

Susquehanna 2

3Q/2011 Plant Inspection Findings

Initiating Events

Mitigating Systems

Significance:  Jun 30, 2011

Identified By: NRC

Item Type: NCV NonCited Violation

Failure to Implement Risk Management Actions during Dual Unit Elevated Risk

The inspectors identified a Green NCV of 10 CFR 50.65a(4) when PPL failed to manage risk as assessed on June 1, 2011. During a period of dual unit Orange risk, PPL did not adequately implement protected equipment risk management actions (RMAs) designated in its risk assessment. During a walkdown, the inspectors identified that none of the core spray divisions or safety relief valves (SRVs) on either unit had been protected. They also identified that Unit 1 Division II low pressure coolant system (LPCI) had not been protected and Unit 2 Division I LPCI was only partially protected. Finally, the inspectors identified that some Unit 1 Division II residual heat removal (RHR) shutdown cooling equipment listed as protected in the Station Leadership Report had not been protected. This issue was documented in PPL's CAP as Condition Report (CR) 1417135.

The inspectors determined that the performance deficiency was more than minor due to its similarity to examples 3.j and 3.k of IMC 0612 Appendix E, "Examples of Minor Issues." The issue also affected the Mitigating Systems cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences and its human performance attribute. Specifically, the issue was programmatic based on the extent of protected equipment deficiencies, five consecutive quarters of 10 CFR 50.65a(4) violations, the timing of the violation during dual unit Orange risk, and that if left uncorrected could lead to more significant issues such as pre-event human error that impacts mitigating equipment availability during a subsequent initiating event with already elevated plant risk. Since the exposure time of the deficiency was limited to four hours and with due consideration of the other RMAs taken by PPL, this finding is determined to be of very low safety significance (Green). This finding was determined to have a cross-cutting aspect in Problem Identification and Resolution, (PI&R) CAP. Specifically, although PPL had recognized the negative trend with execution of a root cause analysis (RCA), interim corrective actions for the adverse trend of 10 CFR 50.65 a(4) violations proved inadequate to prevent another violation of this regulation for the fifth consecutive quarter. (P.1 (d)) (1R13)

Inspection Report# : [2011003](#) (*pdf*)

Significance:  Jun 24, 2011

Identified By: NRC

Item Type: NCV NonCited Violation

Failure to Provide Redundant Fire Water Pumps

The team identified a non-cited violation of Susquehanna Unit 1 Operating License Condition 2.C.(6), and Unit 2 Operating License Condition 2.C.(3) for the failure to implement all provisions of the approved Fire Protection Program. Specifically, PPL had not adequately implemented a fire water supply system with two redundant 100% capacity fire water pumps and three sources of supply water. PPL's hydraulic analysis determined that after 20 minutes of single pump operation, two fire water pumps would need to operate to supply the design rated flow for several sprinkler systems required to be operable by the Susquehanna Steam Electric Station (SSES) Technical Requirements Manual. Subsequently, seven sprinkler systems were determined to be degraded because design flow rates could not be achieved and maintained by a single pump. PPL performed an operability evaluation that determined the affected sprinkler systems were capable of performing their intended functions at lower flow rates and for a shorter duration than originally specified by plant design. In addition, the Unit 2 cooling tower basin was

determined to be inoperable as a sole source of supply water for the fire water system. An Operations Directive was issued to not align the fire water system to the Unit 2 cooling tower.

The team determined the failure to verify the adequacy of design to satisfy licensing basis requirements was a performance deficiency. This issue was more than minor because it was similar to NRC Inspection Manual Chapter (IMC) 0612, Appendix E, "Examples of Minor Issues," Example 3.k, which states that an analysis to verify the adequacy of design contained incorrect assumptions. The example concludes that the issue is more than minor if the error resulted in a condition where there was a reasonable doubt on the operability of the component. For this issue, a knowledgeable engineer could not determine the adequacy of design based on a review of the existing hydraulic analysis and associated design details without performing additional complex analysis and preliminary calculations. The team performed a Phase 1 Significance Determination Process screening, in accordance with NRC IMC 0609, Appendix F, "Fire Protection Significance Determination Process." This finding affected the fixed fire protection systems category, and was screened to very low safety significance because the affected sprinkler systems were determined to have a low degradation rating. This finding did not have a cross-cutting aspect because it was determined to be a legacy issue and was not considered to be indicative of current licensee performance.
Inspection Report# : [2011007](#) (pdf)

