

Diablo Canyon 2

4Q/2016 Plant Inspection Findings

Initiating Events

Mitigating Systems

Significance: **W** Sep 12, 2016

Identified By: NRC

Item Type: VIO Violation

Failure to Establish Adequate Work Instructions for Installation of Namco™ Snap Lock Limit Switches

The inspectors identified a preliminary White finding associated with an apparent violation of Technical Specification 5.4.1.a, "Procedures," for the licensee's failure to develop adequate instructions for the installation, adjustment, and testing of Namco™ Model EA170 snap lock limit switches. Specifically, the licensee failed to provide site-specific instructions for limiting the travel of these external limit switches when installed in safety-related motor operated valves. Consequently, the lever switch actuator for valve RHR-2-8700B, residual heat removal pump 2-2 suction from the refueling water storage tank, was installed such that the limit switch was operated repeatedly in an over-travel condition resulting in a sheared internal roll pin that ultimately caused the limit switch to fail. Following identification of this issue, the licensee replaced the limit switch for valve RHR-2-8700B and implemented actions to modify maintenance procedures for installing, calibrating, and testing motor-operated valve external limit switches. The licensee entered this issue into their corrective action program as Notification 50852345.

The performance deficiency is more than minor, and therefore a finding, because it is associated with the procedure quality attribute of the 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). Specifically, maintenance procedure MP E-53.10R, "Augmented Stem Lubrication for Limitorque Operated Valves," used to perform limit switch adjustments on the Unit 2 valve RHR-2-8700B, did not provide adequate acceptance criteria to prevent overtravel of the limit switch actuating lever. This resulted in a subsequent failure of the limit switch, preventing the open permissive signal for valve SI-2-8982B, residual heat removal pump 2-2 suction from the containment recirculation sump, used during the emergency core cooling system (ECCS) recirculation mode. The inspectors evaluated the finding using the Attachment 0609.04, "Initial Characterization of Findings," worksheet to Inspection Manual Chapter (IMC) 0609, "Significance Determination Process," issued June 19, 2012. The attachment instructs the inspectors to utilize IMC 0609, Appendix A, "Significance Determination Process (SDP) for Findings At-Power," issued June 19, 2012. In accordance with NRC Inspection Manual Chapter 0609, Appendix A, Exhibit 2, "Mitigating Systems Screening Questions," the inspectors determined that the finding required a detailed risk evaluation because it represented an actual loss of function of the train B ECCS for greater than its technical specification allowed outage time. A senior reactor analyst performed a detailed risk evaluation in accordance with IMC 0609, Appendix A, Section 6.0, "Detailed Risk Evaluation." The calculated increase in core damage frequency was dominated by small and medium loss of coolant accident initiators with failures of the opposite train of ECCS or related support systems. The analyst did not evaluate the large early release frequency because this performance deficiency would not have challenged the containment. The NRC preliminarily determined that the increase in core damage frequency for internal and external initiators was 7.6E-06/year, a finding of low to moderate risk significance (White). The inspector did not identify a cross-cutting aspect with this finding because it was not reflective of current performance. The inadequate procedure was developed in 2011 and did not reflect the licensee's

current performance related to procedure development.

(IR 05000275; 05000323/2016010, dated October 3, 2016, ML16277A340)

(FIRST UPDATE)

The finding was determined to be of low-to-moderate safety significance (White), because the NRC's calculated lower and upper estimations of the increase in core damage frequency of the performance deficiency were both greater than 1.0E-6 per year but less than 1.0E-5 per year. The NRC concluded that the preliminary significance determination change in core damage frequency result of 7.6E-6 per year represents the upper range of the increase in core damage frequency associated with the performance deficiency. Based on the information provided by the licensee at the November 15, 2016 regulatory conference, the NRC adjusted a number of assumptions used in the preliminary significance determination. Specifically, the NRC lowered the common cause alpha factors and adjusted several assumptions related to medium break loss-of-coolant accidents. The NRC also performed a variety of human error probability calculations to determine the likelihood of recovering the functionality of valve SI-2-8982B. The results of these calculations, which removed much of the conservatism from the assumptions used in the preliminary risk assessment, predicted a high likelihood of success (96.4 percent success) for recovering valve SI-2-8982B. Using these assumptions, the NRC concluded the lower range of increase in core damage frequency associated with the performance deficiency to be 1.3E-6 per year.

