UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION I
2100 RENAISSANCE BLVD., SUITE 100
KING OF PRUSSIA, PA 19406-2713

February 10, 2017

EA-16-283

Mr. Timothy S. Rausch
President and Chief Nuclear Officer
Susquehanna Nuclear, LLC
769 Salem Blvd., NUCSB3
Berwick, PA 18603

SUBJECT: SUSQUEHANNA STEAM ELECTRIC STATION – INTEGRATED INSPECTION REPORT 05000387/2016004 AND 05000388/2016004

Dear Mr. Rausch:

On December 31, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Susquehanna Steam Electric Station (SSES), Units 1 and 2. On January 24, 2017, the NRC inspectors discussed the results of this inspection with you and other members of your staff. The results of this inspection are documented in the enclosed report.

NRC inspectors documented four findings of very low safety significance (Green) in this report. Two of these findings involved violations of NRC requirements. The NRC is treating these violations as non-cited violations (NCVs) consistent with Section 2.3.2.a of the Enforcement Policy.

The inspectors also reviewed Licensee Event Reports (LERs) 50-387/2016-011-020 and 50-387/2016-011-019, which described the details associated with two separate reactor coolant system (RCS) pressure boundary leaks from a local power range monitor instrument housing and a small bore seal pipe associated with the Unit 1 B reactor recirculation pump, respectively. Although these constituted violations of TSs involving the reactor coolant pressure boundary, the NRC concluded that they were not within Susquehanna's ability to foresee and correct, Susquehanna's actions did not contribute to the degraded conditions, and that your actions taken were reasonable to address the issues. As a result, the NRC did not identify a performance deficiency. A risk evaluation was performed and the issues were determined to be of very low safety significance. Based on the results of the NRC's inspection and assessment, I have been authorized, after consultation with the Director, Office of Enforcement, and the Regional Administrator to exercise enforcement discretion in accordance with NRC Enforcement Policy Section 2.2.4, "Using Traditional Enforcement to Disposition Violations Identified at Power Reactors" and Section 3.10, Reactor Violations With No Performance Deficiencies."

If you contest the violations or significance of 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; and the NRC Resident Inspector at Susquehanna. In addition, if you disagree with a cross-cutting aspect assignment or a finding not associated with a regulatory requirement 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 U. S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001; with copies to the Regional Administrator, Region I, and the NRC Resident Inspector at Susquehanna.

This letter, its enclosure, and your response (if any) will be made available for public inspection and copying at http://www.nrc.gov/reading-rm/adams.html and the NRC's Public Document Room in accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding."

Sincerely,

/RA/

Michael L. Scott, Director
Division of Reactor Projects

Docket Nos. 50-387 and 50-388
License Nos. NPF-14 and NPF-22

Enclosure:
Inspection Report 05000387/2016004
and 05000388/2016004 w/Attachment:
Supplementary Information

cc w/encl: Distribution via ListServ

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REGION I

Docket Nos.:	50-387 and 50-388
License Nos.:	NPF-14 and NPF-22
Report No.:	05000387/2016004 and 05000388/2016004
Licensee:	Susquehanna Nuclear, LLC (Susquehanna)
Facility:	Susquehanna Steam Electric Station, Units 1 and 2
Location:	Berwick, Pennsylvania
Dates:	October 1, 2016 through December 31, 2016
Inspectors:	J. Greives, Senior Resident Inspector T. Daun, Resident Inspector E. H. Gray, Senior Reactor Inspector B. Smith, Resident Inspector J. Furia, Senior Health Physicist P. Ott, Operations Engineer J. DeBoer, Emergency Preparedness Inspector S. Anderson, Reactor Inspector
Approved By:	Daniel L. Schroeder, Chief Reactor Projects Branch 4 Division of Reactor Projects

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SUMMARY

IR 05000387/2016004 and 05000388/2016004; October 1, 2016 through December 31, 2016; Susquehanna Steam Electric Station Units 1 and 2; Licensed Operator Requalification Program, Maintenance Effectiveness, Surveillance Testing, and Follow-Up of Events and Notices of Enforcement Discretion

This report covered a three-month period of inspection by resident inspectors and announced baseline inspections performed by regional inspectors. The inspectors identified two non-cited violations, both of which were of very low safety significance (Green and/or Severity Level IV). The significance of most findings is indicated by their color (i.e., greater than Green, or Green, White, Yellow, Red) and determined using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process (SDP)", dated April 29, 2015. Cross-cutting aspects are determined using IMC 0310, "Aspects Within Cross-Cutting Areas," dated December 4, 2014. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy, dated November 1, 2016. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 6.

Cornerstone: Initiating Events

- Green. A finding of very low safety significance (Green) for failure to develop an adequate work plan for replacement of a voltage potential indicating light on a breaker on the Unit 2 'B' auxiliary bus was self-revealed when the Unit 2 'B' reactor recirculation pump (RRP) tripped, along with other non-safety related loads on November 14, 2016, resulting in a rapid unplanned power change and transition to single loop operation. Specifically, operations and maintenance personnel did not recognize that disconnecting the neutral wires from the light socket would interrupt power to all of the degraded voltage relays for the auxiliary bus. Therefore, the relays de-energized when the maintenance was performed, tripping all the breakers on the bus. Susquehanna's immediate corrective actions included stabilizing the plant, entering single loop operations, and entering the issue into their corrective action program (CAP). Additionally, Susquehanna performed a maintenance department stand down to communicate immediate lessons learned from the event while a more thorough causal analysis was conducted.

  The performance deficiency was more than minor because it was associated with the Equipment Performance attribute of the Initiating Events cornerstone and affected its objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, implementation of work instructions resulted in the trip of the Unit 2 'B' RRP, 'B' and 'D' circulating water (CW) pumps, 'B' and 'D' condensate pumps, and the 'B' service water (SW) pump, which caused an automatic trip of the 'C' reactor feed pump and runback of the 'A' RRP, resulting in a rapid power reduction to 32 percent rated thermal power (RTP). The inspectors evaluated the finding in accordance with IMC 0609, Appendix A "The SDP for Findings At-Power," dated June 19, 2012, Exhibit 1 for the Initiating Events cornerstone and determined the finding was of very low safety significance (Green) because it did not cause a reactor trip. This finding was determined to have a cross-cutting aspect in the area of Human Performance, Work Management because Susquehanna did not implement a process of planning work activities such that nuclear safety is the overriding priority, including the identification and management of risk commensurate with the work. Specifically, Susquehanna did not recognize the risk of interrupting a daisy chained neutral when planning a minor maintenance work order and did not recognize the impact of the work activity in the field. [H.5] (Section 4OA3)

Cornerstone: Mitigating Systems

- Green. A self-revealing finding was identified associated with inadequate licensed operator performance during the annual licensed operator requalification operating test and biennial written examination. Specifically, 17 of 71 operators (23.9%) failed at least one portion of the requalification examinations.

  This finding is more than minor because it is associated with the Mitigating Systems cornerstone attribute of human performance and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, 17 of 71 licensed operators failed to demonstrate a satisfactory understanding of the required knowledge and abilities required to safely operate the facility under normal, abnormal, and emergency conditions. The inspectors evaluated this performance deficiency using IMC 0609, "SDP", Appendix I, "Licensed Operator Requalification SDP." This finding is of very low safety significance (Green) because the finding is related to requalification exam results, did not result in a failure rate of greater than 40 percent and all 17 operators were remediated and successfully retested prior to returning to licensed duties. This finding has a cross-cutting aspect in the area of Human Performance, Training, because Susquehanna did not provide adequate operator requalification training to maintain a knowledgeable, technically competent workforce. [H.7] (Section 1R11)

- Green. A finding of very low safety significance (Green) and associated NCV of Title 10 *Code of Federal Regulations* (CFR) 50, Appendix B, Criterion XVI, "Corrective Action," was self-revealed when Susquehanna failed to assure that conditions adverse to quality were promptly identified and corrected on two separate occasions. Both examples resulted in the failures of safety-related automatic transfer switches (ATSs) associated with the low pressure coolant injection (LPCI) swing buses. Corrective actions included enhancing the work instructions for all applicable ATSs based off original equipment manufacturer (OEM) input and scheduling the enhanced work instructions to be performed on the four swing bus ATSs during their next scheduled bus outages.

  Inspectors determined that the finding was more than minor because it was associated with the Equipment Performance attribute of the Reactor Safety – Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). In both examples, the failure to correct conditions adverse to quality resulted in the loss of power to the LPCI swing bus and inoperability of the respective division of LPCI. In accordance with IMC 0609.04, "Initial Characterization of Findings," dated June 19, 2012, inspectors and Exhibit 2 of IMC 0609, Appendix A, "The SDP for Findings At-Power," dated June 19, 2012, inspectors determined that the finding was of very low safety significance (Green). Specifically, though a single train was inoperable for greater than its technical specification (TS) allowed outage time, in consultation with regional senior reactor analysts, inspectors determined it did not represent an actual loss of function. The finding is related to the cross-cutting area of Problem Identification and Resolution, Evaluation, because Susquehanna did not thoroughly evaluate issues to ensure that resolutions address causes and extent of conditions commensurate with their safety significance. Specifically, Susquehanna either failed to evaluate deficiencies encountered during maintenance or failed to ensure that corrective actions aligned with and corrected the identified causes. [P.2] (Section 1R12)

Cornerstone: Barrier Integrity

- Green. A finding of very low safety significance (Green) and NCV of TS 5.4.1, "Procedures" was self-revealed when Susquehanna incorrectly calibrated the Unit 1 'B' refuel floor high exhaust duct high radiation monitor on November 15, 2014. This impacted the initiation capability of secondary containment isolation and control room emergency outside air supply system (CREOASS) and resulted in Susquehanna exceeding the allowed outage time for TSs 3.3.6.2, Secondary Containment Isolation, and 3.3.7.1, CREOASS Instrumentation. Upon identification of the issue, Susquehanna properly calibrated the radiation monitor to restore its operability.

  This finding is more than minor because it is associated with the Human Performance (Routine OPS/Maintenance Performance) attribute of the Barrier Integrity cornerstone and affected the cornerstone objective of providing reasonable assurance that physical design barriers (Secondary Containment and Control Room Ventilation) protect the public from radionuclide releases caused by accidents or events. Specifically, incorrectly calibrating the radiation monitor resulted in both systems being inoperable for almost two years. In accordance with IMC 0609.04, "Initial Characterization of Findings," and Exhibit 3 of IMC 0609, Appendix A, "The SDP for Findings At-Power," both dated June 19, 2012, the inspectors determined that this finding is of very low safety significance (Green) because the performance deficiency was only associated with the radiological barrier function of the Control Room and Secondary Containment. This finding had a cross-cutting aspect in the area of Human Performance, Avoid Complacency because Susquehanna did not recognize and plan for the possibility of mistakes, latent problems, or inherent risk, even while expecting successful outcomes. Specifically, Susquehanna personnel did not consider the potential undesired consequences of their actions before performing work and implement appropriate error-reduction tools (e.g. self-check, peer-check). [H.12] (Section 1R22)

REPORT DETAILS

Summary of Plant Status

Unit 1 began the inspection period at 100 percent power. On October 14, 2016, operators reduced power to approximately 67 percent, performed a control rod sequence exchange and returned the unit to 100 percent on October 15, 2016. On October 31, 2016, power was reduced to 23 percent when the 'A' reactor recirculating pump (RRP) tripped as the result of an electrical fault associated with the RRP motor generator set. Following the restoration of the 'A' RRP on November 1, 2016, operators commenced raising power and on November 3, 2016 the unit returned to 100 percent. On December 16, 2016, operators reduced power to 72 percent to perform a rod pattern adjustment and conduct scram time testing. Operators returned power to 100 percent on December 17, 2016 and the unit remained at or near 100 percent power for the remainder of the inspection period.

Unit 2 began the inspection period performing a shutdown for a planned turbine maintenance outage and the station reached operational condition 4 (cold shutdown) on October 1, 2016. Following the completion of the turbine maintenance activities, operators commenced a reactor startup on October 7, 2016. Operators returned the unit to 100 percent power on October 11, 2016. On October 28, 2016, operators reduced power to 72 percent to perform a rod pattern adjustment and returned to 100 percent the next day. On November 14, 2016, power was reduced to 29 percent when the 'B' reactor recirculating pump (RRP) tripped during maintenance. Following the restoration of the 'B' RRP, operators restored the unit to 100 percent power. On November 19, 2016, operators reduced power to 70 percent to perform a rod pattern adjustment and returned the unit to 100 percent on November 20, 2016. On December 9, 2016, operators reduced power to approximately 68 percent, performed a control rod sequence exchange and returned the unit to 100 percent on December 10, 2016. On December 30, 2016, operators reduced power to 75 percent to perform a rod pattern adjustment and returned to 100 percent on December 31, 2016.

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity and Emergency Preparedness

1R01 Adverse Weather Protection (71111.01 – 3 samples)

.1 Readiness for Seasonal Extreme Weather Conditions

a. Inspection Scope

The inspectors reviewed Susquehanna's readiness for the onset of seasonal low temperatures from October 31-November 10, 2016. The review focused on the engineered safeguards service water pump house, the circulating water pump house, the station emergency diesel generators, and the station portable diesel generator (Blue Max). The inspectors reviewed the Updated Final Safety Analysis Report (UFSAR), technical specifications, control room logs, and the CAP to determine what temperatures or other seasonal weather could challenge these systems, and to ensure Susquehanna personnel had adequately prepared for these challenges. The inspectors reviewed station procedures, including Susquehanna's seasonal weather preparation procedure and applicable operating procedures.

The inspectors performed walkdowns of the selected systems to ensure station personnel identified issues that could challenge the operability of the systems during cold weather conditions. Documents reviewed for each section of this inspection report are listed in Attachment A.

b. Findings

No findings were identified.

.2 Readiness for Impending Adverse Weather Conditions

a. Inspection Scope

The inspectors reviewed Susquehanna's preparations for a high wind advisory and extreme cold temperatures on November 21, 2016 and for a cold weather alert on December 16, 2016. The inspectors reviewed the implementation of adverse weather preparation procedures before the onset of and during this adverse weather condition. The inspectors walked down the emergency diesel generators to ensure system availability and the main, auxiliary, and offsite power transformers to ensure that transient material was controlled to limit the likelihood of a high wind generated missile. The inspectors verified that operator actions defined in Susquehanna's adverse weather procedure maintained the readiness of essential systems. The inspectors discussed readiness and staff availability for adverse weather response with operations and work control personnel.

b. Findings

No findings were identified.

