train or system inoperable or out of service. The inspectors reviewed the functional systems descriptions, Updated Final Safety Analysis Report (UFSAR), system operating procedures, and Technical Specifications (TS) to determine correct system lineups for

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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.

- Motor driven auxiliary feedwater (MDAFW) pumps #1 and #2 when turbine driven AFW pump trip and throttle valve inadvertently tripped
- Unit 1 1B and 1C charging pump during maintenance on the Unit 1 1A charging pump
- Emergency Diesel Generator (EDG)#1 and #3 during maintenance on EDG#2
- 1A and 1B Emergency Service Water (ESW) pumps during maintenance on the 1C ESW pump

b. Findings

No findings were identified.

.2 Complete Walkdown

a. Inspection Scope

The inspectors performed a detailed walkdown and inspection of the Unit 1 and Unit 2 Auxiliary Feedwater systems to verify the systems were properly aligned and capable of performing their safety function, and to assess their material condition. During the walkdown, the inspectors verified breaker positions were in the proper alignment, component labeling was accurate, hangers and supports were functional, and local indications were accurate. Recent testing history was also reviewed to verify that standby components were performing within their design. The plant health report, system drawings, condition reports, the UFSAR, and Technical Specifications were reviewed and outstanding deficiencies were verified to be properly classified and not affect system operability and capability to perform its safety function. The inspectors reviewed the corrective action program to verify equipment alignment issues were being identified and resolved.

b. Findings

No findings were identified.

1R05 Fire Protection

.1 Quarterly Fire Protection Reviews

a. Inspection Scope

The inspectors conducted tours of the six 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

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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 to verify fire protection deficiencies were being identified and properly resolved.

- Fire Zone 3C Unit 1 Train 1J Emergency Switchgear Room (ESGR)
- Fire Zone 4B Unit 2 Train 2H ESGR
- Fire Zone 5 Main Control Room
- Fire Zone 6 EDG Room #1
- Fire Zone 7 EDG Room #2
- Fire Zone 8 EDG Room #3

b. Findings

No findings were identified.

1R06 Flood Protection Measures

a. Inspection Scope

The inspectors reviewed the internal flood protection measures and procedural controls established to address potential flooding in the Unit 1 and 2 turbine buildings, the emergency switchgear rooms, and mechanical equipment rooms 3 and 4 during ongoing work to diagnose and repair a non-isolable leak in the Unit 1 main condenser ‘B’ water box, which required opening the waterbox manways. The inspectors conducted a walk down of the affected areas to observe and assess the condition of the installed flood dikes, floor drain backflow preventers, the sealing of holes and penetrations between flood areas, the adequacy of water tight doors, the operability of flooding alarms, and the installed sump pumps. The inspectors reviewed the corrective action program and verified internal flooding related problems were being identified and properly addressed.

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification Program

.1 Resident Inspector Quarterly Review

a. Inspection Scope

The inspectors observed and evaluated a licensed operator simulator exercise given on January 12, 2011. The scenario involved a containment pressure transmitter failure, a failed open pressurizer spray valve, a large break loss of coolant accident, a failure of the containment spray pumps to auto start, and a recirculation mode transfer failure. The inspectors observed and evaluated a licensed operator simulator exercise on March 3, 2011. The scenario involved a major fire with fatalities, a complicated reactor trip resulting from an unisolated electrical fault, and the loss of an emergency bus. This scenario was intended to exercise the entire operations crew and assess the ability of the operators to react correctly to multiple failures. The inspectors observed the crew's performance to determine whether the crew met the scenario 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 critique 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 Licensed Operator Requalification

a. Inspection Scope

The inspectors reviewed the facility operating history and associated documents in preparation for this inspection. During the week of January 24, 2011, the inspectors reviewed documentation, interviewed licensee personnel, and observed the administration of operating tests associated with the licensee's operator requalification program. Each of the activities performed by the inspectors was done to assess the effectiveness of the facility licensee in implementing requalification requirements identified in 10 CFR Part 55, "Operators' Licenses." Evaluations were also performed to determine if the licensee effectively implemented operator requalification guidelines established in NUREG-1021, "Operator Licensing Examination Standards for Power Reactors," and Inspection Procedure 71111.11, "Licensed Operator Requalification Program." The inspectors also evaluated the licensee's simulation facility for adequacy for use in operator licensing examinations using ANSI/ANS-3.5-1998, "American National Standard for Nuclear Power Plant Simulators for use in Operator Training and Examination." The inspectors observed two crews during the performance of the operating tests. Documentation reviewed included written examinations, Job

