UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
475 ALLENDALE ROAD
KING OF PRUSSIA, PENNSYLVANIA 19406-1415

February 14, 2012

Mr. Timothy S. Rausch
Senior Vice President and Chief Nuclear Officer
PPL Susquehanna, LLC
769 Salem Boulevard, NUCSB3
Berwick, PA 18603-0467

SUBJECT: SUSQUEHANNA STEAM ELECTRIC STATION – NRC INTEGRATED INSPECTION REPORT 05000387/2011005 AND 05000388/2011005

Dear Mr. Rausch:

On December 31, 2011, the U. S. Nuclear Regulatory Commission (NRC) completed an inspection at your Susquehanna Steam Electric Station (SSES) Units 1 and 2. The enclosed integrated inspection report (IR) presents the inspection results, which were discussed on January 10, 2012, with you and other members of your staff.

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

This report documents three NRC-identified findings and one self-revealing finding of very low safety significance (Green). Two of these findings were determined to involve violations of NRC requirements. Additionally, three 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 are entered into your correction action program (CAP), the NRC is treating these findings as non-cited violations (NCVs) consistent with Section 2.3.2 of the NRC's Enforcement Policy. If you contest any NCV in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN.: Document Control Desk, Washington, D.C. 20555-0001; with copies to the Regional Administrator Region I; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, D.C. 20555-0001; and the NRC Resident Inspectors at the SSES. In addition, if you disagree with the cross-cutting aspect 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 I, and the NRC Resident Inspectors at the SSES.

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Sincerely,

/RA/

Paul G. Krohn, Chief
Reactor Projects Branch 4
Division of Reactor Projects

Docket Nos. 50-387; 50-388
License Nos. NPF-14, NPF-22

Enclosures: Inspection Report 05000387/2011005 and 05000388/2011005
w/Attachment: Supplemental Information

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REGION I

Docket No:	50-387, 50-388
License No:	NPF-14, NPF-22
Report No:	05000387/2011005 and 05000388/2011005
Licensee:	PPL Susquehanna, LLC (PPL)
Facility:	Susquehanna Steam Electric Station, Units 1 and 2
Location:	Berwick, Pennsylvania
Dates:	October 1, 2011 through December 31, 2011
Inspectors:	P. Finney, Senior Resident Inspector J. Greives, Resident Inspector C. Crisden, Emergency Preparedness (EP) Specialist J. Furia, Senior Health Physicist W. Schmidt, Senior Reactor Analyst R. Fuhrmeister, Senior Reactor Inspector J. Noggle, Senior Health Physicist K. Modes, Senior Health Physicist D. Schroeder, Salem Senior Resident Inspector A. Rosebrook, Senior Project Engineer J. D'Antonio, Senior Operations Engineer T. Fish, Senior Operations Engineer S. Ibarrola, Project Engineer E. Miller, Project Engineer
Approved By:	Paul G. Krohn, Chief Reactor Projects Branch 4 Division of Reactor Projects

TABLE OF CONTENTS

SUMMARY OF FINDINGS

IR 05000387/2011005, 05000388/2011005 10/01/2011 – 12/31/2011; Susquehanna Steam Electric Station, Units 1 and 2; Maintenance Risk Assessments and Emergent Work Control, Operability Evaluations, Event Followup.

The report covered a 3-month period of inspection by resident inspectors and announced inspections performed by regional inspectors. Inspectors identified three findings and one self-revealing finding of very low safety significance (Green). Two of these findings involved violations of NRC requirements and were characterized as Non-Cited Violations (NCVs). The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). The ross-cutting aspects for the findings were determined using IMC 0310, "Components Within The Cross-Cutting Areas (CCAs)." 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 (ROP)," Revision 4, dated December 2006.

Cornerstone: Initiating Events

- Green. A self-revealing finding of very low safety significance (Green) was identified when PPL personnel did not have adequate procedures to perform post-modification testing on the unit 2 digital integrated control system (ICS). Specifically, scheme checks and functional testing failed to identify an improper termination in the high reactor water level main turbine trip circuit. This error reduced the channel trip circuitry from a two-out-of-three logic to allowing a main turbine trip from a single channel. As a result, on August 19, 2011, during the first implementation of quarterly surveillance testing for the trip function following ICS and extended power uprate implementation, a main turbine trip and automatic reactor scram occurred.

  The performance deficiency was determined to be more than minor because the finding was associated with the Initiating Events cornerstone attribute of Equipment Performance, and affected the cornerstone objective of limiting the likelihood of those events that upset plant stability and challenged critical safety functions during power operation. Specifically, inadequate post-modification testing failed to identify an improperly terminated jumper which ultimately led to a main turbine trip and automatic reactor scram during subsequent surveillance testing. The inspectors evaluated the finding using IMC 0609, Attachment 4, "Initial Screening and Characterization of Findings," and determined the finding did not contribute to both the likelihood of a reactor trip and the likelihood that mitigation equipment or functions would not be available. Consequently, the finding is of very low safety significance (Green). This finding is related to the CCA of Human Performance – Resources because PPL did not ensure that personnel, equipment, procedures, and other resources were available and adequate to assure nuclear safety. Specifically, PPL did not ensure that complete, accurate and up-to-date maintenance and test procedures were available to perform post-modification testing on the digital ICS. (H.2(c)) (Section 4OA3)

Cornerstone: Mitigating Systems

- Green. An NRC-identified Green finding of TS 5.4.1, "Procedures," due to PPL's failure to properly plan and implement work instructions and Quality Control (QC) hold point inspections associated with a modification to the 'C' Emergency Diesel Generator (EDG) fuel pump assemblies was identified. The error resulted in the failure of the 'C' EDG to continue running during surveillance testing on December 6, 2011. This resulted in PPL failing to meet the requirements of TS 3.8.1, "AC Sources- Operating", when it was determined that the 'C' EDG was inoperable from September 19, 2011, following restoration from its maintenance outage, until December 6, 2011, when the operable 'E' EDG was substituted for the 'C' EDG. Additionally, the failure to implement work instructions resulted in PPL failing to meet the requirements of 10 CFR Part 50, Appendix B, Criterion X, "Inspection," which requires, in part, that licensees execute a program for inspection of activities affecting quality to verify conformance with the documented instructions, procedures, and drawings for accomplishing the activity. The deficiency was entered into PPL's corrective action program (CAP) as condition Report (CR) 1506105 and a root cause analysis (RCA) was performed.

  The performance deficiency was determined to be more than minor because the finding was associated with the Mitigating Systems cornerstone attribute of Human Performance, and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). The finding was evaluated using Phase 1 and inspectors determined the finding was potentially greater than very low safety significance because the finding represented an actual loss of safety function of a single train for greater than its TS Allowed Outage Time. The Phase 2 analysis determined the finding was potentially greater than very low safety significance given an exposure time of 75 days. A Phase 3 analysis was conducted by an NRC Senior Reactor Analyst (SRA). This analysis indicated an increase in core damage frequency (ΔCDF) for internal initiating events in the range of 1 core damage accident in 40,000,000 years of reactor operation, in the low E-8 range per year for each unit. The dominant core damage sequences included losses of offsite power with the failure of all EDGs, due to common cause, resulting in a station blackout, followed by operator failure to extend RCIC operation with loss of DC power, failure to depressurize the reactor and failure to recover offsite power within 4 hours. The finding is related to the CCA of Human Performance, Work Practices, in that PPL personnel did not use human error prevention techniques, such as holding pre-job briefings, self and peer checking, and proper documentation of activities, commensurate with the risk of the assigned task, such that work activities are performed safely. Specifically, PPL did not perform adequate human error prevention techniques such that the incorrect assembly of delivery valve springs and stops avoided. (H.4(a)) (Section 1R13)

- Green. An NRC-identified, Green NCV of 10 CFR 50, Appendix B, Criterion XI, "Test Control," occurred when the Unit 2 RCIC ramp generator signal converter (RGSC) failed during maintenance but post maintenance testing (PMT) failed to identify the failure, which went unrecognized until RCIC tripped on overspeed during its normal operating pressure surveillance on June 29, 2011. Consequently, from June 26, 2011, when PPL commenced a reactor startup and transitioned to plant conditions under which RCIC was required to be operable, until June 29, 2011, PPL RCIC was inoperable. After the RGSC was replaced, RCIC was re-tested via SO-250-002 on July 1 and declared operable on July 2. In response to the event, PPL initiated an apparent cause evaluation (ACE), an RCA, and RGSC post-

mortem investigation. PPL entered this issue into their CAP as CRs 1430270, 1450534, and 1516769.

The failure to conduct adequate post-maintenance testing (PMT) that demonstrates RCIC would perform satisfactorily in service via test procedures was a performance deficiency that was reasonable for PPL to foresee and correct. The finding was more than minor since it affected the equipment performance attribute of the Mitigating Systems cornerstone and its objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, reliable operation and the capability of RCIC in automatic were affected by a failure of its RGSC during the refueling outage. The inspectors evaluated the finding in accordance with IMC 0609 Attachment 4, Phase I – Initial Screening and Characterization of Findings, and determined it to be Green, since it was not a design or qualification deficiency, was not a loss of system safety function, and was not risk significant due to an external initiating event. This finding had a cross-cutting aspect in the area of Problem Identification and Resolution (PI&R) - Operating Experience (OE), in that licensees are to implement and institutionalize OE through changes to station processes, procedures, equipment, and training programs. Specifically, PPL did not implement and institutionalize various OE pertinent to RCIC in maintenance, PMTs, and system monitoring. (P.2(b)) (Section 4OA3)

Cornerstone: Barrier Integrity

- Green. An NRC-identified Green NCV of 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," occurred when PPL did not perform an adequate operability assessment for a failed suppression pool (SP) spray flow indicator in accordance with Nuclear Department Administrative Procedure (NDAP)-QA-0703, “Operability Assessments and Requests for Enforcement Discretion," Revision 15. The issue was entered into PPL’s CAP as Condition Report (CR) 1478716.

  The finding is more than minor because it was similar to example 3.j in IMC 0612, Appendix E, “Examples of Minor Issues” in that an error in a calculation is not minor if the error results in reasonable doubt on the operability of the system or component. In this case, the error made in evaluating the operability of the SP spray mode of residual heat removal (RHR) operation resulted in the system subsequently being declared inoperable. Additionally, the error affected the structures, systems and components (SSCs) and barrier performance attribute of the Barrier Integrity cornerstone objective to provide reasonable assurance that physical design barriers (fuel cladding, reactor coolant system (RCS), and containment) protect the public from radionuclide releases caused by accidents or events. Specifically, one subsystem of SP spray was declared inoperable, constituting 62.5 hours of subsystem unavailability. The finding was evaluated for significance using IMC 0609, Attachment 4, “Phase 1 - Initial Screening and Characterization of Findings.” Since the finding was not a degradation of the barrier function of the control room against smoke or toxic gas, did not represent an actual open pathway of the physical integrity of containment, and did not involve an actual reduction in function of hydrogen ignitors in the reactor containment, the finding was determined to be of very low safety significance (Green). This finding is related to the CCA of Problem Identification and Resolution (PI&R) - CAP because PPL did not thoroughly evaluate problems such that the resolutions address the causes and extent of conditions, to include properly classifying, prioritizing and evaluating for operability. Specifically, PPL failed to appropriately evaluate the effect that an instrumentation failure had on the operability of the SP spray subsystem. (P.1(c)) (Section 1R15)

Other Findings

Three violations of very low safety significance or severity level IV that were identified by PPL have been reviewed by inspectors. Corrective actions taken or planned by PPL have been entered into PPL's CAP. These violations and corrective action tracking numbers are listed in Section 4OA7 of this report.

REPORT DETAILS

Summary of Plant Status

Unit 1 began the inspection period at 100% power. Unit 1 was reduced to 68% power on November 11 for a control rod sequence exchange and returned to 100% power on November 13. Unit 1 operated at or about 100% power for the remainder of the inspection period.

Unit 2 began the inspection period at 100% power. Unit 2 was reduced to 67% power on November 5 for a control rod sequence exchange and returned to 100% power the next day. Unit 2 operated at or about 100% power for the remainder of the inspection period.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R01 Adverse Weather Protection (71111.01 – 1 sample)

Readiness for Seasonal Extreme Weather Conditions

a. Inspection Scope

The inspectors performed a review of PPL's readiness for the onset of seasonal low temperatures. The review focused on the condensate system and the Engineering Safeguards and Service Water pumphouse. The inspectors reviewed the Updated Final Safety Analysis Report (UFSAR), Technical Specifications (TSs), control room logs, and the CAP to determine what temperatures or other seasonal weather could challenge these systems, and to ensure PPL personnel had adequately prepared for these challenges. The inspectors reviewed station procedures, including PPL's seasonal weather preparation procedure and applicable operating procedures. The inspectors performed walkdowns of the selected systems to ensure station personnel identified issues that could challenge the operability of the systems during cold weather conditions. Documents reviewed for each section of this inspection report are listed in the Attachment.

- Common, winter preparations

b. Findings

No findings were identified.

1R04 Equipment Alignment

.1 Partial System Walkdowns (71111.04Q – 3 samples)

a. Inspection Scope

The inspectors performed partial walkdowns of the following systems:

- Unit 1, Division I core spray following SO-151-A02
- Unit 1, '1C' Residual Heat Removal (RHR) during '1A' RHR maintenance
- Common, 'E' EDG while substituted for 'D'

The inspectors selected these systems based on their risk-significance relative to the reactor safety cornerstones at the time they were inspected. The inspectors reviewed applicable operating procedures, system diagrams, the UFSAR, TSs, work orders, CRs, and the impact of ongoing work activities on redundant trains of equipment in order to identify conditions that could have impacted system performance of their intended safety functions. The inspectors also performed field walkdowns of accessible portions of the systems to verify system components and support equipment were aligned correctly and were operable. The inspectors examined the material condition of the components and observed operating parameters of equipment to verify that there were no deficiencies. The inspectors also reviewed whether PPL staff had properly identified equipment issues and entered them into the CAP for resolution with the appropriate significance characterization.

b. Findings

No findings were identified.

.2 Full System Walkdown (71111.04S - 1 sample)

a. Inspection Scope

The inspectors performed a complete system walkdown of accessible portions of the Unit 1 high pressure coolant injection (HPCI) system to verify the existing equipment lineup was correct. The inspectors reviewed operating procedures, surveillance tests, drawings, equipment line-up check-off lists, and the UFSAR to verify the system was aligned to perform its required safety functions. The inspectors also reviewed electrical power availability, component lubrication and equipment cooling, hangar and support functionality, and operability of support systems. The inspectors performed field walkdowns of accessible portions of the systems to verify system components and support equipment were aligned correctly and operable. The inspectors examined the material condition of the components and observed operating parameters of equipment to verify that there were no deficiencies. Additionally, the inspectors reviewed a sample of related CRs and work orders to ensure PPL appropriately evaluated and resolved any deficiencies.

- Unit 1, HPCI during reactor core isolation cooling (RCIC) system outage window (SOW)

b. Findings

No findings were identified

1R05 Fire Protection

.1 Resident Inspector Quarterly Walkdowns (71111.05Q - 4 samples)

a. Inspection Scope

The inspectors conducted tours of the areas listed below to assess the material condition and operational status of fire protection features. The inspectors verified that PPL controlled combustible materials and ignition sources in accordance with administrative procedures. The inspectors verified that fire protection and suppression equipment was available for use as specified in the area pre-fire plan, and passive fire barriers were maintained in good material condition. The inspectors also verified that station personnel implemented compensatory measures for out of service, degraded, or inoperable fire protection equipment, as applicable, in accordance with procedures.

- Unit 1, reactor building (RB) 749' elevation (Fire Zones 1-5A-N, S, W, 1-5H)
- Unit 2, RB 749' elevation (Fire Zones 2-5A-N, S, W, 2-5H)
- Common, Units 1 and 2 turbine building 729' elevation (Fire Zones 0-35A, 2-35C)
- Common, control structure cable chases (elevations 699', 714', 729', 741') (multiple fire zones) during CO_2 system isolation

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification Program

.1 Resident Inspector Quarterly Review (71111.11Q – 1 sample)

a. Inspection Scope

The inspectors observed licensed operator simulator training on November 1, 2011, which included a loss of control room annunciators, main turbine blade failure, loss of coolant accident (LOCA), and a radioactive release. The inspectors evaluated operator performance during the simulated event and verified completion of risk significant operator actions, including the use of abnormal and emergency operating procedures (EOPs). The inspectors assessed the clarity and effectiveness of communications, implementation of actions in response to alarms and degrading plant conditions, and the oversight and direction provided by the control room supervisor. The inspectors verified the accuracy and timeliness of the emergency classification made by the shift manager and the TS action statements entered by the shift technical advisor. Additionally, the inspectors assessed the ability of the crew and training staff to identify and document crew performance problems.

b. Findings

No findings were identified.

.2 Biennial Requalification Program Review (71111.11B – 1 sample)

a. Inspection Scope

The following inspection activities were performed using NUREG-1021, "Operator Licensing Examination Standards for Power Reactors," Revision 9, Supplement 1,

Inspection Procedure (IP) Attachment 71111.11, “Licensed Operator Requalification Program,” Appendix A, “Checklist for Evaluating Facility Testing Material” and Appendix B, “Suggested Interview Topics.”

A review was conducted of recent operating history documentation found in inspection reports, licensee event reports (LERs), PPL’s CAP, and the most recent NRC plant issues matrix (PIM). The inspectors also reviewed specific events from PPL’s CAP which indicated possible training deficiencies, to verify that they had been appropriately addressed. The senior resident inspector was also consulted for insights regarding licensed operators’ performance to determine any operational events were indicative of possible training deficiencies.

The operating tests for the week of November 28, 2011, were reviewed for quality and performance.

On December 22, 2011, the results of the annual operating tests for year 2011 and the written exam for 2010 were reviewed to determine if pass fail rates were consistent with the guidance of NUREG-1021, "Operator Licensing Examination Standards for Power Reactors," Revision 9, Supplement 1, and NRC Manual Chapter 0609, Appendix I, “Operator Requalification Human Performance SDP.” The review verified the following:

- Crew pass rate was greater than 80 percent. (Pass rate was 94.1 percent.)
- Individual pass rate on the dynamic simulator test was greater than 80 percent. (Pass rate was 95.4 percent.)
- Individual pass rate on the job performance measures of the operating exam was greater than 80 percent. (Pass rate was 100 percent.)
- Individual pass rate on the 2010 written exam was greater than 80 percent. (Pass rate was 89.9 percent.)
- More than 75 percent of the individuals passed all portions of the exam. (84.1 percent (2010) / 87.7 percent (2011) of the individuals passed all portions of the examination.)
- Observations were made of the dynamic simulator exams and job performance measures (JPM) administered during the week of November 28, 2011. These observations included facility evaluations of crew and individual performance during the dynamic simulator exams and individual performance of five JPMs.

The remediation plans for one crew failure from the 2011 annual operating test and seven written failures from the 2010 biennial examination were reviewed to assess the effectiveness of the remedial training.

Six operators were interviewed for feedback on their training program and the quality of training received.

Simulator performance and fidelity were reviewed for conformance to the reference plant control room.

A sample of records for requalification training attendance, program feedback, reporting, and medical examinations were reviewed for compliance with license conditions, including NRC regulations.

b. Findings

SL IV NCV of 10 CFR 55.59, "Requalification," was identified by PPL and is documented in section 4OA7 of this report.

1R12 Maintenance Effectiveness (71111.12 – 3 samples)

a. Inspection Scope

The inspectors reviewed the samples listed below to assess the effectiveness of maintenance activities on SSC performance and reliability. The inspectors reviewed system health reports, corrective action program documents, maintenance work orders, and maintenance rule basis documents to ensure that PPL was identifying and properly evaluating performance problems within the scope of the maintenance rule. For each sample selected, the inspectors verified that the SSC was properly scoped into the maintenance rule in accordance with 10 CFR 50.65 and verified that the (a)(2) performance criteria established by PPL staff was reasonable. As applicable, for SSCs classified as (a)(1), the inspectors assessed the adequacy of goals and corrective actions to return these SSCs to (a)(2). Additionally, the inspectors ensured that PPL staff was identifying and addressing common cause failures that occurred within and across maintenance rule system boundaries.

- Unit 2, containment spray cooling flow instrument failures
- Common, calibration of pressure switches in various reactor modes
- Common, EDG heating, ventilation and air-conditioning (HVAC) damper failures

b. Findings

No findings were identified.

1R13 Maintenance Risk Assessments and Emergent Work Control (71111.13 – 5 samples)

a. Inspection Scope

The inspectors reviewed station evaluation and management of plant risk for the maintenance and emergent work activities listed below to verify that PPL performed the appropriate risk assessments prior to removing equipment for work. The inspectors selected these activities based on potential risk significance relative to the reactor safety cornerstones. As applicable for each activity, the inspectors verified that PPL personnel performed risk assessments as required by 10 CFR 50.65(a)(4) and that the assessments were accurate and complete. The inspectors evaluated the selected activities to determine whether risk assessments were performed when specified and appropriate risk management actions (RMAs) were identified.