1R04 Equipment Alignment

.1 Partial System Walkdowns (71111.04 – 3 samples)

a. Inspection Scope

The inspectors performed partial walkdowns of the following systems:

- Common, 'A' control structure chiller and CREOASS while the 'B' chiller was out of service (OOS) for planned maintenance on October 12, 2016
- Common, division I 125VDC while T-20 was OOS for maintenance on October 19, 2016
- Unit 2, division II residual heat removal (RHR) following maintenance on November 3, 2016

The inspectors selected these systems based on their risk-significance relative to the reactor safety cornerstones at the time they were inspected. The inspectors reviewed applicable operating procedures, system diagrams, the UFSAR, technical specifications, work orders, condition reports, and the impact of ongoing work activities on redundant trains of equipment in order to identify conditions that could have impacted the system's performance of its intended safety functions. The inspectors also performed field walkdowns of accessible portions of the systems to verify system components and support equipment were aligned correctly and were operable.

The inspectors examined the material condition of the components and observed operating parameters of equipment to verify that there were no deficiencies. The inspectors also reviewed whether Susquehanna staff had properly identified equipment issues and entered them into the CAP for resolution with the appropriate significance characterization.

b. Findings

No findings were identified.

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

a. Inspection Scope

On November 28 and December 2, 2016, the inspectors performed a complete system walkdown of accessible portions of the Unit 1 and Unit 2 standby liquid control systems to verify the existing equipment lineup was correct. The inspectors reviewed operating procedures, surveillance tests, drawings, equipment line-up check-off lists, and the UFSAR to verify the system was aligned to perform its required safety functions. The inspectors also reviewed electrical power availability, component lubrication, hanger and support functionality, and operability of support systems. The inspectors performed field walkdowns of accessible portions of the systems to verify as-built system configuration matched plant documentation, and that system components and support equipment remained operable. The inspectors confirmed that systems and components were aligned correctly, free from interference from temporary services or isolation boundaries, environmentally qualified, and protected from external threats. The inspectors also examined the material condition of the components for degradation and observed operating parameters of equipment to verify that there were no deficiencies. For identified degradation the inspectors confirmed the degradation was appropriately managed by the applicable aging management program. Additionally, the inspectors reviewed a sample of related condition reports and work orders to ensure Susquehanna appropriately evaluated and resolved any deficiencies.

b. Findings

No findings were identified.

1R05 Fire Protection

.1 Resident Inspector Quarterly Walkdowns (71111.05Q – 5 samples)

a. Inspection Scope

The inspectors conducted tours of the areas listed below to assess the material condition and operational status of fire protection features. The inspectors verified that Susquehanna controlled combustible materials and ignition sources in accordance with administrative procedures. The inspectors verified that fire protection and suppression equipment was available for use as specified in the area pre-fire plan, and passive fire barriers were maintained in good material condition.

The inspectors also verified that station personnel implemented compensatory measures for OOS, degraded, or inoperable fire protection equipment, as applicable, in accordance with procedures.

- Unit 2, high-pressure coolant injection (HPCI) and 'B' core spray rooms (fire zones 2-1A and 2-1C) on October 2, 2016
- Common, control structure elevations 783' and 806' (fire zones 0-29A; 0-29B, 0-29C; 0-29D; and 0-30A) on October 12, 2016
- Unit 2, RHR "B" pump room (fire zone 2-1E) on November 8, 2016 Unit 1 and 2, core spray valve areas (fire zones 1-5B and 2-5B) on November 29, 2016
- Unit 1 and 2, upper relay and cable spreading rooms (fire zones 0-27A, 0-27B, 0-27C, and 0-27E) on December 22, 2016

b. Findings

No findings were identified.

1R07 Heat Sink Performance (711111.07A – 1 sample)

a. Inspection Scope

The inspectors reviewed the "D" emergency diesel generator (EDG) jacket water heat exchanger readiness and availability to perform its safety functions. The inspectors reviewed the design basis for the component and verified Susquehanna's commitments to NRC Generic Letter 89-13, "Service Water System Requirements Affecting Safety-Related Equipment." The inspectors observed actual performance tests for the heat exchangers and/or reviewed the results of previous inspections of the "D" EDG jacket water and similar heat exchangers. The inspectors discussed the results of the most recent inspection with engineering staff and reviewed pictures of the as-found and as-left conditions. The inspectors verified that Susquehanna initiated appropriate corrective actions for identified deficiencies. The inspectors also verified that the number of tubes plugged within the heat exchanger did not exceed the maximum amount allowed.

b. Findings

No findings were identified.

1R11 Licensed Operator Requalification Program and Licensed Operator Performance (71111.11Q – 2 samples)

.1 Quarterly Review of Licensed Operator Requalification Testing and Training

a. Inspection Scope

The inspectors observed licensed operator simulator evaluation on October 4-5, 2016, which was conducted as part of annual licensed operator requalification examinations. The inspectors evaluated operator performance during the simulated events and verified completion of risk significant operator actions, including the use of abnormal and emergency operating procedures. The inspectors assessed the clarity and effectiveness of communications, implementation of actions in response to alarms and degrading plant conditions, and the oversight and direction provided by the control room supervisor. The inspectors verified the accuracy and timeliness of the emergency classification made by the shift manager and the TS action statements entered by the unit supervisor.

Additionally, the inspectors assessed the ability of the crew and training staff to identify and document crew performance problems.

b. Findings

No findings were identified.

.2 Quarterly Review of Licensed Operator Performance in the Main Control Room

a. Inspection Scope

On October 7, 2016, inspectors observed the control room operators perform a planned reactor startup from the Unit 2 maintenance outage. The inspectors observed the reactivity control briefing to verify that it met the criteria specified in OP-AD-002, "Standards for Shift Operations," Revision 57, OP-AD-300, "Administration of Operations," Revision 5, and OP-AD-338, "Reactivity Manipulations Standards and Communication Requirements," Revision 31. The inspectors observed the crews during the evolutions to verify that procedure use, crew communications, control board component manipulations, and coordination of activities in the control room met established standards.

b. Findings

No findings were identified.

.3 Licensed Operator Requalification Program (71111.11A – 1 sample)

a. Inspection Scope

On December 13, 2016, one NRC region-based inspector conducted an in-office review of results of the 2016 licensee-administered annual operating tests for Susquehanna Steam Electric Station Unit 1 and Unit 2 operators. The inspection assessed whether Pass/Fail rates were consistent with the guidance of NRC Manual Chapter 0609, Appendix I, and "Operator Requalification Human Performance SDP". The review verified that the crew failure rate did not exceed 20%, however, the individual operator failure rate exceeded 20%.

- 17 of the 71 operators failed at least one section of the annual exam. The overall individual failure rate was 23.9%.
- 2 of the 12 crews failed the simulator test. The crew failure rate was 16.7%.

b. Findings

Introduction. A self-revealing Green finding was identified associated with inadequate licensed operator performance during the annual licensed operator requalification operating test and biennial written examination. Specifically, 17 of 71 operators (23.9%) failed at least one portion of the requalification examinations.

Description. During the facility-administered annual licensed operator requalification operating test and biennial written examination, Susquehanna training staff evaluated individual operator performance during dynamic simulator scenarios, job performance measures and on the written examination. Facility results of this evaluation indicated that 17 of 71 licensed operators (23.9%) failed at least one portion of the requalification examination, exceeding the threshold failure rate of 20%.

Susquehanna initiated CR-2016-24890 to document exceeding the 20% exam failure threshold and restricted the failed operators from licensed duties. Susquehanna conducted remediation training and successful retesting prior to returning the 17 operators to licensed duties.

Analysis. The inspectors determined that the individual examination failure rate of greater than 20% was a performance deficiency against the expected knowledge and abilities of licensed operators as demonstrated during the requalification examinations required by 10 CFR 55.59(a)(2) and that this performance deficiency was reasonably within Susquehanna's ability to foresee and correct. This finding was more than minor because it is associated with the Mitigating Systems cornerstone attribute of human performance and affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, 17 of 71 licensed operators failed to demonstrate a satisfactory understanding of the required knowledge and abilities required to safely operate the facility under normal, abnormal, and emergency conditions.

The inspectors evaluated this performance deficiency using IMC 0609, "SDP", Appendix I, "Licensed Operator Requalification SDP." This finding is of very low safety significance (Green) because the finding is related to requalification exam results, did not result in a failure rate of greater than 40 percent, and all 17 operators were remediated and successfully retested prior to returning to licensed duties. This finding has a cross-cutting aspect in the area of Human Performance, Training, because Susquehanna did not initially provide adequate operator requalification training to maintain a knowledgeable, technically competent workforce [H.9].

Enforcement. This finding does not involve enforcement action because no violation of regulatory requirements was identified. Susquehanna entered this issue into their CAP as CR-2016-24890. Because this issue did not involve a violation and has very low safety significance (Green), it was identified as a finding (FIN). **(FIN 05000387; 388/2016004-01, Failure Rates Exceed Twenty Percent (20%) For Biennial Requalification Exam).**

1R12 Maintenance Effectiveness (71111.12Q – 3 samples)

a. Inspection Scope

The inspectors reviewed the samples listed below to assess the effectiveness of maintenance activities on structure, system, and component performance and reliability. The inspectors reviewed system health reports, CAP documents, maintenance work orders, and maintenance rule basis documents to ensure that Susquehanna was identifying and properly evaluating performance problems within the scope of the maintenance rule. For each sample selected, the inspectors verified that the structure, system, or component was properly scoped into the maintenance rule in accordance

with 10 CFR 50.65 and verified that the (a)(2) performance criteria established by Susquehanna staff was reasonable. As applicable, for structures, systems, and components classified as (a)(1), the inspectors assessed the adequacy of goals and corrective actions to return these structures, systems, and components to (a)(2). Additionally, the inspectors ensured that Susquehanna staff was identifying and addressing common cause failures that occurred within and across maintenance rule system boundaries.

- Common, repetitive failures of startup bus lockout relays on October 19, 2016
- Common, LPCI swing bus ATS failures on November 23, 2016
- Unit 2, medium voltage breaker failures on December 5, 2016

b. Findings

Introduction. A self-revealing finding of very low safety significance (Green) and associated NCV of 10CFR50 Appendix B, Criterion XVI, "Corrective Action," was identified with two separate examples of failing to assure that conditions adverse to quality were promptly identified and corrected. Both examples resulted in the failures of safety-related ATSs associated with the LPCI swing buses.

Description. Two redundant Class 1E 480 VAC swing buses provide power to their respective division's LPCI valves (including the LPCI injection, RHR minimum flow bypass, and reactor recirculation system pump discharge and bypass valves). The LPCI swing bus is capable of receiving electrical power from either of two Class 1E 480 VAC load centers, a preferred source and an alternate source. An ATS is provided for automatically transferring the swing bus from the preferred to the alternate power source. A common mode-common cause failure analysis demonstrates that the transfer switch, as a component of the swing bus system design, will not degrade the independence and separation between the redundant Class 1E channels (load center channels A and C or B and D).

Event 1 - On March 5, 2016, while performing the Unit 1 Division 2 Monthly Swing Bus surveillance (SO-106-B01) the ATS, 1ATS229, failed to close in on the alternate supply resulting in a loss of the Division 2 LPCI swing bus. Troubleshooting performed by Engineering and Electrical Maintenance identified that the upper linkage rod was too long, resulting in the continuous cycling of the switch without latching in the alternate position. Additionally the length of the linkage rod applied excessive force to the bolt attaching the rod to the mounting plate resulting in the deformation of the bolt. Susquehanna entered these conditions into CAP as CR-2016-05668. An equipment apparent cause evaluation (EACE) was performed by engineering which identified the deformed bolt as the direct cause of the failure. The apparent cause of the bolt deformation was that the upper linkage rod was too long. In reviewing previous failures of 1ATS229, inspectors noted that on November 10, 2013, a similar failure occurred when 1ATS229 would not transfer to the alternate position and continuously cycled between the normal and alternate position as documented in CR-2013-03361. The EACE performed in 2013 concluded that vibrations during the monthly swing bus testing caused the transfer switch motor mounting bolts to loosen and a contributing cause was that the linkage rods were not adjusted optimally. In 2013, the motor mounting bolts were replaced with nylon lock nuts. The EACE also stated that linkage rod adjustments were now required by enhanced work instructions. Inspectors performed a review of enhanced work instructions and while they did require technicians to observe the linkage

for proper operation and adjust as necessary, guidance was not adequate to ensure optimal linkage adjustment. Susquehanna reported this as a condition prohibited by technical specifications and a condition that could have prevented the fulfillment of a safety function in LER 50-387/2016-007-00. As reported in this LER, firm evidence existed that from February 5, 2016 – March 5, 2016, that 1ATS229 would not have functioned to transfer from the preferred source to the alternate source if called upon to operate.

Event 2 – On September 20, 2016, while performing the Unit 2 Division 1 Monthly Swing Bus surveillance (SO-206-A01) the ATS 2ATS219 failed to close in on the normal supply resulting in a loss of the Division 1 LPCI swing bus (2B219). Investigation revealed that during preventative maintenance (PM) in 2011, 2ATS219 had not been lubricated properly. As corrective action for ATS failures in 2003, PMs were generated for the four swing bus ATS's which included lubricating hinge points on main contactors. This PM was performed under work order 1315626 in February 2011 but the cleaning and lubrication of the main contactor hinge points was not performed. CR-1351509 was written for the partial close of the PM and requested a work order be generated and the work rescheduled. The PM was not rescheduled to be performed, though the lubrication was a critical portion of the PM task. Following the failure in 2016, the full PM was completed under work order 1808063. Additionally, the OEM of the ATS was brought in to provide maintenance guidance to the station. Corrective actions include enhancing the work instructions for all applicable ATSs based off OEM's input and performing the enhanced work instructions on the four swing bus ATSs during their next and all future preventative maintenance activities.

Analysis. Inspectors reviewed the two examples where Susquehanna did not implement corrective actions for conditions adverse to quality and determined that these examples constituted a performance deficiency that was within Susquehanna's ability to foresee and correct, and should have been prevented. Specifically, in November 2013, linkage rod adjustment was identified as a contributing cause to the failure of 1ATS229, but the corrective actions did not ensure the linkage rod was optimally adjusted before returning the ATS to service, which resulted in a failure in March 2016. In February 2011, lubrication of the main contactors of 2ATS219 was not performed and a CR was generated, but no actions were taken to lubricate the main contactors until after it failed as a result of lack of lubrication.

Inspectors determined that the finding was more than minor because it was associated with the Equipment Performance attribute of the Reactor Safety – Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences (i.e., core damage). In both examples, the failure to correct conditions adverse to quality resulted in the loss of power to the LPCI swing bus and inoperability of the respective division of LPCI. In accordance with IMC 0609.04, "Initial Characterization of Findings," dated June 19, 2012, inspectors and Exhibit 2 of IMC 0609, Appendix A, "The SDP for Findings At-Power," dated June 19, 2012, and determined that the finding was of very low safety significance (Green). Specifically, though a single train was inoperable for greater than its TS allowed outage time, in consultation with a regional SRA, inspectors determined it did not represent an actual loss of function of the train as defined by the standardized plant analysis risk model for Susquehanna.