Significance:  Jun 24, 2011

Identified By: NRC

Item Type: NCV NonCited Violation

Failure to Establish Adequate Test Acceptance Criteria for Fire Pump Performance Testing

The team identified a non-cited violation of Susquehanna Unit 1 Operating License Condition 2.C.(6), and Unit 2 Operating License Condition 2.C.(3) for the failure to implement all provisions of the approved Fire Protection Program. Specifically, PPL established acceptance criteria in the fire pump performance tests that was non-conservative compared to design basis requirements and the test acceptance criteria was insufficient to demonstrate that the fire pumps could provide sufficient pump pressure to satisfy required sprinkler system hydraulic needs. PPL performed an operability evaluation that determined the fire pumps were capable of performing their intended functions based on predicted flow rates and current pump degradation.

The team determined the failure to establish acceptance criteria in annual pump performance tests that demonstrated the pumps would perform satisfactorily in service was a performance deficiency. This issue was more than minor because it was similar to NRC Inspection Manual Chapter (IMC) 0612, Appendix E, "Examples of Minor Issues," Example 3.k, which states that an analysis to verify the adequacy of design contained incorrect assumptions. The example concludes that the issue is more than minor if the error resulted in a condition where there was a reasonable doubt on the operability of the component. For this issue, a knowledgeable engineer could not determine whether pump performance was adequate to satisfy design needs based on a review of the existing pump test results, hydraulic analysis, and associated design details without performing additional complex analysis and preliminary calculations. The team performed a Phase 1 Significance Determination Process screening, in accordance with NRC IMC 0609, Appendix F, "Fire Protection Significance Determination Process." This finding affected the fixed fire protection systems category, and was screened to very low safety significance because the affected sprinkler systems were determined to have a low degradation rating. This finding had a cross-cutting aspect in the area of Problem Identification and Resolution, Corrective Action Program because annual fire pump performance testing in 2009 and 2010 identified significant pump degradation, but PPL failed to initiate a condition report or correct the condition.
[IMC 0310, Aspect P.1(a)]

Inspection Report# : [2011007](#) (pdf)

Significance:  Mar 31, 2011

Identified By: NRC

Item Type: FIN Finding

RWST Level Transmitter Failure Not Entered in CAP

Inspectors identified a Green finding of MT-AD-605, "Maintenance and Calibration of Installed Plant Instrumentation (IPI)," Revision 11, when as-found calibration results of the refueling water storage tank (RWST) level transmitter were discovered outside tolerance and not captured in the CAP. Consequently, RWST level was later discovered to be 25 percent lower than indicated in the control room and below emergency operating procedure (EOP) procedural expectations. The inspectors concluded that finding the level transmitter out of tolerance by more than twice the as-

found tolerance should have been entered into the CAP as a Level 3 condition adverse to quality (CAQ) Cause CR with a due date not to exceed September 28, 2010, and that the CR would have directed PPL to investigate the issue earlier, avoided inaccurate level indications to control room operators, and prevented RWST level from ultimately lowering below EOP normal levels. This issue was entered into PPL's CAP as CR 1371594.

