Salem 1
2Q/2013 Plant Inspection Findings

Initiating Events

Significance: G Jun 30, 2013
Identified By: Self-Revealing
Item Type: NCV NonCited Violation
Failure to Follow the Loss of Main Condenser Vacuum Procedure
A self revealing NCV of Technical Specification (TS) 6.8.1 "Procedure and Programs," resulted from operators' failure to implement the Loss of Condenser Vacuum procedure. Specifically, operators failed to follow S1.OP-AB.COND-0001, "Loss of Main Condenser Vacuum," which directed closure of the main steam isolation valves (MSIVs). This resulted in the inability to potentially recover the condenser as a heat sink, after the loss of circulating water (CW) pumps initiator was recovered, due to the actuation of the 11 low pressure (LP) turbine shell rupture disk. Corrective actions from the cause evaluation include developing additional abnormal operating procedure guidance to address a loss of all CW pumps, and designing simulator training scenarios to focus on secondary plant stabilization following reactor and turbine trips.

The performance deficiency (PD) was determined to be more than minor because it was associated with the human performance attribute of the Initiating Events cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. The finding was considered associated with the initiating events cornerstone since it occurred during recovery actions after the reactor trip. The finding was determined to be of very low safety significance (Green) per IMC 0609, "Significance Determination Process," Appendix A, Exhibit 1 "Initiating Events", Section B "Transient Initiators," because the PD did not cause both a reactor trip and the loss of mitigation equipment relied upon to transition the plant from the onset of the trip to a stable shutdown condition. Specifically, the PD occurred after the reactor trip and resulted in the loss of one system (main condenser) of a number of available mitigation systems used to transition the plant to a stable shutdown condition. The PD did not cause the initiating event of a loss of condenser heat sink, but instead it only affected the ability to potentially recover the heat sink after circulating water was restored. This finding has a cross-cutting aspect in the area of Human Performance, Resources, in that PSEG did not ensure that the crew was skilled in secondary plant stabilization and recovery. Specifically, PSEG did not ensure that the training program previously focused on the secondary plant stabilization and / or recovery post trip. [H.2(b)] (Section 4OA3

Inspection Report# : 2013003 *(pdf)*

Significance: G Mar 31, 2013
Identified By: NRC
Item Type: FIN Finding
Inadequate Relay Testing Instructions Cause Loss of One Offsite Power Source
(Green) A self-revealing finding was identified because the work instructions used to perform relay testing on January 21, 2013, did not include the level of detail required by site work planning standards. Specifically, they did not specify the test switches that needed to be open to isolate the transformer for the testing. This caused the loss of #4 station power transformer (SPT), which caused both units to align the 4160 Vac vital buses to a single source of offsite power and Unit 2 to reduce power to 95 percent when it lost half of its running circulating water pumps. Planned corrective actions include updating relay procedures and reevaluating the risk assignment of relay work.

The performance deficiency was determined to be more than minor because it is associated with the procedure quality attribute of the Initiating Events cornerstone and affected the cornerstone objective to limit the likelihood of those events that upset plant stability and challenge critical safety functions during shut-down as well as power operations. Specifically, PSEG work instructions did not include which test switches were required to be opened prior to testing, which led to the loss of one source of offsite power at each unit and Unit 2 down-powering due to the loss of circulating water pumps. In accordance with IMC 0609.04, "Initial Screening and Characterization," and Exhibit 1 of IMC 0609, Appendix A, "The Significance Determination Process for Findings At-Power," issued June 19, 2012, the inspectors determined that this finding is of very low safety significance (Green) because the performance deficiency did not cause both a reactor trip and the loss of mitigation equipment relied upon to transition the plant from the onset of the trip to a stable shutdown condition. This finding had a cross-cutting aspect in the area of Human Performance, Work Control, because PSEG did not plan and coordinate work activities consistent with nuclear safety. Specifically, PSEG did not incorporate risk insights on the potential impact on offsite power during #4 SPT maintenance. As a result, PSEG did not plan and coordinate work activities to minimize the probability or consequences of the loss of off-site power. [H.3(a)]
Inspection Report# : 2013002 *(pdf)*

Mitigating Systems

Significance: G Jun 30, 2013
Identified By: Self-Revealing
Item Type: NCV NonCited Violation
Incorrect Component Installed for Containment Closure
A self-revealing NCV of Unit 1 of 10 CFR Part 50, Appendix B, Criterion VIII, "Identification and Control of Materials, Parts, and Components," because PSEG did not prevent the installation and use of incorrect components. Specifically, PSEG installed an incorrect bladder that was being used as a substitution component for establishing adequate containment closure during refueling operations. On May 2, 2013, while serving as a credited containment boundary, the installed bladder failed, causing Unit 1 to suspend fuel movements during refueling operations and enter TS 3.9.4 for "Containment Building Penetrations."