The finding had a cross-cutting aspect in the area of Problem Identification and Resolution, Evaluation, because Susquehanna did not thoroughly evaluate issues to ensure that resolutions address causes and extent of conditions commensurate with their safety significance. For the first event, even though the evaluation identified a contributing cause as improper linkage rod length, the evaluation did not thoroughly investigate how the linkage rod length impacts other components related to the ATS. As a result of the evaluation, corrective action associated with incorrect linkage rod length were inadequate to correct the deficiency. In event 2, a CR was written when the work group could not accomplish the work instructions to grease the main contactors, but no evaluation was performed to understand the impact of not greasing the contactors. [P.2]

Enforcement. 10 CFR 50, Appendix B, Criterion XVI, "Corrective Action," requires that measures be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and non-conformances are promptly corrected. Contrary to the above, conditions adverse to quality identified in November 2013 and February 2011 were not corrected, resulting in failures of 1ATS229 on March 5, 2016 and 2ATS219 on September 20, 2016. Additionally TS 3.5.1 requires both divisions of LPCI to be operable in Mode 1 and this provides a period of 7 days to restore operability if one division is failed. Unit 1, Division 2 LPCI remained inoperable from February 5 through March 5, 2016, when ATS was in a condition that it would have not transferred to its alternate source if called to do so.

Because this violation was of very low safety significance (Green), and Susquehanna has entered this performance deficiency into the CAP as CR-2016-05589; CR-2016-21554; and 2016-277281, the NRC is treating this as a NCV in accordance with Section 2.3.2 of the NRC Enforcement Policy. **(NCV 05000387; 388/2016004-02; Failure To Promptly Correct A Condition Adverse To Quality With LPCI Swing Bus Automatic Transfer Switches)**

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

a. Inspection Scope

The inspectors reviewed station evaluation and management of plant risk for the maintenance and emergent work activities listed below to verify that Susquehanna performed the appropriate risk assessments prior to removing equipment for work. The inspectors selected these activities based on potential risk significance relative to the reactor safety cornerstones. As applicable for each activity, the inspectors verified that Susquehanna personnel performed risk assessments as required by 10 CFR 50.65(a)(4) and that the assessments were accurate and complete. When Susquehanna performed emergent work, the inspectors verified that operations personnel promptly assessed and managed plant risk. The inspectors reviewed the scope of maintenance work and discussed the results of the assessment with the station's probabilistic risk analyst to verify plant conditions were consistent with the risk assessment. The inspectors also reviewed the TS requirements and inspected portions of redundant safety systems, when applicable, to verify risk analysis assumptions were valid and applicable requirements were met.

- Unit 1, yellow risk during spray pond bypass valve maintenance on October 13, 2016
- Common, elevated risk during T-20 outage on October 19, 2016
- Unit 1, emergent repair of faulted relay associated with 1A RRP on November 1, 2016

- Unit 2, division I RHR system outage window (SOW) on November 8, 2016
- Unit 2, yellow risk associated with automatic depressurization system timer calibrations on December 29, 2016

b. Findings

No findings were identified.

1R15 Operability Determinations and Functionality Assessments (71111.15 – 3 samples)

a. Inspection Scope

The inspectors reviewed operability determinations for the following degraded or non-conforming conditions based on the risk significance of the associated components and systems:

- Common, reduced emergency service water flow to the 'D' EDG jacket water cooler on October 1, 2016
- Unit 1, containment vacuum breaker opened alarm actuating periodically on November 1, 2016
- Common, part 21 on safety-related 24V DC batteries on November 22, 2016

The inspectors evaluated the technical adequacy of the operability determinations to assess whether TS operability was properly justified and the subject component or system remained available such that no unrecognized increase in risk occurred. The inspectors compared the operability and design criteria in the appropriate sections of the technical specifications and UFSAR to Susquehanna's evaluations to determine whether the components or systems were operable. The inspectors confirmed, where appropriate, compliance with bounding limitations associated with the evaluations. Where compensatory measures were required to maintain operability, such as in the case of operator workarounds, the inspectors determined whether the measures in place would function as intended and were properly controlled by Susquehanna.

b. Findings

No findings were identified.

1R18 Plant Modifications (71111.18 – 1 sample)

.1 Permanent Modifications

a. Inspection Scope

The inspectors evaluated a modification to the Unit 2 primary containment implemented by engineering change package 1672802, "SSES Unit 2 Reliable Hardened Containment Vent System." The inspectors verified that the design bases, licensing bases, and performance capability of the affected systems were not degraded by the modification. In addition, the inspectors reviewed modification documents associated with the upgrade and design change, including installation of two new primary containment isolation valves and a rupture disk, which serves as the secondary containment bypass leakage boundary isolation. The inspectors did not review the

acceptability of the modification for the purposes of venting primary containment under beyond design basis conditions, which will be evaluated separately, and focused their review on ensuring that the modification was installed consistent with the current licensing basis.

b. Findings

No findings were identified.

1R19 Post-Maintenance Testing (71111.19 – 5 samples)

a. Inspection Scope

The inspectors reviewed the post-maintenance tests for the maintenance activities listed below to verify that procedures and test activities adequately tested the safety functions that may have been affected by the maintenance activity, that the acceptance criteria in the procedure were consistent with the information in the applicable licensing basis and/or design basis documents, and that the test results were properly reviewed and accepted and problems were appropriately documented. The inspectors also walked down the affected job site, observed the pre-job brief and post-job critique where possible, confirmed work site cleanliness was maintained, and witnessed the test or reviewed test data to verify quality control hold point were performed and checked, and that results adequately demonstrated restoration of the affected safety functions.

- Unit 2, reactor core isolation coolant (RCIC) following a SOW on October 28, 2016
- Unit 2, division 2 RHR following a SOW on November 5, 2016
- Common, planned maintenance on offsite power transformer, 0X213 on November 16, 2016
- Unit 2, HPCI following a SOW on November 30, 2016
- Common, “B” CREOASS following repairs to HDM07824B1 on December 14, 2016

b. Findings

No findings were identified.

1R20 Refueling and Other Outage Activities (71111.20 – 1 sample)

a. Inspection Scope

The inspectors reviewed the station’s work schedule and outage risk plan for the Unit 2 maintenance outage, which was conducted from October 1 through October 10, 2016. The inspectors reviewed Susquehanna’s development and implementation of outage plans and schedules to verify that risk, industry experience, previous site-specific problems, and defense-in-depth were considered. During the outage, the inspectors observed portions of the shutdown and cooldown processes and monitored controls associated with the following outage activities:

- Configuration management, including maintenance of defense-in-depth, commensurate with the outage plan for the key safety functions and compliance with the applicable technical specifications when taking equipment OOS
- Implementation of clearance activities and confirmation that tags were properly hung and that equipment was appropriately configured to safely support the associated work or testing

- Status and configuration of electrical systems and switchyard activities to ensure that technical specifications were met
- Monitoring of decay heat removal operations
- Reactor water inventory controls, including flow paths, configurations, alternative means for inventory additions, and controls to prevent inventory loss
- Activities that could affect reactivity
- Tracking of startup prerequisites and startup and ascension to full power operation
- Identification and resolution of problems related to outage activities

b. Findings

No findings were identified.

1R22 Surveillance Testing (71111.22 – 6 samples)

a. Inspection Scope

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

- Unit 1, quarterly calibration of drywell pressure instrument channels on October 17, 2016
- Common, refuel floor high exhaust radiation monitor calibration on October 19, 2016
- Unit 1, RCIC comprehensive flow surveillance on October 27, 2016 (IST)
- Unit 2, Division 2 residual heat removal service water (RHRSW) pump, valve and flow surveillance on December 15, 2016 (IST)
- Unit 2, quarterly calibration of reactor pressure vessel pressure channels (core spray and LPCI permissive) SI-280-301 on December 9, 2016
- Unit 2, reactor vessel water low-low level instrument calibration on December 29, 2016

b. Findings

Introduction. A finding of very low safety significance (Green) and associated violation of TS 5.4.1, “Procedures” was self-revealed when Susquehanna incorrectly calibrated the Unit 1 ‘B’ refuel floor high exhaust duct high radiation monitor on November 15, 2014. This impacted the initiation capability of secondary containment isolation and CREOASS and resulted in Susquehanna exceeding the allowed outage time for TSs 3.3.6.2, Secondary Containment Isolation, and 3.3.7.1, CREOASS Instrumentation.

Description. Secondary containment isolation and CREOASS are credited to function, in part, in response to a fuel handling accident. TS 3.3.6.1, Secondary Containment Isolation, and TS 3.3.7.1, CREOASS Instrumentation, lists the required functions that will provide for these isolations and lists the required number of instrumentation channels for each function. One function, the refuel floor high exhaust duct high radiation monitor is one of the required channels and is required to be operable during operations with the potential to drain the reactor vessel (OPDRVs), core alternations, or movement of irradiated fuel in secondary containment. If the channel is determined to be inoperable, TSs require it to be placed in a trip condition within 24 hours.

On October 19, 2016, Susquehanna performed SI-079-335, "24-Month Calibration-Refuel Floor High Exhaust Duct 'B' Radiation Monitor." This channel monitors for a fuel handling accident and initiates the secondary containment isolation system and CREOASS if a preset value is reached. This surveillance implementing procedure calibrates the radiation monitor and satisfies the surveillance requirements of TS 3.3.6.2.4 and TS 3.3.7.1.4. During performance of the surveillance, technicians identified the 'B' channel set to trip at 36 milli-Rem per hour (mR/hr), versus a TS required value of less than 25 mR/hr. As required by TS 3.3.6.2 and 3.3.7.1, Susquehanna re-calibrated the instrument to within the TS allowed value, restoring the channel to an operable condition.

Susquehanna entered the issue into the CAP as CR-2016-23713 and determined that the instrument was incorrectly calibrated during the previous performance of the surveillance on November 15, 2014. To perform the calibration, technicians use a log-log plot to convert the as-found meter indication to a corresponding calibrated dose rate. If adjustments are required, the process is then repeated in reverse order to convert the required calibrated dose rate to a required meter indication and an instrument adjustment is made. During the performance in 2014, the technician mislabeled the X and Y axes on the plot, which resulted in the instrument being calibrated incorrectly. In this case, the only peer-check was performed during supervisor review, which did not identify the error. Inspectors reviewed the surveillance procedure and determined that, though the procedural steps are vague with regard to how to plot the data on the axes, there is a sample plot included in the procedure which clearly annotates how to perform the calibration. Ultimately, inspectors determined that the procedure was adequate to perform the surveillance, but had not been implemented correctly.

Analysis. Inspectors determined that failing to correctly implement a surveillance procedure was a performance deficiency that was within Susquehanna's ability to foresee and correct and should have been prevented. Specifically, on November 15, 2014, maintenance technicians incorrectly performed a calibration procedure, which resulted in a radiation monitor associated with secondary containment and CREOASS isolation being outside the TS required value. This finding is more than minor because it is associated with the Human Performance (Routine OPS/Maintenance Performance) attribute of the Barrier Integrity cornerstone and affected the cornerstone objective of providing reasonable assurance that physical design barriers (Secondary Containment and Control Room Ventilation) protect the public from radionuclide releases caused by accidents or events. Specifically, incorrectly calibrating the radiation monitor resulted in both systems being inoperable for almost two years. In accordance with IMC 0609.04, "Initial Characterization of Findings," and Exhibit 3 of IMC 0609, Appendix A, "The SDP for Findings At-Power," both dated June 19, 2012, the inspectors determined that this finding is of very low safety significance (Green) because the performance deficiency was only associated with the radiological barrier function of the control room and secondary containment.

This finding had a cross-cutting aspect in the area of Human Performance, Avoid Complacency because Susquehanna did not recognize and plan for the possibility of mistakes, latent problems, or inherent risk, even while expecting successful outcomes [H12]. Specifically, Susquehanna personnel did not consider the potential undesired consequences of their actions before performing work and implement appropriate error-reduction tools (e.g. self-check, peer-check).

Enforcement. TS 5.4.1.a, "Procedures," requires in part, that written procedures shall be established, implemented, and maintained covering the applicable procedures recommended in RG 1.33. RG 1.33, Appendix A requires implementing procedures for each surveillance in plant TSs. SI-079-335, "24-Month Calibration- Refuel Floor High Exhaust Duct 'B' Radiation Monitor," implements the requirements of TS SR 3.3.6.2.4 and 3.3.7.1.4, and provides instructions for how to calibrate the radiation monitor. Contrary to the above, on November 15, 2014, maintenance technicians incorrectly implemented the calibration procedure, which resulted in the radiation monitor trip setpoint being outside the operability requirements of both TSs.

Additionally, TS 3.3.6.1, Secondary Containment Isolation, and TS 3.3.7.1, CREOASS Instrumentation, require the refuel floor high exhaust duct high radiation monitor be operable during OPDRVs, core alternations, or movement of irradiated fuel in secondary containment. If the channel is determined to be inoperable, TSs require it to be placed in a trip condition within 24 hours. Contrary to this, the radiation monitor was inoperable from November 15, 2014 through October 19, 2016 without being placed in the trip condition, a period during which OPDRVs, core alterations, and fuel moves were performed for longer than 24 hours.

Upon identification of the issue, Susquehanna properly calibrated the radiation monitor to restore operability to the systems. Because it was of very low safety significance (Green) and has been entered into the CAP as CR-2016-23713, this finding is being treated as a NCV in accordance with section 2.3.2 of the NRC's Enforcement Policy. (**NCV 05000388/2016004-03, Refuel Floor Radiation Monitor Inoperable Due to being Improperly Calibrated**)

1EP4 Emergency Action Level and Emergency Plan Changes (IP 71114.04 – 1 sample)

a. Inspection Scope

Susquehanna implemented various changes to the Susquehanna Emergency Action Levels (EALs), Emergency Plan, and Implementing Procedures. Susquehanna determined that, in accordance with 10 CFR 50.54(q)(3), any change made to the EALs, Emergency Plan, and its lower-tier implementing procedures, did not result in reduction in effectiveness of the Plan, and that the revised Plan continued to meet the standards in 50.47(b) and the requirements of 10 CFR 50 Appendix E.

The inspectors performed an in-office review of all EAL and Emergency Plan changes submitted by Susquehanna as required by 10 CFR 50.54(q)(5), including changes to lower-tier emergency plan implementing procedures, to evaluate for any potential reductions in effectiveness of the Emergency Plan. This review by inspectors was not documented in a NRC Safety Evaluation Report and does not constitute formal NRC approval of the changes. Therefore, these changes remain subject to future NRC inspection in their entirety. The requirements in 10 CFR 50.54(q) were used as reference criteria. The specific documents reviewed during this inspection are listed in the Attachment.

b. Findings

No findings were identified.

2. RADIATION SAFETY

Cornerstone: Occupational/Public Radiation Safety (PS)

2RS1 Radiological Hazard Assessment and Exposure Controls (71124.01) (3 samples)

a. Inspection Scope

The inspectors reviewed Susquehanna's performance in assessing and controlling radiological hazards in the workplace. The inspectors used the requirements contained in 10 CFR 20, TSs, Regulatory Guide (RG) 8.38, and the procedures required by TSs as criteria for determining compliance.