When PPL performed emergent work, the inspectors verified that operations personnel promptly assessed and managed plant risk. The inspectors reviewed the scope of maintenance work and discussed the results of the assessment with the station's probabilistic risk analyst to verify plant conditions were consistent with the risk assessment. The inspectors also reviewed the technical specification requirements and

inspected portions of redundant safety systems, when applicable, to verify risk analysis assumptions were valid and applicable requirements were met.

- Unit 1, RCIC SOW
- Unit 1, HPCI SOW
- Units 1 and 2, yellow risk during RHR valve exercising
- Common, yellow risk during 'B' EDG damper troubleshooting
- Common, 'C' EDG 8R cylinder

b. Findings

Introduction. A Green finding of TS 5.4.1, "Procedures," was identified by the inspectors due to failure to properly plan and implement work instructions and QC hold point inspections associated with a modification to the 'C' EDG fuel pump assembly. The error resulted in the failure of the 'C' EDG to continue running during surveillance testing on December 6, 2011. This resulted in PPL failing to meet the requirements of TS 3.8.1, "AC Sources - Operating" when it was determined that the 'C' EDG was inoperable from September 19, 2011, following restoration from its maintenance outage, until December 6, 2011, when the operable 'E' EDG was substituted for the 'C' EDG. Additionally, the failure to implement work instructions resulted in PPL failing to meet the requirements of 10 CFR Part 50, Appendix B, Criterion X, "Inspection," which requires, in part, that licensees execute a program for inspection of activities affecting quality to verify conformance with the documented instructions, procedures, and drawings for accomplishing the activity.

Description. On December 6, 2011, while performing SO-024-001C, Revision 8, "Monthly Diesel Generator 'C' Operability Test," plant operators noted that the cylinder temperature for the 8R cylinder had lowered to 350° F, a 450° F drop from the previously recorded full load value of 800° F. Operators informed control room and maintenance personnel who determined that the 8R cylinder was not firing. Though analysis exists to ensure that the EDG remains operable with only one cylinder not firing, plant operators conservatively declared the EDG inoperable, TS 3.8.1 was entered, and CR 1501555 was generated. The 'E' EDG was substituted for the 'C' EDG at 1:04 p.m., on December 6, 2011 and TS 3.8.1 was cleared.

An immediate extent of condition review was performed, as required by TS action statements, and it was determined that the loss of firing was likely the result of a diesel overhaul completed in September 2011. This overhaul included disassembly of the fuel pumps to upgrade the o-rings to a material that was more compatible with ultra-low-sulfur diesel (ULSD) fuel oil. It was postulated that the current failure was related to this work activity and, since this was the first EDG to receive this upgrade, it was determined that the condition likely did not exist on the other engines.

A maintenance work order was developed to determine the cause of the 'C' EDG cylinder's failure to fire. As part of this plan, the fuel pump for the 8R cylinder was disassembled so that the delivery valve could be inspected. The purpose of this was to verify that the delivery valve spring and stop had been installed correctly, based on recent OE from South Texas Project (STP) documented in IR 05000498;499/2011004 (ML113140231). STP learned that during their reassembly of the delivery valve holder, the spring and stop were incorrectly aligned and reinstalled into the valve holder, which

resulted in the spring breaking apart and ultimately resulted in failure of the delivery valve and injector due to foreign material impact.

On December 12, 2011, plant personnel disassembled the fuel pump for the 8R cylinder and observed the spring to be broken into several pieces. However, due to the method in which the disassembly was performed and inspected by PPL, plant personnel did not positively observe the orientation of the delivery valve spring and stop. However, an NRC inspector was present to observe the disassembly of the fuel pump and did observe that the stop was incorrectly oriented on the spring. The inspector informed PPL of the observation; however, PPL was unable to come to positive agreement with the inspector's observation. Later, the 8R fuel injector was as-found bench tested and failed all acceptance criteria, likely due to impact from foreign material from the broken spring.

A PPL meeting was conducted on December 13th to determine the path forward. It was determined that plant personnel would borescope the other 15 fuel pumps to verify correct orientation of the spring and stop in the delivery valve holder. This maintenance was conducted on December 14th and observed by NRC inspectors. After performing the borescope on 3 fuel pumps, plant personnel determined that the method was inconclusive and determined that all 15 cylinders would need to be disassembled to verify the orientation and physical status of the springs and stops. Upon disassembly, it was determined that 11 of the remaining 15 delivery valves had their springs and stops inverted as was the case in the OE from STP. Additionally, the springs for the 11 delivery valves were all broken into multiple pieces. After considering this new information and the observation made by NRC inspectors during disassembly of the 8R fuel pump, it was determined that the spring and stop for the 8R cylinder was also oriented incorrectly, which caused its spring to break. CR 1506105 was generated to document that a total of 12 out of 16 fuel delivery valve springs and stops were installed incorrectly and a RCA and Susquehanna Error Prevention Team Assessment (SEPTA) were conducted.

The RCA determined that the delivery valve springs and stops were installed incorrectly during the modification to the fuel pumps to upgrade its o-ring to a material that was more compatible with ultra-low-sulfur diesel (ULSD) fuel oil. Plant Component Work Order (PCWO) 1308182 was performed in September 2011. The RCA determined that 1) the work instructions to perform the modification were inadequate, 2) workers proceeded with the work using the inadequate work instructions, and 3) QC hold point inspections were insufficient in both quality and performance to identify the error. The RCA determined that the STP OE discussed above was appropriately evaluated via Engineering Work Request (EWR) 1451697 and was included in the work instructions for PCWO 1308182 as a note for the QC inspector. The QC hold point, PCWO 1308182 step 6.12 states:

> "Verify the Delivery Valve Holder is installed with the match marks previously established in step 6.5. Ref: EC1444639
>
> Note. The pilot spring and stop within the delivery valve must be installed within the delivery valve cavity and the leak off port in the connector is directed away from the engine exhaust manifolds when assembled. Reference Action Request (AR)/EWR-1451697, Photo 2."

AR/EWR 1451697 discussed the STP OE and included Photo 2, which depicted a correctly installed delivery valve spring and holder. Another photo depicting the incorrect orientation was included in the EWR. Additionally, both photos were included in the work package.

The work was conducted over two days. On August 31, 2011, a pre-job brief was conducted which discussed the STP OE and the lead mechanic who had performed the work correctly on cylinders 1L, 2L, and 3L, had attended an industry meeting in which the STP OE was discussed and was knowledgeable about the issue. On September 1, 2011, a second lead mechanic performed the maintenance on cylinders 4L-8L and 1R-8R. This mechanic incorrectly implemented the work instructions for all the cylinders he worked with the exception of 5L, which was done correctly. This mechanic had not been present at the industry meeting, nor had he attended just-in-time training, in which a mock-up was used to demonstrate the correct installation. Additionally, the pre-job briefing conducted on September 1, 2011, did not discuss the relevant OE as required by station procedures and the mechanic did not attend this brief. With regard to QC hold-point inspections, it was determined that the same inspector had performed the hold point inspection on all 16 cylinders, but failed to verify correct orientation of the springs and stops. Although not required, the QC inspector had not attended the maintenance department just-in-time training or maintenance's pre-job brief on either day. Peer checks, independent verifications (other that the specified hold point), or concurrent verifications were not specified by the work package or used by the mechanics.

The 'C' EDG was realigned for a PMT on September 19, 2011, at 0430. Following PMT, necessary re-work was performed on the 'C' EDG, which necessitated the functional 'E' EDG being substituted in from 1725 on September 19, 2011 until 1501 on September 21, 2011. PPL determined that in the incorrect orientation, the springs would have failed almost immediately when the diesel was run. However, EDG performance would not be impacted until the FME from the broken spring migrated to the associated injector or cylinder. Given one cylinder failed after 18 hours of run time, PPL determined that the safety function of the 'C' EDG was impacted, because they did not have reasonable assurance the EDG was able to fulfill its 24-hour mission time as assumed in the Probabilistic Risk Analysis (PRA). Specifically, the EDG is not able to perform its safety function with more than 1 cylinder out of service and with springs from 12 cylinders broken and all 12 cylinders being subject to possible damage from foreign material, it was determined that the 'C' EDG was not operable and would not have performed its safety function. As a result, the 'C' EDG was determined to have been inoperable for a total period of 76.46 days. The allowed outage time specified in TS 3.8.1 is 72 hours. PPL took action to repair the 12 affected fuel pump assemblies and replace the 12 affected fuel injectors. Additional maintenance activities were performed to ensure that all foreign material was removed from the engine.

Analysis. The inspectors determined that failure to plan and implement work instructions and QC hold point inspections was a performance deficiency within PPL's ability to foresee and prevent. Though the performance deficiency was discovered during surveillance testing, inspectors determined that the NRC inspector's observation during troubleshooting, specifically identifying the 8R delivery valve spring and stop were installed incorrectly (when plant personnel had not positively observed the incorrect orientation), added significant value and, therefore, this finding is being treated as NRC-identified in accordance with IMC 0612, Section 0612-10.c. The inspectors screened the

performance deficiency in accordance with IMC 0612, Appendix B, “Issue Screening.” The performance deficiency was determined to be more than minor because the finding was associated with the Mitigating Systems cornerstone attribute of Human Performance, and affected the cornerstone objective of ensuring the availability reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage).

The finding was determined to be of very low safety significance, for both Susquehanna Units 1 and 2, in accordance with IMC 0609, Appendix A, “Determining the Significance of Reactor Inspection Findings for At-Power Situations” (IMC 0609A) using significance determination process (SDP) Phases 1, 2 and 3. Phase 1 screened the finding to Phase 2 because it represented a loss of the ‘C’ EDG safety function, between September 22 and December 6, 2011 (75 days), longer than the TS LCO of 14 days. A Region I Senior Reactor Analysis (SRA) conducted a Phase 3 analysis because the Phase 2 analysis, conducted by the inspectors using the Susquehanna Pre-solved Risk-Informed Inspection Notebook and the SAPHIRE 8 SDP interface, indicated that the finding could be more than very low significance.

The SRA used the Susquehanna Standardized Plant Analysis Risk (SPAR) model, Revision 8.20 and 8.16, for Unit 1 and 2 respectively and SAPHIRE 8 to conduct the Phase 3 analysis. In completing the analysis the SRA assumed the following:

- 75 day exposure period.
- ‘C’ EDG failure to run probability of 0.36 over the 75 days. The SRA calculated this using cumulative binomial probability given that: 1 injector, of the 12 susceptible, failed during the approximate 18 hours of operation from September 22 through December 6, 2011.
- The ‘C’ EDG would fail with more than 1 injector failing over a 24-hour mission time.
- The probability of common cause failure of the 5 station EDGs (A though D and the spare E) was calculated as if the ’C’ EDG had failed with potential common cause.
- The basic events for common cause failures of 6 EDGs (A through E, and the Blue Max) were taken to ignore, because of the lack of similarity in design, installation, and maintenance, between the station EDGs and the Blue Max.
- The ‘E’ EDG could have been substituted for the ‘C’ EDG if it did fail.

This analysis indicated an increase in core damage frequency (ΔCDF) for internal initiating events in the range of 1 core damage accident in 40,000,000 years of reactor operation, in the low E-8 range per year for each unit. The dominant core damage sequences included losses of offsite power with the failure of all EDGs, due to common cause, resulting in a station blackout, followed by operator failure to extend RCIC operation with loss of DC power, failure to depressurize the reactor, and failure to recover offsite power within 4 hours.

The finding is related to the cross-cutting area of Human Performance, Work Practices, in that PPL personnel did not use human error prevention techniques, such as holding pre-job briefings, self and peer checking, and proper documentation of activities, commensurate with the risk of the assigned task, such that work activities are performed safely. Specifically, PPL did not perform adequate human error prevention techniques such that the incorrect orientation of the delivery valve springs and stops were avoided. (H.4(a))

Enforcement: The violation related to this finding is currently under review by the NRC. When that review is completed, the decision relative to any violation will be transmitted to you via separate correspondence. In accordance with NRC IMC 0612, since the significance determination of the underlying finding has been completed and does not interfere with the NRC's current review of the violation, the finding can be issued at this time. The finding and associated violation, although dispositioned separately, only count as one input into the plant assessment process. However, the number and characterization of violations is subject to change pending the NRC's final review. This issue is identified in the PPL's CAP as CR 1506105. **(FIN 05000387;388/2011005-01 Failure to Properly Implement Work Instructions Results in 'C' EDG Inoperability)**

1R15 Operability Determinations and Functionality Assessments (71111.15 – 9 samples)

a. Inspection Scope

The inspectors reviewed operability determinations for the following degraded or non-conforming conditions:

- Unit 1, drywell temperature exceeded environmental qualification (EQ) limit during testing
- Unit 1, main steam line flow switch failure to reflect plant conditions
- Unit 2, suppression chamber spray flow instrument failure
- Unit 2, emergency core cooling system (ECCS) keepfill pressures elevated during RHR SP cooling
- Unit 2, isotopic activity in '2A' and '2C' reactor feed pump turbine (RFPT) lube oil reservoirs
- Unit 2, HPCI stop valve closed position degrading trend
- Common, 'B' CS chiller flow switch failure
- Common, 10 CFR 21 report on NUS controller seismic clips
- Common, EDG loading during LOCA/loss of offsite power (LOOP)

The inspectors selected these issues based on the risk significance of the associated components and systems. The inspectors evaluated the technical adequacy of the operability determinations to assess whether technical specification operability was properly justified and the subject component or system remained available such that no unrecognized increase in risk occurred. The inspectors compared the operability and design criteria in the appropriate sections of the technical specifications and UFSAR to PPL's evaluations to determine whether the components or systems were operable. In addition, the inspectors reviewed the selected operability determinations to evaluate whether the determinations were performed in accordance with NDAP-QA-0703, "Operability Assessments." Where compensatory measures were required to maintain operability, the inspectors determined whether the measures in place would function as intended and were properly controlled by PPL. The inspectors determined, where appropriate, compliance with bounding limitations associated with the evaluations.

b. Findings

Introduction. An NRC-identified Green NCV of 10 CFR 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," occurred when PPL did not perform an

adequate operability assessment for a failed SP spray flow indicator in accordance with procedure NDAP-QA-0703, “Operability Assessments and Requests for Enforcement Discretion," Revision 15.

Description. On October 14, 2011, the flow indicator for Unit 2 Division II SP spray, FI-25120B, failed upscale. CR 1478388 was initiated by the control room and the SP spray mode of RHR was assessed for operability. Control room personnel determined that the function was operable based on the problem being “an indication only issue.” It further stated that “the RHR pumps remain available and the flow path for SP sprays remains intact, thus, the SP spray function remains operable.” Inspectors identified the CR during their daily review of CRs as required by IP 71152.

Inspectors questioned the prompt operability determination based on the definition of OPERABLE in Unit 2 TSs. Specifically, consistent with Part 9900: “Technical Guidance, Operability Determinations and Functionality Assessments for Resolution of Degraded or Nonconforming Conditions Adverse to Quality or Safety,” Unit 2 TSs define operable as:

- A system, subsystem, division, component, or device shall be OPERABLE or have OPERABILITY when it is capable of performing its specified safety function(s) and when all necessary attendant instrumentation, controls, normal or emergency electrical power, cooling and seal water, lubrication, and other auxiliary equipment that are required for the system, subsystem, division, component, or device to perform its specified safety function(s) are also capable of performing their related support function(s).

The FSAR describes SP spray as a manually initiated and independently controlled function of the RHR system. Each division of the RHR system can be aligned as SP spray, providing two fully redundant subsystems. The two subsystems perform the SP spray function by circulating water from the SP through the RHR heat exchangers (HXs) and returning it to the SP spray spargers. The SP spray spargers accommodate a small portion of the total RHR pump flow and the remainder of the flow returns to the SP through the SP cooling or drywell spray flow paths.

Inspectors reviewed plant procedures used to implement the SP spray function of RHR. OP-249-004, “RHR Containment Cooling,” Revision 23, is the procedure used to implement SP spray as directed by EOPs. For Division II, the procedure directs operators to spray the SP by throttling open the SP spray control valve as necessary to maintain ≤ 500 GPM as indicated on FI-25120B, while maintaining total loop flowrate ≤ 10,000 GPM on a separate flow indicator, FI-E11-1R603B. Inspectors questioned plant operators whether the FI-25120B flow indicator was “necessary attendant instrumentation” as described in the definition of operable based on the fact that the subsystem was a manually controlled system and the procedure could not be implemented as written. Operators responded that the total loop flow indicator, FI-E11-1R603B, could be used to monitor the ≤ 500 GPM flow for SP spray. They described that SP cooling flow could be established at ~ 9,000 GPM and then SP spray flow throttled such that total flow was raised to ~ 9,450 GPM, thus meeting the intent of the procedure.

Inspectors continued to question this approach as it seemed that the SP spray function was inoperable, but was being restored to an operable but degraded status through the use of a compensatory measure. As described in the Part 9900 Guidance

"compensatory measures may be used to… restore inoperable SSCs to an operable but degraded or nonconforming status." It also states that "in general, these measures should have minimal impact on the operators or plant operations and should be relatively simple to implement." Plant operators agreed that the use of a different flow indicator, not specified by procedure, would constitute a compensatory measure.

NDAP-QA-0703 states, in part, that an initial operability screening should be documented such that it "provide[s] a basis for operability." Further, it states to "document the compensatory actions performed…in the Comments box" of the CR. Inspectors determined that the CR did not provide a basis for system operability, nor did it describe or identify the compensatory measures necessary to maintain operability. In fact, the compensatory measures were not discussed in the CR or formally presented to plant operators via turnover, just-in-time training, or a night order.

Additionally, inspectors questioned the technical validity of using total loop flow as a substitute for SP spray flow based on two considerations:

- It was not reasonable to accurately establish a spray flow of less than 500 GPM on a meter that is calibrated to a tolerance of ± 600 GPM, given that the flow would constitute a one increment increase on a 0-30,000 GPM meter, or roughly a 5 percent rise in indicated flow; and
- With SP cooling and SP spray designed in a parallel flow configuration, it was not reasonable to assume that when the SP spray control valve is opened, SP cooling flow would remain constant and any additional indicated flow would be directed only to the SP spray header.

These two factors would likely result in a reduced capability of the suppression chamber spray system.

CR 1478716 was generated to address the inspectors concerns. After evaluating these concerns and discussing the technical aspects of the concerns with plant engineering and Nuclear Regulatory Affairs (NRA), operators declared the subsystem of SP spray inoperable and entered TS 3.6.2.4 for RHR SP spray. The meter for the flow indicator was replaced on October 16, 2011, constituting 62.5 hours of subsystem inoperability, or roughly 37 percent of the allowed outage time.

Analysis. Failure to adequately assess system operability is a performance deficiency which was reasonably within PPL's ability to foresee and correct. The finding is more than minor because it was similar to example 3.j in IMC 0612 Appendix E, "Examples of Minor Issues" in that an error in a calculation is not minor if the error results in reasonable doubt on the operability of the system or component. In this case, the error made in evaluating the operability of the SP spray mode of RHR operation when corrected, resulted the system being declared inoperable. Additionally, the error affected the SSC and barrier performance attribute of the Barrier Integrity cornerstone objective to provide reasonable assurance that physical design barriers (fuel cladding, RCS, and containment) protect the public from radionuclide releases caused by accidents or events. Specifically, one subsystem of SP spray was inoperable for 62.5 hours. The finding was evaluated for significance using IMC 0609, Attachment 4, "Phase 1 - Initial Screening and Characterization of Findings." Since the finding was not a degradation of the barrier function of the control room against smoke or toxic gas, did not represent an actual open pathway of the physical integrity of containment, and did

not involve an actual reduction in function of hydrogen ignitors in the reactor containment, the finding was determined to be of very low safety significance (Green).

This finding is related to the CCA of PI&R - CAP because PPL did not thoroughly evaluate problems such that the resolutions address the causes and extent of conditions, to include properly classifying, prioritizing, and evaluating for operability. Specifically, PPL failed to appropriately evaluate the effect that an instrumentation failure had on the operability of the SP spray subsystem. (P.1(c))

Enforcement. 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," states, in part, that "activities affecting quality shall be prescribed by instructions, procedures, or drawings… and shall be accomplished in accordance with these instructions, procedures, or drawings." NDAP-QA-0703, "Operability Assessments and Requests for Enforcement Discretion," Revision 15, states, in part, that an initial operability screening should be documented such that it "provide[s] a basis for operability." Contrary to the above, the operability determination for the SP spray subsystem performed following failure of the SP spray flow indicator on October 14, 2011 was inadequate, such that it did not provide a reasonable basis for operability. Because this finding is of very low safety significance and has been entered into PPL's CAP (CR 1478388 and 1478716), this violation is being treated as an NCV consistent with the NRC Enforcement Policy. **(NCV 05000388/2011005-02, Inadequate Operability Assessment of Suppression Pool Spray)**

1R18 Plant Modifications

.1 Permanent Modifications (71111.18 – 1 sample)

a. Inspection Scope

The inspectors reviewed a permanent plant modification to determine whether the changes adversely affected system or support system availability, or adversely affected a function important to plant safety. The inspectors reviewed the associated system design bases, including the FSAR, TSs, and assessed the adequacy of the safety determination screening and evaluation. The inspectors also assessed configuration control of the changes by reviewing selected drawings and procedures to verify that appropriate updates had been made. The inspectors compared the actual installation to the modification documents to determine whether the implemented change was consistent with the approved documents. The inspectors reviewed selected post-installation or removal test results as appropriate to evaluate whether the actual impact of the change or removal had been adequately demonstrated by the test. The following modification and document was included in the review:

- Common, Units 1 and 2 RB drains

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19 – 7 samples)

a. Inspection Scope

The inspectors reviewed the post-maintenance tests for the maintenance activities listed below to verify that procedures and test activities ensured system operability and functional capability. The inspectors reviewed the test procedure to verify that the procedure adequately tested the safety functions that may have been affected by the maintenance activity, that the acceptance criteria in the procedure was consistent with the information in the applicable licensing basis and/or design basis documents, and that the procedure had been properly reviewed and approved. The inspectors also witnessed the test or reviewed test data to verify that the test results adequately demonstrated restoration of the affected safety functions.