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Performance Measures (JPMs), simulator scenarios, licensee procedures, on-shift records, simulator modification request records, simulator performance test records, operator feedback records, licensed operator qualification records, remediation plans, watchstanding records, and medical records. The records were inspected using the criteria listed in Inspection Procedure 71111.11.

b. Findings

No findings were identified.

.3 Operating Experience Smart Sample (OpESS) FY 2010-02 "Sample Selections for Reviewing Licensed Operator Examinations and Training Conducted on the Plant-Referenced Simulator."

a. Inspection Scope

The inspectors observed one annual requalification scenario that consisted of a Steam Generator Tube Rupture followed by a Loss of Offsite Power with one Diesel Generator (DG) out-of-service and the other DG dedicated to the other unit. This resulted in a station blackout until the operating crew took actions to re-align the operating DG to unit one. The scenario provided the inspectors insight into how the operating crew would respond to a complicated event demonstrating the following aspects of the smart sample:

- Changing plant/system parameters with a consequence for operator inaction.
- Loss of instrumentation and alarms normally used for event diagnosis.
- Coordination and concurrent use of multiple procedures.
- Require prioritization of multiple alarms or instrument readings.
- Require operators to take manual control of automatic functions.
- Widespread loss of motive force (electrical power) necessary to operate primary or secondary side equipment used for event mitigation.

b. Findings

No findings were identified.

1R12 Maintenance Effectiveness

a. Inspection Scope

For the two equipment issues described in the condition reports 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). Inspectors performed walkdowns of the accessible portions of the system,

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performed in-office reviews of procedures and evaluations, and held discussions with system engineers. The inspectors compared the licensee's actions with the requirements of the Maintenance Rule (10 CFR 50.65), station procedures ER-AA-MRL-10, "Maintenance Rule Program," Revision 4, and ER-AA-MRL-100, "Implementing the Maintenance Rule," Revision 1.

- CR414214, CCHX 1-CC-E-1C test shows degraded trend
- MRE013233 Unit 1 AMSAC trouble alarm – declared non-functional

b. Findings

No findings were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control

a. Inspection Scope

The inspectors evaluated, as appropriate, the four 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 safety monitor associated with the risk profile of Units 1 and 2. The inspectors reviewed the corrective action program to verify deficiencies in risk assessments were being identified and properly resolved.

- On-line elevated risk (yellow) condition for Unit 1 associated with planned maintenance on the condenser waterbox while at full power
- On-line green risk condition for Units 1 and 2 associated with a planned entry into a 6-hour shutdown TS LCO for the replacement of a failed reactor protection relay for turbine auto stop oil logic
- On-line green risk condition for Units 1 and 2 associated with the heavy load lift of the new Unit 2 low pressure turbine rotor onto the turbine deck
- Orange shutdown risk for Unit 2 during forced outage repair of 2-RC-MOV-2595

b. Findings

No findings were identified.

1R15 Operability Evaluationsa. Inspection Scope

The inspectors reviewed the five 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 corrective action program to verify deficiencies in operability determinations were being identified and corrected.

- CR409561, Unit 1 TDAFW pump mechanical leakage
- CR409949, Unplanned inoperability for the Unit 1 TDAFW pump
- CR410764, Suspected through wall leakage on the 1B Component Cooling (CC) Water Heat Exchanger
- CR415037, '1D' CC heat exchanger macrofouling results
- CR414887, EDG #2 battery temperature during charging

b. Findings:

No findings were identified.

1R18 Plant Modifications.1 Temporary Modificationsa. Inspection Scope

The inspectors reviewed temporary modification, S-2-11-0084, "Installation/removal of electrical jumpers needed to facilitate replacement of relay 2-RP-RLY-AST2XB" 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.