The finding was more than minor since it affected the Mitigating Systems cornerstone objective to maintain the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences and was associated with its equipment performance and configuration control attributes. Specifically, the lack of accurate level indication caused operators to believe that more RWST inventory was available than actually present and an EOP procedural decision is based, in part, on the available RWST inventory. The finding was determined to be of very low safety significance in accordance with IMC 0609, Appendix A, "Determining the Significance of Reactor Inspection Findings for At-Power Situations" using SDP Phases 1, 2, and 3. Phase 1 screened the finding to Phase 2 because it represented an actual loss of safety function to makeup to the condensate storage tank (CST) from the RWST per 10CFR50.65, for greater than 24 hours. A Region I Senior Reactor Analyst (SRA) conducted a Phase 3 analysis because the Phase 2 analysis, conducted by the inspectors using the Susquehanna pre-solved Risk-Informed Inspection Notebook, indicated that the finding could be of more than very low safety significance. In conducting the Phase 3 analysis the SRA determined that refilling the CST from the RWST was not modeled in the Susquehanna Standardized Plant Analysis Risk (SPAR) model, Revision 8.15. The SRA reviewed a PPL-completed risk significance analysis which included the increase of both core damage and large early event release frequencies (i.e., delta CDF and delta LERF) assuming that the RWST was not available for a year. This PPL analysis, which appeared conservative given the actual volume of water in the RWST during the approximately 6 months that the RWST level instruments were not functioning properly, indicated that the delta CDF and delta LERF were in the very low safety significance range.

The finding was determined to have a cross-cutting aspect in Human Performance, Work Practices, in that the licensee defined and communicated expectations regarding procedural compliance, however, personnel did not follow procedures. Specifically, PPL technicians did not enter the out-of-tolerance level instrument calibration into the CAP in accordance with procedures.

Inspection Report# : [2011002](#) (pdf)

Significance:  Mar 31, 2011

Identified By: NRC

Item Type: FIN Finding

B CS Chiller Inoperable due to Refrigerant Stacking

The inspectors identified a Green finding for failure to evaluate the condition of the 'B' control structure (CS) chiller after completion of SE-054-301, "Emergency Service Water/Control Structure Chilled Water System Leakage Test," Revision 12. Specifically, personnel failed to evaluate whether system parameters were restored to normal prior to restoring the chiller to an operable status and, when maintenance subsequently reported that refrigerant level was non-visible, failed to appropriately evaluate the degraded condition with regard to equipment operability. PPL entered this issue into their CAP as CR 1382448.

The finding is more than minor because it is associated with the equipment performance attribute of the Mitigating systems cornerstone and affected its objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). Specifically, the condition of refrigerant stacking that occurred affected the reliability of the 'B' CS Chiller. The finding was evaluated for significance using IMC 0609, Attachment 4, "Phase 1 - Initial Screening and Characterization of Findings." Since the finding did not result in a loss of safety function or the loss of a train for greater than its Technical Specification (TS) allowed outage time, and was not potentially risk significant due to external event initiators, the finding was determined to be of very low safety significance (Green). This finding is related to the cross-cutting area of PI&R – CAP, because PPL did not thoroughly evaluate problems such that the resolutions address the causes and extent of conditions, to include properly classifying, prioritizing and evaluating for operability. Specifically, PPL failed to appropriately evaluate the effect that refrigerant stacking had on the operability of the CS chiller and subsequently, failed to evaluate the CAQ and assign corrective actions.

Inspection Report# : [2011002](#) (pdf)

Significance:  Mar 31, 2011

Identified By: NRC

Item Type: NCV NonCited Violation

Failure to Replace Piping on B CS Chiller

An NRC-identified, Green NCV of 10 CFR 50, Appendix B, Criterion XVI, "Corrective Actions," was identified because PPL failed to correct a condition adverse to quality, an adverse trend of Freon leaks, by identifying that previous work orders (WOs) have not been implemented as required prior to new leaks occurring. Three separate refrigerant leaks were identified that collectively led to the inoperability of the 'B' CS chiller due to an inability to meet its mission time. The leaks occurred on a section of pipe that was prescribed to be replaced as part of the extent of condition review of similar Freon leaks. However, the corrective actions to replace the line were not implemented as planned. PPL entered this issue into their CAP as CR 1387934.

