



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
REGION I**  
2100 RENAISSANCE BOULEVARD, SUITE 100  
KING OF PRUSSIA, PENNSYLVANIA 19406-2713

September 21, 2012

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

**SUBJECT: SUSQUEHANNA STEAM ELECTRIC STATION – NRC PROBLEM  
IDENTIFICATION AND RESOLUTION INSPECTION REPORT  
05000387/2012009 AND 05000388/2012009**

Dear Mr. Rausch:

On July 27, 2012, the U. S. Nuclear Regulatory Commission (NRC) completed an inspection at your Susquehanna Steam Electric Station, Unit 1 and 2. The enclosed report documents the inspection results discussed on July 27, 2012, with you and other members of your staff.

This inspection examined activities conducted under your license as they relate to identification and resolution of problems and compliance with the Commission's rules and regulations and conditions of your license. Within these areas, the inspection involved examination of selected procedures and representative records, observations of activities, and interviews with personnel.

Based on the samples selected for review, the inspectors concluded that PPL Susquehanna, LLC (PPL) had, in general, developed adequate program procedures for identifying, evaluating, and resolving problems. While the NRC acknowledges progress made since the last biennial problem identification and resolution inspection conducted in January 2010 (ML100140339)<sup>1</sup>, some weaknesses in implementation of the corrective action program remain. In particular, as documented in the attached report, the inspectors identified weaknesses in the quality and timeliness of evaluations and in the implementation of timely corrective actions. Prior to the inspection, you and your staff identified problems with the implementation of your corrective action program in similar areas and corrective actions to address these problems were ongoing at the time of this inspection. Based on the results of this inspection and your internal assessments, the NRC will continue to closely monitor the implementation and effectiveness of your corrective actions in these areas through the baseline inspection program.

The report documents three NRC-identified findings of very low safety significance (Green). The inspectors determined that the findings also involved violations of NRC requirements. However, because of the very low safety significance and because they were entered into your corrective action program, the NRC is treating these findings as non-cited violations (NCVs),

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<sup>1</sup>Designation in parenthesis refers to an ADAMS accession number. Documents referenced in this letter are publicly available using the accession number in ADAMS.

consistent with Section 2.3.2 of the NRC Enforcement Policy. If you contest these NCVs, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with copies to the Regional Administrator, Region I; the Director, Office of Enforcement, U. S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Susquehanna Steam Electric Station. In addition, if you disagree with the cross-cutting aspect assigned to 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 Inspector at the Salem Nuclear Generating Station.

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

Sincerely,

**/RA/**

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

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

Enclosure: Inspection Report 05000387/2012009 and 05000388/2012009  
w/Attachment: Supplemental Information

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**U.S. NUCLEAR REGULATORY COMMISSION**

REGION I

Docket Nos: 50-387, 50-388

License Nos: NPF-14, NPF-22

Report No: 05000387/2012009 and 05000388/2012009

Licensee: PPL Susquehanna, LLC (PPL)

Facility: Susquehanna Steam Electric Station, Unit 1 and 2

Location: Berwick, Pennsylvania

Dates: July 9 through July 13, 2012  
July 23, through July 27, 2012

Team Leader: Leonard Cline, Senior Project Engineer

Inspectors: Eugene DiPaolo, Senior Resident Inspector, Limerick  
Cary Bickett, Senior Project Engineer  
Jonathan Greives, Resident Inspector

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

**TABLE OF CONTENTS**

SUMMARY OF FINDINGS ..... 3

REPORT DETAILS ..... 6

4. OTHER ACTIVITIES (OA) ..... 6

    4OA2 Problem Identification and Resolution (71152B)..... 6

    4OA6 Meetings, Including Exit ..... 24

SUPPLEMENTARY INFORMATION ..... A-1

KEY POINTS OF CONTACT ..... A-1

LIST OF ITEMS OPENED, CLOSED, DISCUSSED, AND UPDATED..... A-1

LIST OF DOCUMENTS REVIEWED ..... A-2

LIST OF ACRONYMS..... A-6

## SUMMARY OF FINDINGS

IR 05000387/2012009, 05000388/2012009, 07/9/2012 – 07/27/2012; Susquehanna Steam Electric Station, Units 1 and 2; Identification and Resolution of Problems, the inspectors identified three findings in the areas of Problem Evaluation and Corrective Action Implementation.

This NRC team inspection was performed by two senior regional inspectors, one senior resident inspector, and one resident inspector. The inspectors identified three findings of very low safety significance (Green) during this inspection and classified the findings as non-cited violations (NCVs). The significance of most findings is indicated by their color (Green, White, Yellow, Red) using NRC Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). Findings for which the SDP does not apply may be Green or assigned a severity level after NRC management review. Cross-cutting aspects associated with findings are determined using IMC 0310, "Components Within the Cross-Cutting Areas." The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

### Problem Identification and Resolution

The inspectors concluded that PPL Susquehanna, LLC (PPL) had, in general, developed adequate program procedures for identifying, evaluating, and resolving problems. The inspectors review of the implementation of the program concluded that PPL was generally effective at identifying problems, but that, based on a sample of issues entered into the CAP and inspector observations there were still weaknesses in the areas of evaluation of problems and implementation of effective and timely corrective actions. The inspectors also identified observations regarding weaknesses in adherence to the standards established by corrective action program procedures in these areas. The inspectors also identified three findings of very low safety significance in the corrective action program area. One finding was related to an inadequate evaluation and two were related to inadequate implementation of timely and effective corrective actions. The inspectors acknowledge that PPL was aware of the weaknesses identified in the evaluation and implementation areas based on the results of PPL's quality assurance (QA) audits and self-assessments and the previously identified substantive cross-cutting issue in evaluation of identified problems [P.1(c)]. The inspectors also acknowledge that PPL currently has an action plan in place to address these concerns. The NRC will closely monitor the implementation and effectiveness of these corrective actions through the baseline inspection program.

The inspectors concluded that, in general, PPL adequately identified, reviewed, and applied relevant industry operating experience to Susquehanna Steam Electric Station (SSES) operations and identified appropriate corrective actions. In addition, based on those items selected for review, the inspectors determined that PPL self-assessments and audits were thorough and appropriately used the corrective action program to initiate corrective actions for identified issues.

With respect to safety conscious work environment, based on interviews and reviews of the corrective action program (CAP) and the Employees Concerns Program (ECP) the inspectors did not identify conditions that negatively impacted the site's safety conscious work environment and determined that site personnel were willing to raise safety issues through multiple means.

## **Cornerstone: Mitigating Systems**

Green. The inspectors identified an NCV of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Actions," because PPL did not take appropriate action to promptly correct an identified condition adverse to quality associated with PPL's motor-operated valve (MOV) lubrication program. PPL did not adhere to the corrective action timeliness standards specified in its corrective action process procedure NDAP-QA-0702, "Action Request and Condition Report Process," Revision 36. Section 7.56.1 states, in part, that compensatory action will be provided if permanent action will not be performed in a timely fashion. Specifically, while evaluating permanent revisions to the program to address the deficiencies, PPL did not take compensatory actions to address MOV grease analysis procedure and engineer qualification program deficiencies before sixty MOV grease analyses were completed in refueling outage 15. PPL entered this performance deficiency into their CAP under CR 1562326.

The inspectors determined that the performance deficiency was more than minor because it was associated with the equipment performance attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, failure to implement compensatory actions to analyze grease samples in MOVs affects the reliability of these valves. An MOV lubrication program is an integral part of the station's Generic Letter 89-10 program for safety-related MOVs. PPL uses the results of the MOV grease analysis to determine the need for a valve actuator overhaul. The inspectors screened this issue to Green via Inspection Manual Chapter 0609, Attachment 4 and Appendix A, because the finding does not represent a loss of system and/or function, does not represent an actual loss of function of at least a single train for greater than its technical specification allowed outage time or two separate safety systems out-of-service for greater than its technical specification allowed outage time, and does not represent an actual loss of function of one or more non-technical specification trains of equipment designated as high safety-significant in accordance with the licensee's Maintenance Rule program for greater than 24 hrs. The inspectors determined that this issue had a cross-cutting aspect in the area of human performance, work practices, because PPL personnel did not follow PPL corrective action program procedure requirements regarding compensatory actions [H.4(b)]. (Section 40A2.1.c(1))

Green. The inspectors identified an NCV of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Actions," because PPL did not identify and correct the inadequate weekly testing procedure that resulted in the inoperability of the safety-related 24-volt battery 1D670 that occurred on March 1, 2012. Specifically, because the engineer assigned to perform the Apparent Cause Evaluation (ACE) for the March 1, 2012, failure did not interview the technicians who performed the last weekly surveillance on the battery before the failure, PPL did not identify that the weekly testing procedure did not provide adequate instructions for restoring low battery electrolyte level. PPL entered this performance deficiency into their CAP as CR 1602339.