Inspection Planning

The inspectors reviewed the performance indicators (PIs) for the occupational exposure cornerstone, radiation protection (RP) program audits, and reports of operational occurrences in occupational radiation safety since the last inspection.

Radiological Hazards Control and Work Coverage (1 sample)

The inspectors evaluated in-plant radiological conditions and performed independent radiation measurements during facility walkdowns and observation of radiological work activities. The inspectors assessed whether posted surveys; radiation work permits (RWPs); worker radiological briefings and RP job coverage; the use of continuous air monitoring, air sampling and engineering controls; and dosimetry monitoring were consistent with the present conditions. The inspectors examined the control of highly activated or contaminated materials stored within the spent fuel pools and the posting and physical controls for selected high radiation areas (HRAs), locked high radiation areas (LHRAs) and very high radiation areas (VHRAs) to verify conformance with the occupational PI.

Risk-Significant HRA and VHRA Controls (1 sample)

The inspectors reviewed the procedures and controls for HRAs, VHRAs, and radiological transient areas in the plant.

Radiation Worker Performance and Radiation Protection Technician Proficiency (1 sample)

The inspectors evaluated radiation worker performance with respect to RP work requirements. The inspectors evaluated RP technicians in performance of radiation surveys and in providing radiological job coverage.

b. Findings

No findings were identified.

2RS2 Occupational ALARA Planning and Controls (71124.02) (2 samples)

a. Inspection Scope

The inspectors assessed Susquehanna's performance with respect to maintaining occupational, individual and collective radiation exposures as low as is reasonably achievable (ALARA). The inspectors used the requirements contained in 10 CFR 20, applicable RGs, TSs, and procedures required by TSs as criteria for determining compliance.

Inspection Planning

The inspectors conducted a review of Susquehanna's collective dose history and trends; ongoing and planned radiological work activities; previous post-outage ALARA reviews; radiological source term history and trends; and ALARA dose estimating and tracking procedures.

Radiological Work Planning (1 sample)

The inspectors selected the following radiological work activities based on exposure significance for review:

- RWP 2016-1002, Refuel Floor Outage Activities
- RWP 2016-1003, Refuel Floor Outage Activities
- RWP 2016-1320, Scaffold Work in the Drywell
- RWP 2016-1373, Snubber Work in the Drywell

For each of these activities, the inspectors reviewed: ALARA work activity evaluations; exposure estimates; exposure reduction requirements; results achieved (dose rate reductions, actual dose); person-hour estimates and results achieved; and post-job reviews that were conducted to identify lessons learned.

Verification of Dose Estimates and Exposure Tracking Systems (1 sample)

The inspectors reviewed the current annual collective dose estimate; basis methodology; and measures to track, trend, and reduce occupational doses for ongoing work activities, evaluated the adjustment of exposure estimates, or re-planning of work and reviewed post-job ALARA evaluations of excessive exposure.

b. Findings

No findings were identified.

2RS8 Radioactive Solid Waste Processing and Radioactive Material Handling, Storage, and Transportation (71124.08) (6 samples)

a. Inspection Scope

The inspectors verified the effectiveness of Susquehanna's programs for processing, handling, storage, and transportation of radioactive material. The inspectors used the requirements of 49 CFR 170-177, 10 CFR 20, 61, and 71, applicable industry standards, RGs, and procedures required by TSs as criteria for determining compliance.

Inspection Planning

The inspectors conducted an in-office review of the solid radioactive waste system description in the UFSAR, the process control program, and the recent radiological effluent release report for information on the types, amounts, and processing of radioactive waste disposed. The inspectors reviewed the scope of quality assurance audits performed for this area since the last inspection.

Radioactive Material Storage (1 sample)

The inspectors observed radioactive waste container storage areas, verified the postings and controls and that Susquehanna had established a process for monitoring the impact of long-term storage of the waste.

Radioactive Waste System Walkdown (1 sample)

The inspectors walked down the following:

- Accessible portions of liquid and solid radioactive waste processing systems to verify current system alignment and material condition
- Abandoned in place radioactive waste processing equipment to review the controls in place to ensure protection of personnel
- Changes made to the radioactive waste processing systems since the last inspection
- Processes for mixing and transferring radioactive waste resin and/or sludge discharges into shipping/disposal containers
- Current methods and procedures for dewatering waste

Waste Characterization and Classification (1 sample)

The inspectors identified radioactive waste streams and reviewed radiochemical sample analysis results to support radioactive waste characterization. The inspectors reviewed the use of scaling factors and calculations to account for difficult-to-measure radionuclides.

Shipment Preparation (1 sample)

The inspectors reviewed the records of shipment packaging, surveying, labeling, marking, placarding, vehicle checks, emergency instructions, disposal manifest, shipping papers provided to the driver, and Susquehanna verification of shipment readiness.

Shipping Records (1 sample)

The inspectors reviewed selected non-excepted package shipment records.

Problem Identification and Resolution (1 sample)

The inspectors assessed whether problems associated with radioactive waste processing, handling, storage, and transportation, were identified at an appropriate threshold and properly addressed in Susquehanna's CAP.

b. Findings

No findings were identified.

3. OTHER ACTIVITIES

4OA1 Performance Indicator Verification (71151)

.1 Mitigating Systems Performance Index (4 samples)

a. Inspection Scope

The inspectors reviewed Susquehanna's submittal of the Mitigating Systems Performance Index for the following systems for the period of October 1, 2015 through September 30, 2016:

- Unit 1, RHR System
- Unit 2, RHR System
- Unit 1, Cooling Water System
- Unit 2, Cooling Water System

To determine the accuracy of the PI data reported during those periods, the inspectors used definitions and guidance contained in Nuclear Energy Institute (NEI) Document 99-02, "Regulatory Assessment Performance Indicator Guideline," Revision 7. The inspectors also reviewed Susquehanna's operator narrative logs, condition reports, mitigating systems performance index derivation reports, event reports, and NRC integrated inspection reports to validate the accuracy of the submittals.

b. Findings

No findings were identified.

.2 Occupational Exposure Control Effectiveness (1 sample)

a. Inspection Scope

The inspectors reviewed Susquehanna submittals for the occupational radiological occurrences PI for the first through third quarter 2016. The inspectors used PI definitions and guidance contained in NEI 99-02, Revision 7, to determine the accuracy of the PI data reported. The inspectors reviewed electronic personal dosimetry accumulated dose alarms, dose reports, and dose assignments for any intakes that occurred during the time period reviewed to determine if there were potentially unrecognized PI occurrences.

b. Findings

No findings were identified.

.3 Radiological Effluent TS/Offsite Dose Calculation Manual (ODCM) Radiological Effluent Occurrences (1 sample)

a. Inspection Scope

The inspectors reviewed Susquehanna submittals for the radiological effluent TS/ODCM radiological effluent occurrences PI for the first through third quarter 2016. The inspectors used PI definitions and guidance contained in the NEI 99-02, Revision 7, to determine if the PI data was reported properly. The inspectors reviewed the public dose assessments for the PI for public radiation safety to determine if related data was accurately calculated and reported.

The inspectors reviewed the CAP database to identify any potential occurrences such as unmonitored, uncontrolled, or improperly calculated effluent releases that may have impacted offsite dose. The inspectors reviewed gaseous and liquid effluent summary data and the results of associated offsite dose calculations to determine if indicator results were accurately reported.

b. Findings

No findings were identified.

4OA2 Problem Identification and Resolution (71152 – 6 samples)

.1 Routine Review of Problem Identification and Resolution Activities

a. Inspection Scope

As required by Inspection Procedure 71152, “Problem Identification and Resolution,” the inspectors routinely reviewed issues during baseline inspection activities and plant status reviews to verify Susquehanna entered issues into the CAP at an appropriate threshold, gave adequate attention to timely corrective actions, and identified and addressed adverse trends. In order to assist with the identification of repetitive equipment failures and specific human performance issues for follow-up, the inspectors performed a daily screening of items entered into the CAP and periodically attended CR screening meetings. The inspectors also confirmed, on a sampling basis, that, as applicable, for identified defects and non-conformances, Susquehanna performed an evaluation in accordance with 10 CFR Part 21.

b. Findings

No findings were identified.

.2 Semi-Annual Trend Review

a. Inspection Scope

The inspectors performed a semi-annual review of site issues to identify trends that might indicate the existence of more significant safety concerns. As part of this review, the inspectors included repetitive or closely-related issues documented by Susquehanna in trend reports, site PIs, major equipment problem lists, system health reports, maintenance rule assessments, and maintenance or CAP backlogs. The inspectors also

reviewed Susquehanna's CAP database for the third and fourth quarters of 2016 to assess CRs written in various subject areas (equipment problems, human performance issues, etc.), as well as individual issues identified during the NRCs daily CR review (Section 4OA2.1). The inspectors reviewed the Susquehanna quarterly trend report for the third quarter of 2016, conducted under LS-125-1009, "Station Trending Manual," Revision 2, to verify that Susquehanna personnel were appropriately evaluating and trending adverse conditions in accordance with applicable procedures.

b. Findings and Observations

No findings were identified.

Human Performance Events. Inspectors continued to note an adverse trend in the number of human performance events. This trend was noted previously in the semi-annual review of trends documented in IR 2016-002 (ML16225A000). In review of CAP records and findings since this was last documented, inspectors noted that the number of human performance related events remained high. Significant examples include:

- Unit 1 'B' refuel floor high exhaust duct high radiation monitor incorrectly calibrated which rendered it inoperable for longer than the TS allowed outage time. Additional details are included in section 1R22 of this report.
- While replacing a light socket on the Unit 2 'B' auxiliary bus, operations and maintenance personnel did not recognize that disconnecting the neutral wires would interrupt power to all of the degraded voltage relays for the bus. When the leads were lifted, the relays de-energized, tripping all the breakers on the bus, which tripped the 'B' RRP, along with other non-safety related loads. Additional details are included in section 4OA3 of this report.
- Incorrect transmission of wind direction between the Recovery Manager and Senior State Official during a protective action recommendation notification. The error was not identified during the communication or drill critique. Additional details are included in section 1EP6 of IR 387; 388/2016002 (ML16225A000).
- Some procedures were not erased in between simulator sessions, potentially compromising exam security during a requalification exam. Ultimately it was determined that exam security was not impacted since the stray information could not have impacted crew performance (CR-2016-21572)
- Maintenance did not install a jumper during a breaker swap for the 'B' CREOASS fan, which resulted in the outside air damper closing and battery room exhaust isolating. (CR-2016-23201)
- While replacing an uninterruptible power supply, maintenance made contact with an energized terminal resulting in tripping of the alternate power supply and loss of several control room indications and alarms. (CR-2016-19680)

Inspectors also noted that Susquehanna continued to assess human performance as the most significant gap for the station in the third quarter performance assessment report and continues to track actions to address the gap in their plan for excellence. Notwithstanding this, inspectors identified that the number of prompt investigations initiated in 2016, an investigative tool used, in part, to quickly gather facts in human performance related events, had dropped significantly from the previous year, lowering from an average of 12 to 8 investigations per month in 2015 and 2016, respectively.

Additionally, the number of CRs generated with human performance related trend codes applied had lowered significantly from 33 to 25 to 19 CRs per month in 2014, 2015, and 2016, respectively. Inspectors determined that these trends appeared inconsistent with the station's qualitative assessment of performance and could affect their ability to monitor and correct the gap.

Reactor Manual Control System. Inspectors noted an apparent trend in issues with the Unit 1 reactor manual control system (system number 156) in 2016. Specifically, inspectors noted that there were 42 CRs generated for issues with the system in 2016. This was elevated when compared to the previous years in which only 12 and 6 CRs were generated in 2014 and 2015, respectively. This represented a 250% increase from the period that covered the previous Unit 1 refueling outage (2014). Inspectors noted that a trend CR was generated by Susquehanna in the 3rd quarter associated with the system, however, this CR was generated to drift issues with rod drive control system power supplies which accounted for only 3 of the 42 CRs generated in 2016. Though none of the issues were the result of more than minor performance deficiencies, inspectors determined that collectively they represent a potential challenge to operations personnel and warranted further management review.

.3 Annual Sample: Unit 1 HPCI Turbine Exhaust Line Vacuum Breaker Failed In-service Test

a. Inspection Scope

The inspectors performed an in-depth review of Susquehanna's analysis and corrective actions associated with CR-2014-12407, "HPCI Turbine Exhaust Vacuum Breaker Line Check Valve found 20 degrees stuck open," written April 17, 2014. Specifically, while executing work order 1413027, the Unit 1 HPCI turbine exhaust vacuum breaker line check valve 155F077 was found to be approximately 20 degrees stuck open and unable to open or close when pressure was applied to the valve disc.

The inspectors assessed Susquehanna's problem identified threshold, apparent cause evaluation (ACE), and the prioritization and timeliness of Susquehanna's corrective actions to determine whether Susquehanna was appropriately identifying, characterizing, and correcting problems associated with this issue, and whether the planned or completed corrective actions were appropriate. The inspectors compared the actions taken to the requirements of Susquehanna's CAP and 10 CFR 50, Appendix B. In addition, the inspectors reviewed subsequent CRs and cause evaluations, work activities, and interviewed personnel to assess the effectiveness of the implemented corrective actions.

b. Findings and Observations

No findings were identified.

On April 27, 2011, Unit 2 RCIC turbine exhaust vacuum breaker, 249F064, failed its IST due to its counterweight rotating out of position because of wear to its set screw. Susquehanna specified an extent of condition action to inspect similar valves on Unit 1's RCIC and HPCI systems during the following 2012 Unit 1 refueling outage. However, these activities were inappropriately rescheduled from 2012 to 2014. On April 17, 2014, the Unit 1 HPCI turbine exhaust vacuum breaker check valve was found to be approximately 20 degrees stuck open and failed its IST due to prior incorrect

maintenance performed on the valve stemming back to 2007 where reinstallation steps were performed out of order. An opportunity to identify the condition adverse to quality was missing during the 2012 Unit 1 outage when the extent of the condition inspection was deferred. For more information on the issue and subsequent finding see Susquehanna inspection report (05000387/388/2014003).

Susquehanna's corrective actions specified in their ACE included repairing the check valve, adding procedural guidance to the work instructions in order to prevent similar incorrect maintenance on subsequent check valves, and specifying modifications to lessen the effect of normal wear to the set screw to avoid the counterweight rotating out of position. A contributing cause identified by the ACE was that the IST engineer had not tracked the work orders that were deferred to completion. Susquehanna specified a corrective action to revise procedure NDAP-QA-0423 to add specific instructions for the tracking of IST component corrective actions to ensure that the actions are completed as scheduled. Following a subsequent 2015 condition report, CR-2015-10801, which involved Susquehanna maintenance personnel identifying a loose counterweight on check valve 255F077 during an inspection, Susquehanna made changes to the PM strategy concerning all eight of the vacuum breakers on both units, increasing inspection periodicity to every two years for components subject to the normal wear experienced from operation.