(Letter to E. Halpin from K. Kennedy, dated December 28, 2016, ML16363A429)

Inspection Report# : [2016010](#) (pdf)

Significance:  Jul 14, 2016

Identified By: Self-Revealing

Item Type: NCV Non-Cited Violation

Inadequate Maintenance Procedure affected the Performance of Safety-Related Emergency Diesel Generator

The inspectors assessed a self-revealed, non-cited violation of Technical Specification 5.4.1.a, "Procedures," for the licensee's failure to implement properly preplanned maintenance procedures that affected the performance of safety-related equipment. Specifically, two maintenance procedures associated with the emergency diesel generators' fuel injectors lacked adequate details on specific key mechanical parameters (capscrew bolt torque setup and fuel injection pump alignment) to ensure that maintenance activities were performed in a manner adequate to the circumstances. In both examples, the licensee entered the issues into the corrective action program and corrected the condition to restore the emergency diesel generators to an operable status.

This finding was more than minor because it was associated with the procedure quality attribute of the Mitigating Systems cornerstone and affects the associated cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events. Using Inspection Manual Chapter 0609, Appendix A, "The Significance Determination Process for Findings At Power," issued June 19, 2012, the inspectors determined the finding was of very low safety significance (Green) because the finding did not represent the loss of a system or function, the loss of a train of a technical specification safety system for greater than its allowed outage time, or the loss of a non-technical specification high-safety-significant system for greater than 24 hours. This finding had a cross-cutting aspect in the area of human performance associated with work management – "organization implements a process of planning, controlling, and executing work activities such that nuclear safety is the overriding priority." Specifically, work on the emergency diesel generators fuel oil system components was not effectively planned and executed by incorporating conditions to ensure a successful outcome [H.5].

Inspection Report# : [2016009](#) (pdf)

Significance:  Mar 31, 2016

Identified By: NRC

Item Type: NCV Non-Cited Violation

Failure to Verify Adequate Design Airflow for 480 volt AC Switchgear and 125 volt DC Inverter Rooms

The inspectors identified a non-cited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for the failure to verify the design adequacy of the safety-related ventilation system for the 480-volt AC switchgear and 125-volt DC inverter rooms. Specifically, the licensee failed to verify sufficient ventilation system airflow to ensure the temperature in rooms housing safety-related electrical equipment remained below 104 degrees Fahrenheit. The licensee's corrective actions were documented in Notification 50840266.

The failure to provide design control measures to verify the adequacy of the 480-volt AC switchgear and 125-volt DC inverter rooms ventilation system design was a performance deficiency. The performance deficiency was more than minor because it was associated with the design control attribute of the 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. Specifically, the reduction in airflow to the rooms impacts the reliability of the safety-related equipment ventilation system to maintain the temperatures in these rooms below design limits for the duration of all accident scenarios. Using NRC Inspection Manual Chapter 0609, Appendix A, Exhibit 2, "Mitigating Systems Screening Questions," the inspectors determined the finding was of very low safety significance because (1) the finding was not a deficiency affecting the design or qualification of a mitigating system; (2) the finding did not represent a loss of system and/or function; (3) the finding did not represent an actual loss of function of a single train for greater than its technical specification allowed outage time; and (4) the finding does not represent an actual loss of function of one or more non-technical specification trains of equipment designated as high safety-significant in accordance with the licensee's maintenance rule program for greater than 24 hours.

The inspectors determined that this finding did not have a cross-cutting aspect because the most significant contributor of this finding occurred more than three years ago, and is therefore, not representative of current licensee performance.

Inspection Report# : [2016001](#) (*pdf*)

Significance:  Mar 10, 2016

Identified By: NRC

Item Type: NCV Non-Cited Violation

Failure to Evaluate 480 Vac Motor Starters with Circuit Breaker Trip Settings Higher than Manufacturers' Specifications

The team identified a Green, non-cited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," which states, in part, "The design control measures shall provide for verifying or checking the adequacy of design, such as by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program." Specifically, prior to September 10, 2013, the licensee failed to verify the design of 480 Vac combination motor starter instantaneous magnetic circuit breakers settings, by the use of alternate or simplified calculational methods, for those breakers whose settings are higher than their manufacturers' specifications, as documented in calculation 195B-DC, "MCCB Settings for 460VAC Class 1E Motors," to provide the required level of protection and ensure that certain failures that could be caused by sustained fault currents below the circuit breaker trip setting would not occur. In response to this finding, the licensee conducted a preliminary evaluation of some of the affected equipment and concluded that sustained fault currents below the trip settings are unlikely. This finding was entered into the licensee's corrective action program as Notification 50838071.