The inspectors determined that this performance deficiency was more than minor because it affected the equipment performance attribute of the Mitigating Systems cornerstone and its objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, as evidenced by the events on March 1, 2012, the use of the inadequate procedure resulted in the inoperability of the 1D670 battery that supports operation of the safety-related source range and intermediate range instrumentation. The inspectors determined that the inadequate procedure problem was a condition adverse to quality. The inspectors screened this issue to Green via Inspection

Manual Chapter 0609, Attachment 4 and Appendix A, because the finding does not represent a loss of system and/or function, does not represent an actual loss of function of at least a single train for greater than its technical specification allowed outage time or two separate safety systems out-of-service for greater than its technical specification allowed outage time, and does not represent an actual loss of function of one or more non-technical specification trains of equipment designated as high safety-significant in accordance with the licensee's Maintenance Rule program for greater than 24 hrs. The inspectors determined that this finding had a cross-cutting aspect in the area of problem identification and resolution, corrective action program, because PPL did not appropriately evaluate the unexpected inoperability of a safety-related battery such that a condition adverse to quality, the inadequate maintenance procedure that likely caused the battery inoperability, was identified and corrected [P.1.(c)]. (Section 40A2.1.c(2))

Green. The inspectors identified an NCV of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Actions," because PPL did not identify an inadequate recirculation valve surveillance procedure when the licensee completed the extent of condition review that was performed as part of the root cause analysis for the Reactor Core Isolation Cooling (RCIC) ramp generator signal converter (RGSC) failure on June 29, 2011. Specifically, PPL did not adhere to the extent of condition determination standards established in PPL procedure NDAP-00-0752, "Cause Analysis." The actions taken to address the extent of condition were not of a depth sufficient to identify the same deficiency that existed in the RCIC flow surveillance procedure in other applicable surveillance procedures. As a result, the inadequate recirculation valve surveillance procedure was not identified. PPL entered this performance deficiency into their CAP as CR 1596633.

The inspectors determined that this performance deficiency was more than minor because it affected the procedural quality attribute of the Mitigating Systems cornerstone and its objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, PPL did not complete an evaluation of the extent of condition for the identified inadequate RCIC surveillance procedure to a depth that would have identified the same deficiency in other similar procedures. As a result, an independent review by inspectors identified a similar condition associated with the reactor recirculation valve exercising procedure. The inspectors determined that this procedure problem was a condition adverse to quality. The inspectors screened this issue to Green via Inspection Manual Chapter 0609, Attachment 4 and Appendix A, because the finding does not represent a loss of system and/or function, does not represent an actual loss of function of at least a single train for greater than its technical specification allowed outage time or two separate safety systems out-of-service for greater than its technical specification allowed outage time, and does not represent an actual loss of function of one or more non-technical specification trains of equipment designated as high safety-significant in accordance with the licensee's Maintenance Rule program for greater than 24 hrs. The inspectors determined that this finding had a cross-cutting aspect in the area of problem identification and resolution, corrective action program, because, although the root cause analysis appropriately bounded and defined the necessary actions to address the extent of condition, the implementation of those actions was insufficient to ensure similar conditions did not exist in other site procedures [P.1.(d)]. (Section 40A2.1.c(3))



## REPORT DETAILS

### 4. OTHER ACTIVITIES (OA)

#### 4OA2 Problem Identification and Resolution (71152B)

This inspection constitutes one biennial sample of problem identification and resolution (PI&R) as defined by Inspection Procedure 71152. All documents reviewed during this inspection are listed in the Attachment to this report. All issues documented in the report as minor performance deficiencies are not subject to enforcement action in accordance with the NRCs Enforcement Policy.

#### .1 Assessment of Corrective Action Program Effectiveness

##### a. Inspection Scope

The inspectors reviewed the procedures that described PPL's corrective action program (CAP) at SSES. To assess the effectiveness of the CAP, the inspectors reviewed performance in three primary areas: problem identification, prioritization and evaluation of issues, and corrective action implementation. The inspectors compared performance in these areas to the requirements and standards contained in 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," and PPL procedure NDAP-QA-0702, "Action Request and Condition Report Process." For each of these areas, the inspectors considered risk insights from the station's risk analysis and reviewed condition reports (CRs) selected across the seven cornerstones of safety in the NRCs Reactor Oversight Process. Included in this sample were CRs that documented PPL's evaluation and corrective actions for a selective sample of NRC-identified non-cited violations (NCVs) and findings that had been identified since the last biennial PI&R inspection completed in January 2010. Additionally, the inspectors attended plan-of-the-day, Susquehanna review committee, management review committee (MRC), and corrective action review board (CARB) meetings. The inspectors also selected items from the following functional areas for review: engineering, operations, maintenance, emergency preparedness, radiation protection, chemistry, and physical security.

##### (1) Effectiveness of Problem Identification

In addition to the items described above, the inspectors reviewed system health reports, a sample of completed corrective and preventative maintenance work orders, completed surveillance test procedures and periodic trend reports. The inspectors also completed field walkdowns of various systems on site, such as the residual heat removal (RHR), emergency service water (ESW), RHR service water, high pressure coolant injection, and reactor core isolation cooling systems (RCIC). Additionally, the inspectors reviewed a sample of CRs written to document issues identified through internal self-assessments, audits, emergency preparedness drills, and the operating experience program. The inspectors completed this review to verify that PPL entered conditions adverse to quality into their corrective action program as appropriate.

(2) Effectiveness of Prioritization and Evaluation of Issues

The inspectors reviewed the evaluation and prioritization of a sample of CRs issued since the last NRC biennial Problem Identification and Resolution inspection completed in January 2010. The inspectors' review included the appropriateness of the assigned significance, the scope and depth of the causal analysis, and the timeliness of resolution. The inspectors assessed whether the evaluations identified likely causes for the issues and developed appropriate corrective actions to address the identified causes. The inspectors also confirmed that, when necessary, issue evaluations addressed equipment operability, NRC reporting requirements, and other areas potentially affected by the identified performance deficiencies. The inspectors also reviewed CRs that were assigned lower levels of significance that did not include formal cause evaluations to ensure that they were properly classified.

(3) Effectiveness of Corrective Actions

The inspectors reviewed PPL's completed corrective actions through documentation review and, in some cases, field walkdowns to determine whether the actions addressed the identified causes of the problems. The inspectors also reviewed CRs for adverse trends and repetitive problems to determine whether corrective actions were effective in addressing the broader issues. The inspectors reviewed PPL's timeliness in implementing corrective actions and effectiveness in precluding recurrence for significant conditions adverse to quality. The inspectors also reviewed a sample of CRs associated with selected NCVs and findings to verify that PPL personnel properly evaluated and resolved these issues. In addition, the inspectors expanded the corrective action review to five years to evaluate PPL actions related to the MOV program, safety-related chillers, and reactor protection system electrical protection assembly breakers.

b. Assessment

(1) Effectiveness of Problem Identification

PPL staff at SSES initiated over 20,000 CRs between January 2010 and June 2012. For this inspection, as part of the scope described above, the inspectors reviewed the documentation associated with approximately 300 of these CRs. Based on the samples selected for review, the inspectors determined that PPL identified problems and entered them into the corrective action program at a low threshold.

The inspectors observed supervisors at the plan-of-the-day, Susquehanna review committee, MRC, and CARB meetings appropriately questioning and challenging CRs to ensure clarification of the issues that allowed for appropriate assignments for follow-up actions. The inspectors also confirmed that PPL trended equipment and programmatic issues in accordance with the site's trending program requirements as defined by NDAP-00-0710, "Station Trending Program," and appropriately documented problems identified through trending in the site's CAP.

The inspectors confirmed that in response to inspector observations during this inspection, when appropriate, PPL personnel initiated CRs and took action to address the issues of concern. Furthermore, based on the scope of issues reviewed, the inspectors determined that, in general, PPL appropriately entered issues into the CAP for evaluation and resolution. The inspectors also confirmed that conditions adverse to

quality identified by PPL were documented and tracked for resolution in the site's CAP. The inspectors did identify one performance deficiency associated with implementation of the Generic Letter (GL) 89-10 motor-operated valve (MOV) program where a degraded condition identified by technicians during the performance of preventative maintenance was not entered into the corrective action program as required by program procedures. The details of this issue are described in the section 4OA2.1.c of this report. The inspectors also identified two NCVs of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," because PPL did not identify and correct conditions adverse to quality. In one instance the inspectors determined that the underlying cause for the failure to identify the issue was an inadequate evaluation, in the other it was the failure to implement adequate corrective actions intended to identify the extent of the identified condition.

## (2) Effectiveness of Prioritization and Evaluation of Issues

The inspectors determined that, in general, PPL appropriately prioritized and evaluated issues commensurate with the safety significance of the identified problem. PPL screened CRs for operability and reportability, categorized the CRs by significance, and assigned actions to the appropriate department for evaluation and resolution. The CR screening process considered human performance issues, radiological safety concerns, repetitiveness, adverse trends, and potential impact on the safety conscious work environment (SCWE).

Items reviewed by the inspectors during the inspection were categorized for evaluation and resolution commensurate with the significance of the issues. Guidance provided by PPL procedure NDAP-QA-0702 for categorization appeared sufficient to ensure consistent implementation based on the sample of CRs reviewed by the inspectors. In general, issues were appropriately screened and prioritized commensurate with their safety significance.