.2 Permanent Modifications

a. Inspection Scope

The inspectors reviewed the completed permanent plant modification design change package (DCP) SU-09-00074, "ESW Pump Diesel Exhaust Modification." The inspectors conducted walkdowns of the installation at various stages of completion, reviewed the 10 CFR 50.59 Safety Review/Regulatory Screening, technical drawings, test plans and the modification package to assess the TS implications. In addition, the inspectors reviewed calculations and conducted interviews with licensee personnel.

b. Findings

No findings were identified.

1R19 Post Maintenance Testing

a. Inspection Scope

The inspectors reviewed five post maintenance test procedures and/or test activities for selected risk-significant mitigating systems 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 38102854173, Install new zinc plugs on 1-VS-E-4A
- WO 38102947377, Relay replacement for main turbine auto stop oil logic
- WO 38102813254, Rod out condenser tubes for 1-VS-E-4A
- WO 38102969528, Install/remove test equipment for 1-SW-P-1C
- WO 38102648817, Emergency Bus 2H not reading 60Hz as expected

b. Findings

No findings were identified.

1R20 Refueling and Other Outage Activities

Unit 2 Forced Outage

a. Inspection Scope

The inspectors reviewed the outage safety review and related contingency plans for the Unit 2 forced outage, which began on February 2, 2011, to confirm that the licensee had appropriately considered risk, industry experience, and previous site-specific problems in developing and implementing a plan that assured maintenance of defense-in-depth. The inspectors used Inspection Procedure 71111.20, "Refueling and Outage Activities," to observe portions of the maintenance and startup activities to verify that the licensee maintained defense-in-depth commensurate with the outage risk plan and applicable TS. The inspectors monitored licensee controls over the outage activities listed below.

- Licensee configuration management, including daily outage reports, to evaluate maintenance of defense-in-depth commensurate with the OSR for key safety functions and compliance with the applicable TS when taking equipment out of service.
- Implementation of clearance activities and confirmation that tags were properly hung and equipment appropriately configured to safely support the work or testing.
- Controls over the status and configuration of electrical systems to ensure that TS and outage safety plan requirements were met, and controls over switchyard activities
- Controls over activities that could affect reactivity
- Startup and ascension to full power operation, tracking of startup prerequisites, and walkdown of the primary containment to verify that debris had not been left which could block emergency core cooling system strainers.
- Licensee identification and resolution of problems related to forced outage activities

b. Findings

Introduction: An unresolved item (URI) was identified by the inspectors relating to erratic indications associated with the Unit 2 Main Control Room (MCR) Instrument Level Indication Recorder, 2-RC-LR-200A.

Description: On February 2, 2011, while Unit 2 was operating at 100% power, the C loop RCS cold leg loop isolation valve, 2-RC-MOV-2595, experienced stem to disc separation resulting in a low RCS flow condition in the 'C' RCS loop and subsequent automatic reactor trip. The licensee decided to repair the valve in Cold Shutdown by draining the RCS to mid-loop. The RCS standpipe is relied upon to provide both local and remote indication of RCS level during reduced inventory and mid-loop configurations.

The licensee drained to reduced inventory and was forced to re-fill the RCS due to the unreliable level indication of 2-RC-LR-200A. Troubleshooting was performed on the

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electronics of the level recorder and associated circuitry and the instrument was tested before a second attempt at draining to mid-loop was commenced. During the second attempt 2-RC-LR-200A again became unreliable and operators were again forced to re-fill the RCS. The licensee then performed more in-depth troubleshooting of the instrumentation and performed a third drain down to mid-loop conditions once it had been returned to service. The third attempt was successful, although the instruments still experienced several instances of erratic indication. The licensee entered this issue into their CAP as CR413227, and initiated Apparent Cause Evaluation (ACE) 018543.

The inspectors require additional information, including the licensee's completed investigation in ACE018543 to determine if there is a performance deficiency which is more than minor. This issue is identified as URI 05000281/2011002-01, Reactor Coolant System Instrumentation Erratic Level Indication.