The team determined the failure to evaluate 480 Vac combination motor starters with instantaneous magnetic circuit breaker trip current settings higher than their manufacturers' specifications was a performance deficiency. The performance deficiency was more-than-minor, and therefore a finding, because it related to the design control attribute of the Mitigating Systems cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, improper motor starter breaker trip settings could result in a fire in the motor control center cubicle, damage to motor starter components, spurious tripping of the entire motor control center, or lack of protection for downstream components during fault conditions.

In accordance with Inspection Manual Chapter 0609, Appendix A, “The Significance Determination Process (SDP) for Findings At-Power,” dated July 19, 2012, the finding screened as having very low safety significance (Green) because it was a design or qualification deficiency that did not represent a loss of operability or functionality; did not represent an actual loss of safety function of the system or train; did not result in the loss of one or more trains of non-technical specification equipment; and did not screen as potentially risk-significant due to seismic, flooding, or severe weather. This finding did not have a cross-cutting aspect because the most significant causal factor of the performance deficiency did not reflect current licensee performance.

Inspection Report# : [2016007](#) (pdf)

Significance:  Mar 10, 2016

Identified By: NRC

Item Type: NCV Non-Cited Violation

Failure to Promptly Correct the Lack of Design Verification of 460 Vac Motors at Maximum Allowable Frequency

The team identified a Green, non-cited violation of 10 CFR Part 50, Appendix B, Criterion XVI, “Corrective Action,” which states, in part, “Measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected.” Specifically, prior to March 16, 2016, the licensee failed to assure that the lack of design verification of 460 Vac motors, which could be overloaded at the maximum allowable diesel generator frequency, was promptly corrected after having been identified in a 2013 apparent cause evaluation and again in a 2015 self-assessment as documented in Notifications 50572850 and 50826105, respectively. In response to this finding, the licensee performed a preliminary evaluation of the affected 460 Vac motors and concluded that operation at maximum emergency diesel generator frequency would not cause them to overheat or trip on overcurrent. This finding was entered into the licensee's corrective action program as Notifications 50835699 and 50838988.

The team determined the failure to correct the lack of design verification of 460 Vac motors at maximum allowable frequency when powered from the emergency diesel generators was a performance deficiency. The performance deficiency was more-than-minor, and therefore a finding, because it related to the design control attribute of the Mitigating Systems cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, operation of 460 Vac motors above their rated or analyzed maximum allowable frequencies could result in motor overheating or a trip of the thermal overload relays. In accordance with Inspection Manual Chapter 0609, Appendix A, “The Significance Determination Process (SDP) for Findings At-Power,” dated July 19, 2012, the finding screened as having very low safety significance (Green) because it was a design or qualification deficiency that did not represent a loss of operability or functionality; did not represent an actual loss of safety function of the system or train; did not result in the loss of one or more trains of non-technical specification equipment; and did not screen as potentially risk-significant due to seismic, flooding, or severe weather. This finding had a cross-cutting aspect in the area of problem identification and resolution associated with evaluation because the licensee failed to ensure that the organization thoroughly evaluated issues to ensure that resolutions address causes and extent of conditions.

Inspection Report# : [2016007](#) (pdf)

Significance:  Mar 10, 2016

Identified By: NRC

Item Type: NCV Non-Cited Violation

Failure to Ensure Safety-Related Alternating Current and Direct Current Equipment Functionality at Maximum Allowable Voltages

The team identified a Green, non-cited violation of 10 CFR Part 50, Appendix B, Criterion III, “Design Control,”

which states, in part, “The design control measures shall provide for verifying or checking the adequacy of design, such as by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program.” Specifically, prior to February 10, 2016, the licensee failed to verify the design of (1) equipment on the nominally 125 Vdc system at the maximum voltage specified in Procedure OP J-9:IV, “Performing a Battery Equalizing Charge,” and (2) equipment on 480 Vac and 120 Vac vital buses at maximum voltages specified in Procedure OP J-2:VIII, “Guidelines for Reliable Transmission Service for DCP,” by the use of alternate or simplified calculational methods, to ensure equipment functionality. In response to this finding, the licensee conducted a preliminary evaluation of the affected equipment and concluded that any past exposure to voltages above their maximum rating would not have caused a loss of functionality. This finding was entered into the licensee's corrective action program as Notifications 50834558, 50835906, 50835394, 50835945, 50835949, 50836376, 50836439, 50836638, 50836872, and 50836995.