The finding was more than minor since it was associated with the equipment performance attribute of the Mitigating systems cornerstone and affected its objective to ensure the availability, reliability and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the availability and reliability of the control room emergency outside air supply (CREOAS) and CR floor cooling systems was impacted by the 'B' CS chiller failure. In accordance with IMC 0609, Appendix A, "Determining the Significance of Reactor Inspection Findings for At-Power Situations," the finding was determined to be of very low safety significance (Green) because the finding was not a design or qualification deficiency, did not represent a loss of a system/train safety function and did not screen as potentially risk significant due to external events. This finding is related to the cross-cutting area of PI&R – CAP, because PPL did not thoroughly evaluate problems such that the resolutions address the causes and extent of conditions, to include properly classifying, prioritizing, and evaluating for operability. Specifically, despite four condition reports generated in 2010 that identified adverse trends in Freon leaks or chiller performance issues, PPL failed to appropriately evaluate the trend so as to identify causes, evaluate the effectiveness of past corrective actions, include similar equipment in extent of condition reviews, or identify that the 'B' CS chiller filter/dryer line was not replaced as planned.

Inspection Report# : [2011002](#) (pdf)

G

Significance: Dec 31, 2010

Identified By: NRC

Item Type: NCV NonCited Violation

Failure to Adequately Evaluate Periods of Elevated Risk for Necessary Risk Management Actions

An NRC-identified NCV of 10 CFR 50.65(a)(4) occurred when PPL failed to conduct an adequate risk assessment of online maintenance activities during the week of October 24, 2010. In one period of elevated risk on October 27, 2010, the entire duration in which valve functionality was affected was not appropriately accounted for in the risk assessment. Though the maintenance window was calculated as Yellow risk, when the entire period of functionality was considered the duration of Yellow risk was extended from 9.5 to 12.5 hours. Additionally, on October 26, 2010, online risk was calculated as Yellow for a period of 13.5 hours. In neither of these cases was the protected equipment program implemented as a risk management action as required by station procedures. This NCV affected the Human Performance attribute of the Mitigating Systems cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). The item is similar to example 7.e. in IMC 0612 Appendix E, "Examples of Minor Issues" in that failure to perform an adequate risk assessment when required by 10 CFR 50.65 (a)(4) is not minor if the overall elevated plant risk would put the plant into a higher licensee established risk category OR would require, under plant procedures, risk management actions (RMAs) or additional RMAs. In one case, plant risk was reclassified from Green to Yellow when the maintenance was properly modeled and in both cases the maintenance duration was in excess of the PPL established threshold requiring protected equipment as an RMA; therefore, the violation is more than minor. The inspectors then evaluated the finding using IMC 0612 Appendix K, "Maintenance Risk Assessment and Risk Management Significance Determination Process." Since the incremental core damage probability deficit was less than 1 E-6 and the incremental large early release probability deficit was less than 1 E-7, this finding is determined to be of very low safety significance (Green). This finding was determined to have a cross cutting aspect in the area of Problem Identification and Resolution, Corrective Action Program. Specifically, though PPL had recognized a negative trend, as well as the underlying weaknesses in the assessment of on-line risk prior to the violation occurring, they failed to take appropriate corrective actions to address the adverse trend in a timely manner, commensurate with safety significance and complexity.

Inspection Report# : [2010005](#) (pdf)

Significance:  Dec 31, 2010

Identified By: NRC

Item Type: NCV NonCited Violation

Failure to Control, Calibrate and Evaluate M&TE

An NRC-identified NCV of 10 CFR 50, Appendix B, Criterion XII, "Control of Measuring and Test Equipment", occurred when PPL failed to control and calibrate measuring and test equipment (M&TE) at specified periods and document evaluations of missing M&TE. The issue was evaluated IAW IMC 0612 Appendix E examples and determined to be similar to 3J, 3K and 4A. Namely, that significant programmatic deficiencies were identified that could lead to worse errors if uncorrected (3J, 3K) and that there was a routine of failing to perform evaluations (4A). Specifically, overdue or missing M&TE were not being evaluated for their associated impact on the validity of past work in the CAP program since at least 2008 or that evaluations when performed did not meet the requirements of NDAP-QA-0515, Control and Calibration of Plant Measuring and Test Equipment, Revisions 3 and 4. It also affected the equipment performance attribute of the Mitigating Systems cornerstone and its objective to ensure the availability, reliability and capability of systems that respond to initiating events to prevent undesirable consequences.