1R22 Surveillance Testing

a. Inspection Scope

For the eight 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-OPT-CH-002, "Charging Pump Operability and Performance Test For 1-CH-P-1B," Revision 49

Surveillance Testing:

- 1-OPT-FW-003, "Turbine Driven Auxiliary Feedwater Pump 1-FW-P-2," Revision 39
- 2-OPT-CS-002, "Containment Spray System Test," Revision 13
- 0-OPT-EG-001, "Number 3 Emergency Diesel Generator Monthly Start Exercise Test," Revision 56
- 2-OPT-EG-001, "Number 2 Emergency Diesel Generator Monthly Start Exercise Test," Revision 56
- 2-PT-8.1, "Reactor Protection System Logic," Revision 32
- 1-PT-8.6, "Recirculation Mode Transfer Signal Automatic Switchover Logic Test," Revision 13
- 0-OSP-AAC-001, "Quarterly Test of 0-AAC-DG-0M, Alternate AC Diesel Generator," Revision 35

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b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator (PI) Verification

a. Inspection Scope

The inspectors performed a periodic review of the three following Unit 1 and 2 PIs to assess the accuracy and completeness of the submitted data and whether the performance indicators 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 January 1, 2010 through December 31, 2010. Documents reviewed included applicable NRC inspection reports, licensee event reports, operator logs, station performance indicators, and related CRs.

- Unplanned Scrams per 7000 Critical Hours
- Unplanned Power Changes per 7000 Critical Hours
- Unplanned Scrams With Complications

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 in order to help identify repetitive equipment failures or specific human performance issues for follow-up, the inspectors performed a daily screening of items entered into the licensee's CAP. This review was accomplished by reviewing daily CR report summaries and periodically attending daily CR Review Team meetings.

.2 Annual Sample: Review of CR412345, "Automatic Reactor Trip Occurred on Unit 2"

a. Inspection Scope

The inspectors reviewed the licensee's assessments and corrective actions for CR412345, "Automatic Reactor Trip Occurred on Unit 2," 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 CR

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against the requirements of the licensee's CAP as specified in procedure, PI-AA-200, "Corrective Action Program," Revision 16, and 10 CFR 50, Appendix B.

b. Findings and Observations

Failure to Determine the Correct Cause and Prevent Recurrence for a Significant Event

Introduction: A Green, self-revealing finding was identified for the licensee's failure to comply with the standards established in their CAP to determine the correct cause and take corrective action to prevent recurrence (CAPR) for a significant event, specifically, an automatic reactor trip following the failure of a Unit 2 'C' reactor coolant loop isolation valve (RCLIV).

Description: On February 2, 2011, Unit 2 experienced an automatic reactor trip due to a low reactor coolant flow condition in the 'C' reactor coolant loop following the stem to disc separation of the 'C' cold leg RCLIV. The licensee entered this condition into their CAP as CR412345, "Automatic Reactor Trip Occurred on Unit 2" and initiated root cause evaluation (RCE) 1041, "Unit 2 Reactor Trip due to 2-RC-MOV-2595 Failure". The inspectors reviewed CR412345 and RCE1041. The inspectors noted that a root cause for the event was determined to be inadequate assembly of the valves stem to upper wedge connection, specifically inadequate torque applied to this connection, which lead to failure in a high vibration environment. Additionally, RCE1041 determined a root cause to be failure to perform adequate component failure analysis for a previous RCLIV failure that occurred on July 5, 1999.

The inspectors reviewed Category 1 RCE S-99-1746, "Unit 2 'A' Cold Leg Loop Stop Valve Failure Event", which evaluated the July 5, 1999, failure of another Unit 2 RCLIV which resulted in an automatic reactor trip. RCE S-99-1746 determined that the root cause for the event was inadequate preventative maintenance for failure to lubricate the valve's stem nut, and improper system operation for applying excessive closing torque and routine backseating of the valve. Corrective actions taken as a result of this root cause included, modifying valve maintenance and operational procedures to ensure compliance with vendor recommendations and condition monitoring to determine if internal valve inspections were warranted. The inspectors identified that RCE S-99-1746 documented industry operating experience of similar valve failures whose root causes were determined to include "inadequate pre-load torque between stem and disc". The inspectors also identified that no further analysis was conducted and no corrective actions were implemented that addressed this issue. The inspectors noted that RCE1041 documented numerous instances of the licensee receiving operating experience, before and after the 1999 RCLIV failure, regarding failures of similar style valves operating in a high vibration environment, all of which were incorrectly determined to be not applicable.