The inspectors reviewed Susquehanna's extent of condition inspections, PM templates, procedure revisions, and work instructions and determined them to be reasonable. The inspectors reviewed documents pertaining to Susquehanna's 2016 performed and 2017 planned inspections for each of the Unit 1 and Unit 2 RCIC and HPCI vacuum breakers, and did not identify any deficiencies in the changes made or in the work performed. The inspectors did identify that the use of the specific instructions for tracking of IST components by the IST engineer was not consistent between the 2014 and 2015 vacuum breaker issues in that in 2014 an action request was created to track completion of the work order while in 2015 no action request was created. The inspectors determined that the issue was minor because although the actions were inconsistent for tracking completion by the IST engineer, all inspections of the vacuum breaker check valves were performed per the PM schedule.

.4 Annual Sample: Corrective Actions for Instrument Drift associated with Safety-Related Core Spray and Low Pressure Injection Permissive Switches

a. Inspection Scope

The inspectors performed an in-depth review of Susquehanna's evaluation and corrective actions associated with CR-2015-06243, LER 388/2015-001 and the associated licensee identified violation documented in NRC Integrated Inspection Report 50-387; 388/2016-001. The licensee identified violation was documented because Susquehanna had not considered the effects of mechanical hysteresis on the function of reactor steam dome pressure switches when operated above their normal range resulting in the pressure switches drifting outside of their TS allowable values for emergency core cooling system injection valve permissive interlocks for greater than the TS allowable time. Susquehanna performed an EACE to identify the cause and identify the corrective actions. Inspectors reviewed the evaluation and its associated corrective actions.

Susquehanna determined the apparent cause of the failures was a less than adequate design when replacing the pressure switches in 1999/2000 which did not consider the effects of mechanical hysteresis when operated above their normal operating range. Three causal factors were also identified by Susquehanna during the evaluation; less than adequate system and component monitoring, less than adequate preventive maintenance, and less than adequate use of internal and external operating experience. Seven corrective actions were approved by the corrective action review board on May 12, 2015 that related to the direct cause, apparent cause, causal factors, or extent of cause.

b. Findings and Observations

No findings were identified.

The inspectors identified weaknesses in some of Susquehanna's key corrective actions. Corrective actions generated by the EACE were not consistently entered and appropriately tracked in Actionway as intended. Specifically, the EACE directed the replacement of the Unit 2 'A' pressure switch with a new switch with an assigned due date of March 4, 2016. Work order 1890777 was generated for this replacement and coded as a corrective action work order. The EACE also directed the replacement of the other seven switches, which also had corrective work orders generated, across the two units as an extent of condition action with an assigned due date of October 21, 2016. Rather than tracking the replacement of the switches, an action was initiated to confirm that the replacement switch was the correct replacement and if not, find a replacement that was correct (ACT-06-CR-2015-06243) with an assigned due date of August 14, 2015. Contrary to the closure actions described in the evaluation, on August 13, 2015, the action was closed after determining that the replacement switch was an acceptable replacement with a comment that the engineering change will be performed under AR-2015-22530 with a due date of September 18, 2015. AR-2015-22530 was extended to November 17, 2015 due to higher priorities and again to December 31, 2015. On November 19, 2015, it was discovered that the design change would require a higher level of design. On December 28, 2015, CARB approved revising the action to a long term corrective action to develop a design change and evaluate replacing the component with a new (like in kind) replacement. The corrective action work orders were all canceled. No action was established to replace PIS-B21-2N021A until work order 2024880 was initiated on September 13, 2016. Work order 2024880 is scheduled to be completed in May 2017, 24 months after the action was first identified in the EACE.

The EACE identified a causal factor of less than adequate system and component monitoring. Corrective actions associated with this causal factor were directed toward establishing clear criteria for calibration failures, but did not address the issue of trending drift data to identify performance issues and validating that the as-left calibration data was appropriate. Inspectors noted that the performance of PIS-B21-2N021A was an outlier and the as-left calibration bands (+/- 3 psig) would not support the operability of the switch (+/- 13 psig) when the instrument drifted greater than 10 psig, which had occurred on one occasion since January 2015. In this case, the instrument was previously left at the upper end of the as-left calibration band and the instrument drifted low so the instrument remained operable for the calibration interval. Inspectors verified the system engineer has been trending the raw data but noted that no statistical analysis of the data has been performed to ensure the as-left calibration provided reasonable assurance of operability for the complete calibration interval.

Overall, the inspectors concluded that Susquehanna has taken adequate compensatory actions to address the degraded condition of the switches. Specifically, the 45 day calibration frequency has prevented the instruments from drifting outside their TS allowable values to date.

.5 Annual Sample: Drift on RPS Electrical Protection Assembly Breakers Protective Setpoints

a. Inspection Scope

The inspectors performed an in-depth review of Susquehanna's evaluations and corrective actions associated with CR-2014-37655 and CR-2014-28492, for the underfrequency as-found settings for reactor protection system (RPS) electrical protection assembly (EPA) breakers. The latter CR documented that during a review of LER 2013-009-00, NRC inspectors questioned how the as left set-point bands for EPA breaker underfrequency trip provided reasonable assurance that the associated TS allowable value for underfrequency trip would continue to be met between calibrations, given the vendor specified drift values of the equipment were in excess of that assumed in the setpoint calculation. Susquehanna performed a calibration on all 16 of the EPA breaker's and adjusted the setpoints to the new allowable range for the underfrequency trip of 57.20 Hz to 57.25 Hz.

The inspectors assessed Susquehanna's problem identification threshold, problem analysis, extent of condition reviews, compensatory actions, and the prioritization and timeliness of Susquehanna's corrective actions to determine whether Susquehanna was appropriately identifying, characterizing, and correcting problems associated with this issue and whether the planned or completed corrective actions were appropriate. The inspectors compared the actions taken to the requirements of Susquehanna's CAP and Title 10 of the CFR Part 50, Appendix B, Criterion XVI, Corrective Action. In addition, the inspectors reviewed documentation associated with this issue, including the ACE, operability determination, revised surveillance procedures, completed walkdowns, and interviewed engineering personnel to assess the effectiveness of the implemented corrective actions to complete full resolution of the issue.

b. Findings and Observations

No findings were identified.

The inspectors found that Susquehanna took appropriate actions to identify the apparent cause of the issue. The apparent cause was determined to be that the calculation, EC-SOPC-0501, did not take into consideration the manufacturer's stated setpoint drift and temperature effects when determining the underfrequency setpoint of the EPA logic cards. The operation manual, identifies a drift value of +/-0.2 Hz for a change from setpoint at 75 degrees Fahrenheit. Susquehanna revised the RPS/EPA Calculation EC-SOPC-0501 to address the setpoint drift, temperature effects, and as-left tolerance for the under frequency setting of the EPA assemblies. The surveillance procedures were updated to reflect these changes and surveillance testing was completed on all the EPA assemblies to reflect the new setpoints and guidance for as left conditions identified in the calculation.

Susquehanna also performed an extent of condition review for this condition a sampling of 35 TS setpoints calculations to verify setpoint drift and/or temperature effects were considered in determining the components setpoints. From the 35 calculations sampled, all showed drift and temperature had been considered in determining the component setpoints.

The inspector determined Susquehanna's overall response to the issue was commensurate with the safety significance, was timely, and the actions taken and planned were reasonable to resolve the drift in setpoints for the RPS/EPA breaker underfrequency settings.

.6 Annual Sample: Susquehanna Unit 1 Socket Weld Leaks on the 1B Reactor Recirculation Pump Lower Seal Vent to Pump Seal Cooler Line

a. Inspection Scope

The inspector reviewed Susquehanna staff's performance to identify, evaluate and correct a small reactor coolant boundary leak, observed on June 6, 2016, from 3/4-inch socket weld #8 located on the Susquehanna Unit 1 B RRP lower seal vent line to the pump seal cooler. This reactor coolant pressure boundary leak was reported to the NRC in LER 05000387/2016-019-00 dated August 3, 2016, as a condition prohibited by the Susquehanna Unit 1 TSs.

This weld had previously been found by Susquehanna staff to be leaking and repaired in December 2014, and found leaking again in November 2015, and replaced as a corrective action. NRC inspectors previously reviewed LERs associated with these two leaks and documented conclusions, which involved a finding, in NRC Inspection Report 05000387/2016001 dated May 12, 2016 (ADAMS ML16132A421).

This inspection scope involved review of Susquehanna's documentation of the weld replacement of socket #8, completed in November 2015 prior to plant restart in January 2016, and their subsequent apparent cause evaluation, completed before a leak in the same weld was identified in June 2016. The inspectors further reviewed Susquehanna's corrective actions accomplished in June 2016 and later, involving complete replacement of the pump seal cooler assembly with a different design to remove the welded connection which had leaked repetitively, metallurgical laboratory testing of the removed socket weld assembly to identify the leak causes, completion of a root cause evaluation, and installation of vibration analysis sensors on the redesigned piping to connection #8 to measure vibration as a function of plant operating parameters.

The inspectors assessed Susquehanna staff's problem identification threshold, cause analyses, operability determinations, extent of condition reviews, compensatory actions, and the prioritization and timeliness of corrective actions regarding the leak. This review was conducted to determine whether the Susquehanna staff were appropriately, identifying, characterizing, and correcting problems associated with the socket weld leaks and whether the planned or completed corrective actions were appropriate. The inspectors interviewed Susquehanna's technical engineering personnel to discuss the results of the cause evaluations and to assess the effectiveness of the implemented corrective actions. The inspectors compared the actions taken to Susquehanna's CAP, the EPRI guidance on socket weld optimization, and the requirements of 10 CFR 50, Appendix B.

b. Findings and Observations

No findings were identified.

The inspectors reviewed the weld repair documentation from November 2015 including the work order details and the use of the gas tungsten shielded arc welding process to produce a 2 x1 fillet weld configuration to replace weld #8. The weld was determined to be completed by a welder, procedure and equipment qualified in accordance with accordance with the ASME Code Section IX. Notwithstanding, the inspectors determined the weld replacement was not effectively completed to correct the condition as evidenced by a leak identified in June 2016.

The inspectors reviewed Susquehanna staff's evaluation and actions including Susquehanna Metallurgical Report L-2022-003 dated July 2016. This report identified two aspects of the June 2016 leak cause involving a fatigue initiation site at the root of the socket weld and an external weld surface grinding contour that was a site for external crack initiation. These two small cracks merged internally to provide a leakage path. The inspector noted weld #8 had leakage in 2014 and 2015, with the June 2016 leak being the third occurrence. Similar socket welds on the 1B cooler did not develop leakage during this time period.

The inspector reviewed Susquehanna's root cause evaluation associated with CR-2016-14366 and their actions to identify the causes of the leak and prevent recurrence. Actions to prevent recurrence included changes to the socket weld configuration, related welding process and controls, and the measurement of system vibration at points on the piping near connection #8 after return to operation. The inspector reviewed Susquehanna report "SSES Unit 1 RRP Branch Line Startup and Full Power Testing Report", dated September 19, 2016, with the responsible engineer to determine the results of vibration monitoring and scope of additional measurement and results analysis.

The inspectors concluded Susquehanna staff identified the causes of the leak identified in June 2016. The inspectors further concluded the corrective actions to use a modified seal cooler which had an integral fitting in place of weld #8 and to monitor the associated pipe line for vibration during various operational conditions were reasonable to likely prevent leak recurrence in this area.

4OA3 Follow-Up of Events and Notices of Enforcement Discretion (71153 – 7 samples)

.1 Plant Events

a. Inspection Scope

For the plant events listed below, the inspectors reviewed and/or observed plant parameters, reviewed personnel performance, and evaluated performance of mitigating systems. The inspectors communicated the plant events to appropriate regional personnel, and compared the event details with criteria contained in IMC 0309, "Reactive Inspection Decision Basis for Reactors," for consideration of potential reactive inspection activities. As applicable, the inspectors verified that Susquehanna made appropriate emergency classification assessments and properly reported the event in accordance with 10 CFR Parts 50.72 and 50.73.

The inspectors reviewed Susquehanna's follow-up actions related to the events to assure that Susquehanna implemented appropriate corrective actions commensurate with their safety significance.

- Unit 1, 1A RRP trip and single loop operations on October 31, 2016
- Unit 2, Aux bus load shed and RRP trip on November 14, 2016

b. Findings

Introduction. A finding of very low safety significance (Green) for failure to develop an adequate work plan for replacement of a voltage potential indicating light on a breaker on the unit 2 'B' auxiliary bus was self-revealed when the Unit 2 'B' RRP tripped, along with other non-safety related loads, on November 14, 2016, resulting in a rapid unplanned downpower and transition to single loop operation. Specifically, operations and maintenance personnel did not recognize that disconnecting the neutral wires from the light socket would interrupt power to all of the degraded voltage relays for the auxiliary bus. Therefore, the relays de-energized when the maintenance was performed, tripping all the breakers on the bus.

Description. The non-safety related auxiliary busses are provided with two undervoltage protection circuits that will trip large loads from the bus in order to minimize the load on the bus once power is restored. One such protective feature senses degraded voltage on the bus and trips the CW pumps, SW pumps, condensate pumps, and RRP powered from the bus after a time delay. This is a non-safety related protective feature of the bus. The neutral line for these relays are connected in series, or daisy chained, and are provided with bus potential indicating lights.

On November 14, 2016, fix-it-now (FIN) electricians implemented minor maintenance work order 1855044, which replaced a light socket for the potential indicating light on the breaker for the 'D' CW pump on the Unit 2 'B' auxiliary bus. The impacts and effects of the work order were reviewed under release work order (RLWO) 1903793 by operations supervision. The RLWO described that the breaker would remain closed and control power applied throughout the work and did not identify any plant impacts for the maintenance activity. When the FIN electricians disconnected the light socket, all the breakers on the Unit 2 'B' auxiliary bus that are equipped with degraded voltage protection tripped. This resulted in a trip of the 'B' RRP, 'B' and 'D' CW pumps, 'B' and 'D' condensate pumps, and the 'B' SW pump. The loss of the condensate pumps caused an automatic trip of the 'C' reactor feed pump and runback of the 'A' RRP. Power was stabilized at 32 percent RTP following the transient.

Susquehanna entered the issue into the CAP as CR-2016-25622 and performed a prompt human performance investigation to determine what had occurred. In review, Susquehanna determined that operations supervision did not recognize that the neutral wires for all the degraded voltage relays and their potential indicating lights on the bus were daisy chained. Therefore, the relays all sensed a loss of voltage when the light socket were disconnected and the neutral path was interrupted. Susquehanna reviewed the plant drawings and determined that the drawings had adequately identified the wiring scheme.