The inspectors reviewed 13 root cause analyses (RCAs), 50 apparent cause analyses (ACEs), 2 common cause evaluations and approximately 50 work group evaluations. For the evaluations reviewed, the inspectors determined that, with some exceptions, PPL's evaluations were generally thorough. Operability and reportability determinations were generally documented when conditions warranted and in most cases, the evaluations supported the conclusion. Most causal analyses appropriately considered the extent of condition or problem, generic issues, and previous occurrences of the issue. Notwithstanding, for the samples reviewed, the inspectors did identify performance deficiencies related to evaluation quality and timeliness. The performance deficiencies identified include one NCV related to evaluation quality that is described in section 4OA2.1.c of this report as a violation of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Actions," for failure to identify and correct a condition adverse to quality. The details for the identified minor performance deficiencies are described below. The inspectors acknowledged that the PPL pre-PI&R focused area self-assessment (FASA) also identified quality and timeliness issues during the assessment, and that at the time of this inspection PPL was implementing actions to address the evaluation timeliness and quality concerns. In particular, the PPL action plan for the substantive cross-cutting issue in the evaluation of identified problems (P.1(c)) included actions intended to address these concerns.

The inspectors identified three evaluations that did not adhere to the standards established in the corrective action program procedure for cause evaluations, NDAP-00-0752, "Cause Analysis." In these examples the deficient evaluations were caused by personnel discarding failed equipment before an adequate evaluation of cause was completed or evaluators incorrectly applying a proven analysis method. Evaluation quality standards are upheld at the site by departmental CARBs and the site CARB. Whether an evaluation must be reviewed by these boards is determined by the site procedure. For the examples below, the procedure requirements for these reviews were followed and for these examples all were reviewed by a departmental CARB; however, none were reviewed by the site CARB. The departmental CARB reviews did not identify the deficiencies observed by the inspectors. PPL acknowledged the issues discussed below and the departmental CARB standards deficiencies for these examples. PPL documented these issues in CR 1602188.

1. For the following two CRs the maintenance work group that identified the failed equipment subsequently discarded the failed equipment upon completion of the maintenance or testing in accordance with the work instructions.
  - CR 1557151: Excess flow check valve failed initial check valve operability.
  - CR 1554948: During local leak rate testing SV157102A leakage exceeded the admin limit of 500 sccm requiring valve replacement and retest.

To conduct of an ACE, PPL procedure NDAP-00-0752 requires the quarantine of affected equipment/parts to preserve evidence in events involving equipment failures. For each of these issues the MRC directed that an ACE be performed. In accordance with NDAP-00-0752, the ACE was intended to identify the most probable cause of the failure using at least one formal analytical method. Discarding the failed equipment or component inhibited PPL's evaluation in identifying the most probable cause for the failure. The inspectors concluded that although the ACEs completed in response to these issues were not adequate, this performance deficiency was not more than minor because the inspectors determined that, for each case, PPL adequately corrected the condition adverse to quality by replacing the failed equipment.

2. CR 1549033: PSV152F012B Unit 1 Core Spray Pumps B/D discharge header relief valve failed as-found lift testing in the high direction. PPL procedure NDAP-00-0752 requires that an ACE must use at least one formal analytical method. For this issue the evaluator used a failure mode and effect analysis (FMEA) analytical method, but the inspectors determined that the evaluation was not adequate because the evaluator did not properly implement the standards of the analytical method as described in NDAP-00-0752. Specifically, the FMEA performed listed multiple possible failure mechanisms, but did not evaluate each one individually to determine whether it was, or was not, a potential cause. The evaluator stopped the evaluation after the first failure mechanism analysis identified it as the probable cause. The inspectors concluded that the performance deficiency was not more than minor because the inspectors review determined that the corrective actions specified by PPL to address the failed relief valve (i.e., valve replacement) adequately corrected the identified condition adverse to quality.

The inspectors also reviewed three evaluations that did not adhere to the timeliness standards specified in PPL procedure NDAP-QA-0702, "Action Request and Condition

Report Process,” indicating that PPL still has difficulty completing timely evaluations to support timely implementation of corrective actions. Per Section 8.6 of that procedure, ACEs are to be completed within 30 days, and RCAs are to be completed within 45 days of MRC approval of CR classification. In two of the three cases identified by the team (nos. 2 and 3 below), extensions beyond the original evaluation due date were approved before the evaluation was overdue and the documented extension approval included a valid basis in accordance with procedure requirements. In the single example where the extension was not approved before the evaluation went past its due date (no. 1 below), the extension was ultimately approved by the required approval authority and also included a valid basis in accordance with the procedure requirements. Therefore, the inspectors determined that, even though the extension was not properly approved before the evaluation was overdue, the overdue evaluation did not impact plant safety. For issues 1 and 2 below, the inspectors determined the timeliness performance deficiency was not more than minor, for issue 3 regarding MOV grease analysis, a finding for untimely corrective actions due to inadequate compensatory actions was identified and is described in section 4OA2.1.c of this report. PPL initiated CR 159531 and 1605182 to address these issues.

1. CR 1497012: Unauthorized entry into limiting condition for operation (LCO) action statement 3.6.1.1 during repairs to RHR flow instrument. The event occurred in November 2011 and at the time of the inspection the RCA was still not CARB approved. The time to complete the RCA as of the inspection exit was approximately 250 days. The inspectors determined that this performance deficiency was not more than minor because, despite the delay in evaluation, actions required to correct the condition adverse to quality were completed.
2. CR 1529828: Control structure chiller performance issues/chiller health in the past has been white or yellow. This CR was assigned as a RCA on March 30, 2012, but the root cause was not final until June 1, 2012. Total time to complete this RCA was 64 days. The inspectors determined that this performance deficiency was not more than minor because, despite the delay in the completion of the evaluation, the approved due date extensions included an appropriate evaluation of the need for interim compensatory measures to prevent additional failures and the completed RCA identified appropriate and thorough corrective actions to improve chiller performance.
3. CR 1562326: NRC identified an NCV because PPL did not have a procedure for qualitative MOV grease analysis. There was a general lack of documentation of grease analysis associated with work orders. The current MOV engineer and predecessor did not possess a qualification for grease analysis. The CR originally written to document the issue in March of 2012 was classified as L4 correct, which required no evaluation. No action was taken at that time and the CR was ultimately closed to another CR that was written in April 2012 after the NRC inspection exit meeting that described the issue. PPL originally classified this CR as a L1 RCA, which required completion of an RCA. However, PPL eventually downgraded the classification to a L2 Cause, which required an ACE. At the time of the inspection, the evaluation was still not complete. Total time to complete evaluation for this issue as of the end of the inspection was over 130 days. The finding associated with this issue is discussed in section 4OA2.1.c.

### (3) Effectiveness of Corrective Actions

The inspectors reviewed CR disposition documentation and verification of corrective action implementation through reviews of implementing actions and discussions with personnel involved for approximately 300 PPL CRs. Based on the samples reviewed, the inspectors identified weaknesses in the identification and implementation of compensatory actions until permanent corrective actions can be completed, implementation of the process used to revise corrective actions approved by management, and the timeliness of corrective action implementation.

1. Compensatory action identification and implementation. PPL procedure NDAP-QA-0702, section 8.8.12, required that PPL determine what compensatory actions were required to ensure that affected structures, systems, and components (SSCs) were capable of performing their design function prior to the final completion of the corrective actions that fully addressed the degraded condition. The procedure required that compensatory action was assigned and tracked through the corrective action process. The items listed below were examples where the inspectors determined that PPL did not adhere to this standard. PPL initiated CR 1601933 and 16505188 to address these issues.
  - a. CR 1541932: PPL performed an RCA to address the fact that liquid radwaste alarm set points, meteorological tower wind direction computer points, and other compensatory measures did not ensure proper and accurate emergency classification and notification for events. The RCA identified that one of the root causes was that emergency planning procedure EP-AD-015 did not provide specific guidance for verification and validation of emergency action level (EAL) changes. PPL assigned a corrective action to revise the procedure with a due date of November 16, 2012, but did not initiate or track compensatory measures. PPL provided email correspondence that documented the completion of informal training with EP personnel regarding the procedure problems. The inspectors concluded that the informal training was an adequate compensatory action for the inadequate EAL change issue, but since it was conducted outside the corrective action program and not formally tracked by site processes, the inspectors determined that this was a performance deficiency. This issue was determined to be minor because, to date, personnel who were responsible for EAL changes were properly briefed on the shortfalls of EP-AD-015 and no additional examples of inadequate EAL changes were identified.
  - b. CR 1562326: In March of 2012 the NRC identified an NCV of 10 CFR 50, Appendix B, Criterion V, because PPL did not have a procedure for qualitative MOV grease analysis and there was a general lack of documentation of grease analysis results. The inspectors determined that no compensatory actions were taken to address the impact of this performance deficiency on the performance of maintenance on SSCs during the Unit 1 refueling outage that started in April 2012. Over sixty grease analyses were performed during the outage. The inspectors identified this issue as a more-than-minor performance deficiency that is fully described in section 4OA2.1.c of this report.
2. Corrective action revisions: PPL procedure NDAP-QA-0702, section 8.17.2, required that actions taken to complete a CR corrective action should not deviate from the originally requested action. However, if deviation was necessary, approval for the

change was required to be obtained from the highest level that approved the original CR in which the action appeared. The item listed below was an example where the inspectors determined that PPL did not adhere to this standard. PPL initiated CR 1605191 to address this concern.