The PD was determined to be more than minor because it affected the configuration control attribute of the barrier integrity cornerstone to provide reasonable assurance that physical design barriers, containment boundaries, are preserved and protect the public from radionuclide releases caused by accidents or events. This finding is also similar to IMC 0612, Appendix E, example 5.c, in that, an incorrect and inadequate part was installed and placed in service for establishing containment closure during refueling operations. The finding is of very low safety significance (Green) per 0609 Appendix G, "Shutdown Operations SDP," Figure 1 and Attachment 1, Checklist 4, "Pressurized Water Reactor (PWR) Refueling Operation: RCS Level >23' or PWR Shutdown Operation with Time to Boil >2 hours and Inventory in the Pressurizer," because it did not require a qualitative assessment and although this issue created a direct pathway from the containment atmosphere to the mechanical penetration area, invalidating PSEG's credited containment closure boundaries during refueling operations, it did not increase the likelihood of a loss of reactor coolant system inventory or degrade the licensee's ability to terminate a leak path or recover decay heat removal once it is lost. The finding had a cross-cutting aspect in the area of Human Performance, Resources, in that, PSEG did not ensure that complete, accurate and up-to-date design documentation, procedures, and work packages, and correct labeling of components. Specifically, PSEG failed to prevent the installation and use of incorrect components credited for containment closure during refueling operations because the incorrect part number was used in the procurement process and work order(WO). [H.2(c)] (Section 1R13)

Inspection Report# : 2013003 *(pdf)*

Significance: G Jun 30, 2013
Identified By: NRC
Item Type: NCV NonCited Violation
Scaffold Installed with Insufficient Separation to Safety-Related Equipment
The inspectors identified an NCV of 10 CFR 50, Appendix B, Criterion V, "Procedures," because PSEG did not ensure adequate separation was maintained between temporary scaffolding and safety-related equipment. Specifically, the inspectors identified numerous scaffolds installed in the plant with less than the minimum standoff distance to safety-related equipment specified in PSEG procedures and no engineering evaluation to support these deviations. Following inspector identification of the issue, PSEG performed independent walkdowns of all scaffolding and entered all discrepancies into their CAP. All discrepancies were corrected and assessed for any potential impact to the operability or functionality of the system and PSEG determined that there was no loss or degradation of equipment or function specifically designed to mitigate a seismic event. PSEG also initiated an apparent cause evaluation (ACE 70152874) on numerous scaffolding issues identified by the inspectors and PSEG Nuclear Oversight (NOS) personnel.

This PD was considered more than minor because it affected the protection against external factors attribute of the mitigating systems cornerstone and its objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, PSEG routinely did not evaluate scaffold installations when insufficient separation to safety-related equipment was provided. Additionally, it was similar to example 4.a in IMC 0612, Appendix E, "Examples of Minor Issues," which states that the issue of failing to appropriately evaluate scaffold installation as required by procedures is more than minor if the licensee routinely failed to perform engineering evaluations. The issue was evaluated in accordance with IMC 0609, Appendix A, "The SDP for Findings At-Power," and determined to be of very low safety significance (Green) since it did not involve the loss or degradation of equipment or function specifically designed to mitigate a seismic event. This finding has a cross-cutting aspect in the area of Human Performance, Work Practices, because PSEG did not ensure that personnel work practices support human performance. Specifically, PSEG personnel did not follow scaffold installation procedures when they routinely installed scaffold within the allowable clearance of safety-related equipment without an engineering evaluation. [H.4(b)] (Section 1R20)