MT-AD-509, Control of Minor Maintenance Activities, states that operations supervision is responsible for preparing and releasing RLWOs for minor maintenance work and requires the minor maintenance work order be processed in accordance with NDAP-QA-0502, Work Order Process. Step 5.5.10 of NDAP-QA-0502 requires operations supervision to prepare the RLWO in accordance with NDAP-QA-0302, System Status and Equipment Control, and states, in part, that they shall review impairments to additional systems and any logic or automatic functions affected by the work. NDAP-QA-0302 provides further instruction, including a job aid for preparation of RLWOs, and requires operations supervision to identify all the affected systems, any operational impacts and any system impacts of the work. A maintenance planning directive had been established providing specific guidance for planning work orders that isolate a daisy chained neutral, however, because the work order was screened as minor maintenance the work was planned and performed by FIN, without engagement of the planning organization. Due to the inadequate review of the work by FIN and operations supervision, the risk of working on a daisy chained neutral was not recognized or managed.

Inspectors determined that the station documentation, including plant drawings, were adequate to have correctly identified the impacts of the work activity. However, Susquehanna's planning of the activity did not adequately review the drawings to identify the impact. Susquehanna's immediate corrective actions included stabilizing the plant, entering single loop operations, and entering the issue into their CAP. Additionally, Susquehanna performed a maintenance department stand down to communicate immediate lessons learned from the event while a more thorough causal analysis was conducted.

Analysis. The inspectors determined that Susquehanna's failure to develop an adequate work plan for replacement of a voltage potential indicating light was a performance deficiency that was within their ability to foresee and correct, and should have been prevented. The performance deficiency was more than minor because it was associated with the Equipment Performance attribute of the Initiating Events cornerstone and affected its objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, implementation of work instructions resulted in a loss of the Unit 2 'B' RRP, 'B' and 'D' CW pumps, 'B' and 'D' condensate pumps, and the 'B' SW pump, which caused an automatic trip of the 'C' reactor feed pump and runback of the 'A' RRP, resulting in a rapid power reduction to 32 percent RTP. The inspectors evaluated the finding in accordance with IMC 0609, Appendix A "The SDP for Findings At-Power," dated June 19, 2012, Exhibit 1 for the Initiating Events cornerstone and determined the finding was of very low safety significance (Green) because it did not cause a reactor trip.

This finding was determined to have a cross-cutting aspect in the area of Human Performance, Work Management because Susquehanna did not implement a process of planning work activities such that nuclear safety is the overriding priority, including the identification and management of risk commensurate with the work. Specifically, Susquehanna did not recognize the risk of interrupting a daisy chained neutral when planning a minor maintenance work order and did not recognize the impact of the work activity in the field. [H.5]

Enforcement. This finding does not involve enforcement action since no regulatory requirement violation was identified. Specifically, since the work being performed was on a non-safety related piece of equipment, implementation of Susquehanna's procedures, MT-AD-509, Control of Minor Maintenance Activities, NDAP-QA-0502, Work Order Process, and NDAP-QA-0302, System Status and Equipment Control, are not required to be implemented as part of Susquehanna's 10 CFR 50, Appendix B, Quality Assurance Program. Because the finding does not involve a violation of regulatory requirements and has very low safety significance, it is identified as a FIN. (**FIN 05000387/2016004-04, Auxiliary Bus Load Shed When A Daisy Chained Neutral Was Interrupted During Maintenance)**

.2 LERs Associated with Reactor Coolant Pressure Boundary Leakage

a. Inspection Scope

.i (Closed) LER 05000387/2016-020-00: Reactor Coolant Pressure Boundary Leakage at Local Power Range Monitor (LPRM) Housing as a result of Intergranular Stress Corrosion Cracking (IGSCC)

On June 8, 2016, while performing under vessel inspections during a maintenance outage, Susquehanna identified a leak from a LPRM instrument housing above the instrument housing flange. Susquehanna determined the location of the leak was part of the reactor coolant pressure boundary and determined that this leakage constituted a violation of the Unit 1 TS LCO 3.4.4, "Reactor Coolant System (RCS)," which requires RCS leakage to be limited to no pressure boundary leakage.

The pressure boundary leakage was reported in accordance with 10 CFR 50.72(b)(3)(ii)(A) in event notification 51987. Susquehanna performed a root cause analysis of the pressure boundary leakage (CR-2016-14544) and determined it was caused by IGSCC. The LER and associated evaluation was reviewed for accuracy, the appropriateness of corrective actions, violations of requirements, and potential generic issues. This LER is closed.

.ii (Closed) LER 05000387/2016-019: "Pressure Boundary Leakage from an Inadequate Weld Repair in Small Bore Pump Seal Vent Piping"

On June 6, 2016 during a drywell entry following an unplanned Unit 1 outage to investigate increasing unidentified drywell leakage of 0.53 g/m, Susquehanna staff identified a leak on the Unit 1 'B' RRP lower seal cavity vent piping on a socket weld to connection #8. Susquehanna determined the location of the leak was part of the reactor coolant pressure boundary. Susquehanna determined that this leakage constituted a violation of the Unit 1 TS LCO 3.4.4,"RCS," which requires RCS leakage to be limited to no pressure boundary leakage. The affected piping had been in service for approximately 7 months following a previous repair of the weld at this location in November 2015 (ref. LER 05000387/2015-009). Prior to November 2015 the affected piping had been in service for approximately 11 months following an initial repair of the weld at this location in December 2014 (ref. LER 05000387/2014-011).

The pressure boundary leakage was reported in accordance with 10 CFR 50.72(b)(3)(ii)(A). Susquehanna performed a root cause analysis of the June 2016 pressure boundary leakage event (CR-2016-14366) and determined the previous weld repair in November 2015 left a crack initiating site at the root of the socket weld and provided an external weld surface ground condition that provided a site for external fatigue crack initiation. The LER and associated evaluations and follow-up actions were reviewed for accuracy, the appropriateness of corrective actions, violations of requirements, and potential generic issues. This LER is closed.

b. Findings

Description. Inspectors determined that these events constituted two separate examples of violations of TS 3.4.4, “RCS.”

Event 1: On June 8, 2016, while performing under vessel inspections, leakage was identified at an LPRM housing above the housing flange, on the LPRM housing tube. Susquehanna determined the leakage was non-isolable from the reactor vessel and was part of the reactor coolant pressure boundary. Additionally, Susquehanna determined that this leakage constituted a violation of the Unit 1 TS, Section 3.4.4 titled "RCS" that requires RCS leakage to be limited to no pressure boundary leakage. The condition was reported in event notification 51987 as required by 10 CFR 50.72(b)(3)(ii)(A) because it represented a degradation of a principal safety barrier.

Susquehanna evaluated the flaw and determined the cause of the reactor coolant pressure boundary leakage was IGSCC. The leak area was repaired by a weld overlay in accordance with ASME Section XI. Additionally, Susquehanna visually inspected all other Unit 1 LPRM, intermediate range monitor, and source range monitor housings for signs of leakage or defects and no further issues were identified.

Inspectors reviewed LER 2016-020, CR-2016-14544, which documented the related root cause evaluation and failure modes analysis for this condition, and related work documents associated with the repair. Though Susquehanna’s root cause analysis documented that the leak likely existed during the refueling outage in April 2016, the leakage was likely small enough that it would not have been readily identifiable during normal under vessel inspections. Additionally, Susquehanna determined that the leakage originated from an original construction weld and that applicable welding procedures and practices had been followed at the time. The inspectors determined Susquehanna’s causal analysis and actions to address the leak were reasonable. As such, inspectors did not identify a failure to meet a requirement or standard that either caused the pressure boundary leakage or allowed the leakage to go undetected prior to plant startup.

Event 2: On June 6, 2016, Susquehanna identified a leak on the Unit 1 ‘B’ RRP lower seal cavity vent piping at connection #8. Since Unit 1 was in Mode 1, full operation, when the elevated drywell leakage occurred, Susquehanna determined that this constituted a violation of the Unit 1 TS LCO 3.4.4, "RCS" which requires, in part, RCS leakage to be limited to no pressure boundary leakage. Susquehanna entered this leak condition into the CAP as CR-2016-14366 and performed an evaluation to identify the cause of the leakage and specify corrective actions. Susquehanna determined that a leak at the same location was identified on November 13, 2015 (LER 05000387/ 2015-009). That leak was weld repaired on November 21, 2015, and is documented in CR-2015-30901.

Susquehanna attributed the cause of the leak of June 2016 to undetectable lack of fusion at the root of the socket weld, unrecognized cyclic or vibrational loading and external cold working from weld grinding. The NRC Inspectors determined that Susquehanna's 2015 corrective actions did not prevent the fatigue cracking which resulted in pressure boundary leakage recurring before June 2016. However, the inspectors confirmed that qualified weld procedures and personnel were used in the 2015 full replacement with the proper 2 x 1 weld configuration. Susquehanna corrected the condition adverse to quality by replacing the entire pump seal cooler assembly including a fitting in lieu of weld #8 prior to the restart of Unit 1 in June 2016. This replacement was accompanied with the installation of vibration analysis sensors on the piping to connection #8 to provide piping vibration measurements as a function of plant operating parameters.

Enforcement. TS 3.4.4, "RCS" requires RCS leakage be limited to no pressure boundary leakage in Mode 1. Contrary to this, pressure boundary leakage from a LPRM instrument housing and from socket weld #8 occurred between plant start-up in December 2015 and plant shutdown on June 6, 2016, and existed while in Mode 1. The inspectors determined that these violations of TS 3.4.4 are more than minor, but not the result of performance deficiencies. Specifically, for the first event, though leakage likely existed during the previous refueling outage when personnel were performing unrelated maintenance and inspection activities, it was likely too small to reasonably identify and correct. Similarly, for the 2016 leak identified in weld #8, the leakage causes were not within Susquehanna's ability to foresee as they had replaced the weld with the industry recommended 2 x 1 taper configuration and used qualified procedures and personnel. The Susquehanna staff had also measured the susceptibility of the attached piping for vibrational inputs. In accordance with the NRC Enforcement Policy guidance and IMC 0612, these violations are being treated under the traditional enforcement process and best characterized as a Severity Level (SL) IV (very low safety significance) violation, similar to example d.1 in NRC Enforcement Policy, Section 6.1, "Reactor Operations." Although a performance deficiency was not identified, to verify that the issue was of very low safety significance, the inspectors considered risk insights obtained by using IMC 0609, SDP, Appendix A, Exhibit 1, "Initiating Events Screening Questions." The inspectors determined that these TS violations would screen to Green (very low safety significance) because the boundary leakage would not have exceeded the leak rate for a small loss of coolant accident (LOCA) and would not affect any LOCA accident mitigating systems or components. Therefore, the inspectors considered that the SL IV characterization was appropriate. The licensee entered these issues into the Susquehanna's CAP as CR-2016-14544 and CR-2016-14366.

Because these issues are of very low safety significance, it has been determined that it was not reasonable for Susquehanna to be able to foresee and prevent, and as such no performance deficiencies exist. The NRC has decided to exercise enforcement discretion in accordance with Sections 2.2.4 and 3.5 of the NRC Enforcement Policy and refrain from issuing enforcement action for the violation of TS (EA-16-283). Further, because Susquehanna's actions did not contribute to this violation, it will not be considered in the assessment process or the NRC's Action Matrix.

.3 (Closed) LER 05000387/2016-018-00 and 05000387/2016-018-01: Inoperability of RCIC Due to an Oil Leak

On April 16, 2016 during overspeed testing of the RCIC system, a small amount of leakage from the RCIC Turbine Lube Oil Filter, 1F212B, was identified while Reactor Pressure Vessel pressure was below 150 psig. Tightness was checked and the leak appeared to stop during the overspeed testing. On April 22, 2016 at approximately 14:00, after the unit had entered Mode 1, a one to two drop per second leak from the filter was identified which Susquehanna determined rendered RCIC inoperable. Susquehanna entered the issue into the CAP as CR-2016-15550 and determined the leakage was due to a poorly seated gasket or gasket manufacturing defect.

Susquehanna determined that the causal information provided evidence that RCIC was inoperable prior to the transition to Mode 1, and as a result, the condition was considered to be a violation of TS 3.0.4 and reportable in accordance with 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by TS.

Immediate corrective actions included replacing the gasket and verifying leak tightness of the joint. The LER and associated evaluations were reviewed for accuracy, the appropriateness of corrective actions, violations of requirements, and generic issues. The enforcement aspects of this issue were documented in IR 05000387; 388/2016008 (ML16246A291). That report also documented that Susquehanna did not report the failure as a loss of safety function in accordance with 10 CFR 50.73(a)(2)(v). At the time, inspectors determined that this was required since after Susquehanna's extended power uprate licensee amendment being approved, RCIC is credited in USFAR safety analysis. This was documented as a minor violation of 10 CFR 50.73. Susquehanna entered the reporting issue into the CAP as CR-2016-15710 and determined that the failure was not in fact reportable as a loss of safety function because RCIC is only credited in the loss of feedwater transient analysis and is not credited to function following any accidents. Inspectors reviewed the evaluation and other relevant regulatory guidance. Regulatory Issue Summary 01-014, "Position on Reportability Requirements for RCIC System Failure," discusses the reporting basis for RCIC failures under 10 CFR 50.73(a)(2)(v) and states that "reporting of RCIC system failure or inoperability is required by the relevant regulations only for plants whose final safety analysis report explicitly credits the RCIC system for mitigating the consequences of a rod ejection accident." Since RCIC is not credited in Susquehanna's UFSAR for mitigation of a rod ejection accident, inspectors determined that reporting under that criterion was not required and that no minor violation of 10 CFR 50.73 had existed. This LER is closed.

.4 (Closed) LER 05000387; 388 /2016-024-00: Refuel Floor Radiation Exhaust Monitor Isolation Setpoint Above Technical Specification Limit Due to Human Performance Error

On October 19, 2016, Susquehanna performed SI-079-335, "24-Month Calibration-Refuel Floor High Exhaust Duct 'B' Radiation Monitor," which calibrates the radiation monitor trip setpoint that initiates the secondary containment isolation system and CREOASS in the event of a fuel handling accident. During performance of the surveillance, technicians identified the 'B' channel set to trip above the TS required value of less than 25 mR/hr. Susquehanna re-calibrated the instrument to within the TS allowed value, restoring the channel to an operable condition.

Susquehanna entered the issue into the CAP as CR-2016-23713 and determined that the instrument was incorrectly calibrated during the previous performance of the surveillance on November 15, 2014 due to a human performance error. Because the channel was inoperable for the entire 24 month period and is an input into a 1 out of 1 logic for the two systems, the condition required reporting in accordance with 10 CFR 50.73(a)(2)(i)(B) and 10 CFR 50.73(a)(2)(v)(C) as a condition prohibited by TS and as a condition that could have prevented fulfillment of a safety function. The LER and associated evaluations were reviewed for accuracy, the appropriateness of corrective actions, violations of requirements, and generic issues. The enforcement aspects of this issue are documented in section 1R22 of this inspection report.