The team determined the failure to evaluate operation of 125 Vdc and 480 and 120 Vac equipment at maximum allowable voltages was a performance deficiency. The performance deficiency was more-than-minor, and therefore a finding, because it related to the equipment performance attribute of the Mitigating Systems cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, operation of equipment outside of its rated or analyzed maximum allowable voltages adversely affects the reliability and capability of that equipment required to perform safety-related functions. In accordance with Inspection Manual Chapter 0609, Appendix A, “The Significance Determination Process (SDP) for Findings At-Power,” dated July 19, 2012, the finding screened as having very low safety significance (Green) because it was a design or qualification deficiency that did not represent a loss of operability or functionality; did not represent an actual loss of safety function of the system or train; did not result in the loss of one or more trains of non-technical specification equipment; and did not screen as potentially risk-significant due to seismic, flooding, or severe weather. This finding had a cross-cutting aspect in the area of human performance associated with design margins because the licensee failed to ensure that the organization operated and maintained equipment within design margins and that margins were carefully guarded and changed only through a systematic and rigorous process.

Inspection Report# : [2016007](#) (pdf)

Significance:  Mar 10, 2016

Identified By: NRC

Item Type: NCV Non-Cited Violation

Failure to Evaluate the Extent of Condition for a Degraded Condition on a Nonsafety-Related 4160 Vac Breaker

The team identified a Green, non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, “Instructions, Procedures, and Drawings,” which states, in part, “Activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings.” Specifically, in October of 2015, the licensee failed to evaluate the extent of condition of a cracked holding pawl on a nonsafety-related 4160 Vac SF6 breaker, which was procured as safety-related, in accordance with Procedure OM7.ID1, “Problem Identification and Resolution,” when the failure of the component could adversely impact safety-related breakers of the same make and model. In response to this finding, the licensee is performing a procedure review to include steps to perform an extent of condition analysis for unplanned nonsafety-related equipment issues that may also affect similar safety-related equipment. This finding was entered into the licensee's corrective action program as Notifications 50836859 and 50836689.

The team determined the failure to evaluate the impact of a cracked holding pawl identified on a nonsafety-related 4160 Vac SF6 breaker on additional safety-related 4160 Vac SF6 breakers was a performance deficiency. The performance deficiency was more-than-minor, and therefore a finding, because it related to the equipment performance attribute of the Mitigating Systems cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the 4160 Vac

breaker with the cracked holding pawl was procured as safety-related; therefore, the condition extends to safety-related 4160 Vac breakers of the same make and model and potentially adversely affects the ability to perform their safety function. In accordance with Inspection Manual Chapter 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," dated July 19, 2012, the finding screened as having very low safety significance (Green) because it was a design or qualification deficiency that did not represent a loss of operability or functionality; did not represent an actual loss of safety function of the system or train; did not result in the loss of one or more trains of non-technical specification equipment; and did not screen as potentially risk-significant due to seismic, flooding, or severe weather. This finding had a cross-cutting aspect in the area of human performance associated with conservative bias because the licensee failed to ensure that individuals used decision-making practices that emphasized prudent choices.

Inspection Report# : [2016007](#) (*pdf*)

Significance: G Mar 10, 2016

Identified By: NRC

Item Type: NCV Non-Cited Violation

Failure to Evaluate the Voltage Effects of Limiting Design Basis Events on the 230 kV Offsite Power Circuit

The team identified a Green, non-cited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," which states, in part, "The design control measures shall provide for verifying or checking the adequacy of design, such as by the performance of design reviews, by the use of alternate or simplified calculational methods, or by the performance of a suitable testing program." Specifically, prior to January 30, 2014, the licensee failed to verify the design of the 230 kV preferred offsite power source, such as by the performance of design reviews or use of alternate or simplified calculational methods, by assuming in calculation 359-DC, "Determination of 230 kV Grid Capability Limits as DCPD Offsite Power Source," that the reactor trip and engineered safety features actuation system signals are coincident in time for all postulated design basis events. However, the plant is designed such that, during some events, the signals are separate in time and would result in a greater vital bus voltage depression than analyzed. In response to this finding, the licensee conducted a preliminary evaluation and concluded that the current transmission grid conditions were such that the calculation criteria would be met in the event of a design basis event involving non-coincident reactor trip and engineered safety features actuation system signals. This finding was entered into the licensee's corrective action program as Notification 50839137.