- Unit 1, 1A RHR service water (RHRSW) pump motor cable testing
- Unit 1, RCIC outage window
- Unit 1, '1D' RHR pump outage window
- Unit 1, Hydrogen recombiner isolation valve
- Unit 1, HPCI outage window
- Unit 2, 'D' EDG outage window
- Common, backup diesel-driven fire pump annual performance testing following maintenance

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22 – 4 samples)

a. Inspection Scope

The inspectors observed performance of surveillance tests and/or reviewed test data of selected risk-significant SSCs to assess whether test results satisfied technical specifications, the UFSAR, and procedure requirements. The inspectors verified that test acceptance criteria were clear, tests demonstrated operational readiness and were consistent with design documentation, test instrumentation had current calibrations and the range and accuracy for the application, tests were performed as written, and applicable test prerequisites were satisfied. Upon test completion, the inspectors considered whether the test results supported that equipment was capable of performing the required safety functions.

As part of the extended power uprate (EPU), the inspectors also reviewed a surveillance that demonstrated incorporation of a license condition regarding neutronic methods and long term stability control via the oscillation power range monitor (OPRM) within the average power range monitor (APRM). The inspectors reviewed the following surveillance tests:

- Unit 2, 24 month calibration of APRM 21 (EPU)
- Units 1 and 2, SI-180-301/SI-280-301 reactor pressure vessel (RPV) pressure instrument calibration
- Common, Division I emergency service water (ESW) flow surveillance (IST)
- Common, control room emergency outside air supply system (CREOASS) testing per Surveillance Requirement (SR) 3.3.7.1.5

b. Findings

A Green NCV of TS 5.4.1, "Procedures," associated with the CREOASS system, was identified by PPL and is documented in section 4OA7 of this report.

Cornerstone: Emergency Preparedness

1EP2 Alert and Notification System Evaluation

a. Inspection Scope (71114.02 – 1 sample)

An onsite review was conducted to assess the maintenance and testing of the Alert and Notification System (ANS). During this inspection, the inspectors interviewed the EP staff responsible for the oversight of the ANS testing and maintenance programs. The inspectors reviewed the associated ANS procedures and the Federal Emergency Management Agency (FEMA)-approved ANS Design Report to ensure compliance with design report commitments for system maintenance and testing. The inspection was conducted in accordance with NRC IP 71114, Attachment .02, Planning Standards, 10 CFR 50.47(b)(5) and the related requirements of 10 CFR Part 50, Appendix E, were used as reference criteria.

b. Findings

No findings were identified.

1EP3 Emergency Response Organization Staffing and Augmentation System

a. Inspection Scope (71114.03 - 1 sample)

The inspectors conducted a review of Susquehanna's Nuclear Emergency Response Organization (NERO) augmentation staffing requirements and the process for notifying and augmenting the NERO. The review was performed to ensure the readiness of key PPL staff to respond to an emergency event and to ensure PPL's ability to activate their emergency response facilities in a timely manner. The inspectors reviewed the Susquehanna Emergency Plan for NERO staffing requirements, the NERO duty roster, applicable station procedures, pager test reports, the 2009 augmentation report, a sample of drill reports, and CRs related to this area. The inspectors also reviewed a sampling of NERO responders' training records to ensure training and qualifications were up-to-date. The inspection was conducted in accordance with NRC IP 71114, Attachment 3, Planning Standards (PSs), 10 CFR 50.47(b)(2) and related requirements of 10 CFR Part 50, Appendix E, were used as reference criteria.

b. Findings

No findings were identified.

1EP4 Emergency Action Level and Emergency Plan Changes

a. Inspection Scope (71114.04 - 1 sample)

Since the last NRC inspection of this program area, in October 2010, PPL did not implement any changes to the Susquehanna Emergency Plan. However, various changes were made to several of the Susquehanna Emergency Plan lower-tier implementing procedures. PPL had determined that, in accordance with 10 CFR 50.54(q), the changes made to the lower-tier implementing procedures, had not resulted in any decrease in effectiveness of the Emergency Plan, and that the Emergency Plan continued to meet the requirements of 10 CFR 50.47(b) and Appendix E to 10 CFR Part 50. The inspectors reviewed one Emergency Action Level (EAL) basis change and a sample of changes to the lower-tier emergency plan implementing procedures, for any potential decreases in effectiveness of the emergency plan for the period of October, 2010 to September 2011. However, this review by the inspectors was not documented in an NRC Safety Evaluation (SE) Report and does not constitute formal NRC approval of the changes. Therefore, these changes remain subject to future NRC inspection in their entirety. The inspection was conducted in accordance with NRC IP 71114, Attachment 4. The requirements in 10 CFR 50.54(q) were used as reference criteria.

b. Findings

No findings were identified.

1EP5 Correction of Emergency Preparedness Weaknesses

a. Inspection Scope (71114.05 - 1 sample)

The inspectors reviewed a sampling of drill reports, a 10 CFR 50.54(t) audit report, a quality assurance (QA) assessment report, self-assessments, and EP-related CRs to assess PPL's ability to evaluate their EP performance and program. The inspectors reviewed a sampling of CRs initiated from July 2009 through October 2011, by PPL at Susquehanna from staff, drills, self- assessments and audits. This inspection was conducted in accordance with NRC IP 71114, Attachment 5, PS, 10 CFR 50.47(b)(14) and the related requirements of 10 CFR Part 50, Appendix E, were used as reference criteria.

b. Findings

No findings were identified.

2. RADIATION SAFETY

Cornerstone: Occupational/Public Radiation Safety (PS)

2RS1 Radiological Hazard Assessment and Exposure Controls (71124.01 - 1 sample)

a. Inspection Scope

The inspectors reviewed PPL Performance Indicators (PIs) for the Occupational Exposure cornerstone for followup. The inspectors reviewed the results of radiation protection program audits. The inspectors reviewed reports of operational occurrences related to occupational radiation safety since the last inspection.

The inspectors selected containers holding nonexempt licensed radioactive materials that may cause unplanned or inadvertent exposure of workers, and verified that they were labeled and controlled.

The inspectors reviewed radiation work permits (RWPs) used to access high radiation areas (HRA) and identified what work control instructions or control barriers had been specified. The inspectors verified that allowable stay times or permissible dose for radiologically significant work under each RWP was clearly identified. The inspectors verified that electronic personal dosimeter (EPD) alarm setpoints were in conformance with survey indications and plant policy.

The inspectors selected occurrences where a worker's EPD noticeably malfunctioned or alarmed. The inspectors verified that workers responded appropriately to the off-normal conditions. The inspectors verified that the issues were included in the CAP and dose evaluations were conducted as appropriate.

The inspectors discussed with the radiation protection manager (RPM) the controls and procedures for high-risk HRAs and very high radiation areas (VHRA). The inspectors verified that any changes to PPL's procedures did not substantially reduce the effectiveness and level of worker protection.

The inspectors discussed with first-line health physics (HP) supervisors the controls in place for special areas that have the potential to become VHRAs during certain plant operations. The inspectors verified that PPL controls for all VHRAs, and areas with the potential to become a VHRA, ensured that an individual is not able to gain unauthorized access to the VHRA.

The inspectors verified that problems associated with radiation monitoring and exposure control were being identified by PPL at an appropriate threshold and were properly addressed for resolution in PPL's CAP. In addition to the above, the inspectors verified the appropriateness of the corrective actions for a selected sample of problems documented by PPL that involve radiation monitoring and exposure controls to determine whether PPL was assessing the applicability of OE to their plant.

b. Findings

A Green NCV of TS 5.7.1, "HRAs," was licensee-identified for failure to post and control HRA and is documented in section 40A7 of this report.

2RS2 Occupational ALARA Planning and Controls (71124.02 - 1 sample)

a. Inspection Scope

Using PPL records, the inspectors determined the historical trends and current status of significant tracked plant source terms known to contribute to elevated facility aggregate exposure. The inspectors determined that PPL was making allowances or developing contingency plans for expected changes in the source term as the result of changes in plant fuel performance issues or changes in plant primary chemistry.

The inspectors verified that problems associated with as low as is reasonably achievable (ALARA) planning and controls were being identified by PPL at an appropriate threshold and were properly addressed for resolution in PPL's CAP.

b. Findings

No findings were identified.

2RS3 In-Plant Airborne Radioactivity Control and Mitigation (71124.03 – 1 sample)

a. Inspection Scope

The inspectors reviewed the FSAR for an overview of the respiratory protection program and a description of the types of devices used. The inspectors reviewed the FSAR, TSs, and EP documents to identify the location and quantity of respiratory protection devices stored for emergency use. The inspectors reviewed PPL's procedures for maintenance, inspection, and use of respiratory protection equipment including self-contained breathing apparatus (SCBA). Additionally, the inspectors reviewed procedures for air quality maintenance.

The inspectors verified that PPL provided respiratory protective devices such that occupational doses are ALARA. As available, the inspectors selected work activities where respiratory protection devices were used to limit the intake of radioactive materials, and verified that PPL performed an evaluation concluding that further engineering controls were not practical and that the use of respirators was ALARA. The inspectors verified that PPL had established means to verify that the level of protection provided by the respiratory protection devices during use was at least as good as that assumed in PPL's work controls and dose assessment.

The inspectors verified that respiratory protection devices used to limit the intake of radioactive materials are certified by the National Institute for Occupational Safety and Health/Mine Safety and Health Administration (NIOSH/MSHA) or had been approved by the NRC. The inspectors selected work activities where respiratory protection devices were used and verified that the devices were used consistent with their NIOSH/MSHA certification.

The inspectors reviewed records of air testing for supplied-air devices and SCBA bottles. The inspectors verified that air used in these devices meet or exceeded Grade 'D' quality. The inspectors verified that plant breathing air supply systems met the minimum pressure and airflow requirements for the devices in use.

The inspectors selected individuals qualified to use respiratory protection devices, and verified that they had been deemed fit to use the device(s) by a physician.

The inspectors selected individuals assigned to wear a respiratory protection device and observed them donning, doffing, and functionally checking the device as appropriate. The inspectors verified that these individuals knew how to safely use the device and how to properly respond to any device malfunction or unusual occurrence. The inspectors reviewed training curricula for users of the devices.

The inspectors chose respiratory protection devices staged and ready for use in the plant or stocked for issuance for use. The inspectors observed the physical condition of the device components and reviewed records of routine inspection for each. The inspectors selected a sampling of the devices, and reviewed records of maintenance on the vital components. The inspectors verified that onsite personnel assigned to repair vital components had received vendor-provided training.

Based on FSAR, TSs, and EOP requirements, the inspectors reviewed the status and surveillance records of SCBAs staged in-plant for use during emergencies. The inspectors observed PPL's capability for refilling and transporting SCBA air bottles to and from the control room and operations support center during emergency conditions.

The inspectors selected individuals on control room shift crews, and individuals from designated departments currently assigned emergency duties. The inspectors determined that control room operators and other emergency response and radiation protection personnel were trained and qualified in the use of SCBAs. The inspectors determined that personnel assigned to refill bottles were trained and qualified for that task.

The inspectors verified that appropriate mask sizes and types were available for use. The inspectors selected on-shift operators, and verified that they had no facial hair that would interfere with the sealing of the mask to the face. The inspectors also verified that vision correction did not penetrate the face seal.

The inspectors reviewed the past two years of maintenance records for SCBA units used to support operator activities during accident conditions and designated as "ready for service." The inspectors verified that any maintenance or repairs on an SCBA unit's vital components were performed by an individual, or individuals, certified by the manufacturer of the device to perform the work. The inspectors reviewed the onsite maintenance procedures governing vital component work, and identified any inconsistencies with the SCBA manufacturer's recommended practices. For those SCBAs designated as "ready for service," the inspectors ensured that the required, periodic air cylinder hydrostatic testing was documented and up to date, and the retest air cylinder markings required by the U.S. Department of Transportation were in place.

b. Findings

No findings were identified.

2RS5 Radiation Monitoring Instrumentation (71124.05 – 1 sample)

a. Inspection Scope

The inspectors selected portable survey instruments in use or available for issuance. The inspectors checked calibration and source check stickers for currency, and assessed instrument material condition and operability.

The inspectors observed PPL staff performance as the staff demonstrated source checks for various types of portable survey instruments. The inspectors determined that high-range instruments were source checked on all appropriate scales.

The inspectors selected one of each type of laboratory analytical instruments used for radiological analyses. The inspectors verified that daily performance checks and calibration data indicated that the frequency of the calibrations was adequate and there were no indications of degraded instrument performance.

As part of the PI&R review, the inspectors verified that appropriate corrective actions were implemented in response to indications of degraded instrument performance.

The inspectors verified that an electronic calibration was completed for all range decades above 10 rem/hour and that at least one decade at or below 10 rem/hour was calibrated using an appropriate radiation source.

The inspectors determined that the calibration acceptance criteria were reasonable, accounting for the large measuring range and the intended purpose of the instruments.

The inspectors selected high-range effluent monitors or other effluent/process monitors that are relied on by PPL in its EOPs as a basis for triggering EALs and subsequent emergency classifications, or to make protective action recommendations during an accident. The inspectors evaluated the calibration and availability of these instruments.

The inspectors reviewed PPL's capability to collect high-range, post-accident iodine effluent samples.

The inspectors observed electronic and radiation calibration of these instruments to verify conformity with PPL's calibration and test protocols.

The inspectors selected samples of each type of these instruments used on site, and verified that the alarm set-point values were reasonable under the circumstances to ensure that licensed material is not released from the site.

The inspectors reviewed calibration documentation for each instrument selected above, and discussed the calibration methods with the licensee to determine consistency with the manufacturer's recommendations.

The inspectors reviewed calibration documentation for at least one of each type of instrument. For portable survey instruments and ambient air monitors (ARMs), the inspectors reviewed detector measurement geometry and calibration methods, and had PPL demonstrate use of its instrument calibrator.

The inspectors selected portable survey instruments that did not meet acceptance criteria during calibration or source checks. The inspectors verified that PPL had taken appropriate corrective action for instruments found significantly out of calibration. The inspectors verified that PPL had evaluated the possible consequences of instrument use since the last successful calibration or source check.

The inspectors reviewed the current output values for PPL's portable survey and ARM instrument calibrator units. The inspectors verified that PPL periodically measured calibrator output over the range of the instruments used through measurements by ion chamber/electrometer.

The inspectors verified that the measuring devices had been calibrated by a facility using the National Institute of Standards and Technology (NIST) traceable sources and that correction factors for these measuring devices were properly applied by PPL in its output verification.

The inspectors reviewed PPL's Title 10 of the Code of Federal Regulations (10 CFR) Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste," source term to determine if the calibration sources used were representative of the types and energies of radiation encountered in the plant.

The inspectors verified that problems associated with radiation monitoring instrumentation were being identified by PPL at an appropriate threshold and were properly addressed for resolution in the licensee CAP.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES

4OA1 Performance Indicator Verification (71151) (11 samples total)

.1 Mitigating Systems Performance Index (MSPI) (6 samples)

a. Inspection Scope

The inspectors reviewed PPL's submittal of the MSPI for the following system for the period of August 1, 2010 through September 30, 2011:

- Unit 1 Emergency AC power system (MS06)
- Unit 2 Emergency AC power system (MS06)

The inspectors reviewed PPL's submittal of the MSPI for the following systems for the period of October 1, 2010 through September 30, 2011:

- Unit 1 Heat Removal System (MS08)
- Unit 2 Heat Removal System (MS08)
- Unit 1 RHR Systems (MS09)
- Unit 2 RHR Systems (MS09)

To determine the accuracy of the PI data reported during those periods, the inspectors used definitions and guidance contained in Nuclear Energy Institute (NEI) Document 99-02, "Regulatory Assessment PI Guideline," Revision 6. The inspectors also reviewed PPL's operator narrative logs, CRs, mitigating systems performance index derivation reports, event reports, and NRC integrated inspection reports to validate the accuracy of the submittals. The review also included revisions of the MSPIs for January through September 2010 as corrective actions for NCV 2010005-06 in IR 05000387; 388/2010005.

b. Findings

No findings were identified.

.2 Occupational Exposure Control Effectiveness (1 sample)

a. Inspection Scope

The inspectors reviewed PPL's PI for the Occupational Radiation Safety cornerstone (OR01) for followup. The inspectors reviewed a listing of PPL ARs for issues related to the occupational radiation safety PI, which measures nonconformances with HRAs greater than 1 Roentgen/hour (R/hr) and unplanned personnel exposures greater than 100 millirem (mrem) total effective dose equivalent (TEDE), 5 rem skin dose equivalent (SDE), 1.5 rem lens dose equivalent (LDE), or 100 mrem to the unborn child.

The inspectors determined if any of these PI events involved dose rates >25 R/hr at 30 centimeters or >500 R/hr at 1 meter. If so, the inspectors determined what barriers had failed and if there were any barriers left to prevent personnel access. For unintended exposures >100 mrem TEDE (or >5 rem SDE or >1.5 rem LDE), the inspectors determined if there were any overexposures or substantial potential for overexposure. At the time of the inspection, the inspectors determined that no PI events had occurred during the assessment period. However, a reportable HRA event related to a source transfer occurred on December 5, 2011 (see section 4OA3). This event is not covered by this sample.

b. Findings

No findings were identified.

.3 RETS/ODCM Radiological Effluent Release Occurrences (1 sample)

a. Inspection Scope

The inspectors reviewed a listing of PPL's ARs for issues related to the PI for the Public Radiation Safety cornerstone (PR01), which measures radiological effluent release occurrences per site that exceed 1.5 mrem/quarter (qtr) whole body or 5 mrem/qtr organ dose for liquid effluents; or 5 millirads (mrads)/qtr gamma air dose, 10 mrads/qtr beta air dose; or 7.5 mrems/qtr organ doses from Iodine-131 (I-131), I-133, Hydrogen-3 (H-3) and particulates for gaseous effluents.

b. Findings

No findings were identified.

.4 Emergency Preparedness Cornerstone (3 samples)

a. Inspection Scope

The inspectors reviewed data for the three EP PIs, which are: (1) Drill and Exercise Performance (DEP) (ER01); (2) ERO Drill Participation (ER02); and, (3) ANS Reliability (ER03). The last NRC EP inspection at Susquehanna was conducted in the fourth quarter of 2010; the inspectors reviewed supporting documentation from EP drills,

training records, and equipment tests from the fourth calendar quarter of 2010 through the third quarter of 2011, to verify the accuracy of the reported PI data. The review of these PIs was conducted in accordance with NRC IP 71151, using the acceptance criteria documented in NEI 99-02, "Regulatory Assessment PI Guidelines," Revision 6.

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution (PI&R) (71152 – 4 samples)

.1 Routine Review of PI&R Activities

a. Inspection Scope

As specified by IP 71152, "Problem Identification & Resolution," the inspectors routinely reviewed issues during baseline inspection activities and plant status reviews to verify that PPL entered issues into the CAP at an appropriate threshold, gave adequate attention to timely corrective actions, and identified and addressed adverse trends. In order to assist with the identification of repetitive equipment failures and specific human performance issues for follow-up, the inspectors performed a daily screening of items entered into the CAP and periodically attended screening meetings.

b. Findings

No findings were identified.

.2 Semi-Annual Trend Review

a. Inspection Scope

The inspectors performed a semi-annual review of site issues, as required by IP 71152, "Problem Identification & Resolution," to identify trends that might indicate the existence of more significant safety issues. In this review, the inspectors included repetitive or closely-related issues that may have been documented by PPL outside of the corrective action program, such as trend reports, PIs, major equipment problem lists, system health reports, maintenance rule assessments, and maintenance or corrective action program backlogs. The inspectors also reviewed PPL's corrective action program database for the third and fourth quarters of 2011 to assess CRs written in various subject areas (equipment problems, human performance issues, etc.), as well as individual issues identified during the NRC's daily CR review (Section 4OA2.1). The inspectors reviewed PPL's quarterly trend report for the second and third quarters of 2011 conducted under NDAP-QA-0710, "Station Trending Program," Revision 6 to verify that personnel were appropriately evaluating and trending adverse conditions in accordance with applicable procedures.

Additionally, inspectors performed a detailed review of PPL's 2011 Independent Safety Culture Survey and Report conducted by an external vendor. The survey was administered in February 2011 and the final report was received by PPL in June 2011. The inspectors reviewed the survey questions and methodology, the statistical analysis

of the survey data, and compared the results to the September 2009, Safety Culture Survey Report, the November 2008 SCWE Trending Survey and the 2006 Nuclear Safety Culture Surveys at Susquehanna. The inspectors reviewed all write-in comments for the most recent survey. The inspectors also reviewed CRs, and interviewed selected personnel about the General Work Environment (GWE) on site. The inspectors also reviewed site communications related to general work environment issues. Specific documents reviewed are listed in the Attachment.

b. Findings & Observations

No findings were identified.