Inspection Report# : 2013003 *(pdf)*

Significance: G Mar 31, 2013
Identified By: NRC
Item Type: NCV NonCited Violation
Failure to Install the Correct Size Zinc Anode in 11 Service Water Strainer Results in Strainer Trip
(Green) The inspectors identified an NCV of 10 CFR Part 50, Appendix B, Criterion VII, "Control of Purchased Material, Equipment, and Services," because PSEG did not assure that replacement zinc anodes procured for the service water (SW) strainers conformed to procurement documents. Specifically, PSEG did not confirm the critical characteristics of the SW replacement zinc anodes before they were installed in the SW system. As a result, a zinc anode that did not meet procurement standards, which was installed in the 11 SW strainer, degraded over time, fell into the strainer and stopped it from rotating. PSEG repaired the strainer and corrected the part procurement code as immediate corrective actions.

The performance deficiency was determined to be more than minor because it was associated with the equipment performance attribute of the Mitigating Systems cornerstone and it adversely affected the cornerstonre objective to

ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The issue was also similar to IMC 0612, Appendix E, Example 5.c, in that an incorrect and inadequate part was installed in 11 SW strainer and the strainer was returned to service. The inspectors evaluated the finding in accordance with IMC 0609, Appendix A, "Determining the Significance of Reactor Inspection Findings for At-Power Situations," and determined that the finding was of very low safety significance (Green) because the deficiency did not affect the design or qualification of the SW system, did not represent a loss of system safety function and did not represent an actual loss of function of a single train for greater than its TS allowed outage time. This finding has a cross-cutting aspect in the area of Human Performance, Resources, because PSEG did not ensure that complete, accurate and up-to-date design documentation, procedures, and work packages, and correct labeling of components. Specifically, neither the SW strainer maintenance procedure, the strainer design drawing, nor the material master for the SW strainer zinc anode part identified critical dimensions or physical characteristics for the zinc anode that could have been used by technicians to ensure the corect replacement anode was installed in the 11 SW strainer. [H.2(c)]

Inspection Report# : 2013002 *(pdf)*

Significance: G Dec 31, 2012
Identified By: NRC
Item Type: NCV NonCited Violation
Failure to Maintain Adequate Liquid CO2 Inventory for Fire Suppression
The inspectors identified a Green NCV of the Unit 1 Operating License Condition 2.C because PSEG did not maintain an adequate CO2 inventory to ensure the operability of the installed deluge fire suppression system in accordance with the approved Fire Protection Plan. Specifically, the CO2 tank liquid level gage was not calibrated periodically, the gage was stuck at 72 percent level for a period of five months, and the tank lost pressure and was inoperable because it was empty on September 1, 2012. This issue was entered into PSEG's corrective action program (CAP) as notification 20573227. PSEG's immediate corrective actions were to establish compensatory measures to restore fire protection system operability of the affected spaces on September 2, 2012, and then to complete replacement of the failed tank liquid level gage, leak check the tank and associated piping, and refill the liquid CO2 tank to restore the CO2 tank to operable status on October 23, 2012.

The performance deficiency was determined to be more than minor because it affected the protection against external factors attribute of the Mitigating Systems cornerstone, in that it impacted automatic fire suppression capability, and affected the cornerstone objective of ensuring the availability of systems that respond to external events. The finding was evaluated under IMC 0609, Appendix F, "Fire Protection Significance Determination Process." The conditional core damage probability was calculated utilizing SAPHIRE 8 for Salem Unit 1. Since the delta core damage frequency calculated in step 2.1.4 of Appendix F was less than the value specified in table 2.1.3, "Phase 2 Screening Step 1 Quantitative Screening Criteria," the finding was determined to be of very low safety significance (Green). This finding has a cross-cutting aspect in the area of human performance, work control component. PSEG did not appropriately coordinate work activities by incorporating actions to plan work activities to support long-term equipment reliability by limiting safety system unavailability and reliance on manual actions. Specifically, a liquid level gage calibration preventive maintenance (PM) to maintain operability of the ten ton CO2 tank was created in accordance with vendor guidance in 2008, but the PM had not been implemented as of September 1, 2012.