- a. CR 1484941: Operations personnel did not enter an LCO action statement for the ESW system before a valve that connects non-seismic piping to seismic piping was opened during maintenance activities. PPL determined that the cause of the condition was the unit supervisor's lack of understanding of the maintenance work. Corrective actions generated by the CR evaluation directed the maintenance department to revise work plans and/or procedures to ensure personnel contact the control room prior to stroking valves or dampers locally. The inspectors determined that the completed action did not revise any procedure or work instructions, but assignment was closed by maintenance referring to component manipulation requirements that were already in existence at the time of the event in NDAP-QA-0302, "System Status and Equipment Control." No approval for this deviation from the assigned corrective action was given by the manager that approved the original action. The inspectors determined that this performance deficiency was not more than minor because the inspectors concluded, based on a review of NDAP-QA-0302, that site procedures contained sufficient direction for equipment status and control.
3. Corrective action timeliness: 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," requires that conditions adverse to quality be promptly identified and corrected. PPL procedure NDAP-QA-0702, section 7.5.6, defines "timely" as it relates to corrective actions as providing a reasonable due date that allows sufficient time to complete the action but before more significant consequences occur due to repeat events. For the examples described below the inspectors concluded that the implementation of the assigned corrective actions did not meet the timeliness standard established by Criterion XVI or the site's CAP procedure. PPL initiated CR 1605192 to address these concerns.
    - a. CR 1496237: The CR was initiated on November 22, 2011, to document that the 2A RHR service water pump motor made an unusual cyclic noise during pump startup that dissipated after about five minutes of operation. In response to the CR, PPL directed predictive maintenance to monitor the pump motor during the next pump start. During the next pump start on March 30, 2012, the pump exhibited similar noises during start-up, but motor vibrations taken by predictive maintenance after the pump was up and running were less than code required action levels. As a result, the predictive maintenance organization recommended that action be taken to install the equipment needed to record pump vibration data during pump startup so the pump vibration data could be recorded during startup for the next scheduled pump run. As of the end of this inspection the vibration data was yet to be collected despite the numerous pump runs that have occurred between March and July of 2012. As such the inspectors determined that the corrective actions for this issue have not been timely. The inspectors determined that this issue was not more-than-minor because, since the issue was identified the pump has continued to perform satisfactorily while in service and during in-service tests.

- b. CR 1150831: In October 2004, Susquehanna received operating experience from Columbia Generating Station that stated that under accident conditions, water and steam intrusion into Limitorque valve actuator limit switch enclosures can result in low insulation resistance at the limit switch contacts, potentially resulting in dual valve position indication in the main control room. On June 2, 2010, after completing several evaluations related to this issue, PPL issued action request (AR) 1268022 to initiate an engineering change to replace the valve position indication limit switches on the affected MOVs. As of the completion of this inspection, PPL has extended the due date for this action request five times. The station currently plans to complete this modification in 2014 on Unit 1 and 2015 on Unit 2. The inspectors concluded that PPL has not completed timely actions to correct the identified condition adverse to quality. The inspectors determined that this issue was not more than minor because although it has the potential to affect the position indication for the valves, the condition alone will not prevent them from operating as required during an event to fulfill the intended safety function. Additionally, if the valve exhibits dual position indication during an event, operators are trained to verify alternate indications.
- c. Findings
- (1) Inadequate compensatory actions for inadequate MOV grease assessment procedure

Introduction. The inspectors identified a Green NCV of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Actions," because PPL did not take appropriate action to promptly correct an identified condition adverse to quality associated with the PPL's MOV lubrication program. PPL did not adhere to the corrective action timeliness standards specified in its corrective action process procedure NDAP-QA-0702, "Action Request and Condition Report Process," Revision 36. Section 7.56.1 states, in part, that compensatory action will be provided if permanent action will not be performed in a timely fashion. Specifically, while permanent revisions to the program were being evaluated, PPL did not take compensatory actions to address MOV grease analysis procedure and engineer qualification program deficiencies before sixty MOV grease analyses were performed in refueling outage 15. PPL entered this performance deficiency into their CAP as CR 1562326.

Description. NRC GL 89-10 requested that nuclear power plant licensees ensure the capability of MOVs in safety-related systems to perform their intended functions by reviewing MOV design bases, verifying MOV switch settings initially and periodically, testing MOVs under design-basis conditions where practicable, improving evaluations of MOV failures and necessary corrective actions, and trending MOV problems. The intent of PPL's GL 89-10 MOV maintenance and testing program is to maintain the plant's safety-related MOVs in a condition that ensures they continue to be capable of performing their safety functions within the current licensing bases of the facility. This in turn supports the function of the plant's emergency core cooling and containment systems that are intended to prevent core damage and radioactivity releases that endanger the health and safety of the public.

On March 16, 2012, and March 24, 2012, in response to NRC inspector questions, PPL issued action requests (ARs) 1544737 and 1545581, that documented issues related to their MOV lubrication program. AR 1544737 documented a concern that there was no



PPL procedure that addressed the evaluation of quality-related MOV grease samples or determination of resultant actions based on the evaluation. This AR also noted that although required by the QA program, PPL did not complete development of a qualification card for MOV grease analysis performed at the SSES. AR 1545581 documented concerns related to stem lubrication issues and whether or not valves had to be stroked following stem lubrication. PPL eventually closed both of these ARs to AR 1562326, initiated on April 24, 2012, in response to NRC NCV 05000387; 388/2012002-01 (ML12123A026)<sup>1</sup>, which captured all of the MOV program performance deficiencies. Inspectors reviewed all of these documents and noted that corrective actions related to developing a formal MOV lubrication program would not be initiated or implemented until PPL completed the ACE for these issues.

Per NDAP-QA-0702, Section 8.6, ACEs are to be completed within 30 days, and RCAs are to be completed within 45 days of MRC approval of CR classification. The MRC did not approve the classification of CR 1562326 until May 31, 2012, over a month after initiation. Since its initiation on April 24, 2012, PPL has extended the due date for this CR three times, and as of the completion of this inspection, still had not completed the cause evaluation or taken any corrective actions to address the procedure or qualification program deficiencies.

Per NDAP-QA-0702, Section 8.8.14, "Developing Corrective and Associated Actions," all actions generated will be specific, measurable, accountable, reliable, timely, effective, and reviewed (SMARTER criteria). Per Section 7.56.1, "Guidelines for SMARTER Criteria," PPL was to provide compensatory actions if permanent action would not be performed in a timely fashion. The inspectors determined that since the Unit 1 refueling outage 15 started on March 31, 2012, and the scope of the outage included grease sampling for approximately 60 MOVs, many of which were inaccessible during normal power operations, compensatory actions were required to meet the timeliness standard established in NDAP-QA-0702. Based on discussions with the MOV engineer and the program engineering manager the inspectors determined that no actions were taken after the issue was identified and prior to the completion of the Unit 1 outage to ensure that the reliability of safety-related equipment would not be affected by the inadequate grease analysis standards. As of July 27, 2012, PPL had grease samples from the Unit 1 refueling outage that still required official analysis to determine the need for actuator overhaul.

The inspectors reviewed the work order documentation for the grease samples completed during refueling outage 15, discussed the results of the maintenance activity with the MOV engineer and the program engineering manager, and looked at a small number of the grease samples from refueling outage 15 that PPL retained following the outage. Based on the review of all the work order documentation completed during refueling outage 15, and discussions with PPL Program Engineering, the inspectors did not identify any additional MOVs in need of overhaul other than those already scheduled by the MOV engineer.

During the documentation reviews the inspectors did, however, identify one valve where the maintenance technician, who performed the grease sampling, noted that the grease in the actuator for the valve, HV14182B (feedwater inlet valve from the reactor water

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<sup>1</sup>Designation in parenthesis refers to an ADAMS accession number. Documents referenced in this letter are publicly available using the accession number in ADAMS.

cleanup system), was “hard as a rock,” which appeared to contradict the MOV engineer’s documented assessment of the valve’s grease condition. Based on the sample drawn by the technician, and using a non-proceduralized grease evaluation method, engineering determined that the grease was “firm-sticky/firm-dry,” and scheduled an overhaul. Procedure MT-GM-050, “Limitorque Type SMB 000 – 4 and Type SB-3 Operator Maintenance,” states, “If abnormal consistency or impurities are found, then initiate an AR/CR to document findings.” Maintenance did not generate a CR upon discovery of this condition. Engineering did not generate a CR because they did not consider “firm-sticky/firm-dry” to be abnormal, but rather “indicative of the actuator requiring an overhaul.” Additionally, based on how the samples were delivered from maintenance to engineering, no interaction occurred between the two groups and thus, no action was taken by engineering to reconcile the “hard as a rock” observation made by the maintenance technician. Following inspector questions, PPL documented an evaluation of the condition and concluded that based on the performance history of the valve, the “gearbox grease in its present condition will not limit the design capabilities of HV14182B.” This valve is currently scheduled to be overhauled in 2014. PPL reviewed all of the MOV grease samples taken during the outage to ensure there were not any other discrepancies between technician observations of grease conditions and engineering’s determination of grease condition. No additional examples of this observation were identified. PPL initiated CR 1601915 to address this issue.