The inspectors noted that at the time of the 1999 event the licensee implemented their CAP via procedures such as, VPAP-1601, "Corrective Action," Revision 12 and VPAP-1501, "Deviations," Revision 12, and VPAP-1604, "Root Cause Evaluation Program,"

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Revision 2. The inspectors reviewed the licensee's CAP relative to the treatment of the July 1999 RCLIV failure and noted the following:

- VPAP-1601, section 4.19 defines Significant, in part, as: "Events that need immediate attention to prevent recurrence"
- VPAP-1601, Attachment 3 identifies reactor trips as Significant
- VPAP-1604, section 6.2.2 directs that for Category 1 RCEs, the team will "recommend corrective actions to prevent recurrence"

The inspectors concluded that the 1999 reactor trip was a significant event, as defined in VPAP-1601. The inspectors also concluded that the licensee failed to determine the correct cause of the significant event, and as a result failed to take corrective action to prevent recurrence, as required by VPAP-1601.

Analysis: The inspectors determined that the failure to determine the correct cause and take corrective action to prevent recurrence for a significant event was contrary to the requirements of the licensee's CAP procedures and was, therefore, a performance deficiency. The inspectors reviewed IMC 0612, Appendix B, and determined the performance deficiency was more than minor because it adversely affected 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 as well as power operations. The inspectors reviewed IMC 0609, Attachment 4, and determined that the finding was of very low safety significance, or Green, because it did not contribute to both the likelihood of a reactor trip and the likelihood that mitigation equipment or functions will not be available. The cause of this finding involved the cross-cutting area of problem identification and resolution, the component of operating experience, and the aspect of implementing operating experience, P.2(b), because the licensee failed to implement and institutionalize operating experience.

Enforcement: Enforcement action does not apply because the finding did not involve a violation of regulatory requirements. Contrary to the licensee's CAP, on February 2, 2011, the licensee failed to determine the correct cause and take corrective action to prevent recurrence for a significant event. Because this finding does not involve a violation of regulatory requirements, has very low safety significance (Green), and has been entered into the licensee's CAP as CR412345, it is identified as FIN 05000281/2011002-02, Failure to Determine the Correct Cause and Prevent Recurrence for a Significant Event.

.3 Licensed Operator Requalification Program Review

a. Inspection Scope

The inspectors selected condition report CR411638 for a detailed review. The CR was initiated because the inspectors identified where Simulator Steady State testing was not being performed in accordance with the requirements of ANSI/ANS-3.5-1998. Steady-state testing is required to demonstrate that simulator parameters match the reference

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plant data at three different power levels. The licensee correctly performed testing for the 100% Power Steady State Simulator Test. However, for the other two power levels, the licensee compared the simulator response with historical simulator data at the designated power levels rather than reference plant data. The licensee has committed to revising TR-AA-SIM-400, Simulator Performance Testing, to require a comparison with actual plant data for all three power levels. The inspectors checked that this issue had been completely and accurately identified in the licensee's CAP and properly classified and prioritized for resolution. Corrective actions have not been verified complete.

The inspectors selected condition report CR411668 for a detailed review. The CR was initiated because the inspectors identified that a potentially disqualifying medical condition for a licensed operator was not evaluated at the time the test results were submitted to the licensee medical department. The licensee identified the disqualifying medical condition four months after the initial test results were submitted, but failed to enter the issue into the corrective action program for resolution. The licensed operator was retested for the medical condition and it was determined that the initial test results were in error due to a faulty test machine. The inspectors reviewed the proposed corrective actions to ensure that the issue of not appropriately evaluating medical test results at the time of submittal was completely and accurately identified in the licensee's CAP. Corrective actions have not been verified complete.

b. Findings

No findings were identified.