General Work Environment (GWE)

The inspectors reviewed usage of available programs, namely the Employee Concerns Program (ECP), anonymous ARs, and the anonymous hotline, for raising concerns over the last six months. The ECP had zero Level 1 concerns (related to nuclear or industrial safety) opened in the second half of 2011. This represented a reduction since the previous assessment, which included a review of three Level 1 concerns opened in the first half of 2011. Level 2 concerns (related to GWE or personnel issues) returned to its previous steady trend of ~ 9 concerns opened per month following a spike to 47 and 23 in April and May, respectively. Use of the anonymous AR process remained consistent with historic data. CRs, as a subset of those anonymous ARs, also remained consistent with historic data. Use of the anonymous hotline remained infrequent, consistent with historical data, at one call for calendar year 2011 occurring in March with no additional calls throughout the year.

Comparison of the 2011 Synergy Survey results with the full 2009 and 2006 Nuclear Safety Culture Survey and the 2008 SCWE Surveys (also administered by Synergy), determined that actions taken to date to address the SCWE appeared to have had a positive impact. SCWE and GWE dropped significantly from 2006 to 2008 (-4.9 percent for SCWE); however these same indicators showed significant improvement from 2008 to 2009 (+4.2 percent for SCWE) and continue to show an improving trend from 2009 to 2011 (+1.6 percent for SCWE). Of the 64 common questions asked in the 2008, 2009, and 2011 surveys, 99 percent of the responses showed improvement and ~60 percent have statistically significant levels of improvement (>5 percent).

The inspectors reviewed all write-in comments provided. There were a relatively large number of responses where individuals felt the plant was making adequate progress. Major themes raised in the write-in comments related to staffing/knowledge management concerns, first line supervisor challenges and compensation, performance evaluation and recognition programs, and accountability.

Overall, Susquehanna improved from the 4th quartile of plants surveyed by Synergy in both the SCWE and GWE areas in 2008 and 2009 to the 2nd and 3rd quartiles, respectively, in 2011. There is clear evidence that the actions taken to date have had a positive effect on the SCWE/GWE at Susquehanna. Based on these results the NRC will no longer formally document its assessments of SWCE at Susquehanna on a semi-annual basis as it has since the issue of the Chilling Effect Letter of January 28, 2009 (ML090280115). However, the NRC will continue to monitor PPL's progress in this area

under the baseline inspection program, as well as supplemental and biennial PI&R inspection activities.

CAP – Evaluation (P.1(c))

On September 1, 2011, the NRC issued its Mid-Cycle Assessment Letter to PPL regarding Susquehanna performance during the first half of 2011 (ML112430469). In the letter, the NRC identified a substantive cross-cutting issue (SCCI) in the CAP component of the PI&R CCA. Specifically, there were five findings with a PI&R cross-cutting aspect of P.1(c) - Evaluation of Identified Problems - during the assessment period. The same theme was identified in the 2010 Annual Assessment letter (ML10260317); however, an SCCI was not assigned at that time since a reasonable duration had not passed to evaluate the effectiveness of PPL's corrective actions. As part of the semi-annual trend review, the inspectors reviewed PPL's scope of efforts and progress in addressing the theme. Major efforts since the last assessment, listed chronologically, included:

- May 12, 2011 - CR 1406091, a Level 2 Cause Condition Adverse to Quality (CAQ), documented a continued trend in NRC findings with an Evaluation cross-cutting aspect, as evidenced by three additional findings documented in the IR 05000387;388/2011002 (ML111380056). The ACE was approved on July 15, 2011. The ACE recognized that many corrective actions had been implemented, including departmental corrective action review boards (CARBs) and enhanced training for personnel who conduct ACEs. An additional corrective action was generated to design, develop and pilot enhanced training for personnel that perform lower-tier EVAL level evaluations. This training was conducted throughout the remainder of 2011.
- September 21, 2011 - CR 1461742 was generated to initiate an RCA to assess why PPL had not addressed and mitigated the cross-cutting theme in a timely manner. As part of the RCA, the team was tasked with determining why the station has been ineffective at eliminating the theme prior to it being identified as SCCI. Many of the actions specified in the RCA were actions referenced from other site projects (i.e., Excellence Plan, 95002 and Risk Recovery Team Plans). Additional actions were included to increase the engagement of Nuclear Regulatory Affairs department in CAP to ensure issues of actual or potential regulatory significance were addressed in a timely and effective manner. The RCA was approved by CARB on October 21, 2011.
- October 10, 2011 - PPL performed a focused area self assessment (FASA) on operability determinations. Despite the assessment determining that "operations personnel performing operability determinations failed to consistently meet the requirements established in the current program" it identified no areas for improvement that met the criteria for CRs in accordance with NDAP-QA-0702. The FASA identified four enhancements to the current program and assigned actions to be completed outside of PPL's CAP. At the time of the assessment, PPL had two NRC-identified examples of inadequate operability determinations that met the more than minor threshold as documented in IR 05000387;388/2011002-03 (ML111380056) and IR 05000388/2011004-04 (ML113120409).
- October 13, 2011 and November 18, 2011 - NRC inspectors communicated to PPL management that, despite a second finding in the past three quarters being issued related to an inadequate evaluation of equipment operability and assigned a CCA of

P.1(c), PPL had only considered CAP evaluations in its scope of actions to address the SCCI.

- November, 29, 2011- SCCI Recovery Plan, Revision 0, issued and included three initiatives:

  1. RCA for failure to address and mitigate the P.1(c) theme (discussed above).
  2. Review of evaluations and outstanding corrective actions associated with all findings assigned a CCA of P.1(c).
  3. Review of Level 3 CRs assigned as EVAL level evaluations.

- December 5, 2011 - NDAP-QA-0702, "AR and CR Process," Revision 34 issued. This revision was a complete re-write of the procedure and was generated to address gaps identified in PPL's CAP in preparation for the upcoming IP 95002 inspection, scheduled for February 2012. The major change to the procedure included a risk-informed screening process to ensure that all conditions are screened to the appropriate level of evaluation (i.e., RCA, ACE, EVAL) based on their risk significance.
- December, 12, 2011 - NDAP-QA-0752, "Cause Analysis," Revision 14 issued. This revision was an extensive re-write and included the principles of a risk-informed CAP. Additionally, this revision included the plant manager's expectations for CAP compliance which were previously communicated to station personnel via a site communication in May, 2011 and which was discussed in the previous semi-annual trend review.
- December 14, 2011 - Initiative 2 and 3 from the SCCI Recovery Plan complete. Initiative 2 included reviews of all evaluations and corrective actions associated with findings assigned a CCA of P.1(c) for quality, adequacy of closed corrective actions, and timeliness of any open corrective actions. New CRs were generated based on this review to close any identified gaps. Initiative 3 included review of selected Level 3 EVALS from 2010 and 2011. The population that PPL reviewed was selected based on risk and regulatory significance and consisted of 695 Level 3 EVAL CRs. Of the CRs reviewed, 208 were determined to have failed based on 14 specific quality criteria, which amounted to ~ 30 percent of the total population. The most prevalent deficiency identified by PPL involved inadequate extent of condition. Other deficiencies included weaknesses in the investigation and/or corrective actions developed. New CRs were generated based on this review to correct any deficiencies identified.

Though outside the period covered by this inspection, the following additional actions have been, or are planned to be taken and are included in this report for completeness:

- January 5, 2012 - CR 1502875, a Level 1 RCA, was generated to address an additional violation of 10 CFR 50, Appendix B, Criterion V, associated with an inadequate operability assessment (See 1R15.b). Despite being the third finding in 2011 with a CCA of P.1(c) that was specifically related to inadequate operability determinations, this was the first RCA to address the weaknesses. It is PPL's intention to include actions and initiatives identified by this RCA in the SCCI Recovery Plan.

Human Performance - Resources (H.2(c))

On September 1, 2011, the NRC issued its Mid-Cycle Assessment Letter to PPL regarding Susquehanna performance from July 1, 2010 through June 30, 2011 (ML112430469). In the letter, the NRC identified a cross-cutting theme in the Resources component of the Human Performance CCA. Specifically, PPL had four findings with a Human Performance cross-cutting aspect of H.2(c) – Documentation, Procedures, and Component Labeling, which included a green finding in each of the four quarters of the assessment period all pertaining to inadequate plant procedures. At the time of the 2011 mid-cycle assessment, an RCA was ongoing to address the theme. As part of the semi-annual trend review, the inspectors reviewed PPL's scope of efforts and progress in addressing the theme. Major efforts since the last assessment, listed chronologically, are provided in this section. Additional discussion and assessment of the evaluation of this theme are included in Section 4OA2.3.

- April 18, 2011 - CR 1389530, a Level 1 RCA for procedure quality, usage, and adherence, was initiated as part of the preparations for the upcoming 95002 supplemental inspection. The evaluation determined that PPL had not adopted a procedure process as defined by industry standards and assigned corrective actions to address the gaps. The RCA was originally approved by CARB on August 12, 2011, but was subsequently revised. The final RCA was approved on November 23, 2011.
- May 24, 2011 - CR 1412321, a Level 3 EVAL, was generated identifying a potential trend in findings with a CCA of H.2(c). The common issues analysis performed concluded that procedure quality was the common thread and referred to corrective actions being executed under CR 1389530. No new corrective actions were identified.
- August 19, 2011 - CR 1453724, a Level 3 EVAL, was generated for a fourth finding with a CCA of H.2(c) and also referred to corrective actions being executed under CR 1389530.
- October 17, 2011 - CR 1479688, a Level 4 Correct, was generated as a result of a fifth finding with a CCA of H.2(c). The management review committee (MRC) determined that, though the CR screened as requiring a separate RCA in accordance with NDAP-QA-0702, the analysis and corrective actions performed under CR 1389530 were likely sufficient. An action item was assigned to verify that no additional compensatory actions were required in response to the most recent CR while actions for the original RCA were in progress.
- October 31, 2011 - Inspectors attempted to review the Operations Procedure Backlog as part of this trend review. It was identified that performance indicators OD12, "Operations Procedure Backlog," and OD12A, "Pri2 Procedure Backlog Age Distribution," had not been updated since December 2009. A search of PPL's CAP, determined that there were over 850 open procedure changes at the time. Though this does not specifically compare to a procedure backlog, since priority of changes is not considered, it is indicative of the number of procedure changes required in the Operations department.
- December 2011 - Two sessions of training was offered to provide the requisite knowledge to attain a new procedure writer's qualification.
- January 9, 2012 - NDAP-QA-0002, "Procedure Program," Revision 28, NDAP-QA-0004, "Procedure Change Process," Revision 0, and NDAP-QA-0008, "Procedure Writer's Guide," Revision 9 were issued. These procedures were issued as a result of CR 1389530 and revised PPL's procedure program to make it consistent with industry standards. Additionally, all new procedures or procedure revisions had to

be reviewed by a qualified person prior to approval.

- January 9, 2012 - Procedure Program Key Performance Indicators included in Revision 28 to NDAP-QA-0002. These included three indicators that would measure backlog: Total Backlog Quantity, Priority Backlog Percentage and Average Age by Priority. The procedure change allowed a 60 day grace period to allow sufficient data collection. Though not a direct reflection of what the PI will indicate, a search of PPL's CAP identified that the number of open procedure changes had grown to over 950.

Human Performance - Work Practices (H.4(a))

On November 8, 2011, the NRC issued its Integrated Inspection Report for the 3rd quarter of 2011 (ML113120409). The report documented a finding assigned a cross-cutting aspect in the Work Practices component of the Human Performance CCA. This represented the fourth finding in 2011 assigned a cross-cutting aspect of H.4(a) - Human Error Prevention Techniques. As part of the semi-annual trend review, the inspectors reviewed PPL's scope of efforts and progress in addressing the potential theme. Major efforts, listed chronologically, included:

- October 27, 2011 - CR 1479689, a Level 1 RCA, was generated to document the fourth finding with a CCA of H.4(a).
- December 22, 2011 - CR 1479689 was approved by CARB and identified that the Human Performance program is not valued as a prevention method to reduce performance deficiencies. Numerous corrective actions were assigned to address the weaknesses, but had not been implemented at the time of this review.

Traditional Enforcement

The inspectors identified what appeared to be a potential trend in violations that were subject to traditional enforcement. Though many were of minor safety significance, the number of violations may be indicative of a trend requiring additional analysis and corrective action. Examples include:

Violations involving ROP PIs:

- Failure to include updated MSPI basis document data in calculations of all ten MSPIs submitted to the NRC for three consecutive quarters. Documented as a SLIV NCV of 10 CFR 50.9, "Complete and Accurate Information," in IR 05000387;388/2010005 (ML110400284).
- Failure to report a reactor scram associated with an uncontrolled circulating water flooding event as an unplanned scram with complications (IE04). This violation was of minor safety significance because it had little effect on the PI calculation. (CR 1336449)
- Failure to accurately report RCS leakage PI (BI01) since its inception. Documented as a SLIV NCV of 10 CFR 50.9, "Complete and Accurate Information," in IR 05000387; 388/2011-004 (ML113120409).
- Error in cooling water PI where estimated information was used to calculate actual demands. This violation was of minor safety significance because it had little effect on the PI calculation. (CR 1463504)

- HPCI valve demands were double-counted when reporting High Pressure Injection Systems PI (MS07). This violation was of minor safety significance because it had little effect on the PI calculation. (CR 1457945)
- Source documentation was not being maintained per station procedures. This violation was of minor safety significance because it had no effect on the PI calculation and the PIs were able to be verified correct. (CR 1327416)
- An MSPI demand failure associated with RCIC was not reported as required. This violation was of minor safety significance because it had little effect on the PI calculation. (CR 1507555)

Violations involving other reports:

- An inaccurate Form 396 for a licensed reactor operator submitted to the NRC. Documented as a SLIV NOV of 10 CFR 10 CFR 55.25 and 10 CFR 55.3 in IR 05000387; 388/2010-005 (ML113120409). Issue was cited as a NOV due to being repeat in nature.
- PPL identified that a required 60-day report associated with a post-EPU license condition was submitted late. This violation was of minor safety significance because no NRC decisions were based on the report. (CR 1470478)
- PPL identified an inaccurate Form 396 for a licensed reactor operator submitted to the NRC. Documented in section 4OA7 as a licensee-identified NCV.

Radiation Protection Postings

NRC inspectors discussed radiation protection postings in the semi-annual trend review documented in IR 05000387; 388/2011003 (ML112220409). Specifically, despite PPL listing radiation area (RA) and high radiation area (HRA) posting events as a monitored trend in the second and third quarter of 2010 and a resolved trend in the fourth quarter of 2010, there was one HRA posting event, a PPL-identified NCV, and three radiation posting events for the first half of 2011. This continued in the second half of 2011, with a total of three Green NCVs in 2011 and a source handling issue discussed in section 4OA3 which resulted in a potential OR01 PI HRA input. Because of these continued weaknesses in RA and HRA postings, as well as less than adequate radiation worker behaviors, PPL developed the “Radiation Protection Organizational Effectiveness Recovery Project Plan” to track progress of numerous CAP products and manage corrective actions aimed at addressing the continuing trend.

EDG Challenges

The inspectors noted a trend in EDG challenges in the semi-annual review of trends documented in IR 05000387; 388/2011003 (ML112220409). During a review of the CAP from the current period, a similar number of minor equipment deficiencies were noted. Additionally, as discussed in 1R13 of this report, an issue associated with the ‘C’ EDG was identified with more than minor significance.

Housekeeping

NRC inspectors identified a potential adverse trend in housekeeping throughout the plant. A search of PPL’s CAP identified a high number of CRs associated with housekeeping.

	Site	Maintenance
1Q10	26	14
2Q10	63	25
3Q10	68	41
4Q10	32	27
1Q11	22	16
2Q11	62	47
3Q11	99	69
4Q11	42	35

Inspectors noted that housekeeping was identified as a potential/emerging trend in PPL's 3Q10 station trend report and CR 1340313, a Level 3 EVAL, was generated. This CR did not identify any new corrective actions, but determined that a currently scheduled action to perform challenge boards to evaluate Maintenance First Line Supervisor fundamentals would adequately address the trend. Despite this corrective action being implemented in June 2010, no significant progress was made. Inspectors also noted that CR 1381909, a Level 3 EVAL, was generated in April 2011 to address the apparent rise in the number of externally-identified housekeeping deficiencies. This was discussed as a potential/emerging trend in the second quarter station trend report and an adverse trend in the third quarter. Despite corrective actions for this EVAL being complete in June 2011, the number of CRs generated in 3rd quarter was the highest in the past two years.

In addition to a higher rate of occurrence, the 3rd quarter 2011 inspection report also included a Green finding for a loss of a fuel pool cooling pump, of which housekeeping was a major contributor. This finding was documented in IR 05000388/2011004 (ML113120409).

Rod Worth Minimizer (RWM) Issues

The inspectors identified what appeared to be a potential adverse trend in RWM inoperability. The following chart shows the number of times the RWM has gone inoperable per quarter, requiring operator action to re-initialize and restore the system:

Quarter	Number of Occurrences	
	Unit 1	Unit 2
3Q10	3	0
4Q10	3	1
1Q11	4	0
2Q11	2	0
3Q11	6	2
4Q11	4	5

Though many of the events occurred while power was high enough that the RWM was not required to be operable, the number of occurrences indicate an emerging adverse equipment performance trend which may impact future plant startups.

Use of Observation Way

Starting in August 2011, PPL implemented a new observation program meant to increase the amount and improve the quality of field observations performed by supervisors. This included rolling out core fundamentals applicable to each department and then observing and coaching station performance based on these fundamentals. Though the program has had less than six months of runtime, it is evident that the number of observations has risen significantly as a result of its implementation. The average number of observations per month since 2009 is:

	Average Observations per Month
2009	235
2010	1089
Jan-Jul 2011	1154
Aug-Oct 2011	1796

Note: Data prior to August 2011 was collected using the previous observation program.

Trend Analysis

The inspectors reviewed the station quarterly trending reports and station PIs for the second and third quarters of 2011 and made the following observations:

- PI SL51, "CAQ Correct Condition (CC) and Prevent Recurrence (PR) Backlog," has continued to increase since June 2009, with a sharp increase in the trend since June 2011. The CC/PR backlog was at an all-time high of 1038 items in October, 2011. CR 1459852, a Level 3 EVAL, was generated on September 1, 2011 and identified that SL51 was red and on an adverse trend. The evaluation was complete on September 15, 2011 and confirmed the adverse trend and prescribed actions, or referred to actions being taken by other CAP products, to address the trend. However, this was not identified as a potential, adverse or monitored trend in the second or third quarter station trend report. Additionally, trend CR 1467220 was generated documenting that pillar 2 of the GWE metrics, which includes SL51, has not received a rating of greater than White since April 2009. This was listed as a potential/emerging trend in the third quarter station trend report.
- Despite receiving additional violations assigned cross-cutting aspects in Human Performance, Human Error Prevention Techniques (H.4(a)) and Resources (H.2(c)), both were listed as resolved trends in the second quarter station trend report. Both had a note stating although the CR may be closed, "the actual trend is not resolved."

As discussed in the previous semi-annual review of trends documented in IR 05000387;388/2011003 (ML112220409), there were a significant number of trends that were either listed as resolved around the same time that similar issues manifested themselves in regulatory findings or that have continued to exist beyond their characterization as being resolved. The inspectors determined that this observation remained valid for the second and third quarter station trend reports.

.3 Annual Sample: Interim Corrective Actions for Condenser Bay Flooding and Progress in CAP Evaluations

a. Inspection Scope

Interim Corrective Actions for Condenser Bay Flooding: The inspectors performed an in-depth review of PPL's review, analysis, and corrective actions associated with Unit 1 condenser bay flooding on July 16, 2010. PPL completed a root cause evaluation for the flooding event documented under CR 1282128. The inspectors reviewed an additional root cause evaluation for the flooding event and associated regulatory actions documented under CR 1318800. The inspectors assessed PPL's problem identification threshold, cause analyses, extent of condition reviews, compensatory actions, and the prioritization and timeliness of corrective actions to determine whether PPL was appropriately identifying, characterizing, and correcting problems associated with this issue and whether the planned or completed corrective actions were appropriate. The inspectors compared the actions taken to the requirements of PPL's corrective action program and 10 CFR Part 50, Appendix B. In addition, the inspectors interviewed engineering personnel to assess the effectiveness of the implemented corrective actions.

Progress in CAP Evaluations: The inspectors reviewed a sample of PPL's RCAs, ACEs, and common cause evaluations completed in 2011. The inspectors also reviewed selected effectiveness reviews, QA reviews, and program audits. The inspectors focused on CAP products related to:

- The Human Performance – Resources - Procedural Quality Cross-Cutting Theme (H.2(c)) identified in the 2011 Mid-Cycle Assessment letter.
- The Human Performance-Work Practices - Human Performance Error Prevention Techniques Cross-Cutting Theme (H.4(a)) identified by PPL following the 4th finding in this area in IR 50-387&388/2011004 issued November 8, 2011. (ML 113120409)
- An emerging trend related to a number of operator licensing medical issues including EA-11-244, an SLIV NOV issued on November 8, 2011 in IR 50-387&388/2011004.

b. Findings and observations

No findings were identified.