Analysis. The inspectors determined that not taking compensatory actions to address MOV grease analysis procedure and engineer qualification program deficiencies before sixty MOV grease analyses were performed in refueling outage 15 was a performance deficiency within PPL’s ability to foresee and correct. The inspectors determined that the performance deficiency was more than minor because it was associated with the equipment performance attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, failure to implement compensatory actions to analyze grease samples in MOVs affects the reliability of these valves. The MOV lubrication program is an integral part of PPL’s GL 89-10 program. PPL uses the results of the MOV grease analysis to determine the need for a valve actuator overhaul. The inspectors screened this issue to Green via Inspection Manual Chapter 0609, Attachment 4 and Appendix A, because the finding does not represent a loss of system and/or function, does not represent an actual loss of function of at least a single train for greater than its technical specification allowed outage time or two separate safety systems out-of-service for greater than its technical specification allowed outage time, and does not represent an actual loss of function of one or more non-technical specification trains of equipment designated as high safety-significant in accordance with the licensee’s Maintenance Rule program for greater than 24 hrs.

The inspectors determined that this issue had a cross-cutting aspect in the area of human performance, work practices, because PPL personnel did not follow PPL corrective action program procedure requirements [H.4(b)]. Specifically, in accordance with PPL procedure NDAP-QA-0702, Section 8.8.14, given the delays in completing the cause evaluation for identified grease evaluation procedure and qualification deficiencies, PPL did not take timely compensatory actions to address the lack of formalized guidance for MOV grease sampling before completing 60 MOV grease analyses during refueling outage 15.

Enforcement. 10 CFR 50, Appendix B, Criterion XVI, "Corrective Actions," states that measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and non-conformances are promptly identified and corrected. PPL procedure NDAP-QA-0702, Section 8.8.14, "Developing Corrective and Associated Actions," requires that all corrective actions generated be specific, measurable, accountable, reliable, timely, effective, and reviewed (SMARTER criteria). Per Section 7.56.1, "Guidelines for SMARTER Criteria," the station is to provide compensatory actions if permanent action will not be performed in a timely fashion. Contrary to the above, between March 24, 2012 and June 30, 2012, PPL did not provide compensatory actions when permanent actions could not be completed in a timely manner. Specifically, PPL did not implement compensatory actions to address the lack of formalized guidance for MOV grease sampling and analysis while the station completed their review of the issue, before completing 60 MOV grease samples in refueling outage 15. However, because this violation was of very low safety significance, and PPL has entered this issue into their corrective action program as CR 1562326, the NRC is treating this as an NCV in accordance with Section 2.3.2 of the NRC Enforcement Policy. **(05000387, 388/2012009-01; Inadequate Compensatory Actions for Inadequate MOV Grease Assessment Procedure)**

- (2) 1D670 battery failed the weekly surveillance by not meeting specific gravity requirements for one pilot cell.

Introduction. The inspectors identified a Green NCV of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Actions," because PPL did not identify and correct the inadequate weekly testing procedure that resulted in the inoperability of the safety-related 24-volt battery 1D670 that occurred on March 1, 2012. Specifically, because the engineer assigned to perform the ACE for the March 1, 2012, failure did not interview the technicians who performed the last weekly surveillance on the battery before the failure, PPL did not identify that the weekly testing procedure did not provide adequate instructions for restoring low battery electrolyte level. PPL entered this performance deficiency into their CAP as CR 1602339.

Description. Battery Bank 1D670 is a safety-related 24-volt direct current (Vdc) battery that functions to supply power to the source and intermediate range nuclear instruments and their associated trip units. Its functional requirements are described in Technical Requirements Manual (TRM) technical requirements for operation (TRO) 3.8.4. Additionally, weekly and quarterly surveillance requirements are specified to ensure the continued operability of the battery. These surveillances use limits specified in TRM Table 3.8.4-1 for electrolyte level, float voltage, and specific gravity that must be met to ensure operability.

On February 22, 2012, while operating in Mode 1 and performing SM-175-001, "Weekly 7 Day Electrical Parameter Checks of +/- 24-Volt Station Batteries," electricians noted that specific gravity and float voltage were in the required band, but that electrolyte level for 1D670 was low out of specification. To address the low electrolyte level technicians added water to restore level to the required band. After water addition, in accordance with procedure, 1D670 was placed on an equalizing charge. On February 29, 2012, during the subsequent weekly battery checks, the pilot cell (cell no. 3) specific gravity was found at 1.198, which was below the minimum specification per TRO 3.8.4 of 1.200. PPL initiated CR 1537463 to document the degraded condition and completed required

testing in accordance with the TRO. The quarterly battery surveillance, SM-157-002, "Quarterly 92 Day Electrical Parameter Checks of +/- 24-Volt Station Batteries" was performed on March 1, 2012, to verify the battery operability. The results of the test determined the battery bank did not meet the Category C criteria defined in TRM 3.8.4, Table 3.8.4-1 for all connected cells and operators declared it inoperable. When the battery was declared inoperable, the TRM required supported equipment to be declared inoperable, however, the supported equipment (i.e., source and intermediate range nuclear instrumentation) was not required to be operable in Mode 1; therefore no additional action was necessary. In operating modes other than Mode 1, during which the weekly procedure SM-175-001 is performed, the reliability of safety-related equipment could be affected.

The inspectors reviewed the ACE (CR 1537463) assigned to address the inoperability of 1D670. In the ACE PPL identified two apparent causes:

- 1) Unexpected failure during maintenance or testing; and
- 2) Cell no. 3 specific gravity remained below the expected range even after extensive recharge, followed by agitation.

The inspectors identified, during interviews of technicians, that the failure was not unexpected. Specifically, when cell no. 3 was watered the previous week, water level was raised from just below the low mark to the high mark. Initial specific gravity was 1.207 and ~1/2 inch of water was added. The vendor manual, IOM 269, states that 1/8" of level corresponds to ~.003 specific gravity units. Therefore, the expected final specific gravity would likely have been below the TRM limit of 1.200. Interviews with senior technicians and engineering personnel determined that the normal practice was to add water to only the mid-range, since extensive water addition typically results in a large change in specific gravity. The technicians performing the watering on February 22 were not aware of the normal practice to only fill the cell to the middle of the range because this guidance was not included in the work instructions for the weekly surveillance procedure. Inspectors also reviewed SM-175-002, "Quarterly (92 Day) Electrical Parameter Check of +/- 24-Volt Station Batteries" and determined that guidance was included in this procedure to implement the normal practice. Specifically, the instructions state "if addition of distilled or demineralized water is necessary, bring electrolyte level to the approximate center between the high and low level lines."

In discussions with the ACE evaluator, it was identified that the technicians that performed the water addition were not available for interview during the investigation. Instead, other qualified technicians were interviewed who described the common practice of adding water to the middle of the range. Based on this information, the evaluator did not identify that the water addition was in excess of the common practice and that the inoperability was not unexpected. NDAP-00-0752, "Cause Analysis" Attachment L, "Apparent Cause Evaluation Process," lists typical sources of information as written statements by witnesses of the event and personnel interviews. Additionally, Attachment I, "Guidelines for Interviewing," states that "personnel directly involved in the event" should be interviewed. Inspectors determined that had the evaluator interviewed the personnel that watered the battery on February 22, 2012, the condition adverse to quality associated with the weekly battery surveillance procedure would likely have been identified and corrected.

The inspectors also identified other procedural deviations from vendor recommendations in the surveillance procedures. The inspectors determined that a more thorough cause evaluation by PPL would also likely have identified these deviations. For example, PPL does not rotate the pilot cell as recommended, which inspectors determined would lead to continued degradation of one cell over time. The vendor manual recommends that the pilot cell be rotated after 10 specific gravity readings. In another example, as a result of the 1D670 inoperability, additional work instructions were written to allow mixing a trouble cell with air if specific gravity was determined to not meet TRM requirements prior to performing the quarterly surveillance. This action could potentially produce non-conservative results since the surveillance data would compare average specific gravity (using un-mixed and potentially stratified cells) to the specific gravity from the bubbled trouble cell. These issues were entered into PPL's CAP as CRs 1602348 and 1602339.

The inspectors determined, that PPL did not appropriately evaluate the inoperability of 1D670 in accordance with NDAP-00-0752, "Cause Analysis," and as a result did not identify and correct a condition adverse to quality, the inadequate maintenance procedure. Specifically, the inspectors identified that investigation of the event did not adhere to the evaluation standard established by site procedures in that the personnel directly involved in the battery watering were not interviewed. As a result, the data used as the basis for the identified apparent causes and corrective actions was not correct.