4OA3 Event Follow-up

.1 Unit 2 Automatic Reactor Trip

The inspectors responded to an automatic reactor trip of Unit 2 on February 2, 2011, due to a low flow condition in the 'C' RCS loop. The inspectors discussed the trip with operations, engineering, and licensee management personnel to gain an understanding of the event and assess follow up actions. The inspector reviewed operator actions taken in accordance with licensee procedures, and reviewed unit and system indications to verify that actions and system responses were as expected. The inspectors also reviewed the initial licensee notifications to verify that the requirements specified in NUREG-1022, "Event Reporting Guidelines," Revision 2, were met. The enforcement aspects of this event are as discussed in Section 4OA2.2.

4OA5 Other Activities.1 Quarterly Resident Inspector Observations of Security Personnel and Activitiesa. 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): Apparent Violation (AV) 05000280,281/2010005-01; Failure to Correct Multiple Conditions Adverse to Fire Protection

Introduction: A Green, self-revealing NCV of Condition 3.I to the Surry Unit 1 and Unit 2 Updated Facility Operating Licenses, DPR-32 and DPR-37, was identified for the licensee's failure to take corrective action for degraded conditions adverse to the fire protection program.

Description: The inspectors had previously opened AV 05000280,281/2010005-01, Failure to Correct Multiple Conditions Adverse to Fire Protection in NRC Integrated Inspection Report 05000280,281/2010005. In 2003 and 2004, three plant issue reports were written: S-2004-1395, S-2004-2571, and S-2003-4662. These reports were written for a population of breakers at the station that were not appropriately sized in accordance with the original Stone and Webster design standards to protect the cables they fed. The two breakers most susceptible to a fire due to inadequate protection for their respective cables included the Unit 2 '1B' RWST chiller motor and the Unit '2B' hydrogen recombiner. In addition, the Unit 1 '2B' charging component cooling water pump was the only safety related load identified as being unprotected. There was a two year delay before a design change package (DCP) was created to begin the process of replacing these breakers.

On October 11, 2010, at 0824 a security officer reported a fire at the Unit 2 '1B' RWST chiller with arcing, fire, and smoke seen at the control panel. The fire was promptly extinguished at 0831 by the fire brigade. The chiller is located in an outside area next to the RWST inside the radiological control area. Additionally, smoke was reported in the upper cable vault area coming from breaker cubicle 2-EP-BKR-2C1-1E-2B, which is the breaker that feeds the RWST chiller. A subsequent inspection identified overheated and damaged cabling inside the breaker cubicle.

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It was discovered that the RWST chiller breaker was a 225 ampere breaker serving a single load of 28 amperes. The cable was sized as a #12 American Wire Gauge rated at 21 amperes. Plant issue report S-2004-2571 first identified that the RWST chiller breaker was oversized. The remaining population of affected breakers were later isolated from their loads as a compensatory measure to prevent additional failures.

Analysis: The inspectors found that the failure to take action to correct multiple oversized breakers constituted a performance deficiency. The finding is more than minor because it adversely affected the external factors attribute (fire) of the Mitigating Systems Cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the Unit 2 '1B' RWST chiller motor and the Unit '2B' hydrogen recombiner breakers were the most susceptible to fire due to their size; also a cable fault could potentially damage safety related cables routed nearby. In addition, the Unit 1 '2B' charging component cooling water pump is safety related and its breaker was also unprotected. The inspectors reviewed IMC 0609, Appendix F, Attachment 1, and determined the category of post fire safe shutdown was affected and the finding required a phase 3 analysis.

A phase 3 risk analysis was performed by a regional SRA in accordance with IMC 0609 Appendix F, NUREG/CR6850, NUREG/CR 6850, supplement 1, and utilizing the latest NRC Surry SPAR probabilistic risk analysis model. The RWST chiller fire occurred at the chiller local control panel and at the source motor control center. The resultant fire scenarios were all reactor trip (transient) scenarios. The dominant sequences included fire induced reactor trip transient initiator with anticipated transient without scram (ATWS) sequences and fire induced reactor trip transient initiator with failures of auxiliary feedwater, main feedwater and failure to implement feed and bleed leading to core damage. The phase 3 risk evaluation was performed for a one year exposure period and the major assumptions in the analysis included:

- Fires were modeled as electrical fires of 70kw and 200kw intensity with severity factors of 0.9 and 0.1.
- Probability of non-suppression was assumed at 1.0.
- Ignition frequency (IF) for the actual fire in RWST Chiller '1B' was assumed at 1.0.
- An IF of 4.5 E-2 was utilized for the other chillers. This value was determined by assuming that the total failure probability for the standby chillers (failure to start, failure to run, and test and maintenance totaling 4.5E-2) was due to fires caused by undersized breakers. This value is greater than the standard IF for motors in NUREG/CR6850.
- All fires were assumed to result in a fire induced reactor trip transient or a fire induced plant shutdown approximated by a reactor trip transient. Fires in one chiller would not impact the standby chiller therefore an adjustment factor of 0.5 was used to account for the availability of the standby chiller and environmental conditions requiring the use of the chillers.