Interim Corrective Actions for Condenser Bay Flooding

Three of the inspector's observations that were presented to PPL at a debriefing on December 2, 2011, provide some insight into the PPL corrective action process regarding complete and thorough reviews and are documented below.

- Plant operator logs for the condenser bay flooding event did not include entries for MSIV closure, the reactor pressure vessel level 8 trip, or the manual start of HPCI and RCIC. This is not in accordance with the requirements of procedure OP-AD-002, "Standards for Shift Operations."
- Locking devices were installed on the condenser manway cover bolts as a corrective action for a manway leak in 2008. Inspectors questioned the use of the engineering change process in evaluating the change to install the locking devices. PPL determined that an engineering change was processed for the

manway cover bolt locking devices on Unit 1, but not on Unit 2. PPL determined that the locking device installation on Unit 2 was not in accordance with PPL's engineering change procedures.

- Demineralizer sight glass failure can result in pressure boundary leakage and flooding. The vendor instructions for the sight glasses state that the sight glasses are not to be reused because the installation process stresses the glass, and reuse increases the chances of failure. Based on the inspector's questions, PPL determined that at least two of the demineralizer sight glasses in service have been reused, contrary to vendor guidance and PPL procedures.

The above issues were screened using IMC 0612 Appendix B, "Issue Screening," and IMC 0612 Appendix E, "Minor Violations." Inspectors determined that these issues were minor violations of NRC requirements. PPL has captured each of these issued in their corrective action process and is evaluating appropriate corrective actions.

Progress in Corrective Action Program Evaluations

Human Performance – Resources - Procedural Quality Cross Cutting Theme (H.2(c))

In the 2011 Mid-Cycle Assessment letter, the NRC gave credit to PPL for identifying this emerging theme. PPL conducted an RCA as part of their pre-IP 95002 efforts to identify any causes common to the events leading to the White Finding related to the July 2010 Flooding Event and White PI from the first quarter of 2011 due to four unplanned scrams from April, 2010 until January, 2011 on Unit 1. This RCA (CR 1389530) identified root causes of procedure quality and procedure use and adherence as a common factor for these safety significant events. This RCA was originally scheduled for completion in May, 2011 (later deferred until July, 2011 as discussed in the NRC Mid-Cycle Assessment); however, the RCA was revised and final CARB approval was not until November 23, 2011. Thus, the corresponding corrective action implementation has been delayed until early 2012. One of the primary corrective actions, to develop a review plan for all PPL procedures, is not due until February 2012 and the reviews themselves are scheduled to be completed by 2016.

The inspectors identified that the RCA (CR 1389530) only considered plant events from January 25, 2008-January 25, 2011. Three of the four H.2(c) findings to be considered for the 2011 assessment period were not included in the scope of this RCA and no followup evaluation was conducted to "bridge the gap" for the 11 month time frame from the end of the RCA scope to the time of the inspection. While several CRs were written, identifying the cross-cutting theme and recommending further evaluations, these CRs were closed to CR1389530 without any further evaluations. While the basis for those decisions are documented and understandable, the inspectors considered that the corrective actions from the RCA may not address the cause of these recent findings or adequately address the theme. Specifically, two of the three H.2(c) findings in 2011 had to do with surveillance implementing procedures not capturing the requirements of the underlying TS. Addressing this type of procedure quality issue could require different actions and different resources than those created in the RCA. The inspectors' observations were captured by PPL and entered into their CAP as CR 1511805.

Human Performance - Work Practices - Human Performance Error Prevention Techniques Cross-Cutting Theme (H.4(a))

PPL identified that they had received a fourth finding with a cross-cutting aspect of H.4(a) following the following issuance of IR 50-387&388/2011004, issued November 8, 2011(ML 113120409). PPL entered this observation into their CAP as CR 1479689 and conducted an RCA in November 2011 which was approved by CARB in December 2011. The inspectors reviewed CR 1479689 and CR 1412321, a common-cause analysis done when the first three H.4(a) findings were identified in a security baseline report issued in the 2nd quarter of 2011. PPL identified that this theme has been a recurring issue at the station and that corrective actions were effective in the short term but lost effectiveness when management focus was taken off this area. Corrective actions were approved and are scheduled to be implemented starting in February 2012.

Operator Licensing Medical Issues

The inspectors reviewed a number of CRs and evaluations related to issues resulting in potentially inaccurate operator licensing documents being submitted to the NRC related to medical and requalification training issues. These issues included EA-11-244, a SLIV NOV issued with IR 50-387&388/2011004, and a licensee-identified SLIV NCV discussed in Sections 1R11 and 4OA7 of this report. PPL conducted an ACE for EA-11-244 (CR 1450138) which was approved by CARB in December 2011. Some of the corrective actions developed from this ACE were effective in identifying additional issues with NRC Form 396 submittals (CR 1486950). The inspectors noted that the issues with operator requalification training submittals appeared somewhat similar in nature to the licensed operator medical issues in that PPL did not identify that required reports needed to be made to the NRC. PPL stated they concurred with the inspectors' observations and were already planning to conduct an additional common cause analysis or ACE to address this issue under CR 1516764.

The inspectors noted that CR 1486950, which identified an issue which could potentially call into question the accuracy of an NRC Form 396 that was to be submitted to the NRC the following month, was closed out without an evaluation. However, NRC operations inspectors reviewed this issue and determined the issue did not result in the NRC Form 396 being inaccurate. Therefore, no violation of NRC requirements occurred.

.4 Annual Sample: Review of 10 CFR 50.65(a)(4) Online Risk Assessment Root Cause Analysis

a. Inspection Scope

The inspectors assessed the adequacy of and associated corrective actions from the RCA for equipment out of service (EOOS) risk deficiencies, completed on March 18, 2011, as the result of CR 1347508, "Plant Risk Improperly Modeled for Several Hours," initiated on January 26, 2011. The inspectors also reviewed the planning, scheduling and implementation process relating to online maintenance risk assessments conducted under 10 CRF 50.65(a)(4). Specifically the inspectors reviewed:

- The detailed RCA report and the adequacy and status of associated corrective actions.

- Online maintenance planning, scheduling and risk assessment processes, as described in: NDAP-QA-1901, "Susquehanna Station Work Management Process," NDAP-QA-1902, "Maintenance Rule Risk Assessment and Management Program," and PSP-26, "Online and Shutdown Risk Assessment Program."
- The implementation of the online maintenance and risk management process during the week of December 11, 2011. This included risk management actions during a period on December 16, when surveillance testing on a spray pond valve resulted in both units being at an elevated Yellow risk condition, which indicated a core damage frequency greater than 4 times, but less than 20 times, the baseline core damage frequency.
- The T-6 planning and scheduling of work for the week starting January 22, 2012.

The inspectors also attended work planning and scheduling meetings and conducted interviews with: the work week manager charged with coordinating the RCA corrective actions; an on-watch shift manager and shift technical advisor; and several other work week managers.

b. Findings & Observations

No findings were identified.

The RCA team developed a thorough report and appropriate corrective action assignments. The immediate corrective actions appeared to heighten the awareness of station personnel to the proper conduct of online risk assessment, based on the observed online risk management during the week of December 11, 2011 and the planning of work for the week of January 22, 2012. However, numerous longer term RCA corrective actions remained uncompleted, with due dates extended several times. In discussion with PPL management, these extensions were, in part, due to resource constraints because of the dual-unit outage in 2011 and other station recovery priorities, including development and implementation of an integrated station risk policy. Inspectors also noted the continuing development by PPL's Plant Analysis group of a method to efficiently enhance work management and operations personnel understanding of the modeled system equipment functionality assumptions and other risk insights from the probabilistic risk analysis models.

.5 Annual Sample: Review of Station Blackout Procedure Changes

a. Inspection Scope

On August 19, 2010, PPL identified that emergency Procedure EO-000-031, "Station Power Restoration," Revision 17, was inadequate for restoration of emergency 4kV busses from a station blackout. Procedural steps to energize the busses once offsite power was available did not reset a breaker anti-pumping relay, which would have resulted in the circuit breakers not closing. This issue was discussed in IR 05000387;388/2010004, issued November 12, 2010.

The inspectors reviewed the condition reports and procedure revisions listed in the attachment to determine what actions PPL took to correct the problem, and what procedure revisions were implemented. The inspectors discussed differences between

Unit 1 and Unit 2 procedures with a senior reactor operator to gain an understanding of the reasons for the differences.

b. Findings & Observations

No findings were identified.

This issue was first identified by PPL during a simulator training scenario. The condition was documented in a condition report, and a revision to the procedure was promptly issued. The condition report was closed on the basis of the issuance of the revised procedure prior to screening being performed. Hence, an appropriate extent of condition review was not conducted.

However, subsequent simulator training scenarios identified additional problems related to RHR pump breakers, ESW pump breakers, and RHRSW pump breakers. These problems were documented, evaluated, compared to system logic diagrams and elementary wiring drawings to determine the design intent. Procedure changes were subsequently developed and issued to enable operators to complete the required actions in the plant to restore AC power after a station blackout.

4OA3 Event Followup (71153 – 4 samples)

.1 (Closed) Licensee Event Report (LER) 05000388/2011-003: Scram due to Main Turbine Trip during ICS Surveillance Testing

a. Inspection Scope

On August 19, 2011, Unit 2 automatically scrammed from 100 percent power due to a main turbine trip. The main turbine trip occurred during performance of the quarterly functional surveillance test of the reactor water high level trip channels. The surveillance test was being performed for the first time since an upgrade of the feedwater level control system to a digital ICS. The main turbine and feedwater trip systems design uses three, narrow-range level channels in a two-out-of-three trip logic. During field troubleshooting, PPL determined that one of the trip channels was terminated improperly such that when the first narrow range channel was tested, an unexpected automatic main turbine trip and resulting RPS actuation occurred. Emergency Notification System (ENS) Notification (EN 47172) was made in accordance with 10 CFR 50.72(b)(2)(iv) for an event or condition that resulted in the actuation of the Reactor Protection System (RPS) while critical and 10 CFR 50.72(b)(3)(iv)(A) due to valid actuation of RPS. The inspectors evaluated plant response to the automatic turbine trip and reactor scram and documented their response in Inspection Report (IR) 05000387;388/2011004. The inspectors reviewed this LER and the corrective actions associated with this event. One self-revealing finding was identified and is documented below. This LER is closed.

b. Findings

Introduction. A self-revealing finding of very low safety significance (Green) was identified when PPL personnel did not have adequate procedures to perform post-modification testing on the digital ICS. Specifically, scheme checks were not performed in accordance with MFP-QA-3904, “Control Scheme Testing,” Revision 3 and functional testing was not performed in accordance with MFP-QA-2310, “Developing Test Criteria,”

Revision 3. The combination of the two procedure inadequacies failed to identify an improper termination in the high reactor water level main turbine trip circuit which reduced the channel trip circuitry from a two-out-of-three logic to allowing a main turbine trip from a single channel. As a result, on August 19, 2011, during the first implementation of quarterly surveillance testing for the trip function following ICS implementation, a main turbine trip and automatic reactor scram occurred.

Description. On August 19, 2011, Unit 2 automatically scrammed from 100 percent power due to a main turbine trip. The main turbine trip occurred during performance of SI-245-201, "Quarterly Functional Performance Test of Feedwater System/Main Turbine Trip System Reactor Vessel Water Level Channels PDT-C32-2N004A, B, C," Revision 15. This surveillance test was being performed for the first time since the Unit 2 upgrade of the feedwater level control system to a digital ICS. The main turbine and feedwater trip systems design uses three, narrow-range level channels in a two-out-of-three trip logic. The surveillance only tests one reactor vessel level channel at a time, so a main turbine trip is not an expected response. However, when the first narrow range reactor water level channel, '2A', was tested, a main turbine trip and automatic reactor scram occurred.

Field troubleshooting by PPL determined that a wiring error in the ICS reactor water level 8 (L8) main turbine trip logic circuitry had reduced the channel trip logic from a two-out-of-three logic to a one-out-of-three trip logic for the '2A' channel. Thus, when the '2A' channel was tested, a main turbine trip occurred. The event was entered into the CAP as CR 1453671 and a RCA was performed.

PPL's RCA determined the direct cause of the main turbine trip to be the improperly terminated connection in the ICS feedwater control panel. This termination was installed in March 2009 as part of the ICS upgrade, however, the installation was not complete, to include post-modification testing, until May 2011. Despite review of documents and interviews with personnel performing the initial field installation, PPL was unable to positively determine that the improper termination was made during the 2009 initial field installation. Since the team was unable to identify when, by what work group, or by what work mechanism the incorrect termination was made, the RCA was unable to identify a root cause associated with the installation and instead focused its attention on the post-modification testing.

Post-modification testing for this function included a scheme check performed to verify correct wiring terminations and functional testing prior to unit startup. Scheme checks were performed by PCWO 1273546. MFP-QA-3904, step 6.2.4 requires the work group to "perform a systematic, thorough, contact-by-contact, conductor-by-conductor, continuity check of the modified scheme, as shown on the designated drawings or attached lists." However, when the work package was developed for PCWO 1273546, it included an end-to-end continuity check with a visual check of all intermediate terminations and jumpers. These visual checks were not listed specifically in the work package and the work package preparer assumed that verbal instruction would be provided to the workers to perform the visual checks using the applicable drawings. NDAP-QA-0502, "Work Order (WO) Process," Revision 23, step 6.9.4 states that "work shall be performed in accordance with the work package, all work instructions, and referenced procedures." Since the list of terminations that were required to be visually verified was not included in the work package, the visual check was not performed and the improper termination of the jumper that caused the event was not discovered.

For functional testing of a trip system, “positive” and “negative” testing strategies can be employed. “Positive” testing ensures a protective action will occur when the logic is satisfied. In this case, two of the three channels being tripped should result in a main turbine trip and satisfies the requirements of TS 3.3.2.2, “Feedwater- Main Turbine High Water Level Trip Instrumentation.” Conversely, “negative” testing ensures that a protective action will not occur if the logic is not satisfied, ensuring an initiating event will not occur when not required. In this case, negative testing would have identified the wiring anomaly.

Regarding functional testing of the reactor high water level main turbine trip function, the RCA addressed two key test procedures: TP-245-036, “Unit 2 ICS Test Plan (EC 864462),” Revision 1 and TP-245-028, “SAT- ICS Initial Operation of FWLC, Reactor Recirculation Speed Control, and RFPT Speed Control,” Revision 2. The first was an overall test plan for ICS that was required as a corrective action from an RCA performed on two scrams that occurred during post-modification testing of the ICS modification on Unit 1. These events were documented in IR 05000387;388/2010003 and is currently being evaluated by URI 05000387/2010003-05. The intent of the corrective action was to specify a detailed test plan for the complex engineering change to prevent recurrence of similar events during the subsequent installation on Unit 2. The second, TP-245-028, specifically tested the reactor water high level trip channels for the main and RFPTs.

MFP-QA-2310, “Engineering Change Testing,” Revision 3, Section 6.5 states that a test plan should include identification of “key functions and requirements, acceptance criteria, and test philosophy and methodology.” PPL’s RCA determined that more broadly, MFP-QA-2310 requires proper functional testing of negative logic to show that one contact tripped in the two-out-of-three logic does not result in a trip of the system. This testing is done to prevent the possibility that conductive paths are present around channel contacts. TP-245-036 and TP-245-028 did not address “negative” testing. In this case, the test plan, TP-245-036, and test procedure, TP-245-028, considered TS requirements but did not utilize risk-informed decision-making during the preparation of these documents to ensure other undesirable consequences were tested.

As a result of inadequate scheme checks and inadequate functional testing, the wiring anomaly was not identified prior to performance of SI-245-201 and resulted in a main turbine trip during surveillance testing and consequently an automatic reactor scram.

Analysis. The inspectors determined that having inadequate procedures to perform post-modification testing on the digital ICS was a performance deficiency within PPL’s ability to foresee and prevent. The inspectors screened the performance deficiency in accordance with IMC 0612, Appendix B, “Issue Screening.” The performance deficiency was determined to be more than minor because the finding was associated with the Initiating Events cornerstone attribute of Equipment Performance, and affected the cornerstone objective of limiting the likelihood of those events that upset plant stability and challenge critical safety functions during power operation. Specifically, inadequate scheme checks failed to identify an improperly terminated jumper and inadequate functional testing failed to ensure that a single input would not result in the protective action. The wiring error ultimately led to a main turbine trip and automatic reactor scram during surveillance testing. The inspectors evaluated the finding using IMC 0609, Attachment 4, “Initial Screening and Characterization of Findings,” and determined the finding did not contribute to both the likelihood of a reactor trip and the likelihood that

mitigation equipment or functions would not be available. Consequently, the finding is of very low safety significance (Green).

This finding is related to the CCA of Human Performance – Resources because PPL did not ensure that personnel, equipment, procedures, and other resources were available and adequate to assure nuclear safety. Specifically, PPL did not ensure that adequate maintenance and test procedures were available to perform post-modification testing on the digital ICS. (H.2(c)).

Enforcement. MFP-QA-3904, "Control Scheme Testing," Revision 3, step 6.2.4 requires work groups to "perform a systematic, thorough, contact-by-contact, conductor-by-conductor, continuity check of the modified scheme, as shown on the designated drawings or attached lists." Contrary to the above, a plant component work order was inadequate to ensure the ICS wiring had been installed properly. Additionally, MFP-QA-2310, "Developing Test Criteria," Revision 3, section 6.5 states that a test plan shall identify "key functions and requirements, acceptance criteria, and test philosophy and methodology." Contrary to the above test procedures, TP-245-036 and TP-245-028 did not address "negative" testing and were inadequate to identify the wiring anomaly that bypassed one of the three inputs to the trip logic circuit. As a result, Unit 2 automatically scrammed from 100 percent power due to a main turbine trip on August 19, 2011. These issues are identified in PPL's CAP in CR 1453671. This finding does not involve enforcement action because no regulatory requirement was identified. **(FIN 05000388/2011005-03, Inadequate Post-Modification Testing Results in Main Turbine Trip and Automatic Scram)**

.2 (Closed) License Event Report (LER) 05000388/2011-001-00: Multiple Test Failures of Main Steam Safety Relief Valves (SRVs)

During the Susquehanna Unit 2 15th Refueling and Inspection Outage, three main steam SRVs failed to meet the setpoint criteria of +/-3 percent set forth in TS 3.4.3. All three SRVs actuated at a setpoint less than the -3 percent criteria. The cause of the lower actuation was attributed to setpoint drift and seat leakage. The event was determined to be a condition prohibited by TSs and reportable under 10 CFR 50.73(a)(2)(i)(B). Additionally, it was determined to be a common cause inoperability of independent trains or channels and reportable under 10 CFR 50.73(a)(2)(vii). The SRVs remained functional and would have relieved pressure. There were no actual adverse consequences as a result of this event.

The inspectors reviewed this LER and the evaluations of this issue including all associated corrective actions. This LER is closed.

b. Findings

A violation of 10 CFR 50 Appendix B, Criterion XVI, "Corrective Actions," was identified for PPL's untimely submittal of a license amendment request that inhibited a change to the plant's SRV TS acceptance criteria to +3%/-5% prior to this violation. However, because the license amendment was subsequently approved by the NRC, and since the three SRV failures were between -3% and -5%, thus meeting the current license acceptance criteria, the violation was determined to be of minor safety significance.

This failure to comply with 10 CFR 50 Appendix B, Criterion XVI constitutes a violation of minor significance that is not subject to enforcement action in accordance with the NRC's Enforcement Policy.

.3 (Closed) LER 05000388/2011-002-00: Condition Prohibited by TS Due to Unknown RCIC Inoperability

a. Inspection Scope

On June 29, 2011, Unit 2 RCIC tripped on overspeed during its quarterly flow surveillance. Subsequently, PPL determined the problem to be the RGSC and that RCIC had been inoperable since June 27 when the plant exceeded 150 psig and the RCIC LCO became applicable. As a consequence of this inoperability, conditions prohibited by TSs 3.0.4 and 3.5.3 occurred. PPL identified the apparent cause of the condition as unexpected, random failure of the RGSC since the RGSC contains no age sensitive components. The inspectors reviewed PPL's actions for this issue including the associated LER, ACE, preliminary RCA, vendor documents, OE, drawings, and computer point trends. The inspectors also interviewed various plant staff regarding the issue.

b. Findings

1. Introduction. An NRC-identified, Green NCV of 10 CFR 50, Appendix B, Criterion XI, "Test Control," occurred when the Unit 2 RCIC RGSC failed during maintenance but went unrecognized until RCIC tripped on overspeed during its normal operating pressure surveillance. Consequently, on June 26, 2011, PPL commenced a reactor startup and transitioned to plant conditions under which RCIC was required to be, but was not, operable.