The NCV was determined to have a cross-cutting aspect in Problem Identification and Resolution, CAP. Namely, problems are thoroughly evaluated such that resolutions address causes and extent of conditions and evaluate CAQs for operability. Specifically, PPL did not thoroughly evaluate problems to include the individual missing M&TE, the overall programmatic recurrence, and the potential effects on operability.

Inspection Report# : [2010005](#) (*pdf*)

Significance: SL-IV Dec 31, 2010

Identified By: NRC

Item Type: NCV NonCited Violation

Inaccurate report of MSPI data

An NRC-identified NCV of 10 CFR 50.9(a), Completeness and Accuracy of Information, occurred when PPL failed to update the Mitigating Systems Performance Indicators (MSPIs) to reflect a change in PPL's MSPI basis document. The change to the basis document affected all five MSPIs on each unit and resulted in inaccurate values for three consecutive quarters. PPL evaluated the MSPIs for needed changes and updated over 100 values used in calculating the PIs and entered the issues in their CAP as CRs 1328561 and 1328563.

Because violations of 10 CFR 50.9 are considered to potentially impede or impact the regulatory process, they are dispositioned using the traditional enforcement process. The inspectors concluded that PPL had reasonable opportunity to foresee and correct the inaccurate information prior to the information being submitted to the NRC. This violation is characterized as a SL IV NCV consistent with Sections 2.2.1.c and 6.9 of the NRC Enforcement Policy. Because this finding was of very low safety significance, was not repetitive or willful, and was entered into PPL's CAP, this violation is being treated as an NCV, consistent with Section 2.3.2.a of the NRC Enforcement Policy. The significance of the associated performance deficiency was screened per the guidance of Manual Chapter 0612, Appendix B and the inspectors determined it to be minor because it did not result in any of the PIs exceeding the Green White threshold. As such, no finding was identified and no cross-cutting aspect was assigned. (Section 40A1

Inspection Report# : [2010005](#) (*pdf*)

Significance:  Oct 08, 2010

Identified By: NRC

Item Type: NCV NonCited Violation

Inadequate Test Control of Safety-Related DC Circuit Breakers

The team identified a finding of very low safety significance (Green) involving a non-cited violation of 10 CFR 50, Appendix B, Criteria XI, "Test Control," in that PPL did not ensure that test results were documented and evaluated to verify that test requirements were satisfied. Specifically, PPL did not adequately evaluate the over-current trip setting test results for 125 Vdc circuit breaker 1D652-12 to ensure the results were within the established acceptance limits. PPL subsequently placed the breaker in-service with an as-left trip setting outside of the approved acceptance band. In response, PPL entered this issue into the CAP and determined there was sufficient margin to ensure breaker operability.

The finding was more than minor because it was associated with the equipment performance attribute of the Mitigating Systems Cornerstone and affected the cornerstone objective of ensuring the operability, availability, and reliability of systems that respond to initiating events to prevent undesirable consequences. The team performed a

Phase 1 SDP screening, in accordance with NRC IMC 0609, Attachment 4, "Phase 1 - Initial Screening and Characterization of Findings," and determined the finding was of very low safety significance (Green) because it was not a design or qualification deficiency, did not represent a loss of system safety function, and did not screen as potentially risk significant due to a seismic, flooding, or severe weather initiating event. This finding has a cross-cutting aspect in the area of Human Performance, Resources Component, because PPL did not ensure that complete, accurate, and up-to-date procedures and work packages were available and adequate to assure nuclear safety. Specifically, the procedure for DC breaker testing did not have adequate administrative controls to ensure that as-left test values were within the established acceptance criteria. (IMC 0310, aspect H.2(c)) (1R21.2.1.2)

Inspection Report# : [2010007](#) (*pdf*)