Analysis. The engineer assigned to perform the apparent cause evaluation for the safety-related 1D670 24-volt battery inoperability did not comply with the standards established in PPL procedure NDAP-00-0752 for performing ACEs. As a result, PPL did not identify and correct a condition adverse to quality associated with weekly battery testing procedures. The inspectors determined that this was a performance deficiency that within PPL's ability to foresee and correct. Specifically, the engineer assigned to perform the ACE did not interview the personnel who performed the last weekly surveillance on the battery before it failed on March 1, 2012. If these technicians had been interviewed, the evaluation would likely have identified that they had not followed the typical practice for watering the battery, because this practice was not defined in the surveillance procedure. The inspectors determined that this performance deficiency was more than minor because it affected the equipment performance attribute of the Mitigating Systems cornerstone and its objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, as evidenced by the events on March 1, 2012, the use of the inadequate procedure resulted in the inoperability of the 1D670 battery that supports operation of the safety-related source range and intermediate range instrumentation. The inspectors determined that the inadequate procedure was a condition adverse to quality. The inspectors screened this issue to Green via Inspection Manual Chapter 0609, Attachment 4 and Appendix A, because the finding does not represent a loss of system and/or function, does not represent an actual loss of function of at least a single train for greater than its technical specification allowed outage time or two separate safety systems out-of-service for greater than its technical specification allowed outage time, and does not represent an actual loss of function of one or more non-technical specification trains of equipment designated as high safety-significant in accordance with the licensee's Maintenance Rule program for greater than 24 hrs.

The inspectors determined that this finding had a cross-cutting aspect in the area of problem identification and resolution, corrective action program, 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. [(P.1.(c))] Specifically, PPL did not appropriately evaluate the unexpected inoperability of a safety-related battery such that the condition adverse to quality, the inadequate maintenance procedure that likely caused the inoperability, was identified and corrected.

**Enforcement.** 10 CFR 50, Appendix B, Criterion XVI, "Corrective Actions," states that measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and non-conformances are promptly identified and corrected. Contrary to this between February 22, 2012, and July 27, 2012, PPL's CAP did not assure that a condition adverse to quality associated with the safety-related 24-volt battery weekly maintenance procedures was promptly identified and corrected. Specifically, PPL did not identify and correct the inadequate weekly testing procedure that resulted in the inoperability of the safety-related 24-volt battery 1D670. Because this violation is of very low safety significance (Green) and PPL entered this into their CAP as CR 1602339, this violation is being treated as an NCV consistent with Section 2.3.2 of the NRC Enforcement Policy. **(NCV 05000387, 388/2012009-02: Failure to Identify and Correct a Condition Adverse to Quality Associated with a Safety-Related Battery Maintenance Procedure)**

(3) Failure to identify a condition adverse to quality associated with reactor recirculation valve exercising surveillance procedure

**Introduction.** The inspectors identified a Green NCV of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Actions," because PPL personnel did not identify an inadequate recirculation valve surveillance procedure when they completed the extent of condition review that was performed as part of the root cause analysis for the RCIC ramp generator signal converter (RGSC) failure on June 29, 2011. Specifically, PPL did not adhere to the extent of condition determination standards established in PPL procedure NDAP-00-0752, "Cause Analysis." The actions taken to address the extent of condition were not of a depth sufficient to identify the same deficiency that existed in the RCIC flow surveillance procedure also existed in other applicable surveillance procedures. As a result, the inadequate recirculation valve surveillance procedure was not identified. PPL entered this performance deficiency into their CAP as CR 1596633.

**Description.** Technical Specification (TS) surveillance testing is performed to verify that operability and performance characteristics of SSCs have not degraded below specific acceptance criteria during a specified period. Surveillance requirements (SRs) for systems that are relied upon to ensure that the plant meets its design bases are defined in the plants NRC-approved license and the plant's technical specifications document these requirements. TS 5.4.1, "Procedures," requires that written procedures be established, implemented and maintained as recommended in Regulatory Guide 1.33, Revision 2, Appendix A, February 1978. Regulatory Guide 1.33, Appendix A, states that "implementing procedures are required for each surveillance test...listed in the technical specifications." If those procedures do not meet the intent of the license requirements, the availability and reliability of the systems relied upon to maintain plant safety may be called into question.

On June 29, 2011, during startup from a Unit 2 refueling outage, operations conducted SO-250-002, "Quarterly RCIC Flow Verification," to verify the operability of the RCIC system. During conduct of the test, the RCIC turbine tripped on overspeed and the

system was declared inoperable. Subsequent troubleshooting and evaluation determined that the RGSC failed as a result of maintenance conducted during the outage and the RCIC system was therefore inoperable during power ascension. Performance deficiencies associated with this event were dispositioned as NCV 0500388/2011005-04 (ML12045A383)<sup>1</sup>.

PPL identified this condition as a significant condition adverse to quality and performed an RCA (CR 1450534) to evaluate the extent of condition, determine the root and contributing causes, evaluate the extent of those causes, and specify corrective actions. The RCA team was tasked with determining why the RGSC failure went unrecognized during plant startup, while the ACE completed under CR 1430270 evaluated the equipment failure. The focus of the RCA was implementation of SO-250-005, "24 Month RCIC Flow Verification," that was conducted at a pressure less than 150 psig to satisfy TS SRs 3.5.3.4 and 3.5.3.5, as well as verify RCIC operability prior to the TS LCO 3.5.3 being applicable. In the RCA, PPL determined that SO-250-005 did not "test all aspects of the system that are relied upon for operability, specifically the RGSC."

NDAP-00-0752, "Cause Analysis," states that the "extent of condition is the total population of items or issues that have or could have the same undesired condition as the item or issue that was identified in the original CR." RCA 1450534 appropriately bounded the extent of condition to "those SSCs that are required to be operable to support TS [Limiting Condition for Operations] LCOs and perform a function of shutting down the reactor, maintaining cold shutdown, removing residual heat, controlling release of radioactive material and mitigating the consequences of an accident." Further, RCA 1450534 stated that actions were necessary to "identify which, if any of these SSCs are not adequately tested prior to being relied upon to satisfy an LCO." CR actions 1518029 and 1518033 were generated to "develop a matrix...using the TS-SR cross-reference matrix and systematically review assigned systems and determine if current testing is adequate to ensure compliance with TS requirements."

The inspectors reviewed the completed CR actions and determined that the actions actually taken were not adequate, because they would not have identified a condition similar to the one that resulted in the undetected inoperable RGSC. Specifically, the action completed reviewed each surveillance procedure and performed an in-depth comparison between the acceptance criteria of the procedure and the corresponding TS SR. Additionally, a review of the surveillance procedure implementing instructions was performed to ensure the steps were consistent with the SR. Though inspectors recognized that the work performed was reasonable to ensure that each SR had a corresponding implementing procedure, the inspectors determined that the action by itself was inadequate to address the extent of condition as specified in the RCA. In particular, the method used to complete the CR actions would likely not have identified the deficient RCIC surveillance procedures. As stated in the RCA, the deficient condition was due to implementing instructions not aligning the system in a method that ensured all components were adequately tested to verify operability despite the acceptance criteria in the implementing procedure being consistent with those specified in the SR. After discussing the concern with PPL personnel responsible with implementing the CR action, they agreed that it was unlikely that the same condition would have been identified in their review.

The inspectors reviewed a small sample of surveillance procedures and identified a procedure that did not fully implement the intent of the TS SR, SO-164-001, "Plant

Startup Reactor Recirculation Valve Exercising.” During the review of SO-164-001, which satisfies TS SR 3.5.1.6, the inspectors determined that the implementing instructions did not meet the intent of the applicable SR. Specifically, SR 3.5.1.6 states “verify each recirculation pump discharge valve and bypass valve cycles through one complete cycle of full travel or is de-energized in the closed position.” The implementing procedure, as written, allows plant operators to “N/A” the opening stroke of the valves and thus maintains them in the closed, but energized position. Inspectors determined that this did not ensure the valve was cycled (open-shut-open) in accordance with the SR. PPL generated CR 1596633 to evaluate the concern. The inspectors determined that the identified inadequate testing procedure was a condition adverse to quality that was required to be corrected. During review of the issue, PPL determined that the procedure was incorrect, but verified via logs that the valve had been opened as part of the reactor recirculation pump start. Thus, the issue did not constitute a missed surveillance. Additionally, it was determined that this procedure had been reviewed during completion of the CR actions that addressed the extent of condition from RCA 1450534; however, since the action taken was not of a depth sufficient to identify a similar condition, the deficiency was not identified.

Analysis. As a result of not performing an adequate evaluation of the extent of condition for a significant condition adverse to quality associated with RCIC surveillance procedures, PPL did not identify a similarly inadequate surveillance procedure for a different plant system. The inspectors determined that this was a performance deficiency within PPL’s ability to foresee and correct. The inspectors determined that this performance deficiency was more than minor because it affected the procedural quality 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, PPL did not complete an evaluation of the extent of condition for the identified inadequate RCIC surveillance procedure to a depth that would have identified the same undesired condition in another procedure. As a result, an independent review by inspectors identified a similar condition associated with the reactor recirculation valve exercising procedure. The inspectors determined that this procedure problem was a condition adverse to quality. The inspectors screened this issue to Green via Inspection Manual Chapter 0609, Attachment 4 and Appendix A, because the finding does not represent a loss of system and/or function, does not represent an actual loss of function of at least a single train for greater than its technical specification allowed outage time or two separate safety systems out-of-service for greater than its technical specification allowed outage time, and does not represent an actual loss of function of one or more non-technical specification trains of equipment designated as high safety-significant in accordance with the licensee’s Maintenance Rule program for greater than 24 hrs.