Factors which mitigated the risk included the use of thermoset cable, the minimal fire growth potential and the lack of impact to safe shutdown equipment. The risk evaluation

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result was an increase of $<1E-6$ for core damage frequency, a finding of very low risk significance, Green. The cause of this finding involved the cross-cutting area of human performance, the component of work control, and the aspect of work planning, H.3(a), because the licensee failed to appropriately prioritize, schedule, and complete work activities consistent with risk insights and the safety significance of the equipment.

Enforcement: 10 CFR 50.48 states, in part, that each operating nuclear power plant must have a fire protection plan that satisfies Criterion 3 of appendix A to this part. The Surry Unit 1 Updated Facility Operating License DPR-32, and Unit 2 Updated Facility Operating License DPR-37, Condition 3.1, specify, in part, that the licensee implement and maintain in effect all provisions of the approved fire protection program as described in the UFSAR and as approved in the Safety Evaluation Report (SER) and subsequent supplements. The UFSAR requires, in part, that the fire protection program (FPP) meet Appendix A to Branch Technical Position (BTP) APCS 9.5-1, "Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976," dated August 23, 1976." Section C.8 of Appendix A to BTP APCS 9.5-1 requires, in part, that measures be established to assure conditions adverse to fire protection, such as failures, malfunctions, and deficiencies, are promptly identified, reported, and corrected. Contrary to the above, the licensee failed to take corrective action within an adequate time period for deficiencies associated with circuits where the breakers were not providing the required electrical protection for their associated cables. As a result, on October 11, 2010, a fire developed on the '1B' RWST Chiller Motor due to a fault in one of the unprotected cables. Because the finding is of very low safety significance (Green) and it was entered into the licensee's CAP as CR398628, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy: NCV 05000280,281/2011002-03, Failure to Correct Multiple Conditions Adverse to Fire Protection.

.3 (Closed): Apparent Violation (AV) 05000280, 281/2010005-04; Inadequate Risk Evaluation for Leaving Common ESGR Door Open.

a. Inspection Scope

The inspectors had previously opened AV 05000280, 281/2010005-04, Inadequate Risk Evaluation for Leaving Common ESGR Door Open in NRC Integrated Inspection Report 05000280,281/2010005. A performance deficiency was identified for failure to adequately assess the increased risk associated with blocking open the common ESGR door and to take the required risk management actions. The inspectors determined a phase 3 risk analysis was required. A bounding risk evaluation was performed by a regional SRA which assumed that all pipe failures in turbine building high energy lines with enough energy to create a harsh environment would lead to failure of all equipment within the ESGR and result in a conditional core damage probability of 1.0. The systems considered were main steam, main steam drain, auxiliary steam, extraction steam, low pressure steam, blowdown, feedpump discharge and feedpump recirculation piping. Pipe mean failure rate data from EPRI report 102186 was used. No isolation of the pipe ruptures were assumed and no credit was allowed for the security officer closing the door or for operations to realize that a HELB had occurred and closing the door. An

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exposure period of 2.5 hours was utilized. The phase 3 SDP risk analysis determined the risk of the performance deficiency was an increase in core damage frequency of $<1E-6$, a finding of very low safety significance, Green. The short exposure period mitigated the risk of the performance deficiency.

b. Findings

The enforcement aspects of this issue are as discussed in Section 4OA7.

4OA6 Meetings, Including Exit

.1 Exit Meeting Summary

On April 26, 2011, the inspection results were presented to Mr. G. Bischof 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.