Additionally, Susquehanna determined that the event will not be counted as a safety system functional failure for the NRC PI based on an engineering analysis documented in AR-2016-26509, which supported the system's ability to fulfill the safety function contained in the accident analysis. Inspectors reviewed the evaluation and EC-RADN-0531, “Secondary Containment Isolation Radiation Monitoring Setpoints,” and determined it was reasonable because the actual as found setting, though outside the TS allowed value, was within the value assumed in the offsite and control room dose analysis. This LER is closed.

.5 (Closed) LER 05000387; 388/2016-007-00: Inoperability of Swing Bus Transfer Switch Due to Deformed Bolt on Linkage

On March 5, 2016 during surveillance testing, ATS, 1ATS229, failed to close in on the alternate supply resulting in a loss of the Division 2 Class 1 E Engineered Safeguards System 480V Motor Control Center 113229 and entry into TS 3.3.3.1, 3.5.1, and 3.6.1.3. Based on the cause of the failure, Susquehanna determined there was firm evidence that the transfer switch would have failed on its next actuation following testing on February 5, 2016. Based on this conclusion, the condition existed for a period longer than allowed by TS. The event was reported in accordance with 10 CFR 50.73(a)(2)(i)(B) as a condition prohibited by TS. Susquehanna also determined that work associated with the Division 1 transfer switch (1ATS219) was performed while the Division 2 switch was unknowingly inoperable resulting in simultaneous inoperability of both divisions. Since both divisions were inoperable for a period of time between February 5, 2016 and March 5, 2016, this is also considered a condition that could have prevented fulfillment of a safety function and is reportable in accordance with 10 CFR (a)(2)(v)(D).

The direct cause was determined to be a deformed bolt on the upper linkage. The apparent cause was the upper linkage rod being too long causing the deformation of the bolt. Corrective actions include revising the preventive maintenance activities for the transfer switch. The inspectors reviewed this LER, Susquehanna's evaluation, and associated corrective actions. The enforcement aspects of this finding are discussed in Section 1R12. This LER is closed.

4OA6 Meetings, Including Exit

On January 24, 2016, the inspectors presented the inspection results to Mr. Timothy S. Rausch, President and Chief Nuclear Officer, and other members of the Susquehanna staff. The inspectors verified that no proprietary information was retained by the inspectors or documented in this report.

ATTACHMENT: SUPPLEMENTARY INFORMATION

SUPPLEMENTARY INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

T. Rausch, President and Chief Nuclear Officer
B. Franssen, Plant Manager
D. Ambrose, Design Engineering Manager
B. Bridge, Radiation Protection Manager
J. Dobiac, Engineer
J. Gorman, Emergency Preparedness Manager
F. Habib, Materials Engineer
M. Hanover, Design Engineer
J. Jennings, Regulatory Affairs Manager
J. Jessick, Radiological Operations Supervisor - ALARA
D. Kostelnik, Engineering Supervisor
C. Mangus, Regulatory Assurance
R. McIntosh, Licensing
K. Murchison, Radioactive Material Shipper
R. Perry, Design Engineer
C. Poncavage, I&C System Engineer
R. Rodriguez-Gilroy, Radiological Operations Supervisor – Operations
E. Schmeck, Maintenance- I&C Supervisor
G. Schrad**,** Regulatory Exam Author, Operations Training
B. Sprung, Regulatory Affairs Engineer
T. Terryah, ISI Programs Manager
T. Walter, Branch Manager Electrical I&C Systems

LIST OF ITEMS OPENED, CLOSED, DISCUSSED, AND UPDATED

Opened/Closed

05000387;388/2016004-01	FIN	Failure Rates Exceed (20%) Twenty Percent for Biennial Requalification Exam (Section 1R11)
05000387;388/2016004-02	NCV	Failure to Promptly Correct a Condition Adverse to Quality with LPCI Swing Bus Automatic Transfer Switches (Section 1R12)
05000388/2016004-03	NCV	Refuel Floor Radiation Monitor Inoperable Due to being Improperly Calibrated (Section 1R22)
05000387/2016004-04	FIN	Auxiliary Bus Load Shed when a Daisy Chained Neutral was Interrupted during Maintenance (Section 4OA3)

Closed

05000387/2016-020-00	LER	Reactor Coolant Pressure Boundary Leakage at Local Power Range Monitor (LPRM) Housing as a result of Intergranular Stress Corrosion Cracking (IGSCC) (Section 4OA3)
05000387/2016-018-00 and 05000387/2016-018-01	LER	Inoperability of RCIC Due to an Oil Leak (Section 4OA3)
05000388;387/2016-024-00	LER	Refuel Floor Radiation Exhaust Monitor Isolation Setpoint Above Technical Specification Limit Due to Human Performance Error (Section 4OA3)
05000387;388/2016-007-00	LER	Inoperability of Swing Bus Transfer Switch Due to Deformed Bolt on Linkage (Section 4OA3)
05000387/2016-019-00	LER	Pressure Boundary Leakage from an Inadequate Weld Repair in Small Bore Pump Seal Vent Piping (Section 4OA3)

LIST OF DOCUMENTS REVIEWED

Section 1R01: Adverse Weather Protection

Procedures
NDAP-00-1913, Seasonal Readiness, Revision 6
NDAP-00-0030, Severe Weather/Natural Disaster Preparation, Revision 10
ON-NATPHENOM-001, Severe Weather/ Natural Phenomena, Revision 3

Condition Reports (*NRC identified)

CR-2016-14243	CR-2016-01870	CR-2016-23481	CR-2016-24114
CR-2016-24358*	CR-2016-24567	CR-2016-27464*	CR-2016-27538*
CR-2016-27586*			

Action Requests

DI-2016-08702	AR-2016-09464	AR-2016-20432

Miscellaneous
Monitoring the Effectiveness of Maintenance at Nuclear Power Plants, Regulatory Guide 1.160
NUMARC 93-01, Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants, Revision 4A
EC-002-1083, Heater Sizing for Blue Max (0G503) Fuel Tank, Revision 0

Section 1R04: Equipment Alignment

Procedures
SO-153-003A, 24 Month SBLC Operability (Loop A), Revision 5
SO-153-003B, 24 Month SBLC Operability (Loop B), Revision 4
SO-153-005A, A SBLC Comprehensive Pump Test Following Maintenance, Revision 2
SO-253-005A, A SBLC Comprehensive Pump Test Following Maintenance, Revision 1
CR-2016-14243, Revision 1

Condition Reports (*NRC identified)
CR-2016-23220*

Maintenance Orders/Work Orders
1050612 1406246 1495522 1798086 1798336 1902929
1995920 2003911

Drawings
M-178, Unit 1 P&ID Control Structure Air Flow Diagram, Sheet 1, Revision 35
M-186, Common P&ID Control Structure Chilled Water System "A", Sheet 1, Revision 43
C-1754, Units 1 & 2 Control Structure Fire Zone Plan Elevation 771'-0", Sheet 1, Revision 11
E-11, Unit 1 and Common Single Line Meter and Relay Diagram 125 & 250 VDC System, Sheet 1, Revision 19
E-11, Unit 2 Single Line Meter and Relay Diagram 125 & 250 VDC System, Sheet 2, Revision 28
M-2151, Unit 2 P&ID RHR, Sheet 3, Revision 27
M-2151, Unit 2 RHR, Sheet 4, Revision 16
M-2151, Unit 2 P&ID RHR, Sheet 5, Revision 2
M-148, Unit 1 P&ID Standby Liquid Control, Sheet 1, Revision 40
M-2148, Unit 2 P&ID Standby Liquid Control, Sheet 1, Revision 28

Miscellaneous
TM-OP-002-ST, Systems Training Student Text, 125VDC Distribution System, Revision 7

Section 1R05: Fire Protection

Drawings
C-1756, Units 1 & 2 Control Structure Fire Doors and Fire Dampers Elevation 806'-0", Sheet 2, Revision 7
C-1756, Units 1 & 2 Control Structure Fire Zone Plan Elevation 806'-0", Sheet 1, Revision 7
C-1755, Units 1 & 2 Control Structure Fire Doors and Fire Dampers Elevation 783'-0", Sheet 2, Revision 8
C-1755, Units 1 & 2 Control Structure Fire Zone Plan Elevation 783'-0', Sheet 1, Revision 10
C-1728, Unit 2 Reactor Building Fire Zone Plan Elevation 645'-0", Sheet 1, Revision 8

Condition Reports (*NRC identified)
CR-2016-26450

Miscellaneous
Fire Protection Review Report, Revision 21
FP-213-240, RHR Pump Room 'B' (II-13) Fire Zone 2-1E Elevation 645'-0", Revision 5
EC-013-1834, Evaluation of the Acceptability of Protecting Safe Shutdown Raceway in Fire Zone 1-5B with 1 hour in lieu of 3 hour Fire Rated Barriers, Revision 0
FP-113-120, Valve Access Area (I 515) Backwash Receiving Tank Room (I 509) Fire Zones 1 5B, 1 5C Elevation 761' 10", Revision 6
FP-213-255, Valve Access Area (II-515) Reactor Backwash Receiving Tank Room (II-509) Fire Zones 2-5B, 2-5C Elevation 761'- 10", Revision 6
FP-213-238, HPCI Pump Room (II-11) Fire Zone 2-1C Elevation 645'-0", Revision 5
FP-213-236, Core Spray Room (II-10) Fire Zone 2-1A Elevation 645'-0", Revision 6
FP-013-163, Unit 1 Upper Cable Spreading Room (C-500) (C-503) Electrician Office (C-504) Fire Zones 0-27C, 0-27D Elevation 754'-0", Revision 7
FP-013-164, Unit 1 Upper Relay Room (C-501) Fire Zone 0-27E Elevation 754'-0", Revision 7
FP-013-161, Unit 2 Upper Relay Room (C-502) Fire Zone 0-27A Elevation 754'-0", Revision 7
FP-013-162, Unit 2 Upper Cable Spreading Room (C-507) Fire Zone 0-27B Elevation 754'-0", Revision 6

Section 1R07: Heat Sink Performance

Procedures
MT-GM-025, Heat Exchanger- Cleaning and Inspection, Revision 21

Condition Reports (*NRC identified)
CR-2016-22047 CR-2016-22054 CR-2016-26993

Maintenance Orders/Work Orders
1828470

Drawings
M3022-2, Sheet 1

Miscellaneous
Heat Exchanger Data Sheet, Jacket Water Cooler Fox Diesel Generators
EC-054-0537, ESW System Heat Load and Flow Rate Requirements for Uprated Power Conditions, Revision 6
EC-024-0556, Design ESW Flow Rate Requirements to the Diesel Generator A-E Heat Exchangers, Revision 5

Section 1R11: Licensed Operator Requalification Program

Procedures
OP-AD-300, Administration of Operations, Revision 17
OP-AD-338, Reactivity Manipulations Standards and Communications Requirements, Revision 31
NDAP-QA-0338, Reactivity Management and Controls Program, Revision 25
GO-200-002, Plant Startup, Heatup and Power Operation, Revision 88

Condition Reports (*NRC identified)
CR-2016-22884* CR-2016-24890

Section 1R12: Maintenance Effectiveness

Procedures
NSEP-AD-0413D, Maintenance Rule- Performance Monitoring, Revision 4
SO-106-B01, Monthly ESS Division 2 Swingbus, Revision 8
MT-GE-048, Cutler-Hammer Type DHR-VR 4.16KV Circuit Breaker and Switchgear Inspection and Maintenance, Revision 22

Condition Reports (*NRC identified)

CR-94223	CR-451668	CR-463172	CR-971729
CR-1082538	CR-2013-03361	CR-2014-32595	CR-2016-05589
CR-2016-11617	CR-2016-18468	CR-2016-20852*	CR-2016-23627
CR-2016-23631	CR-2016-25715	CR-2016-25903	

Action Requests
AR-1082643

Maintenance Orders/Work Orders

451806	1671020	1754501	1770727	1770728	1893682
1959669	1964853	1967293	1975910	1976154	2034179

Drawings
E-153, Unit 2 Schematic Diagram Residual Heat Removal Pump 2B 2P202B, Sheet 49

Miscellaneous
TM-OP-004-ST, 4.16 kV- 480 V ESS Distribution, Revision 05
IOM 354, Operation and Maintenance Instructions Russelectric ATS

Section 1R13: Maintenance Risk Assessments and Emergent Work Control

Procedures
SI-283-322, Quarterly Calibration of Automatic Depressurization System (ADS) Timers B21C-K5A and B21C-K5B
SI-283-329, Quarterly Calibration of ADS Drywell Pressure Bypass Timers B21C-K114A,B,C,D, Revision 19

Condition Reports (*NRC identified)

CR-2016-23611	CR-2016-23755	CR-2016-23863	CR-2016-24687
CR-2016-24923			

Maintenance Orders/Work Orders

1855240	1863063	1957447	1957448	1967293	1978132
2028857	2028859				

Drawings
M-112, Unit 1 P&ID RHR Service Water System, Sheet 1, Revision 53
M-112, Common P&ID RHR Service Water System, Sheet 2, Revision 21
M-2151, Unit 2 P&ID RHR, Sheet 2, Revision 45
M-2151, Unit 2 P&ID RHR, Sheet 1, Revision 62
E-151, Unit 1 Schematic Diagram Reactor Recirc Pump MG Set 1A Drive Motor 1S134A, Sheet 2, Revision 14
E-151, Unit 1 Schematic Diagram Reactor Recirc RPT Breaker 3A, Sheet 31, Revision 18
E-151, Unit 1 Schematic Diagram Reactor Recirc RPT Breaker 4A, Sheet 32, Revision 17
E-151, Unit 1 Schematic Diagram Reactor Recirc RPT Breaker 3B, Sheet 33, Revision 13

Miscellaneous
EC-RISK-1109, PSA-004.18- Emergency SW System Notebook, Revision 3
PL-NF-12-003, Configuration Risk Management Application Guideline #10 ESW System, HV01222B, SPR Pond Loop B BPV, Revision 1
Clearance: 49-001, Unit 2 Div RHR, Protected Equipment, November 7, 2016

Section 1R15: Operability Determinations and Functionality Assessments

Procedures
SM-175-104, 48 Month Division 1 1D670 +- 24VDC Battery Electrical Parameter Test and Inspections, Battery Discharge Modified Performance Test and Battery Charger Capability Test, Revision 15
SM-175-103, 24 Month Division 1 1D670 +- 24 VDC Battery Electrical Parameter Test and Inspections, Battery Service Discharge, and Battery Charger Capability Test, Revision 17

Condition Reports (*NRC identified)