Description. During the spring 2011 refuel outage (RFO), maintenance was performed on Unit 2 RCIC. As part of the maintenance, PPL performed TP-250-004, "RCIC Turbine Overspeed Trip Testing with Auxiliary Steam," Revision 18, on May 9 and 10, to test the electronic and mechanical overspeed trip functions and setpoints of the RCIC turbine. On June 26, Unit 2 was placed in Mode 2 and a reactor startup was commenced. On June 27, surveillance SO-250-005, "24 Month RCIC Flow Verification," Revision 17, was performed with no issues identified. Following the surveillance, the system engineer noted an abnormal electronic governor-magnetic pickup (EG-M) output but assumed it was a computer point problem. Power ascension continued and Unit 2 moved to Mode 1 on June 28. On June 29, RCIC was initiated for SO-250-002, "Quarterly RCIC Flow Verification," Revision 40, and immediately tripped on overspeed. PPL declared RCIC inoperable and determined via troubleshooting that the RGSC was the failed component. After the RGSC was replaced, RCIC was re-tested via SO-250-002 on July 1 and declared operable on July 2. In response to the event, PPL initiated an ACE, an RCA, and RGSC post-mortem investigation. PPL subsequently recognized that the RCIC inoperability had resulted in conditions prohibited by TSs. First, HPCI was not immediately verified operable by administrative means per TS 3.5.3. Second, TS 3.0.4 was violated twice when the plant exceeded 150 psig with RCIC inoperable and a change from Mode 2 to Mode 1 was completed with RCIC inoperable.

The governor vendor completed a post-mortem analysis of the RGSC and determined it was always in the signal converter mode regardless of ramp position. Woodward stated

the probable cause of the failure was an internal short via “a voltage spike/overvoltage on the supply input.” The ACE, approved by the Corrective Action Review Board (CARB) on October 25, determined that the apparent cause was random failure of the RGSC. The RCA, although disapproved by CARB on December 16 for lack of Organizational and Programmatic causal analysis, was approved in all other content to include its root causes and causal factors. The first root cause was less than adequate procedure content, namely surveillance procedures. SO-250-005, as written, places the RCIC flow controller in manual, which bypasses the RGSC ramp function. The second root cause was the System Monitoring and Health Reporting Program failed to maintain equipment reliability. EWR 1190800 was created in February 2010 to create an alarm for the EG-M output as a result of industry OE received in September 2009. This EWR had been deferred three times, was not completed at the time of the RGSC failure, and did not include alarming the RGSC output as an extent of condition.

The inspectors reviewed the ACE, RCA, RGSC post-mortem results, and computer point traces and determined there were aspects of the ACE and RCA that were inadequate or not addressed.

- Computer points for EG-M and RGSC outputs, TRA067 and TRA068 respectively, revealed that the RGSC failed during TP-250-004. Normal outputs during standby conditions are approximately +22 and -5 VDC respectively. As part of the step-by-step prerequisites, TP-250-004, Attachment B, replaces a jumper and 200 ohm resistor on the EG-M with a test potentiometer, lifts and tapes leads on the RGSC ramp function, and installs an open-switched jumper in its place. Following the test, Attachment B restores the EG-M and RGSC to their normal field configuration in the same order. On May 9 around 10:50 pm, as TP-250-004 prerequisites were being completed, TRA067 exhibited a number of spikes. A PPL instrument and control (I&C) instructor explained to the inspectors that the de-termination and installation of components on the EG-M while energized would result in output spiking. Four minutes following the EG-M output spikes, the RGSC output changed from -5 to +63 VDC. RCIC overspeed testing via TP-250-004 was then performed with the flow controller in manual. After the testing, another set of EG-M output spikes are observed followed 6 minutes later by the RGSC going from a new low value of –12 to +63 VDC where it remained. The inspectors noted the relative timing of the spikes and changes in RGSC output were consistent with the procedural sequence in Attachment B for manipulation of the EG-M and RGSC.
- The 1990 General Electric (GE) Service Information Letter (SIL) 351, “HPCI and RCIC Turbine Control System Calibration,” Revision 2, Attachment 2, Procedure III, and EPRI Technical Report 1007460, “Terry Turbine Maintenance Guide, RCIC Application,” Section 22.2.2, Procedure III, both contain direction to “remove the power supply from the EG-M control box terminals” and “connect a normally open switch across terminals 3 and 4 on the RGSC module. There is no necessity or desire to disturb the existing wiring.” The inspectors noted that compliance with these documents during TP-250-004 would have de-energized both the EG-M and RGSC, since the EG-M powers the RGSC at Susquehanna, and would have eliminated the potential effects of accidental contact with termination points during field manipulations.
- The inspectors identified a missed opportunity to recognize the RGSC failure as part of the PMT process. NDAP-QA-0482, “Post Maintenance Testing (PMT),” Revision 4, step 5.4 defines PMT as “any appropriate combination of inspections, checks, and testing performed following maintenance to verify that a particular piece of equipment

or system performs its intended function based on its design criteria, and verification that the original deficiency has been corrected and no new deficiencies created. Includes all of the following: Maintenance Test, Functional/Operability Test." NDAP-QA-0027, "Station Component Verification Requirements," Revision 11, Attachment E, Step 3.2 "Re-landing leads" states that after verifying the correct leads are relanded and terminals are secured, "if practical, perform a system test verification (STV) to verify the lead has been correctly landed." NDAP-QA-0027, step 7.4, says an STV is "accomplished by a functional test which demonstrates that the subject component is in its proper state." PSP-29, "Post Maintenance Test Matrix," Revision 10, Section 4.2 "General I&C Run/Operational Tests" directs performing an operational check by energizing the loop and checking the indicated output value against a known input obtained from redundant channels or operational knowledge. Under Section 4.3 "General Instrument and Controls Functional Test," step 4.3.7 directs "Check the output value against a known output obtained from operating knowledge. Verify that the reading is reasonable." The inspectors determined that an STV of the RGSC computer point was practical based on its availability and ease of accessibility, and if completed would have revealed the RGSC failure as a new deficiency created by the maintenance.

- PPL's request for the vendor's post-mortem investigation was to determine which sub-component had failed. The report identified the U1 op-amp output as always high indicating an internal short. The inspectors questioned PPL on other sub-components that could have yielded the same result for the op-amp output. PPL then requested the vendor conduct additional testing of other sub-components. All other components were proven operational.

Overall, the inspectors determined that the RGSC failure was within PPL's ability to foresee and correct given the existing industry and vendor OE, altering the RGSC and EG-M configurations were opportunities for newly created deficiencies, and the system engineer's recognition and dismissal of an abnormal EG-M output. The inspectors concluded that the timing of the RGSC failure during the manipulation of the RGSC and EG-M combined with the probable cause of voltage spiking and the decision not to incorporate industry guidance on de-energized testing indicated that the RGSC failure was maintenance-induced. Since the inspectors disagreed with PPL's conclusion that the RGSC failure was random, PPL consulted with EPRI who also concluded that the failure was not random. In response, PPL plans to revise their ACE and re-evaluate their RCA. This result combined with inspector's identification of a missed PMT opportunity, and the absence of ramp generator testing at 150 psig reactor pressure, added significant value to the evaluation of the issue. Therefore, the inspectors considered this issue NRC-identified. PPL entered this issue into their CAP as CR 1430270, 1450534, and 1516769.

The inspectors noted a number of OE items that were pertinent but not implemented prior to this issue. These were key factors in determining the issue's cross-cutting aspect in OE implementation.

- Industry OE, evaluated under EWR 1190800, had not been implemented. A contributing cause of the industry OE example was an engineer's failure to enter the unexpected change in RCIC EG-M output into the CAP. In PPL's case, an engineer also noted an abnormal EG-M computer point but did not enter it into CAP.

- A 2008 CR (1014031) that acknowledges age-related industry failures with EG-Ms and RGSCs. PPL's RCA also identified seven other relevant internal and external OEs between 1999 and 2009 that were not incorporated.
- The 1989 GE SIL 336, "Surveillance Testing Recommendations for HPCI and RCIC Systems," Revision 1, that recommended EG-M and RGSC output data be collected during system testing for use in monitoring performance. PPL had evaluated and recommended this monitoring but it had not been implemented. The 2006 EPRI Terry Turbine Maintenance Guide 1007460, Section 3.2.1, also recommended EG-M and RGSC standby and steady-state output be monitored for operational readiness.
- The 1990 GE SIL 351 guidance formerly mentioned had not been implemented.

Analysis. The failure to conduct PMT that demonstrates RCIC would perform satisfactorily in service via test procedures was a performance deficiency that was reasonable for PPL to foresee and correct. The finding was more than minor since it affected the equipment performance attribute of the Mitigating Systems cornerstone and its objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, reliable operation and the capability of RCIC in automatic was affected by a failure of its RGSC during the refueling outage. The inspectors evaluated the finding in accordance with IMC 0609 Attachment 4, "Phase I – Initial Screening and Characterization of Findings," and determined it to be Green, since it was not a design or qualification deficiency, was not a loss of system safety function, and was not risk significant due to an external initiating event.

This finding had a cross-cutting aspect in the area of PI&R - OE, in that licensees are to implement and institutionalize OE through changes to station processes, procedures, maintenance and testing of equipment, and training programs. Specifically, PPL did not implement and institutionalize various OE pertinent to RCIC in maintenance, PMTs, and system monitoring (P.2(b)).

Enforcement. 10 CFR 50, Appendix B, Criterion XI, "Test Control," states, in part, that "a test program shall be established to assure that all testing required to demonstrate that SSCs will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents." Contrary to this, testing during both the refueling outage and prior to exceeding 165 psig reactor pressure were inadequate in demonstrating that RCIC would perform satisfactorily in service. Consequently, on June 26, 2011, PPL commenced a reactor startup and transitioned to plant conditions under which RCIC was required to be, but was not, operable. This resulted in violation of TSs 3.0.4 and 3.5.3. Since this issue was entered into PPL's CAP as CRs 1430270, 1450534 and 1516769, this issue is being treated as an NCV in accordance with the NRC's Enforcement Policy. **(05000388/2011005-04, Inadequate RCIC PMT)**

2. Introduction. During review of LER 05000388/2011-002-00, "Condition Prohibited by TS due to Unknown RCIC Inoperability," the inspectors questioned whether PPL's implementation of TS SR 3.5.3.4 was appropriate. Specifically, the implementing procedure SO-250-005, "24 Month RCIC Flow Verification," Revision 17, as currently written and performed, did not initiate RCIC with its flow controller in automatic nor verify that it reaches rated flow within 30 seconds. SR 3.5.3.4 is completed on a two-year frequency prior to reactor pressure exceeding 165 psig, normally during power ascension from each refueling outage.

Discussion. During review of LER 05000388/2011-002-00, "Condition Prohibited by TS due to Unknown RCIC Inoperability," the inspectors questioned whether PPL's implementation of TS SR 3.5.3.4 was appropriate. Specifically, the implementing procedure SO-250-005, as written, places the flow controller in manual prior to RCIC initiation. Once initiated, the operator raises flow manually to nominal flow and returns the flow controller to automatic. The inspectors recognized that first, this action bypasses the RGSC ramping function, and second, the procedure does not establish rated flow in 30 seconds as an acceptance criterion.

10 CFR 50.36(b) states "The TSs will be derived from the analyses and evaluation included in the safety analysis report." 10 CFR 50.36(c) requires that TSs will include SRs. 10 CFR 50.36(c)(3) states "SRs are requirements related to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained."

TS 3.5.3, "RCIC system," states, that RCIC shall be operable in Mode 1 and Modes 2 and 3 with reactor steam dome pressure greater than 150 psig. TS 3.0.4b, which permits a risk assessment as part of entry into a mode when a limiting condition for operation (LCO) is applicable and not met, is not applicable to RCIC. SR 3.5.3.4 states "Verify, with reactor pressure less than or equal to 165 psig, the RCIC pump can develop a flow rate greater than or equal to 600 gpm against a system head corresponding to reactor pressure."

The Susquehanna FSAR Section 14.2.1.2 describes the Startup Test Program and describes the tests' intent to "confirm the design bases and demonstrate…that the plant will operate in accordance with design and is capable of responding as designed to anticipated transients and postulated accidents." FSAR Section 14.2.12 describes the RCIC startup test, ST-14. The test included reactor injection tests in automatic at 150 psig reactor pressure and both manual and automatic at rated reactor pressure. It also included condensate storage tank (CST) injection tests in both manual and automatic at both ends of the operating pressure range. The Level 1 acceptance criteria for this test was RCIC flow greater or equal to the 100 percent rated value in 30 seconds or less from automatic initiation at any reactor pressure between 150 psig and rated. FSAR Section 14.3.7.8 describes the RCIC test, Test 14, for a power uprate to 3441 MWth with the same Level 1 acceptance criteria and states that it "provided baseline data for future surveillance testing." FSAR Section 5.4.6 states that the RCIC "system is started automatically upon receipt of a low reactor water level signal." FSAR Section 7.4.1 states that RCIC is "initiated automatically…and produces the design flow rate in 30 seconds."

NDAP-QA-0482, PMT, Revision 4, Step 5.2.1 defines Operability tests as those that "ensure that the… SSCs affected by the maintenance…are capable of providing the safety functions specified in the Current Licensing Basis." Step 6.1.1 describes general test requirements. It states that "in order to ensure the integrity of the plant, it is necessary that testing be complete to the degree that the validity of the Initial Test Program…remains intact. The Initial Test Program is described in FSAR Chapter 14. …Testing must include all requirements of the current TSs, Technical Requirements, FSAR and the Plant License including all amendments."

The inspectors also reviewed GE SIL 336, "Surveillance Testing Recommendations for HPCI and RCIC Systems," Revision 1, which was developed after GE observed

inconsistencies and inadequacies in HPCI and RCIC surveillance testing. It states "An operability demonstration of the HPCI and RCIC systems should include not only steady state pump flow and pressure data, but also quick-start control capability and proper valve sequencing. The objective of surveillance testing should be to simulate closely the actual startup sequence of the system following an auto-initiation signal……The system flow controller is frequently placed in 'manual' and its output reduced to a minimum 'speed demand' signal. The speed signal is manually increased after system startup. This practice does not test the dynamic response of the control system…..the following quick-start is recommended for surveillance testing of the systems….. (2) Confirm that the system flow controller is in 'automatic' and set for design flow rate."

If should also be noted that HPCI TS 3.5.1 and SR 3.5.1.9 have identical language to the RCIC TS and SR, yet HPCI is required to be tested in automatic at 165 by the associated ST procedure, while RCIC is not.

Considering RCIC's design basis, testing, and acceptance criteria in the FSAR, the station's requirements to test to the Initial Test Program and other FSAR requirements, and vendor direction on how to implement the SRs, the resident inspectors asked PPL how the requirements of SR 3.5.3.4 for RCIC operability are met for both units with respect to use of automatic flow control and reaching rated flow in 30 seconds. PPL entered the question in their CAP as 1500363 and concluded that SO-250-005 as written satisfied the requirements of SR 3.5.3.4. They stated "Even though the RGSC ramp function is not tested and a quick start is not performed in SO-1(2)50-005, it does verify the pump can develop the required flow at 150 psig. It also verifies the RGSC low signal select and EGM controls are functioning properly."

This issue will be tracked as a URI pending further NRC review of the issue to include consultation with the Office of Nuclear Reactor Regulation (NRR). **(URI 05000387;388/2011005-05, RCIC Low Reactor Pressure SR**)

.4 Source Load of Instrument Calibrator

a. Inspection Scope

On December 5, 2011, PPL received a 1100 curie Cs-137 sealed source and conducted a source transfer into a Hopewell Designs (HD) BX-3 HP survey instrument calibrator. During the transfer, electronic dosimeters worn by the HD contractor and the effluents technician immediately alarmed indicating unexpected high dose rates, and the health physics technicians directed the shield plug to be reinserted. It was determined that effluents technician and HD contractor were exposed to peak does rates of 8 R/hr and 2 R/hr and doses of 6.4 mrem and 3.3 mrem as indicated on their electronic dosimeters, respectively.

On December 13, 2011, two region-based health physicist inspectors reviewed the source load event of December 5, 2011, interviewed licensee staff involved in the event, and reviewed procedures, shipping papers, radiation surveys, work orders, radiation work permits, and licensing documents associated with the event. In addition, the inspectors reviewed the level of security controls in effect while the source was located outside of the protected area.

b. Findings.

Introduction. The inspectors identified a number of issues regarding NRC requirements during a December 5, 2011 transfer of a Cs-137 sealed source into a Hopewell Designs (HD) BX-3 HP survey instrument calibrator at SSES. During the performance of this evolution, personnel may have been exposed to unplanned dose rates of greater than 20 R/hr due to design control and potential procedure related performance deficiencies by the vendor and station personnel. Further investigation, inspection, and dose modeling for the event were ongoing at the end of the inspection period. As a result, the NRC has opened an unresolved item (URI) related to this concern.

Description. On December 5, 2011, PPL received an 1100 curie Cs-137 sealed source and conducted a source transfer into a Hopewell Designs (HD) BX-3 HP survey instrument calibrator. During the initial attempt to lower the source from the transfer shield into the calibrator, the shield door (plug) in the bottom of the transfer shield could not be withdrawn the prescribed 2 inches in order to lower the source down into the calibrator. The HD contractor directed an effluents technician to use additional tooling in order to provide additional manual pressure to withdraw the shield plug. During this subsequent attempt, the shield plug was withdrawn about five inches (three inches further than prescribed) reducing the remaining lead shielding from the source, to about one and one-half inches. The electronic dosimeters worn by the HD contractor and the effluents technician immediately alarmed indicating unexpected high dose rates, and the health physics technicians directed the shield plug to be reinserted, which immediately occurred, returning the dose rates back to normal. It was determined that the exposure time was approximately three seconds.

The work group (consisting of the HD contractor, HP supervisor, two HP technicians and the effluents technician), stopped the work activity and reviewed the radiological exposure status of the workers. It was determined that the peak does rates were of 8 R/hr and 2 R/hr; doses of 6.4 mrem (whole body) and 3.3 mrem (whole body) indicated for the effluents technician's and HD contractor's electronic dosimeters, respectively. Maximum dose rates were calculated to be ~58R/hr on the surface of the shield plug where the effluent technician's hand was. The HD contractor recommended moving forward to attempt the same work activity in order to put the source into a safe configuration. The PPL HP supervisor concurred and the work group resumed the source load operation. This time the Cs-137 source was lowered into the BX-3 calibrator without further incident. Immediately after the source load operation was successfully completed, PPL management was informed and an investigation was initiated, convening a root cause analysis (RCA) team, to determine the cause and initiate appropriate corrective actions.

The NRC had a number of issues related to this event including adherence to radiological work practices in conducting the evolution and proceeding after the initial event, the adequacy of the radiological monitoring used, design control and vendor knowledge concerns related to the configuration of the source transfer assembly, and whether appropriate procedures were used and followed for the evolution. Follow-up inspections for the 10 CFR Part 36 and Part 50 licensees are being conducted by DNMS and DRS/DRP respectfully.

At the conclusion of this inspection period, PPL was still in the process of conducting an RCA of the source load event. Final NRC conclusions regarding performance

deficiencies and enforcement actions have not yet been determined pending a review of PPL's CAP investigation results. This issue will be tracked as an unresolved item (URI) pending further inspection and review of PPL's completed RCA investigation. **(URI 05000387; 388/2011005-06, Loss of Shield Control During Source Load)**

4OA5 Other Activities

. 1 EPU Regulatory Commitments and Surveillance Testing (71004 and 71111.22)

a. Inspection Scope

In accordance with IP 71004, the inspectors reviewed regulatory commitments for Units 1 and 2 associated with EPU. The inspectors reviewed Regulatory Commitments, License Conditions, and Recommended Areas for Inspection in the NRC EPU Safety Evaluations (SEs) for both Unit 1 and Unit 2. They verified that PPL had taken all required actions to address the effects of new or more probable initiating events as stated and confirmed that PPL had performed those actions required to be completed. The inspection was considered an inspection sample that meets the requirements of IP 71004, 02.03.g.

.2 EPU Closure and Summary (71004)

a. Inspection Scope

On January 30, 2008, the NRC approved PPL License Amendments Nos. 246 and 224 for a 13-percent EPU at each Susquehanna Unit and issued the associated SE (ADAMS package ML080020201). The inspectors have observed and reviewed selected activities throughout the phased EPU implementation on both units. The inspectors have determined, based on a sample review of these activities and comparison of records and tests with the current licensing documents, that PPL's commitments have been met regarding the Susquehanna Unit 1 and Unit 2 EPU and that PPL has fully implemented the EPUs within its approved implementation timelines.

As required by IP 71004, Power Uprate, all inspection sample requirements for the power uprate on Unit 1 and Unit 2 have been verified completed and recorded, consistent with the inspection plan. This entry provides a summary of all inspection samples associated with implementation of and as required by IP 71004.