Significance:  Dec 31, 2009

Identified By: NRC

Item Type: FIN Finding

Scenarios for NRC Annual Operating Examinations Did Not Meet Quantitative Standards for Total Malfunctions

The inspectors identified greater finding in that 20% of the NRC annual operating exam simulator scenarios reviewed did not meet the quantitative standard for total malfunctions, 4 to 8 for a single scenario, and 10 to 14 for a scenario set established in NUREG-1021, "Operator Licensing Examination Standards for Power Reactors," Form ES-604-1, "Simulator Scenario Review Checklist." In addition, the licensee's procedures NTP-QA-31.11, "Operator Requalification Exam Preparation and Implementation" and NTP-QA-31.7, "Simulator Scenario Writers Guides," recommend these same quantitative standards. The quantitative guidelines for malfunctions is an important metric because it establishes an objective standard used throughout the nuclear industry to ensure that the simulator portion of the NRC-required annual operating exams are written at an appropriate level of difficulty. As an immediate corrective action, the licensee entered this finding into their corrective action process (CR 1187760).

This finding was more than minor because it was associated with the Human Performance attribute of the Mitigation Systems cornerstone and affected the objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the finding affected the level of difficulty of simulator operating exams which potentially impacted PPL's ability to appropriately evaluate licensed operators. A review of the possible cross-cutting aspects was performed and no cross-cutting aspect was identified that would be considered a contributor to the cause of the finding.

Inspection Report# : [2009005](#) (*pdf*)

Barrier Integrity

Significance:  Jun 30, 2011

Identified By: NRC

Item Type: NCV NonCited Violation

Inadequate Surveillance Procedure Results in Failure to Meet Required Action of Technical Specifications for Secondary Containment Isolation Valves

The inspectors identified a Green NCV of Susquehanna Unit 1 and 2 TS 3.6.4.2, "Secondary Containment Isolation Valves" and TS 5.4.1, "Procedures" for an inadequate surveillance procedure for implementing TS Surveillance Requirements and Action Statements. Specifically, the procedure failed to ensure that SCIVs were verified administratively when in a high radiation areas as required. PPL entered this issue in their CAP as 1421356 and 1431750.

The finding is more than minor because it was similar to example 3.d in IMC 0612 Appendix E, "Examples of Minor Issues" in that the failure to implement a requirement of TSs is not minor if the action had not been conducted. In this case, the valves inside of high radiation areas had not been verified in their closed position as required by TS 3.6.4.2 Required Action A.2. Additionally, it is associated with the procedure quality attribute of the Barrier Integrity cornerstone objective to provide reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. Specifically, the inadequate surveillance procedure resulted in a

violation of TS 3.6.4.2, “SCIVs” since valves that were closed to isolate a pathway due to an inoperable blind flange were not verified in the correct position as required. The finding was evaluated for significance using IMC 0609, Attachment 4, “Phase 1 - Initial Screening and Characterization of Findings.” Since the finding only represented a degradation of the radiological barrier function provided for the reactor building (RB) (i.e. secondary containment), the finding was determined to be of very low safety significance (Green). This finding is related to the cross-cutting area of Human Performance – Resources because PPL did not ensure that personnel, equipment, procedures, and other resources were available and adequate to assure nuclear safety. Specifically, the surveillance procedures SO-000-010, Revision 23, “Monthly Zone III Integrity,” SO-100-010, Revision 24, “Monthly Zone 1 Integrity Verification” and SO-200-010, Revision 24, “Monthly Zone II Integrity Verification,” did not ensure surveillance requirements or actions statements required by TS 3.6.4.2 were implemented. (H.2(c)) (1R04)

Inspection Report# : [2011003](#) (*pdf*)

Emergency Preparedness

Occupational Radiation Safety

Public Radiation Safety

Physical Protection

Although the NRC is actively overseeing the Security cornerstone, the Commission has decided that certain findings pertaining to security cornerstone will not be publicly available to ensure that potentially useful information is not provided to a possible adversary. Therefore, the [cover letters](#) to security inspection reports may be viewed.

Miscellaneous

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