The inspectors determined that this finding had a cross-cutting aspect in the area of problem identification and resolution, corrective action program, because PPL did not take appropriate corrective actions to address safety issues and adverse trends in a timely manner. [(P.1(d))] Specifically, though the RCA appropriately bounded and defined the necessary actions to address the extent of condition, the implementation of those actions was insufficient to ensure no similar conditions existed and as a result did not identify an additional condition adverse to quality.

Enforcement. 10 CFR 50, Appendix B, Criterion XVI, “Corrective Actions,” requires that measures shall be established to assure that conditions adverse to quality, such as



failures, malfunctions, deficiencies, deviations, defective material and equipment, and non-conformances are promptly identified and corrected. Contrary to this, between June 29, 2011, and July 27, 2012, PPL's CAP did not assure that a condition adverse to quality associated with SO-164-001, "Plant Startup Reactor Recirculation Valve Exercising" was promptly identified and corrected. Specifically, PPL did not identify that the recirculation valve surveillance procedure, as written, did not test all aspects of the system response credited in the design basis described in the updated final safety analysis report when it completed the extent of condition review that was performed as part of the RCA for the RCIC RGSC failure on June 29, 2011. Because this violation is of very low safety significance (Green) and PPL entered this into their CAP as CR 1596633, this violation is being treated as an NCV consistent with Section 2.3.2 of the NRC Enforcement Policy. **(NCV 05000387, 388/2012009-03: Failure to Identify and Correct a Condition Adverse to Quality Associated with Reactor Recirculation Valve Exercising Surveillance Procedure)**

.2 Assessment of the Use of Operating Experience

a. Inspection Scope

The inspectors reviewed a sample of CRs associated with review of industry operating experience to verify that PPL appropriately evaluated the operating experience information for applicability to SSES and had taken appropriate actions, when warranted. The inspectors also reviewed evaluations of operating experience documents associated with a sample of NRC generic communications to ensure that PPL adequately considered the underlying problems associated with the issues for resolution via their corrective action program.

b. Assessment

The inspectors determined that for the operating experience reviewed, with one exception, PPL appropriately considered industry operating experience for applicability, and used the information for corrective and preventive actions to identify and prevent similar issues when appropriate. The inspectors concluded that, in general, PPL operating experience was appropriately applied and lessons learned were communicated and incorporated into plant operations and procedures when applicable. The inspectors also observed that industry operating experience was routinely discussed and considered during the conduct of plan-of-the-day meetings and pre-job briefs. The inspectors identified one example of untimely implementation of corrective actions generated as a result of an evaluation of operating experience. This issue is described in section 4OA2.1.b(3)3.b of this report.

c. Findings

No findings were identified.

.3 Assessment of Self-Assessments and Audits

a. Inspection Scope

The inspectors reviewed a sample of audits, including the most recent audit of the corrective action program, departmental self-assessments, and assessments performed

by independent organizations. Inspectors performed these reviews to determine if PPL entered problems identified through these assessments into the corrective action program, when appropriate, and whether PPL initiated corrective actions to address identified deficiencies. The inspectors evaluated the effectiveness of the audits and assessments by comparing audit and assessment results against self-revealing and NRC-identified observations made during the inspection.

b. Assessment

The inspectors concluded that self-assessments, audits, and other internal PPL assessments were generally critical, thorough, and effective in identifying issues. The inspectors observed that PPL personnel knowledgeable in the subject completed these audits and self-assessments in a methodical manner. PPL completed these audits and self-assessments to a sufficient depth to identify issues which were then entered into the corrective action program for evaluation. In general, the station implemented corrective actions associated with the identified issues commensurate with their safety significance.

c. Findings

No findings were identified.

.4 Assessment of Safety Conscious Work Environment

a. Inspection Scope

The inspectors reviewed the SCWE at SSES through conduct of the following activities.

- During interviews with staff personnel, the inspectors questioned individuals regarding: willingness to raise safety concerns, knowledge of the avenues available for raising safety concerns, the effectiveness of actions taken by management to foster a SCWE at the site, and knowledge of other individuals who may have experienced a negative reaction for raising a safety concern.
- The inspectors reviewed implementation of the site employee concerns program (ECP). The inspectors reviewed the site procedure for conducting ECP investigations and reviewed a sample of ECP files to assess the program's effectiveness at addressing potential safety issues.
- The inspectors reviewed the results of the contractor-performed March 2011 Nuclear Safety Culture Assessment. The review included a discussion of the CAs identified by PPL to address issues uncovered during the assessments.

b. Assessment

Based on interviews and reviews of the CAP and the ECP, the inspectors determined that, in general, site personnel were willing to identify and raise safety issues. All persons interviewed demonstrated an adequate knowledge of the avenues available for raising safety concerns including CAP and ECP

The inspectors determined that the results of the nuclear safety culture survey conducted in March 2011 provided PPL insights into the safety culture of the SSES workforce.

c. Findings

No findings were identified.

4OA6 Meetings, Including Exit

On July 27, 2012, the inspectors presented the inspection results to Mr. T. Rausch, Senior Vice President and Chief Nuclear Officer, and other members of the SSES staff. The inspectors confirmed with PPL that any proprietary information that was provided to the inspectors during the inspection was returned to PPL and was not to be removed from the site.

On September 10, 2012, the inspectors conducted a telephonic exit to communicate adjustments to the inspection results that were made during the management review process. The changes were presented to Mr. T. Rausch, Senior Vice President and Chief Nuclear Officer, and other members of the SSES staff.

ATTACHMENT: SUPPLEMENTARY INFORMATION

## SUPPLEMENTARY INFORMATION

### KEY POINTS OF CONTACT

#### Licensee Personnel

T. Rausch, Senior Vice President and Chief Nuclear Officer  
 J. Helsel, Plant Manager  
 K. Cimorelli, Nuclear GM – Programs  
 D. Crispell, Employee Concerns Representative  
 B. Drysdale, General Manager Maintenance  
 S. Davis, Manager – Nuclear Emergency Planning  
 R. Franssen, General Manager – Nuclear Engineering  
 J. Grisewood, Manager – Performance Improvement  
 R. Hoffert, Employee Concerns Representative  
 T. Iliadis, General Manager – Operations  
 J. Tripoli, Manager – Regulatory Affairs  
 L. West, Supervisor, Corrective Action and Assessment

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

#### Opened and Closed

05000387, 388/2012009-01	NCV	Inadequate Compensatory Actions for Inadequate MOV Grease Analysis Procedures (4OA2.1.c(1))
05000387, 388/2012009-02	NCV	Failure to Identify and Correct a CAQ Associated With A Safety-Related Battery Maintenance Procedure (4OA2.1.c(2))
05000387, 388/2012009-03	NCV	Failure to Identify and Correct a CAQ Associated with Reactor Recirculation Valve Exercising Surveillance Procedure (4OA2.1.c(3))

## LIST OF DOCUMENTS REVIEWED

### **Section 4OA2: Problem Identification and Resolution**

#### Procedures

AR-258-001, RHR DIV II BIS Display 2C601, Revision 5  
 EP-AD-019, Nuclear Emergency Planning Offsite Program, Revision 7  
 GO-200-009, Single Recirculation Loop Operation, Revision 25  
 GO-200-012, Power Maneuvers, Revision 40  
 HP-HI-080, Health Physics Activities at the Main RCA Control Points, Revision 21  
 MT-GM-050, Limitorque Type SMB 000-4 and Type SB-3 Operator Maintenance, Revision 23  
 NASI-00-401, Internal Audit Performance Guidance, Revision 6  
 NASP-QA-401, Internal Audits, Revision 11

NDAP-00-0745, Self-Assessment and Benchmarking, Revision 14  
 NDAP-00-0780, Management Review Committee, Revision 2  
 NDAP-QA-0017, Motor-Operated Valve Program, Revision 12  
 NDAP-QA-0300, Conduct of Operations, Revision 31  
 NDAP-QA-0300, Conduct of Operations, Revision 31  
 NDAP-QA-0630, Conduct of Chemistry, Revision 8  
 NDAP-QA-0702, Action Request and Condition Report Process, Revision 36  
 NDAP-QA-0702, Action Request and Condition Report Process, Revision 36  
 NDAP-QA-0703, Operability Assessments and Requests for Enforcement Discretion,  
 Revision 20  
 NDAP-QA-0725, Operating Experience Review Program, Revision 16  
 NDAP-QA-0725, Operating Experience Review Program, Revision 7  
 NEI 06-11, Managing Personnel Fatigue at Nuclear Power Reactor Sites, Revision 1  
 ON-142-001, Circulating Water System Leak, Revision 25  
 ON-242-001, Circulating Water System Leak, Revision 24  
 OP-169-004, Liquid Radwaste Collection, Revision 23  
 OP-249-005, RHR Suppression Pool Cooling, Revision 28  
 OP-264-001, Reactor Recirculation System, Revision 58  
 OP-264-002, Reactor Recirculation System HMI Operations, Revision 1  
 OP-269-004, Liquid Radwaste Collection, Revision 17  
 SI-SSM-021, Nuclear Security Standards and Expectations, Revision 10  
 SM-175-002, Quarterly 92 Day Electrical Parameter Checks of +/- 24 Volt Station Batteries,  
 Revision 15  
 SM-175-001, Weekly 7 Day Electrical Parameter Checks of +/- 24 Volt Station Batteries,  
 Revision 14  
 NDAP-QA-0412, Leakage Rate Testing Program, Revision 14  
 NDAP-QA-0423, Station Pump and Valve Testing Program, Revision 23  
 SM-149-001, 24 Month Vacuum Relief Breaker Valve Position Switch Channel Calibration,  
 Revision 15  
 SO-149-B06, Residual Heat Removal RHR Comprehensive Flow Verification Loop B,  
 Revision 10  
 SM-249-002, 24 Month Calibration Check of RHR Pump 2p202d Offsite Power Timer Relays,  
 Revision 7  
 SO-164-001, Plant Startup Reactor Recirculation Valve Exercising, Revision 17  
 GO-100-002, Plant Startup and Heatup, Revision 76  
 NSEP-AD-0002, Station Health Reporting Process, Revision 6  
 NDAP-QA-0524, Equipment Reliability and Station Health Process, Revision 14