CR-2016-19218	CR-2016-21961	CR-2016-22047	CR-2016-22054
CR-2016-23881	CR-2016-24575	CR-2016-25349	CR-2016-25589

Action Requests
AR-2016-25765

Maintenance Orders/Work Orders

1418928	1542456	1544383	1791344

Drawings
E-171, Schematic Diagram Containment Atmospheric Control Suppression Pool Vacu Relief Unit 1, Sheet 1, Revision 13
M-157, Unit 1 P&ID Containment Atmos Control, Sheet 1, Revision 51
E-321, Unit 1 Schematic Diagram Annun. Misc Systems Recording Panel 1C692, Sheet 1, Revision 9
8856-M149-4(1), Assy-24" CVI-L Integral Valve ASME Sect III, Class 2, Sheet 401, Revision 12

Miscellaneous
IOM 166, Vacuum Relief Valve, Type CV1-L, 24 Inch and Auxiliaries, Revision 6
EC-024-0556, Design ESW Flow Rate Requirements to the Diesel Generator A-E Heat Exchangers, Revision 5
EC-054-0537, ESW System Heat Load and Flow Rate Requirements for Uprated Power Conditions, Revision 6

Section 1R18: Plant Modifications

Condition Reports (*NRC identified)

CR-2016-19500	CR-2016-19587	CR-2016-19801	CR-2016-19872
CR-2016-23637	CR-2016-24663		

Miscellaneous
Branch Technical Position 6-3, Determination of Bypass Leakage Paths in Dual Containment Plants
50.59 Unit 2 Reliable Hardened Containment Vent System, Revision 0
LDCN-5244, Reliable Hardened Containment Vent- U2 Final Piping Tie-in Modification- FSAR Update

EC-STRU-2109, Conc Evaluation of Unit 2 Containment Penetration X-201B for HCVS Piping, Revision 1
EC-PIPE-16383, PSTR HCVS Piping Analysis, Revision 1

Section 1R19: Post-Maintenance Testing

Procedures
SO-250-002, Quarterly RCIC Flow Verification, Revision 52
ON-000-011, Failure of Synchronizing Selector Switch on 0C653, Revision 1
SO-252-002, Quarterly HPCI Flow Verification, Revision 71
SO-249-B05, Quarterly RHR LOOP B Exercising, Revision 16

Condition Reports (*NRC identified)

CR-1706404	CR-2016-10218	CR-2016-24287	CR-2016-24293
CR-2016-24360	CR-2016-24458	CR-2016-25731	CR-2016-25732
CR-2016-25773	CR-2016-25806	CR-2016-25807	CR-2016-25813
CR-2016-25992	CR-2016-26027		

Maintenance Orders/Work Orders

1716083	1830393	1853491	1908083	1919160	1930843
1942661	1993816	2009222	2024144	2026927	2026931
2029181	2034444	2036112	2041403		

Drawings
E-23, Unit 2 Schem Meter and Relay Diag 4.16 kv System, Sheet 4, Revision 28
E-103, Unit 2 Schematic Diagram 4.16kv Bus 2B Incoming Feeder BKR from ESS Trans 211, Sheet 18, Revision 27
E-103, Unit 2 Schematic Diagram 4.16kv Bus 2B Incoming Feeder BKR from ESS Trans 111, Sheet 16, Revision 29
E-103, Unit 2 Schematic Diagram 4.16kv Bus 2B Auxiliary Relay Control, Sheet 17, Revision 29

Section 1R20: Refueling and Other Outage Activities

Condition Reports (*NRC identified)

CR-2016-17541	CR-2016-22332	CR-2016-22333	CR-2016-22334
CR-2016-22335	CR-2016-22337	CR-2016-22338	CR-2016-22339
CR-2016-22365	CR-2016-22366	CR-2016-22367	CR-2016-22368
CR-2016-22377	CR-2016-22385	CR-2016-22421	CR-2016-22512
CR-2016-22557	CR-2016-22843	CR-2016-22847	CR-2016-22864
CR-2016-22878*	CR-2016-22884*	CR-2016-22937	CR-2016-23713

Section 1R22: Surveillance Testing

Procedures
SI-183-321, Quarterly Calibration of Drywell Pressure Channels PS-E11-1N010A,B,C,D (ADS Permissive, RCIC Exhaust Vacuum Breaker Isolation), Revision 21
SI-283-321, Quarterly Calibration of Drywell Pressure Channels PS-E11-2N010A,B,C,D (ADS Permissive, RCIC Exhaust Vacuum Breaker Isolation), Revision 21
SO-150-006, RCIC Comprehensive Flow Verification, Revision 17
SO-216-B03, Quarterly RHRSW Flow Verification Division II, Revision 13

SI-283-208, Quarterly Functional Test of reactor Vessel Water Level (Low Low) Level 3 (ADS Permissive) Channels LIS-B21-2N042A&B, Revision 18
SI-280-301, Quarterly Calibration or Reactor Vessel Pressure Channels PIS-B21-2N021 A, B, C,D and PS-B21-2N021E,G (Core Spray System and LPCI Permissive) Reactor Pressure Greater than Setting (420 PSIG), Revision 27

Maintenance Orders/Work Orders
1650340 1854730 1862429 2002049 2010435 2028404 2033881

Section 1EP4: Emergency Action Level and Emergency Plan Changes

Procedures
Susquehanna Emergency Plan, Revision 59

Section 2RS1: Radiological Hazard Assessment and Exposure Controls

Procedures
NDAP-QA-0626, Radiologically Controlled Area Access and RWP System, Revision 45

Condition Reports (*NRC identified)

CR-2016-06679	CR-2016-07845	CR-2016-09164	CR-2016-07569
CR-2016-08105	CR-2016-10404	CR-2016-07820	CR-2016-09804
CR-2016-06496	CR-2016-06513	CR-2016-06933	CR-2016-10073
CR-2016-08161	CR-2016-06289	CR-2016-07100	CR-2016-07257

Section 2RS2: Occupational ALARA Planning and Controls

Condition Reports (*NRC identified)
CR-2016-07542 CR-2016-07837 CR-2016-07893 CR-2016-10199
CR-2016-10546

Miscellaneous
Unit 1 19th Refuel and Inspection Outage Radiological Performance Report ALARA Reviews for RWPs: 2016-1002; 2016-1003; 2016-1118; 2016-1222; 2016-1308; 2016-1315; 2016-1319; 2016-1320; 2016-1370; 2016-1373; 2016-1384; 2016-1408

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

Procedures
WM-PS-155, 10CFR61 Sample Shipping – Correlation Factor, Revision 5
WM-PS-150, 10CFR61 Non-Processing Waste Stream Sampling, Revision 2
WM-PS-110, General Shipment of Radioactive Material, Revision 10
WM-PS-100, Shipment of Radioactive Waste, Revision 14
WM-PS-210, Packaging and Loading of DAW – Rad Material, Revision 12

Condition Reports (*NRC identified)

CR-2015-12120	CR-2015-01281	CR-2015-24313	CR-2015-25785
CR-2015-08990	CR-2015-14221	CR-2015-18935	CR-2015-31661

Shipments
15-033 15-032 16-057 16-043 16-021

Miscellaneous
PPL Susquehanna Course EF009, Load Securement Training
PPL Susquehanna Course HP230, HAZMAT Training for Radiation Protection Technicians
Teledyne Brown Engineering Analysis for: Bead Resin; LRW Filter; RWCU Filter; DAW; Chem Decon Resin
Source Verification Report AR-2016-16769, Waste Control Specialists NUPIC Audit 23931, Energy Solutions

Section 4OA1: Performance Indicator Verification

Condition Reports (*NRC identified)
CR-2016-26628

Miscellaneous
DI-2015-30639
DI-2015-01048
DI-2015-30637
EC-RISK-1165, MSPI Basis Document JUL12R1 Model Data Input, Revision 1
MSPI Derivation Report, Susquehanna Unit 1, MSPI Cooling Water System, UAI, Sep 2016
MSPI Derivation Report, Susquehanna Unit 1, MSPI Cooling Water System, URI, Sep 2016
MSPI Derivation Report, Susquehanna Unit 1, MSPI Cooling Water System, PLE, Sep 2016
MSPI Derivation Report, Susquehanna Unit 2, MSPI Cooling Water System, UAI, Sep 2016
MSPI Derivation Report, Susquehanna Unit 2, MSPI Cooling Water System, URI, Sep 2016
MSPI Derivation Report, Susquehanna Unit 2, MSPI Cooling Water System, PLE, Sep 2016
MSPI Derivation Report, Susquehanna Unit 1, MSPI RHR System, UAI, Sep 2016
MSPI Derivation Report, Susquehanna Unit 1, MSPI RHR System, URI, Sep 2016
MSPI Derivation Report, Susquehanna Unit 1, MSPI RHR System, PLE, Sep 2016
MSPI Derivation Report, Susquehanna Unit 2, MSPI RHR System, UAI, Sep 2016
MSPI Derivation Report, Susquehanna Unit 2, MSPI RHR System, URI, Sep 2016
MSPI Derivation Report, Susquehanna Unit 2, MSPI RHR System, PLE, Sep 2016

Section 4OA2: Problem Identification and Resolution

Procedures
SI-280-301, Quarterly Calibration of Reactor Vessel Pressure Channels PIS-B21-2N021 A,B,C,D, and PS-B21-2N021E,G (Core Spray System and LPCI Permissive) Reactor Pressure Greater than Setting (420 PSIG), Revision 27
SM-158-002, RPS A Alternate EPA 24 Month Channel Calibration and Functional Test, Revision 15

Condition Reports (*NRC identified)

CR-2014-12407	CR-2014-17151	CR-2014-20671	CR-2014-25851
CR-2014-28492	CR-2014-37655	CR-2015-06243	CR-2015-10801
CR-2015-25426	CR-2015-25428	CR-2015-25881	CR-2015-27360
CR-2015-28853	CR-2015-30901	CR-2015-30958	CR-2015-31012
CR-2015-31072	CR-2016-25451	CR-2016-25457	CR-2016-26515*
CR-2016-26580	CR-2016-26945	CR-2016-26947	CR-2016-26960
CR-2016-27018	CR-2016-27867	CR-2016-27868	CR-2016-27885
CR-2016-27887	CR-2016-14366	CR-2016-14544	

Action Requests

AR-2015-09650	AR-2016-02379	AR-2016-17658

Maintenance Orders/Work Orders

1360523 1396591 1413014 1413028 1761263 1863785
1864034 2024880

Miscellaneous

Maintenance Manual for Swing Check Valves, Flowserve, Anchor/Darling Valve Company
EC-080-1011, Allowable Value, TRM and Process Setpoint of PIS-B21-2N021B,D; PS-B21-2N021E,G Switch Contact #1, RPV Steam Dome Low Pressure Permissive for Recirc Discharge Valve Closure, Revision 1
EC-080-1007, Setpoint B21, E21: Core Spray RHR/LPCI Reactor, Low Pressure Permissive Pressure Indicating Switches PISB212N021A, PISb212N021B, PISB212N021C, and PISB212N021D Setpoint Calculation, Revision 1
Maintenance Rule Basis Document-System 80
641, Electrical Protection Assembly, Revision 0
EC-SOPC-0501, Relay Setting Calc for Electrical Protection Assemblies and Reactor Protection System 1Y201A, 1Y201B and 2Y201A, 2Y201B, Revision 4
Screening Report, December 14, 2016
MRC Report, December 14, 2016
Screening Report, December 13, 2016
MRC Report, December 12, 2016
Screening Report, December 12, 2016
3Q2016 Performance Assessment Report
Susquehanna Plan for Excellence, Revision 7.0
LER 50-387/2012-007-00
LER 50-387/2014-011-00
LER 50-388/2015-004-00
LER 50-387/2015-009-00
LER 50-387/2016-019-00
Root cause Analysis for CR-2015-30901, Revision 4
Root cause Analysis for CR-2016-14366, Revision C
Root cause Analysis for CR-2016-14544, Revision 0 (LPRM)
Return to Service Evaluation of 11/13/2015 Weld Failure on 1B RXR Pump Connection #8 Lower Seal Vent Piping (Ref. CR-2015-30901)
Structural Integrity, Inc. report 9/19/2016 “SSES Unit 1 Reactor Recirculation Pump Branch Line Startup and Full Power Testing Report”
BWXT, Final Report L-2022-003, dated July 2016: “Laboratory Analysis of a Leaking Recirculation Pump Seal Coupling from Susquehanna Unit 1”
Design Considerations Applicability Sheet for Vibration Effects on Small Diameter Piping, No.:62, 6/17/2016, Revision 2
Procedure NDAP-QA-1208, Control of Welding, Revision 14

Section 4OA3: Follow-up of Events and Notices of Enforcement Discretion

Procedures

OP-164-001, Reactor Recirculation System, Revision 84
GO-100-009, Single Recirculation Loop Operation, Revision 22
MT-AD-509, Control of Minor Maintenance Activities, Revision 20
NDAP-QA-0502, Work Order Process, Revision 49

Maintenance Orders/Work Orders

1903793

Condition Reports (*NRC identified)
CR-2016-14544 CR-2016-24687 CR-2016-24696 CR-2016-25622

Miscellaneous
EC-RADN-0531, Secondary Containment Isolation Radiation Monitoring Setpoints, Revision 7
EC-RADN-1126, CRHE and Off Site FHA/EHA Doses-AST, Revision 5
EW 2016-26509
Licensing Document, Change Notice 4572, FSARA Update for U1C16
RIS 01-014, Position on Reportability Requirements for RCIC System Failure

LIST OF ACRONYMS

ACE	apparent cause evaluation
ADAMS	Agencywide Documents Access and Management System
ALARA	as low as is reasonably achievable
ATS	automatic transfer switch
CAP	corrective action program
CFR	*Code of Federal Regulations*
CR	condition report
CREOASS	control room emergency outside air supply system
CW	circulating water
EACE	equipment apparent cause evaluation
EAL	emergency action level
EDG	emergency diesel generator
EPA	electrical protection assembly
FIN	fix-it-now
HPCI	high-pressure coolant injection
HRA	high radiation area
Hz	hertz
IGSCC	intergranular stress corrosion cracking
IR	inspection report
IMC	inspection manual chapter
IST	in-service test
LER	licensee event report
LHRA	locked high radiation area
LOCA	loss of coolant accident
LPCI	low pressure coolant injection
LPRM	local power range monitor
NEI	Nuclear Energy Institute
NRC	Nuclear Regulatory Commission
ODCM	offsite dose calculation manual
OEM	original equipment manufacturer
OOS	out of service
OPDRV	operations with the potential to drain the reactor vessel
PI	performance indicator
PM	preventative maintenance
RCIC	reactor core isolation coolant
RCS	reactor coolant system
RG	regulatory guide
RHR	residual heat removal
RHRSW	residual heat removal service water
RLWO	release work order
RP	radiation protection
RPS	reactor protection system
RRP	reactor recirculation pump
RTP	rated thermal power
RWP	radiation work permit

DP	significance determination process
SL	severity level
SRA	senior risk analyst
SOW	system outage window
SW	service water
TS	technical specification
UFSAR	Updated Final Safety Analysis Report
VHRA	very high radiation area