Inspection Sample	Inspection Procedure (IP)	Inspection Report
MSIV Flow Isolation	71111.17, 71004	2008002
App R RHR	71111.17, 71004	2008002
RHR HX fouling	71111.18, 71004	2008002
EC/FAC	71004	2008002
Steam Dryer	71004, 55050	2008002
Hot Weather	71111.01	2008003
EHC	71111.19, 71004	2008003
CPTT	71111.19, 71004	2008003
Power Ascension	71111.20, 71004	2008003
Modes 4 and 5 tests	71111.20	2008003

Tests, Power Changes	71152	2008003
MELLLA	71004	2008003
MSL Vibrations	71004	2008003
MSIV closure at power	71111.22, 71004	2008003
FSAR vs EOP	71152	2008005
FSAR vs EOP	71152B	2008006
EHC	71111.13, 71004	2009003
LEFM	71111.15, 71004	2009003
CPTT	71111.19, 71004	2009003
Power Ascension	71111.20, 71004	2009003
Steam Dryer	71111.08, 71004	2009003
Steam Dryer	71004	2009003
EHC	71004	2009003
MSIV Flow Isolation	71111.17	2009006
EHC	71111.17	2009006
RFP Suct Press	71111.17	2009006
SLC	71111.17	2009006
UHS Valve	71111.17	2009006
RHR HX	71111.07, 71004	2010002
ICS	71111.19, 71004	2010003
RFPT Auto	71111.19, 71004	2010003
CPTT	71111.19, 71004	2010003
EHC	71111.19, 71004	2010003
Power Ascension	71111.20, 71004	2010003
Simulator NCV	71152	2010004
MSPI NCV	71151	2010005
Battery Charger	71111.21	2010007
HPCI	71111.21	2010007
RHRSW Pumps	71111.21	2010007
125 VDC Battery	71111.21	2010007
EDG MCC	71111.21	2010007
4kV bus	71111.21	2010007
E EDG	71111.21	2010007
RFPs	71111.19, 71004	2011003
Power Ascension	71111.20, 71004	2011003
Power Ascension	71111.20, 71004	2011004
RFPs	71111.19, 71004	2011004
Commitments and License Conditions	71111.22, 71004	2011005

b. Findings and Observations

No findings were identified.

.3 Operation of an ISFSI at Operating Plants (60855.1)

a. Inspection Scope

The inspectors verified by direct observation and independent evaluation that the licensee had performed loading activities at the Independent Spent Fuel Storage Installation (ISFSI) in a safe manner and in compliance with applicable procedures. The inspectors toured the ISFSI and reviewed radiological surveys performed during the past 12 months.

b. Findings

No findings were identified.

.4 (Closed) Unresolved Item (URI) 05000388/2011004-03, RCIC Failure During Surveillance

a. Inspection Scope

In IR 05000387; 388/2011004, the inspectors opened a URI concerning a trip of Unit 2 RCIC following refuel outage maintenance. To close this URI, the inspectors reviewed PPL's actions for this issue including the associated LER, ACE, preliminary RCA, vendor documents, OE, drawings, and computer point trends. The inspectors also interviewed various plant staff regarding the issue. This URI is closed.

b. Findings

A Green NCV was identified and is documented in section 4OA3.3 of this report.

4OA6 Meetings, Including Exit

On October 14, 2011, the inspectors conducted an exit meeting and presented the preliminary inspection results to Mr. F. A. Kearney, Site Vice President, and other members of the Susquehanna staff.

On October 21, 2011, the inspectors presented inspection results to Mr. R. Kearney, Site Vice President and other members of his staff. PPL acknowledged the findings.

On December 2, 2011, the inspectors presented inspection results to Mr. Jeffrey Helsel, Plant Manager and other members of his staff. Additional discussions were conducted by telephone during the week of December 12, 2011, with Mr. Tom Iliadis, General Manager- Nuclear Operations and other members of his staff.

On December 13, 2011, the inspectors presented inspection results to Mr. R. Kearney and other members of his staff. PPL acknowledged the findings.

On January 10, 2012, the inspectors presented inspection results to Mr. T. Rausch, Senior Vice President and Chief Nuclear Officer, and other members of your staff. PPL acknowledged the findings. The inspectors verified that no proprietary information was retained by the inspectors or documented in this report.

4OA7 Licensee-Identified Violations

The following violations of very low safety significance (Green) or severity level IV were identified by PPL and are violations of NRC requirements which meet the criteria of the NRC Enforcement Policy for being dispositioned as an NCV.

- On September 17, 2011, a worker in the Unit 1 recombiner room received a dose rate alarm of 683 mR/hr, but the room was not posted and controlled as HRA, contrary to Plant TS 5.7.1. This issue was of very low significance because it was not an ALARA issue, did not involve an actual or substantial potential for an overexposure, and the ability to assess the actual dose received was not compromised. This issue was documented in PPL's CAP as CR 1466609.

- On November 2, 2011, PPL identified that the full scope of a CREOASS system TS SR was not being met due to procedural deficiencies. Specifically, TS SR 3.3.7.1.5 requires a logic system functional test (LSFT) to be performed using procedures SE-159-200, SE-030-002A, and SE-030-002B. The CREOASS system is a two train system (each with 100 percent capacity), normally with one train in "Auto-Lead," and the second train in "Auto-Standby." The LSFT verifies that on an actual or simulated initiation signal, each CREOASS train starts and operates. However, between September 2004 and November 2011, the CREOASS system was only tested in the "Auto-Lead" position per PPL procedures. PPL entered TS SR 3.0.3, performed a risk assessment, and took corrective action to perform a review of all procedures to ensure all aspects of CREOASS testing are being fully met and updated SE-159-200, SE-030-002A, and SE-030-002B to include testing of the CREOASS system in "Auto-Standby." The issue was determined to be a violation of Susquehanna Unit 1 TS 5.4.1, "Procedures," which requires that written procedures be established, implemented and maintained as recommended in RG 1.33, Revision 2, Appendix A, February 1978. RG 1.33, Appendix A, requires implementing procedures for each SR listed in TS's. The finding is more than minor because it was determined to be similar to example 3.d of IMC 0612, Appendix E, in that the failure to implement the TS SR as required is not minor if the surveillance had not been conducted. Additionally, the finding affected the procedure quality attribute of not ensuring the control room barrier is maintained and the Barrier Integrity cornerstone and its objective to provide reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. The finding was evaluated for significance using IMC 0609, Attachment 4, "Phase 1 – Initial Screening and Characterization of Findings." Since the finding only represented a degradation of the radiological barrier function provided for the control room, the finding was determined to be of very low safety significance (Green). The issue was entered into PPL's CAP as CR 1487546 and 1488400.

- PPL identified that a reactor operator was removed from the requalification program for a period of six months and returned to licensed duties after three months of makeup training without obtaining NRC review. This issue was determined to be a violation of 10 CFR 55.59, "Requalification." Specifically, 10 CFR 55.59 (a) requires that a licensed operator successfully complete an NRC approved requalification program, and that this program be conducted for a continuous period not to exceed 24 months. If this is not done, 55.59 (b) requires the operator to complete additional training and to submit evidence of satisfactory completion of this training to the NRC prior to returning to licensed duties. Contrary to this, PPL did not submit the training

evidence to the NRC for review prior to returning the reactor operator to licensed duties. This issue is documented in PPL's CAP as CRs 1486268 and 1516764 and was determined to be of very low safety significance (SL IV) because it did not cause the NRC to reconsider a regulatory position or undertake a substantial further inquiry. Specifically, the operator's requalification makeup training and license reactivation process was evaluated as satisfactory during the NRC License Operator Requalification Team Inspection discussed in section 1R11.2 of this report. Therefore, the violation is being treated as an NCV in accordance with the NRC Enforcement Policy.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

D. Bockstanz, Senior Engineer
M. Boyle, Senior Reactor Operator (SRO)
P. Brady, Supervising Engineer
L. Casella, Sr. Principal Engineer
N. Coddington, Senior Engineer
S. Davis, EP Program Manager
J. Diltz, Operations Training Manager
C. Goff, Training Manager
J. Goodbread, Jr., Manager, Nuclear Operations
K. Griffith, Operations Training Supervisor
L. Fuller, Senior Engineer
J. Goodbred, Jr., Operations Manager
F. Habib, Senior Engineer
J. Hartzell, Plant Analysis
J. Helsel, Plant Manager
J. Hirt, Supervisor Reactor Engineer
C. Hoffman, Nuclear Fuels Manager
A. Iliatis, General Manager, Operations
W. Kahler, Nuclear Fuels Engineer
D. Kilchner, NRA
H. Koehler, System Engineer
J. Lubinski, I&C
C. Manges, Engineer, NRA
D. McGarry, Risk RCA Corrective Actions Coordinator
B. Meltzer, Supervising Engineer
E. Minda, Engineering
I. Missien, EP Coordinator
B. O'Rourke, NRA
F. O'Neill, Manager, Mechanical Maintenance
M. Palmer, Special Projects
S. Peterkin, Radiation Manager
J. Petrilla, Acting Manager, NRA
M. Rochester – Regulatory Affairs
J. Schleicher, Acting Design Engineering
K. Sessions, Work Week Manager
J. Smith, Nuclear Fuel Contracting Agent
L. West, Performance Improvement
J. Williams, SRO
C. Young, USW-STA
W. Zech, Nuclear Plant Operator

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened

05000387;388/2011005-05	URI	RCIC Low Reactor Pressure SR (Section 4OA3.3.2)
05000387;388/2011005-06	URI	Loss of Shield Control During Source Load (Section 4OA3.4)
05000387;388/2011005-01	FIN	Failure to Properly Implement Work Instructions Results in 'C' EDG Inoperability (Section 1R13)

Opened/Closed

05000388/2011005-02	NCV	Inadequate Operability Assessment of Suppression Pool Spray (Section 1R15)
0500388/2011005-04	NCV	Inadequate RCIC PMT (Section 4OA3.3)
05000388/2011005-03	FIN	Inadequate Post-Modification Testing Results in Main Turbine Trip and Automatic Scram (Section 4OA3.1)

Closed

05000388/2011-003-00	LER	Scram due to Main Turbine Trip during ICS Surveillance (Section 4OA3.1)
05000388/2011-001-00	LER	Multiple Inoperable Main Steam Safety Relief Valves (Section 4OA3.2)
05000388/2011-002-00	LER	Condition Prohibited By TS Violation Due to Unknown RCIC Inoperability (Section 4OA3.3)
05000388/2011004-03	URI	RCIC Failure During Surveillance (Section 4OA5.4)

LIST OF DOCUMENTS REVIEWED
(Not Referenced in the Report)

Section 1R01: Adverse Weather Protection

Procedures:
MT-085-001, Freeze Protection Process Heat Trace Testing and Maintenance, Revision 21
NDAP-00-0024, Winter Operation Preparations, Revision 17
NDAP-00-0030, Severe Weather Preparations (Winter Storm, Hurricane), Revision 3
OP-1(2)85-001, Freeze Protection System, Revision 14 (Revision 13)

Condition Reports:
1493695*, 1496214*, 1496219*

Action Requests:
133445, 1301973, 1321453, 1185041, 1476150, 1464364, 1480802, 1485168, 1354629, 1489159, 1491915, 1487496, 1481108, 1462808, 1486857, 1486795, 1490421*

Work Orders:
1321618, 1344421, 1464778, 1325322, 1323631, 1322393, 1356574

Miscellaneous:
WMXR Winter Report generated November 4, 2011
IE Bulletin 79-24

Section 1R04: Equipment Alignment

Procedures:
OP-151-001, "Core Spray System," Revision 33
TM-OP-051-ST, "Core Spray," Revision 3
CL-151-0011, "Unit 1 Core Spray System, Division I – Electrical," Revision 8
CL-151-0012, "Unit 1 Core Spray System, Division I – Mechanical," Revision 11
CL-151-0018, "Unit 1 Core Spray System, Common – Mechanical," Revision 4
OP-152-001, "HPCI System," Revision 46
CL-152-0012, "Unit 1 HPCI System – Mechanical," Revision 21
CL-152-0011, "Unit 1 HPCI System – Electrical," Revision 11
SO-149-002, Quarterly RHR System Flow Verification, Revision 15
OP-149-001, Quarterly RHR System Flow Verification, Revision 41
OP-024-004, "Transfer and Test Mode of Operation of DG `E'," Revision 29
OP-024-001, "DGs", Revision 59
CL-024-0042, "DG E Transfer Switches – Electrical," Revision 4
CL-024-0043, "DG E – Mechanical, Revision 13
TM-OP-024A-ST, "EDG `E'," Revision 9

Condition Reports (* NRC identified):
1473770*, 1473134*, 1483738, 1483368*, 1483213*, 1483216*, 1483218*, 1483220*, 1483221*, 1250882, 1313771, 1486939*, 1492804*, 1494626*

Drawings:
E106257, "Unit 1 P&ID Core Spray," Revision 39

M-155, Sheet 1, "Unit 1 P&ID HPCI," Revision 55
M-156, Sheet 1, , "Unit 1 P&ID HPCI Turbine – Pump," Revision 36
M-156, Sheet 2, , "Unit 1 P&ID HPCI Lubricating and Control Oil," Revision 9

Miscellaneous:
TS 3.5.2
TS 3.6.2.3

Section 1R05: Fire Protection

Procedures:
FP-213-289, Motor Generator (MG) Area, Evaporator Area, Turbine Laydown Area, Uncontrolled Passage Area, Fire Zone 2-35C, Elevation 729', Revision 5
FP-113-119, Circulation Space (1-500) and Adjacent Rooms (1-511, 517, 514, 508, 513) Fire Zones 1-5A-N,S,W, 1-5H Elevation 749'
FP-213-254, Circulation Space (11-500), Fuel Pool HX Room (11-514), Chiller Room (11-512), Standby Liquid Control System Area (11-513), RPS MG Set Room (11-511), Sample Station (11-508), Fire Zones 2-5A-N, 2-5A-S, 2-5A-W, 2-5H elevation 749'-1" and 762'-10", Revision 8

Condition Reports (*NRC identified):
1472421, 1472422, 1471008, 1388600, 1359409, 1479330*, 1489866, 1233013, 1511508*, 1511509*, 1511510*, 1511568*, 1511529*, 1489866

Work Orders:
1397595, 1491500

Drawing:
X-30-5, Sheet 2, Unit 2 Penetrations RB Area 30-Plan of Elevation 749'-1", Revision 45

Miscellaneous:
Fire Zones: 0-26F, G, H, I, J, 0-24C, E, D, 0-26M, N, P, 0-24M, 0-25D, 0-26V, 0-27H, 0-28R, 0-24L, 0-25C, 0-26T, 0-27G, 0-28Q, 0-24J, 0-25B, 0-26S, 0-27F, 0-28P, 0-26D, C, B, 0-27E (see TRM Table 3.7.3.3-1)
TRM – 3.7.3.3, Table 1

Section 1R11: Licensed Operator Requalification Program

Procedures:
AR-106-001, Main Turbine Generator, Computer HVAC, Instrument AC, 24 VDC, 250 VDC, Revision 48
EP-PS-100, Emergency Director Control Room EP Position Specific Instruction, Revision 26

Condition Reports (* NRC identified):
1486903, 1487486, 1487654*

Miscellaneous:
2011 Gold Team HP Drill
LORT Exam Grades Spreadsheet
LOR Scenarios OP002 10-04-03, 10-05-04, 11-01-01A, 11-02-03
Lesson Plan SM014 Significant OE Reports

Strategies for Successful Transient Mitigation, Revision 0
2011 Annual Simulator Certification Report
Simulator Transient Test 5302 Simultaneous Trip of All Feedwater Pumps September 8, 2011
Simulator Transient Test 5309 Maximum Size Unisolable MSL Rupture August 21, 2011
Simulator Transient Test 5310 Simultaneous Closure of All MSIVs with Stuck Safety Relief Valve (SRV) June 20, 2011
Simulator Transient Test 5304 Simultaneous Trip of All Recirculation Pumps September 18, 2011
Simulator Tests 5501, 5502, 5503 Steady State Test at 30 percent, 70 percent, 100 percent June 25, 2011

Section 1R12: Maintenance Effectiveness

Condition Reports:

1459077, 1459075, 1414771, 1414769, 1035351, 980960, 980959, 1401300, 1401301, 1401303, 1458663, 1458700, 1458661, 1458702, 1443541, 722966, 1167004, 1138405, 1138404, 1414408, 1414409, 1440232, 1485469*, 1486937*, 1503149, 1497289, 1497308, 1496808, 1497010, 1497012, 1497028, 1497280, 1497648, 1497548, 1503267, 1502875, 1497688, 1436864, 1468832, 1470229, 1483148

Work Orders:

1345113, 1226162, 1259534, 961168, 914313, 890483, 695448, 723076, 843617, 870823, 1414934, 1361556, 981051, 1360762, 1414503, 1376242, 1342048, 1393645, 1496832, 1496969

Calculation:
EC-049-0001, Pressure Drops in the RHR System for Various Modes of Operation, Revision 8

Drawing:
M-2151, Sheet 1, Unit 2 P&ID RHR, Revision 47
M-2151, Sheet 5, Unit 2 P&ID RHR, Revision 1

Miscellaneous:
IOM 443-16, Cleanup and Filtering Systems, Volume 7, Part 2, Revision 6
IOM 311-2, Vendor Supplies Instruments, Volume 2, Revision 19
EC-INST-175 1 (2-4), I&C Maintenance Calculation for PSLE512NO19A, Revision 0
FSAR 7.4.1.1
Maintenance Rule Basis Document- RHR
ANSI/ANS-56.8-1994, Containment System Leakage Testing Requirements
50.59 SD 01159, 50.59 Screening Determination for Technical Change to OP-1(2)49-004 and OP-1(2)16-001
DBD014, RHR, Revision 4
Maintenance Rule Design Basis Document for System 28C,"DG Building HVAC"

Section 1R13: Maintenance Risk Assessments and Emergent Work Control

Procedures:
NDAP-QA-1902, Maintenance Rule Risk Assessment and Management Program, Revision 4
PSP-26, Online and Shutdown Nuclear Risk Assessment Program, Revision 9

Condition Reports:
1481323*, 1482688, 1500641*

Miscellaneous:
Equipment Out-of-Service (EOOS) Risk Model Units 1 and 2 for July 13, 2011
Risk Profiles for Units 1 and 2 for October 20, 2011
Risk Profiles for Units 1 and 2 for October 24, 2011
Protected Equipment Program Tracking Form, dated October 19, 2011
Protected Equipment Program Tracking Form, dated November 28, 2011
Risk Profiles for Unit 1 for week of November 28, 2011

Section 1R15: Operability Evaluations

Procedures:
SO-260-001, "Quarterly LOCA Test of Drywell Area Unit Coolant/Fans," Revision 11
OP-149-004, "RHR Containment Cooling," Revision 22
TM-OP-049-ST, "RHR," Revision 7
ON-037-001, Loss of Condensate Transfer System, Revision 10
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TRM 3.5.2
NDAP-QA-0720, Station Report Matrix and Reportability Evaluation Guidance, Revision 17
CH-048-001, Chemistry Sampling Schedule, Analysis and Controls Matrix, Revision 7
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1465349, 1465369, 1465350, 1434686, 1466189, 1466187, 1478388, 1223330, 1149440, 1223551, 971051, 1475449, 561459, 582669, 1170439, 1475730, 517080, 778841, 1484861, 1166603, 1488207, 1172997, 1480479, 1492004, 1494134, 1492349, 1502934, 1502841, 1478716*, 1478388, 1486750*, 1453290, 853174, 1484470, 1478855, 1478856, 1478857, 1478859, 1479088, 1479112, 1478869, 1149440, 1223330, 281619, 1486036

Drawings:
M-2151, Sheet 3, Unit 2 RHR, Revision 24
M-2151, Sheet 1, Unit 2 RHR, Revision 47
M-108, Sheet 2, Condensate and Refuel Water Storage, Revision 14

Miscellaneous:
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IE Bulletin 80-10, Contamination of Nonradioactive System and Resulting Potential for Unmonitored, Uncontrolled Release of Radioactivity to Environment
Adverse Condition Monitoring Plan – Unit 2 HPCI Stop Valve FV25612 Closing Position as Indicated on Computer Point TRA078 is Exhibiting a Degrading Trend, dated November 11, 2011
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TS 3.3.6.1
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Curtiss Flowright Flow Control Company – Scientech 10 CFR Part 21 Notification, CON2000 and RTD 2100 Spring Clips
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ENSs 47498, 47515
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Test Frequency Response Calculations KSV-16-T SN-7157-60 Bechtel Power Corporation for PPL SSES Units 1 and 2 SO-0778, dated May 10, 1982
USNRC RG 1.9, "Application and Testing of Safety-Related DGs in Nuclear Power Plants," dated March, 2007, Revision 4

Section 1R18: Permanent Plant Modifications

Procedures:
NDAP-QA-0409, Door, Floor, Plug and hatch Control, Revision 8

Condition Reports (* NRC identified):
1496586*, 1167421, 1177174, 1222216, 1484456, 474770, 1142675, 1175034, 548841, 68634, 601496, 550127,

Calculations:
EC-070-1013, Evaluation of EWR M80214: Floor Drain Headers Crossing Secondary Containment Ventilation Zone Boundaries Without Isolation, Revision 3
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Work Order:
1222131

Miscellaneous:
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Section 1R19: Post-Maintenance Testing

Procedures:
TP-013-036, "Annual Backup Diesel Driven Fire Pump OP592, Performance Test," Revision 4
SO-152-002, Quarterly Flow Verification, Revision 42
SO-149-B02, "Quarterly RHR System Flow Verification, Revision 19
SO-149-B05, "Quarterly RHR System LOOP B Valve Exercising," Revision 13
SO-024-001D, "Monthly DG `D' Operability Test," Revision 8
OP-172-001, SJAE and Offgas System, Revisions 32, 33, 44, 45
NDAP-QA-0002, "Procedure Program and Procedure Change Process", Revision 22
NDAP-QA-0008, "Procedure Writer's Guide", Revision 9
TM-OP-072B-ST, Offgas Recombiner Student Text, Revision 3
SO-152-002, Quarterly HPCI Flow Verification," Revision 49
TP-152-006, "HPCI Overspeed Trip Testing Using Auxiliary Steam," Revision 14
SO-116-A03, Quarterly RHRSW System Flow Verification, Division I, Revision 6