.2 Licensed Operator Requalification Inspection Exit Meeting Summary

An exit meeting was conducted on January 27, 2011, to discuss the findings of this inspection. The inspectors asked the licensee whether any of the material examined during the inspection should be considered proprietary. No proprietary information was identified.

4OA7 Licensee-Identified Violations

The following violations of very low safety significance (Green) were identified by the licensee and are violations of NRC requirements which meet the criteria of the NRC Enforcement Policy, for being dispositioned as a Non-Cited Violation.

- 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," requires, in part, that activities affecting quality shall be prescribed by documented procedures. Contrary to this, the licensee identified that procedure VPAP-0905, "Insulation Control Program," Revision 5, was not adequately prescriptive to ensure control of insulation work to avoid critical components. Consequently, the Unit 1 Turbine Driven Auxiliary Feedwater Pump was rendered inoperable and unavailable when the trip throttle valve was inadvertently tripped during replacement of insulation on the pump. The inspectors determined the finding was more than minor because it adversely impacted the Mitigating Systems cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The inspectors determined that the violation was not greater than Green because it did not represent a loss of system safety function or the loss of safety function for a single train for greater than the TS allowed outage time. The inspectors determined that the licensee correctly evaluated the finding and developed appropriate corrective actions as documented in the licensee's CAP as CR409949.

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- 10 CFR Part 50.65 (a)(4) requires, in part, that, before performing maintenance activities, the licensee shall assess and manage the increase in risk that may result from the proposed maintenance activity. Contrary to this, the licensee identified that they failed to adequately assess the risk associated with leaving the common ESGR room door open for two hours. The inspectors determined that the finding was more than minor because it adversely impacted the Mitigating Systems cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The senior reactor analyst determined that this violation was not greater than Green because the increase in core damage frequency was $<1E-6$, as discussed in Section 4OA5.3. The inspectors determined that licensee correctly evaluated the finding and developed appropriate corrective action as documented in the licensee's CAP as CR397720.

ATTACHMENT: SUPPLEMENTAL INFORMATION

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SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

M. Adams, Director, Station Engineering
G. Bischof, 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
K. Sloane, Plant Manager (Nuclear)
M. Smith, Manager, Nuclear Oversight
B. Stanley, Director, Station Safety and Licensing
N. Turner, Supervisor, Emergency Preparedness
M. Wilda, Supervisor, Auxiliary Systems

LIST OF ITEMS OPENED, CLOSED AND DISCUSSED

Opened

05000281/2011002-01 URI Reactor Coolant System Instrumentation Erratic Level Indication. (Section 1R20)

Opened and Closed

05000281/2011002-02 FIN Failure to Determine the Correct Cause and Prevent Recurrence for a Significant Event (Section 4OA2.2)

05000280,281/2011002-03 NCV Failure to Correct Multiple Conditions Adverse to Fire Protection (Section 4OA5.2)

Closed

05000280,281/2010005-01 AV Failure to Correct Multiple Conditions Adverse to Fire Protection (Section 4OA5.2)

05000280, 281/2010005-04 AV Inadequate Risk Evaluation for Leaving Common ESGR Door Open (Section 4OA5.3)

Discussed

None

LIST OF ACRONYMS

ADAMS	Agencywide Document Access and Management System
ALARA	As Low As Reasonably Achievable
ANS	Alert and Notification System Testing
CA	Corrective Action
CAP	Corrective Action Program
CFR	Code of Federal Regulations
CR	Condition Report
DEP	Emergency Response Organization Drill/Exercise Performance
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
NRC	Nuclear Regulatory Commission
OD	Operability Determination
PARS	Publicly Available Records
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
RFO	Refueling Outage
RP	Radiation Protection
RTP	Rated Thermal Power
RWP	Radiation Work Permit
SDP	Significance Determination Process
SR	Surveillance Requirements
TDAFWP	Turbine Driven Auxiliary Feedwater Pump
TS	Technical Specifications
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item
VEPCO	Virginia Electric and Power Company
VHRA	Very High Radiation Area
VPAP	Virginia Power Administrative Procedure
WO	Work Order

ALARA	As Low As Reasonably Achievable
CAP	Corrective Action Program
CFR	Code of Federal Regulations
CR	Condition Report
HP	Health Physics
HPT	Health Physics Technician