The team determined the failure to evaluate the voltage effects of a limiting design basis event with non-coincident reactor trip and engineered safety features actuation system signals on the 230 kV offsite power circuit was a performance deficiency. The performance deficiency was more-than-minor, and therefore a finding, because it related to the design control attribute of the Mitigating Systems cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to ensure adequate bus voltages as a result of a design basis event with non-coincident reactor trip and engineered safety features actuation system signals would result in a trip of the undervoltage relays and the loss of the preferred offsite power circuit. In accordance with Inspection Manual Chapter 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," dated July 19, 2012, the finding screened as having very low safety significance (Green) because it was a design or qualification deficiency that did not represent a loss of operability or functionality; did not represent an actual loss of safety function of the system or train; did not result in the loss of one or more trains of non-technical specification equipment; and did not screen as potentially risk-significant due to seismic, flooding, or severe weather. This finding had a cross-cutting aspect in the area of human performance associated with design margins because the licensee failed to ensure that the organization operated and maintained equipment within design margins and that margins were carefully guarded and changed only through a systematic and rigorous process.

Inspection Report# : [2016007](#) (*pdf*)

Significance:  Mar 10, 2016

Identified By: NRC

Item Type: NCV Non-Cited Violation

Failure to Translate Appropriate Load Tap Changer Timing Acceptance Criteria into Periodic Tests

The team identified a Green, non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," which states, in part, "Instructions, procedures, or drawings shall include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished." Specifically, prior to November 25, 2015, the licensee failed to include appropriate quantitative acceptance criteria in Procedure MP E-62.3, "Tap Changer Functional Test for Standby-Startup Transformer 11," to ensure that the load tap changer speed for standby-startup transformer 11 was adequate to restore vital bus voltages to the required level during design basis events. In response to this finding, the licensee performed a preliminary evaluation of the condition and concluded that the most recently measured speed of the load tap changer was adequate to ensure that it would restore vital bus voltage within the required time. This finding was entered into the licensee's corrective action program as Notification 50839333.

The team determined the failure to translate appropriate load tap changer timing acceptance criteria into functional tests to ensure that design assumptions were being maintained was a performance deficiency. The performance deficiency was more-than-minor, and therefore a finding, because it related to the design control attribute of the Mitigating Systems cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the load tap changer could meet its functional test acceptance criterion, but not operate fast enough to restore vital bus voltages within the required time during design basis events, which would result in an undervoltage trip and loss of the preferred offsite power circuit. In accordance with Inspection Manual Chapter 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," dated July 19, 2012, the finding screened as having very low safety significance (Green) because it was a design or qualification deficiency that did not represent a loss of operability or functionality; did not represent an actual loss of safety function of the system or train; did not result in the loss of one or more trains of non-technical specification equipment; and did not screen as potentially risk-significant due to seismic, flooding, or severe weather. This finding had a cross-cutting aspect in the area of human performance associated with design margins because the licensee failed to ensure that the organization operated and maintained equipment within design margins and that margins were carefully guarded and changed only through a systematic and rigorous process.

Inspection Report# : [2016007](#) (*pdf*)

Barrier Integrity

Significance:  Jun 30, 2016

Identified By: Self-Revealing

Item Type: NCV Non-Cited Violation

Misplaced Spent Fuel Assembly in the Spent Fuel Pool

The inspectors reviewed a self-revealed, non-cited violation of Technical Specification (TS) 5.4.1.a, "Procedures," for the licensee's failure to place a spent fuel assembly in its correct location in the spent fuel pool (SFP) in accordance with Procedure OP B-8H, "Spent Fuel Pool Work Instructions." Specifically, the fuel handling crew moved spent fuel assembly TT69 to location E-37 rather than its intended location E-27. In response to this error, reactor engineering performed a technical specification verification in order to ensure that fuel assembly TT69 could remain in Cell E-37. The licensee suspended further fuel movements pending corrective action and remediation of the operators. The licensee entered this into the corrective action program as Notifications 50846834 and 50847067.