Work Orders

1520774	612503	1458540	1251582	1322733	1288689	1080465
1365655	1472411	1316783	1251647	1448161	765893	
1472411	1388951	984794	1366732	1503948	1317763	

Completed Surveillances

SO-0-054-055, RHRSW Flow Verification Test, performed on 3/11/2011  
 SO-030-B03, ESW Pump Inservice Test, performed on 9/2/2010  
 SI-250-301, Quarterly Calibration – RCIC Steam Supply Pressure Channels, performed on 05/04/2011  
 SI-252-301, Quarterly Calibration – HPCI Steam Supply Pressure Channels, performed on 02/24/2011  
 SI-252-301, Quarterly Calibration – HPCI Steam Supply Pressure Channels, performed on 05/28/2011  
 SI-252-301, Quarterly Calibration – HPCI Steam Supply Pressure Channels, performed on 08/30/2011  
 SI-252-301, Quarterly Calibration – HPCI Steam Supply Pressure Channels, performed on 11/29/2011  
 SI-252-301, Quarterly Calibration – HPCI Steam Supply Pressure Channels, performed on 03/01/2012  
 SI-252-301, Quarterly Calibration – HPCI Steam Supply Pressure Channels, performed on 06/05/2012  
 SE-149-004, 24 Month RHR System Logic Functional Test, performed on 3/37/2004  
 SE-149-001, 24 Month RHR System Logic Functional Test, performed on 5/09/2012  
 SE-149-002, 24 Month RHR System Logic Functional Test, performed on 5/09/2012  
 SE-149-007, 24 Month RHR System Logic Functional Test, performed on 2/09/2012  
 SM-149-001, 24 Month RHR pump 1P202C Offsite Power Timer Relay Testing, performed on 11/07/2011  
 SM-249-002, 24 Month RHR pump 2P202D Offsite Power Timer Relay Testing, performed on 10/26/2012

Operating Experience

NRC Information Notice 2010-11, Potential for Steam Voiding in RHR System  
 NRC Information Notice 2012-04, Impacts on Normal Plant Operations due to Leaks or Spills of Chemicals  
 OE 3390, HPCI turbine control valve assembly failure  
 GE SC 10-09, Failure of HPCI turbine overspeed reset control valve diaphragm and associated NRC Part 21  
 GE SIL 336, Surveillance testing recommendations for HPCI and RCIC  
 NRC Security Advisory SA-2011-07, Cyber Vulnerabilities  
 OE 34239, Personal ED dose alarm during diving (HP)  
 OE 30489, Potential loss of RHR safety function in Mode 4

Self Assessments and Audits

1225777, Quality Assurance Audit, Emergency Preparedness Audit  
 1344368, Quality Assurance Audit, FFD – PADS program Audit  
 1251979 & 1310083, Focused Self Assessment, 2012 Pre-PI&R Focused Self Assessment  
 1341747, Focused Self Assessment, Pre-NIEP Evaluation QA Self-Assessment

Safety Conscious Work Environment

Nuclear Safety Culture Assessment, PPL Susquehanna, March 2011, Executive Summary  
Report, 6/15/2011

NDAP-00-0109, Employee Concerns Program, Revision 15

NASI-00-800, Employee Concerns Program Conduct of Operations, Rev. 8

NDAP-00-0111, Investigation and Resolution of Alleged Discrimination for Having Engaged in  
Protected Activities, Rev. 7

Other

Unit 1, 134K-Reactor Building Chilled Water System Health Report

Programs/Components, CPE Chillers System Health Report

SSES Equipment Reliability Summary Report (6/20/12)

IOM-231, "Stationary Batteries 24 VDC & 125 VDC & 250 VDC," Revision 14

NUREG-1482, Guidelines for Inservice Testing at Nuclear Power Plants, 1995 Edition

EC-PIPE-16347, Snubber Failure Evaluations: Unit 1-17<sup>th</sup> RIO, Revision 0

System Health Report – Systems 149/249 – Residual Heat Removal

Maintenance Rule (a)(3) Assessment covering 2008-2009 time period

M&P Lab Report for failed circuit breakers dated March 9, 2006

GE SIL 496, Electrical Protection Assembly Performance, Revision 1

Condition Reports

532219	1598085*	1575433	1468821	1530290	1324149	1554715
1538286	1240345	1086853	1571988	1520709	1503909	1533999
1602348*	1248195	984794	1571290	1474224	1601933	1555442
1602339*	1251584	1251582	1091728	1474315	1331364	1534005
1557151	1367503	1251647	1588827*	1387934	1547511	1602629
1587579	1393540	1366732	1497012	1352925	1515111	1597406
1524863	1239371	1366733	1474781	1545293	1446356	1522187
1526411	1242670	1448161	1499630	900313	1538315	1556996
1557394	1244252	1503948	1450534	1293592	1537511	1440661
1554948	1247527	1288689	1599877	1314219	1529882	1440664
1549033	1248325	765893	1532219	837270	1517898	1392500
1546827	1260392	1317763	1599726	1592317	1569959	1440524
1340919	1265026	1080465	1532977	1491608	1526406	1440534
1502875	1304747	1083716	1535947	1558716	1503236	1440544
1453671	1341898	1084408	1511111	1529828	1331364	1440548
1365759	1382432	627323	1598531*	1496237	1488237	1440584
1478388	1386704	1570413	1601859*	1484941	1502841	1440635
1478716	1428590	1575809	1601899	1232956	1502763	1440641
1532624	1449694	1571200	1601953*	1274633	1539033	1581819
1342334	1471839	1044377	1601954*	1372643	1540368	1541928
1342418	1475449	725347	1262646	1300202	1564622	1413429
1529828	1480211	1571694	1293811	1596929	1506329	1472410
1453671	1484470	1574013	1229194	1334462	1538480	1472006
1485386	1527005	1571862	1255469	1597406	1541932	1375964
1480453	1533995	1571290	1224714	1597389	1539713	1369888
1532611	1542115	1571988	1413416	1549713	1602629	1348282
1487546	1563884	1468821	1557564	1547667	1532671	1308498
1532632	1554945	1091728	1552938	1333186	1538405	1300267
1488400	1559882	1468821	1552575	1516027	1533997	1297475
1554945	1568346	1570413	1534798	1295849	1533994	1296646

A-5

1291135	1476957	1229974	1401300	1527735	1589390	1260753
1270191	1279039	1268022	1401301	1528399	1591349	1260755
1265960	1564018	1273080	1401303	1538460	1591503	1261546
1247022	1440329	1273106	1414408	1544737	1591543	1194033
1246429	1488378	1273525	1414409	1545581	1593915	1185618
1246136	1533996	1282629	1458661	1552348	1600425	1271268
1129995	610888	1284020	1458663	1562326	1602167	1545293
600332	614582	1297039	1458702	1584366	1601866*	1516764
1548540	1150831	1308036	1485469	1584369	1600219*	1450138
1549431	1151011	1318476	1516793	1584993	1602577	1549115
1572465	1158710	1324858	1527004	1585002	1261580	



**LIST OF ACRONYMS**

ACE	apparent cause evaluation
ADAMS	Agency-wide Documents Access and Management System
AR	action request
CAP	corrective action program
CARB	corrective action review board
CFR	Code of Federal Regulations
CR	condition report
EAL	emergency action level
ECP	employee concerns program
ESW	emergency service water
FASA	focused area self-assessment
FMEA	failure mode and affect analysis
GL	generic letter
IMC	inspection manual chapter
LCO	limiting condition for operation
LLRT	local leak rate testing
MOV	motor-operated valve
MRC	management review committee
NCV	non-cited violation
NRC	Nuclear Regulatory Commission
PARS	publicly available records system
PI&R	problem identification and resolution
PPL	PPL Susquehanna, LLC
QA	quality assurance
RCA	root cause analysis
RCIC	reactor core isolation cooling
RGSC	ramp generator signal converter
RHR	residual heat removal
SSC	structures, systems and components
SCWE	safety conscious work environment
SDP	significance determination process
SR	surveillance requirement
SRV	safety relief valve
SSES	Susquehanna Steam and Electric Station
TS	technical specifications
TRM	technical requirements manual
TRO	technical requirement for operation
Vdc	volts direct current