Inspection Report# : 2012005 *(pdf)*

Barrier Integrity

Significance: G Jun 30, 2013
Identified By: NRC
Item Type: NCV NonCited Violation
Inadequate Corrective Actions to Address an Adverse Trend in the 2R1B-2 Radiation Monitor
The inspectors identified an NCV of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," associated with PSEG failing to adequately trend an adverse condition and initiate effective corrective actions to address declining performance. Specifically, PSEG did not take adequate corrective actions to address an adverse trend in radiation monitor channel spiking caused by defective detector foil. As a result of these ineffective corrective actions, on April 20, 2013, a spike of the 2RIB channel 2 radiation monitor (2RIB-2) unintentionally resulted in an unanalyzed post-accident dose analysis condition for the Salem common control room (CR). PSEG has entered this issue into their CAP as Notification 70154084.

The PD was determined to be more than minor because it affected the Human Performance attribute of the barrier integrity cornerstone to maintain the radiological barrier functionality of the CR post-accident. The PD was also similar to IMC 0612, Appendix E, example 3.i, in that, the CR post-accident dose analysis calculation was required to be reperformed by PSEG to assure the post-accident dose analysis limits were not exceeded. The finding is of very low safety significance (Green) per IMC 0609, Attachment 4, "Phase 1, Appendix A, Exhibit 3 – Barrier Integrity Screening Questions," because it only represented a degradation of the radiological barrier function provided for the control room. The finding had a cross-cutting aspect in the area of Problem Identification and Resolution (PI&R), CAP, because PSEG did not adequately trend and assess information from the CAP to identify programmatic and common cause problems. Specifically, PSEG did not take adequate corrective actions to address an adverse trend in the 2R1B-2 detector foil replacement and as a result of these ineffective corrective actions, on April 20, 2013, a spike of the radiation monitor unintentionally resulted in an unanalyzed post-accident dose analysis condition for the Salem common CR. [P.1(b)] (Section 1R04)

Inspection Report# : 2013003 *(pdf)*

Significance: G Mar 31, 2013
Identified By: Self-Revealing
Item Type: NCV NonCited Violation
Failure to Correct Condition Adverse to Quality in Service Water Check Valve
(Green) A self-revealing NCV of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," was identified because PSEG did not complete corrective actions to address degraded valve bearings (i.e., installing new bearings) identified by technicians during SW check valve maintenance in 2010. As a result, binding of the valve disk occurred, which allowed silt accumulation to occur on the valve seat, which prevented the check valve from closing during testing on October 23, 2012. Corrective actions included updating the procedure and ensuring detailed explanations of unsatisfactory conditions that will result in the appropriate use of "mode holds" during outages that ensures completion of significant corrective action items.

The performance deficiency was determined to be more than minor because it affected the containment configuration control attribute of the Barrier Integrity cornerstone and adversely affected the cornerstone objective to provide reasonable assurance that physical design barriers (fuel cladding, reactor coolant system, and containment) protect the public from radionuclide releases caused by accidents or events. Specifically, the failure of the check valve to fully close due to silt accumulation, impacted operability of a service water containment fan cooling unit (CFCU) SW accumulator, which degraded the affected CFCU's cooling water flow, reducing their containment heat removal capacity, which could affect containment integrity if the affected CFCUs were relied upon for containment cooling during an event. In accordance with IMC 0609.04, "Initial Screening and Characterization," and Exhibit 3 of IMC 0609, Appendix A, "The Significance Determination Process for Findings At-Power," issued June 19, 2012, the inspectors determined that this finding is of very low safety significance (Green) because the performance deficiency

did not represent an actual pathway in the physical integrity of the reactor containment, containment isolation system, or heat removal components. This finding has a cross-cutting aspect in the area of Human Performance, Work Practices, because PSEG did not effectively communicate expectations regarding compliance with procedures. Specifically, PSEG failed to install parts required by the internal inspection procedure that led to the check valve being inoperable [H.4(b)].

Inspection Report# : 2013002 *(pdf)*

Emergency Preparedness

Occupational Radiation Safety

Public Radiation Safety

Security

Although the Security Cornerstone is included in the Reactor Oversight Process assessment program, the Commission has decided that specific information related to findings and performance indicators pertaining to the Security Cornerstone will not be publicly available to ensure that security information is not provided to a possible adversary. Other than the fact that a finding or performance indicator is Green or Greater-Than-Green, security related information will not be displayed on the public web page. Therefore, the cover letters to security inspection reports may be viewed.

Miscellaneous

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