The licensee's failure to place a spent fuel assembly in its correct location in the SFP was a performance deficiency. The performance deficiency is more than minor, and therefore a finding, because it is associated with the 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. Using Inspection Manual Chapter 0609, Attachment 04, "Initial Characterization of Findings," and Appendix A, Exhibit 3, "Barrier Integrity Screening Questions," the inspectors determined that the finding was of very low safety significance (Green) because: (1) the finding did not adversely affect decay heat removal capabilities from the spent fuel pool causing the pool temperature to exceed the maximum analyzed temperature limit specified in the site-specific licensing basis, (2) the finding did not result from fuel handling errors, dropped fuel assembly, dropped storage cask, or crane operations over the SFP that caused mechanical damage to fuel clad and a detectable release of radionuclides, (3) the finding did not result in a loss of spent fuel pool water inventory decreasing below the minimum analyzed level limit specified in the site-specific licensing basis, and (4) the finding did not affect the SFP neutron absorber, fuel bundle misplacement (i.e., fuel loading pattern error) or soluble Boron concentration. This finding had a cross-cutting aspect in the area of human performance associated with avoiding complacency. Specifically, individuals failed to recognize and plan for the possibility of mistakes, latent issues, and inherent risk, even while expecting successful outcomes and individuals failed to implement appropriate error reduction tools. [H.12]

Inspection Report# : [2016002](#) (pdf)

Significance:  May 11, 2016

Identified By: NRC

Item Type: NCV Non-Cited Violation

Insufficient procedural direction contained within EOP E-2, Faulted Steam Generator Isolation

The examiners identified a non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings." Specifically, Procedure EOP E-2, "Faulted Steam Generator Isolation," does not contain sufficient procedural direction for isolating auxiliary feedwater flow to a faulted steam generator in the event that auxiliary feedwater control valves cannot be closed from the control room. Procedure EOP E-2, Appendix HH, "Isolated Faulted Steam Generator," Step 1.d, and its associated column, Response Not Obtained, does not ensure that a faulted steam generator would remain isolated under all conditions. The Response Not Obtained column permits operators to either locally close auxiliary feedwater control valves OR secure the auxiliary feedwater pump feeding the faulted steam generator. However, due to the absence of pull-to-lock or hard stop switches for the auxiliary feedwater pumps, the possibility exists for an automatic restart of an auxiliary feedwater pump and a re-initiation of feedwater to a faulted steam generator.

The failure to ensure that Procedure EOP E-2 contained sufficient direction to isolate a faulted steam generator when auxiliary feedwater flow control valves cannot be closed from the control room was a performance deficiency. This performance deficiency was of more than minor safety significance because it was associated with the procedure quality attribute of the Barrier Integrity cornerstone (reactor coolant system and containment) and adversely affected the cornerstone objective of providing reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. Specifically, the re-initiation of feedwater to an isolated, faulted steam generator has the potential to adversely affect the reactor coolant system barrier by causing an additional unintended cooldown of the reactor coolant system, increased potential for pressurized thermal shock, and thermal stress to the steam generator u-tubes. Additionally, the containment barrier would be affected by the re-initiation of feedwater to a steam line break within containment. Using Inspection Manual Chapter 0609, Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," dated June 19, 2012, the team determined that the finding required a detailed risk evaluation due to the potential to affect the reactor coolant system boundary. A senior reactor analyst performed a bounding detailed risk evaluation and estimated the maximum increase in core damage frequency to be 5.9E-8/year, and therefore the finding was determined to be of very low safety significance (Green). This increase in core damage frequency was mitigated by the low probability of multiple equipment failures in the auxiliary feedwater system when combined with the low initiating event frequency of a faulted steam generator.

Because the violation was of very low safety significance (Green) and the issue was entered into the licensee's corrective action program as Notification 50847218, this violation is being treated as a non-cited violation consistent with Section 2.3.2.a of the Enforcement Policy: NCV 05000275/2016301; 05000323/2016301-01, "Insufficient Procedural Direction Contained Within E-2, Faulted Steam Generator Isolation." This finding has a cross-cutting aspect in the area of human performance associated with resources because the organization did not ensure procedures are available and adequate to support nuclear safety.

Inspection Report# : [2016301](#) (*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.

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Miscellaneous

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