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1446799, 1299054, 1480536, 1483174, 1383411, 1484089, 1483967, 1483428, 1483219, 1482708, 1386317, 1448474, 1494101*, 1494008, 1493850, 643487, 1314382, 541721, 772529, 777929, 1278973, 1270183, 1279351, 1463855, 1466608, 1466609, 1466970,

1466968, 1463711, 1484415, 1484421, 1499784, 1499888, 1460603, 1499888, 1500094, 1499889, 1235135, 1311310, 1287522, 1494511, 1418245, 1499880, 1508632, 1508334

Work Orders:
708307, 710377, 1310695, 1464129, 1279213, 1392117, 1469099, 1491877, 1339945

Drawings:
E-154, Sheet 14, RCIC Turbine EXH to Supp Pool Valve - Unit 1, Revision 18
E-154, Sheet 19, RCIC System Control and Indication – Unit 1, Revision 9
M-169, Sheet 1, Offgas Recombiner System, Revisions 40 and 42
M-171, Sheet 1, Ambient Temperature Charcoal Offgas Treatment System, Revision 38

Miscellaneous:
FSAR 11.3
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PPL 50.59 Resource Manual, Revision 5
Unit 1 Operations Logs for September 10, 16, and 17, 2011
Clearance Order 52-001C-1288736-0
5059-01-2420
5059-01-2197

Section 1R22: Surveillance Testing

Procedures:
SI-180-310, "Quarterly Calibration of Reactor Vessel Pressure Channels PIS-B21-2N021 A,B,C,D and PS-B21-IN021 E,G (Core Spray System and LPCI Permissive) Reactor Pressure Less Than Setting (246 psig)," Revision 10
SI-180-301, "Quarterly Calibration of Reactor Vessel Pressure Channels PIS-B21-2N021 A,B,C,D and PS-B21-IN021 E,G (Core Spray System and LPCI Permissive) Reactor Pressure Greater Than Setting (420 psig)," Revision 25
SI-280-301, "Quarterly Calibration of Reactor Vessel Pressure Channels PIS-B21-2N021 A,B,C,D and PS-B21-2N021 E,G (Core Spray System and LPCI Permissive) Reactor Pressure Greater Than Setting (420 psig)," Revision 21
SI-278-341, Calibration Test of APRM 21, Revision 2
SE-259-200, 24 Month LSFT of Containment Isolation Systems, Revision 13
SE-070-011, 24 Month Secondary Containment and Drawdown in Leakage Surveillance Test Zones I, II, and III, Revision 11
SE-170-011, Secondary Containment Drawdown and InLeakage Surveillance Test Zones I, II, and III, Revision 11
SE-270-011, 24 Month Secondary Containment and Drawdown in Leakage Surveillance Test Zones I, II, and III, Revision 11
OP-158-001, RPS, Revision 37
OP-258-001, RPS, Revision 36
SO-054-A03, "Quarterly ESW Flow Verification LOOP A," Revision 10

Condition Reports (* NRC identified):
1440406, 1439968, 1481954*, 1487546, 1404132, 1358007, 1329112, 1294324, 1265050, 1235168, 1456903, 1300267,

Action Request:
1487647

Work Order:
1143311

Miscellaneous:
Unit 1 and 2 Operator's Log for October 18, 2011 and October 20, 2011
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TS 3.3.1.1

Section 1EP2: Alert and Notification System Testing

Procedures:
EP-AD-007, Alert Notification System Annual Test – American Signal Corporation Sirens, Revision 8
EP-AD-011, Alert Notification System – American Signal Corporation Sirens, Revision 7

Miscellaneous:
Susquehanna Nuclear Power Station, Siren Alert Notification System Design Evaluation, September 2008
Susquehanna Nuclear Power Station, Siren Alert Notification System Design Evaluation Report, September 2008
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Section 1EP3: EP Organization Staffing and Augmentation System

Procedures:
NDAP-QA-0777, Susquehanna, LLC EP Program, Revision 14
NTP-QA-52.1, Emergency Plan Training Program, Revision 14

Miscellaneous:
SSES Emergency Plan, Revision 53
2009 Off-hours Unannounced NERO Activation Drill Report, October 27, 2009
Emergency Plan Program Positions and Required Training, October 2, 2011
NERO Personnel on-call/call out List
Monthly Pager Test, January 2011
Monthly Pager Test, March 2011
Monthly Pager Test, May 2011
Monthly Pager Test, September 2011
Monthly Pager Test, September 2010
Monthly Pager Test, June 2010
Monthly Pager Test, March 2010
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Monthly Pager Test, April 2009

Section 1EP4: Emergency Action Level and Emergency Plan Changes

Procedures:
EP-AD-015, Review, Revision, and Distribution of the SSES Emergency Plan and 50.54q Evaluations, Revision 14

NDAP-QA-0726, 10 CFR 50.59 and 10 CFR 72.48 Implementation, Revision 13

Work Requests:
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Section 1EP5: Correction of EP Weaknesses

Condition Reports:
1455547, 1291408, 1324863, 1279251, 1229215, 1178325, 1426229, 1290489, 1291181, 1455547

Action Request:
1360559

Miscellaneous:
SSES Emergency Plan Activation, August 10, 2010, Alert Declaration, Unit 1A RB Chiller Trip and Substantial Freon Leak
EP QA Internal Audit Report May 24 through June 4, 2010
June 28, 2011 Emergency Plan Walk-up Assessment of Emergency Operations Facility
January 25, 2011 Emergency Plan Drill Controller Brief
2010 EP Biennial Exercise Readiness Self Assessment
2011 NRC NEP Program Inspection Preparation
2011 Blue Team Drill Report, August 23, 2011
2011 Green Team Drill Report, June 28, 2011
2010 White Team HP Drill Report, June 10, 2010

Section 1EP6: Drill Evaluation

Condition Reports:
1455585, 1455606, 1455574, 1456031, 1456181, 1456183, 1460402, 1461860, 1464751, 1464872, 1464773, 1464842, 1464872, 1464889, 1464865, 1464868, 1465730*

Section 2RS3: In-plant Airborne Radioactivity Control and Mitigation

Procedures:
HP-TP-759, Inspection and Testing of Fishawk SCBA Protective Equipment, Revision 2
HP-TP-751, Setup and Use of Supplied Air Equipment, Revision 17
HP-TP-758, Inspection and Testing of Respiratory Protective Equipment, Revision 22

Miscellaneous:
Monthly Respirable Air Certifications for: Ops Compressor; SLC Compressor; Eagle Compressor; U-1 S/A Compressor; U-2 S/A Compressor dated December 2010 – September 2011
Training Material HP085, Respirator Repair, Revision 1
OJT/TPE/Qualification Guide:
HP778, Perform Respirator Fit Test, Revision 4
HP776, Inspection and Testing of Respiratory Protection Equipment, Revision 2
HP777, Perform Air Quality Checks, Revision 2
HP779, Use and Maintenance of Supplied Air Systems, Revision 0
HP786, Operate Eagle Air Compressor to Fill SCBA Cylinders, Revision 2
HP794, Operate Eagle Air Compressor to Fill Cylinders Other than SCBA, Revision 0

Section 4OA1: Performance Indicator Verification

Procedures:
EP-AA-103, EP PIs, Revision 0
NDAP-QA-0737, ROP PIs, Revision 7
PA-TI-200, On-Line PRA Model Rollout Process, Revision 3
PA-TI-206, Updating the Tables Required in the Mitigating System Performance Basis Document, Revision 2

Condition Reports (* NRC identified):
1478563*, 1478565*, 1482051*, 1486160*, 1486896*, 1328561, 1328563, 1357370, 1357719, 1507555*

Work Requests:
1473762, 1473765, 1473767, 1473769, 1357297

Miscellaneous:
PI Data – 4th Quarter 2010 to 3rd Quarter 2011
PI Data – 1st Quarter 2010 to 3rd Quarter 2011
SSES Mitigating System Performance Index Basis Document, Revision 5

Section 4OA2: Identification and Resolution of Problems

Procedures:
NDAP-QA-1902,"Maintenance Rule Risk Assessment and Management Program," Revision 4
NDAP-QA-1901, "Susquehanna Station Work Management Process," Revision 12
NDAP-QA-1903, "Refueling Outage Planning Implementation and Assessment," Revision 12
NDAP-00-1912, "Scheduling and Coordination of Work," Revision 17
NDAP-00-0037, "Station Policy Statements"; Attachment A, "Nuclear Safety Risk Management," Revision 2
PSP- 26, "Online and Shutdown Nuclear Risk Assessment," Revision 9
NDAP-QA-0702, "Action Request and CR Process", Revision 33
NDAP-00-0752, "Cause Analysis", Revision 12
OP-AD-002, "Standards for Shift Operation", Revision 37
NDAP-QA-0514, "Rework Evaluation and Reduction", Revision 0
MT-GM-015, "Torquing Guidelines", Revision 24
MT-043-001, "Main Condenser Leak Detection, Tube Pulling, Waterbox Inspection and Cleaning", Revision 19
NDAP-QA-1220, "Engineering Change Process", Revision 8
ON-004-002, "Energizing Dead 4kV ESS Bus", Revision 22
ON-104-201, "Loss of 4kV ESS Bus 1A (1A201)", Revision 14
ON-104-202, "Loss of 4kV ESS Bus 1B (1A202)", Revision 14
ON-104-203, "Loss of 4kV ESS Bus 1C (1A203)", Revision 13
EO-100-030, "Unit 1 Response to Station Blackout", Revision 27
EO-200-030, "Unit 2 Response to Station Blackout", Revision 23
EO-000-031, "Station Power Restoration", Revision 22

Condition Reports (* NRC identified):
1475251*, 1477502*, 1477625*, 1477543, 1478685*, 1478287*, 1477624*, 1480479*, 1480786, 1481130, 1480953, 1482007*, 1485349, 1486926*, 1487663*, 1492683*, 1492785*, 1492683*, 1492675* 1493305*, 1500350*, 1501114*, 1501669, 1501114, 1503708*, 1506759*, 1507750*,

1507768*, 1381909, 1340313, 1495521, 1491945*, 1491939*, 1491934*, 1491929*, 1487849, 1487850, 1479908, 1481310, 1507555*, 1490824, 1478497, 1459852, 1467220, 618059, 911401, 1039066, 1055537, 1067169, 1281580, 1324863, 1343538, 1344043, 1347683, 1385860, 1389530, 1389534, 1390421, 1402236, 1409053, 1412115, 1412321, 1417108, 1421912, 1425680, 1431024, 1453724, 1453724, 1453725, 1458568, 1461742, 1461742, 1474327, 1477279, 1479688, 1481983, 1486950, 1506756, 1510268, 1511805*, 1516317*, 1347508, 1406754, 1406756, 1406758, 1406759, 1406760, 1406762, 1406763, 1406766, 1004556, 1184479, 1413372, 1314219, 1282140, 1284855, 1284454, 1285072, 1324858, 1389534, 1459936, 1282128, 1501137*, 1501135*, 1501208*, 1501191*, 1501134*, 1501153*, 1282140, 1314219, 1324859, 866034, 1004556, 1479668, 1472006, 1479669, 1474096, 1327916, 1327925, 1348282, 1348866, 1438872, 1350977, 1461478, 1294270

Action Requests:
974581, 1074397, 942207, 974594, 1341774, 1342418, 1251979, 1341775, 1342425, 1487670

Work Order:
881451, 1285100, 1282682

Miscellaneous:
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PPL Susquehanna, LLC Performance Metrics, dated October, 2011
SSES QA Station Summary Report May, 2011 through August, 2011, PLI 95190
Radiation Protection Organizational Effectiveness Recovery Project Plan, Revision 0
Risk Informed Decision Making Recovery Project Plan, Revision 0
Degraded Cornerstone Recovery Project Plan, Revision 0
NRC Inspection Report 50-387&388/2011003
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NRC Letter-EA-09-003, “Work environment Issues at SSES-Potential Chilling Effect (PCE),” dated January 28, 2009
PPL Letter PLA-6528 “SSES PPL Susquehanna LLC Work Environment Improvement Plan,” dated June 23, 2009
Susquehanna Concerns Hotline flyer
GWE-PCE Power Point Presentation, dated June 15, 2009
PPL Station Excellence Plan, dated February, 2011
Memorandum of Agreement between PPL and IBEW Local 1600, dated May 9, 2002
Unit 1 4/22/2010 Start-Up Testing & ICS Tuning Scram, Appendix K, Event Plots
Licensee Event Report (LER) 05000387/2010-003-01, Unit 1 Manual Reactor Scram due to Leakage from the Unit 1 Circulating Water System and Subsequent Flooding of the Unit 1 Condenser Bay
Graver Water, Division of the Graver Company, Installation, Maintenance, Information Manual for Sightglasses
PPL Susquehanna, LLC, MNT-004, “Guideline for Evaluating Repeat Maintenance”, Revision 1
EOOS Risk RCA, dated March 18, 2011
UFSAR Section 8.3.2.1.1.2, 250 VDC Systems
Hot Box 11-16, Procedure Changes due to ESW Pump Breaker Anti-Pump Logic

Section 4OA3: Event Followup

Procedures:
NDAP-00-0708, "Corrective Action Review Board," Revision 10
SI-245-201, "Quarterly Functional Performance Test of Feedwater System/Main Turbine Trip System Reactor Vessel Water Level Channels PDT-C32-2N004 A,B,C," Revision 15
MFP-QA-3904, "Control Scheme Testing," Revision 3
NFP-QA-2310, "Engineering Change Testing," Revision 3
TP-245-028, "SAT-ICS Initial Operation of FWCC, Reactor Recirculation Speed Control and RFPT Speed Control," Revision 2
TP-245-036, "Unit 2 ICS Test Plan (EC 864462)," Revision 1

Condition Reports:
1482568*, 1479621, 1453671, 1273546, 1177479, 1178154, 1162307, 1477977, 1399810, 1434009*, 1430573*, 1433948*, 1431931, 1430440, 1500363*. 1506718, 1516769, 1477559

Miscellaneous:
LER 50-388/2009-001-00, Multiple Test Failures of Main Steam Safety Relief Valves
System 83 Journal Reports, Dated August 21, 2011, May 2, 2011, November 15, 2010, March 23, 2010, and April 30, 2009
Safety and Relief Valve Testing and Maintenance Guide, EPRI Technical Guide 105872s

Section 4OA5: Other Activities

Miscellaneous:
BWR-VIP (boiling water reactor-vessel internals project) 26 Location 1 LTP Augmented Plan Report
SE Related to EPU (ML081000255, ML 080390086)
PLA-6306, Issuance of Amendment Regarding the 13 percent EPU
Areva Engineering Information Record 51-9116398-000, Susquehanna Unit 1 Cycle 17 MCPR Safety Limit Results, August 6, 2009
Areva Engineering Information Record 51-9140627-000, Susquehanna Unit 2 Cycle 16 MCPR Safety Limit Results, July 26, 2010
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PLA-6323
PLA-6210
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EC-Fuel-1632, Unit 1 Cycle 14 Development of COLR, Revision 0
EC-Fuel-1412, Unit 1 Stability Option IV Analytical Setpoints, Revision 6
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Susquehanna Area Surveys for ISFSI, dated: January 20, 2011; February 17, 2011; February 24, 2011; March 5, 2011; March 8, 2011; March 10, 2011; March 24, 2011; March 29, 2011; April 4, 2011; April 14, 2011; April 25, 2011; April 30, 2011; May 2, 2011; April 10, 2011; April 21, 2011; April 25, 2011; April 31, 2011; June 8, 2011; June 14, 2011; June 20, 2011; July 6, 2011; July 12, 2011; July 23, 2011; July 26, 2011; August 2, 2011; August 13, 2011; August 16, 2011; August 24, 2011; August 30, 20/11; September 16, 2011; September 20, 2011; and October 4, 2011

LIST OF ACRONYMS

AC	Alternating Current
ACE	Apparent Cause Evaluation
ADAMS	Agencywide Document and Access Management System
ALARA	As Low As Is Reasonably Achievable
ANS	Alert and Notification System
AR	Action Report
ARM	Ambient Air Monitors
APRM	Average Power Range Monitor
BWR-VIP	Boiling Water Reactor, Vessel Internals Project
CAP	Corrective Action Program
CARB	Corrective Action Review Board
CAQ	Condition Adverse to Quality
CC	Correct Condition
CCA	Cross-Cutting Area
CFR	Code of Federal Regulations
CNO	Chief Nuclear Officer
CR	Condition Report
CREOASS	Control Room Emergency Outside Air Supply System
CS	Control Structure
CST	Condensate Storage Tank
CW	Circulating Water
DEP	Drill and Exercise Performance
DG	Diesel Generator
EAL	Emergency Action Level
ECCS	Emergency Core Cooling System
EDG	Emergency Diesel Generator
EHC	Electrohydraulic Control
ENS	Emergency Notification System
EOOS	Equipment Out-of-Service
EOP	Emergency Operating Procedure
EP	Emergency Preparedness
EPD	Electronic Personal Dosimeter
EPU	Extended Power Uprate
EQ	Environmental Qualification
ER	Engineering Request
ESW	Emergency Service Water
EVAL	Evaluation
EWR	Engineering Work Request
FASA	Focused Area Self Assessment
FEMA	Federal Emergency Management Agency
FIN	Finding
FSAR	[SSES] Final Safety Analysis Report
GE	General Electric
HP	Health Physics
HPCI	High Pressure Coolant Injection
HRA	High Radiation Area
HVAC	Heating, Ventilation and Air-Conditioning
HX	Heat Exchanger

ICS	Integrated Control System
I&C	Instrumentation and Controls
IMC	Inspection Manual Chapter
IP	Inspection Procedure
IR	NRC Inspection Report
ISFSI	Independent Spent Fuel Storage Installation
IST	Inservice Testing
JPM	Job Performance Measures
kV	Kilovolts
LCO	Limiting Condition for Operation
LDE	Lens Dose Equivalent
LEFM	Leading Edge Flow Meter
LER	Licensee Event Report
LOCA	Loss of Coolant Accident
LOCA/LOOP	Loss of Coolant Accident/Loss of Offsite Power
LOOP	Loss of Offsite Power
LSFT	Logic System Functional Test
MG	Motor Generator
MRC	Management Review Committee
MSPI	Mitigating Systems Performance Index
NCV	Non-Cited Violation
NDAP	Nuclear Department Administrative Procedure
NEI	Nuclear Energy Institute
NERO	Nuclear Emergency Response Organization
NIST	National Institute of Standards and Technology
NRA	Nuclear Regulatory Affairs
NRC	Nuclear Regulatory Commission
NRR	Office of Nuclear Reactor Regulation
ODCM	Offsite Dose Calculation Manual
OE	Operating Experience
OPRM	Oscillation Power Range Monitor
PARS	Publicly Available Records
PCE	Potential Chilling Effect
PCWO	Plant Component Work Order
PEMA	Pennsylvania Emergency Management Agency
PF	Power Factor
PI	[NRC] Performance Indicator
PI&R	Problem Identification and Resolution
PIM	Plant Issues Matrix
PMT	Post-Maintenance Test
PPL	PPL Susquehanna, LLC
PR	Prevent Recurrence
PRA	Probabilistic Risk Analysis
PS	Planning Standard
QA	Quality Assurance
QC	Quality Control
RA	Radiation Area
RB	Reactor Building
RCA	Root Cause Analysis
RCIC	Reactor Core Isolation Cooling
RCS	Reactor Coolant System

RFO	Refuel Outage
RG	[NRC] Regulatory Guide
RGSC	Ramp Generator Signal Converter
RHR	Residual Heat Removal
RHRSW	Residual Heat Removal Service Water
RMA	Risk Management Actions
ROP	Reactor Oversight Process
RPM	Radiation Protection Manager
RPS	Reactor Protection System
RPV	Reactor Pressure Vessel
RFPT	Reactor Feed Pump Turbine
RTP	Rated Thermal Power
RWM	Rod Worth Minimizer
RWP	Radiation Work Permit
SBO	Station Blackout
SCBA	Self-Contained Breathing Apparatus
SCCI	Substantive Cross-Cutting Issue
SCWE	Safety Conscious Work Environment
SDE	Skin Dose Equivalent
SDP	Significance Determination Process
SE	Safety Evaluation
SEPTA	Susquehanna Error Prevention Team Assessment
SIL	Service Information Letter
SOW	System Outage Window
SP	Suppression Pool
SPAR	Standardized Plant Analysis Risk
SR	Surveillance Requirement
SRO	Senior Reactor Operator
SRV	Safety Relief Valve
SSC	Structures, Systems and Components
SSES	Susquehanna Steam Electric Station
STP	South Texas Project
STV	System Test Verification
TBD	To Be Determined
TEDE	Total Effective Dose Equivalent
TRM	Technical Requirements Manual
TS	Technical Specifications
UFSAR	Updated Final Safety Analysis Report
ULSD	Ultra-Low-Sulfur Diesel
VHRA	Very High Radiation Areas
WO	Work Order