UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
1600 EAST LAMAR BLVD
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February 7, 2013

EA-13-021

Mr. Edward D. Halpin
Senior Vice President and
Chief Nuclear Officer
Pacific Gas and Electric Company
Diablo Canyon Power Plant
P.O. Box 56, Mail Code 104/6
Avila Beach, CA 93424

SUBJECT: DIABLO CANYON POWER PLANT, UNITS 1 AND 2 - NRC TRIENNIAL FIRE INSPECTION REPORT (05000275/2012008; 05000323/2012008) AND EXERCISE OF ENFORCEMENT DISCRETION

Dear Mr. Halpin:

On November 8, 2012, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at the Diablo Canyon Power Plant. The enclosed inspection report documents the inspection results, which were discussed in a debrief meeting on November 8, 2012, with you and other members of your staff. Following additional in-office review, an exit meeting was conducted on December 20, 2012, with you and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The team reviewed selected procedures and records, observed activities, and interviewed personnel.

One NRC-identified finding and one self-revealing finding of very low safety significance (Green) were identified during this inspection. Both of these findings involved violations of NRC requirements. Additionally, two findings involving 10 CFR 50.48(b) were identified and were violations of NRC requirements. The team screened these violations and determined that they warrant enforcement discretion per NRC Enforcement Policy, Section 9.1, "Enforcement Discretion for Certain Fire Protection Issues (10 CFR 50.48)" and Section 11.05(b) of Inspection Manual Chapter 0305 (EA-13-021).

If you contest any findings in this report, you should provide a written 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, D.C. 20555-0001; with copies to the Regional Administrator, Region IV; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, D.C. 20555-0001; and the NRC Senior Resident Inspector at the Diablo Canyon Power Plant.

If you disagree with a cross-cutting aspect assignment in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region IV, and the NRC Senior Resident Inspector at Diablo Canyon Power Plant. The information you provide will be considered in accordance with Inspection Manual Chapter 0305.

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

Sincerely,

/RA/

Geoffrey B. Miller, Chief
Engineering Branch 2
Division of Reactor Safety

Dockets: 50-275; 50-323
Licenses: DPR-80; DPR-82

Enclosure: Inspection Report No. 05000275/2012008; 05000323/2012008
w/Attachment:
1 - Supplemental Information

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ADAMS: ☐ No ☒ Yes	☒ SUNSI Review Complete	Reviewer Initials: GBM
	☒ Publicly Available	☒ Non-Sensitive
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ENCLOSURE

U.S. NUCLEAR REGULATORY COMMISSION
REGION IV

Dockets:	50-275; 50-323
Licenses:	DPR-80; DPR-82
Report Nos.:	05000275/2012008 and 05000323/2012008
Licensee:	Pacific Gas and Electric Company
Facility:	Diablo Canyon Power Plant, Units 1 and 2
Location:	7 ½ miles NW of Avila Beach Avila Beach, California
Dates:	October 22 to December 20, 2012
Team Leader:	J. Mateychick, Senior Reactor Inspector, Engineering Branch 2
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Approved By:	Geoffrey B. Miller, Branch Chief Engineering Branch 2 Division of Reactor Safety

SUMMARY OF FINDINGS

IR; 05000275/2012008; 05000323/2012008; October 22 to December 20, 2012; Pacific Gas and Electric Company; Diablo Canyon Power Plant, Units 1 and 2: Triennial Fire Protection Team Inspection.

The report covered a two-week triennial fire protection team inspection by specialist inspectors from Region IV. Two Green findings, which were non-cited violations (NCVs), were identified. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter 0609, "Significance Determination Process," dated June 2, 2012. Findings for which the significance determination process (SDP) does not apply may be Green or be assigned a severity level after NRC management review. Cross-cutting aspect are determined using IMC 0310, "Components Within the Cross Cutting Areas" dated October 28, 2012. All violations of NRC requirements are dispositioned in accordance with the NRC's Enforcement Policy dated June 7, 2012. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

A. NRC-Identified and Self-Revealing Findings

Cornerstone: Mitigating Systems

- Green. The team reviewed a self-revealing non-cited violation of License Conditions 2.C(4) for Unit 1 and 2.C(5) for Unit 2, "Fire Protection Program," due to the licensee inadvertently isolating the firewater yard loop for approximately three days, reducing the plant's fire protection capability without compensatory actions. The licensee entered this issue in their corrective action program as Notification 50513006.

  The failure to maintain the fire water system configuration as required in the approved fire protection program was a performance deficiency. The performance deficiency was more than minor because it was associated with the protection against external events (fire) attribute of the Mitigating Systems Cornerstone and it adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The performance deficiency affected the fire protection defense-in depth strategies involving post-fire safe shutdown systems. The major fire loading in the yard area resulted from the 12 large transformers. The senior reactor analyst made the bounding assumption that any transformer fire without suppression would result in an unrecoverable loss of offsite power. A bounding value was calculated by multiplying the fire ignition frequency by the conditional core damage probability. This resulted in a change to core damage frequency of 1.2×10^{-7}. Therefore, the subject finding was of very low safety significance (Green).

  This performance deficiency had a cross-cutting aspect in the area of resources associated with providing complete, accurate and up-to-date design documentation, procedures, and work packages, and correct labeling of components. Specifically, the licensee did not provide sufficient details in procedures for operators to successfully align an infrequently operated valve with no position indication. [H.2(c)] (Section 1R05.03.b)

- Green. The team identified a non-cited violation of License Conditions 2.C(4) for Unit 1 and 2.C(5) for Unit 2, "Fire Protection Program," due to the licensee's failure to establish or adequately implement compensatory measures for non-compliances with the licensee's approved fire protection program. These non-compliances were identified during the licensee's ongoing transition to a new fire protection program in compliance with National Fire Protection Association Standard 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," (NFPA 805). The licensee entered this issue in their corrective action program as Notifications 50521360 and 50531363.

  The failure to establish or maintain appropriate compensatory measures for identified deficiencies in the approved fire protection program was a performance deficiency. The performance deficiency was more than minor because it was associated with the protection against external events (fire) attribute of the Mitigating Systems Cornerstone and it adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. A senior reactor analyst evaluated the significance of this performance deficiency.

  A fire that results in the loss of switchgear room ventilation would cause a loss of all ac and dc power if operators did not take action to recover cooling. The analyst determined that the licensed operators would have at least two clear annunciators indicating that ventilation had been lost and that room temperatures were increasing. Additionally, Procedure CP-M10, "Fire Protection of Safe Shutdown Equipment", was available to assist in providing portable fan cooling to the rooms.

  For a fire to result in an intersystem loss of coolant accident, it would have to cause a 3-phase hot short on both of two shutdown cooling suction valves. Given that each valve is on a different electrical train, the analyst determined that the conditional probabilities of the hot shorts involved would best be modeled as independent. Accounting for the risk associated with both issues evaluated, the analyst estimated the change to core damage probability to be 1.5×10^{-7} per unit. Therefore, the performance deficiency was considered to be of very low safety significance (Green).

  This finding did not have a cross-cutting aspect because it was not indicative of the licensee's present performance. (Section 1R05.10.b)

B. Licensee-Identified Violations

None.

REPORT DETAILS

1. REACTOR SAFETY

Cornerstones: Initiating Events, Mitigating Systems, and Barrier Integrity

1R05 Fire Protection (71111.05T)

This report presents the results of a triennial fire protection inspection conducted in accordance with NRC Inspection Procedure 71111.05T, "Fire Protection (Triennial)," at the Diablo Canyon Power Plant. The licensee committed to adopt a risk-informed fire protection program in accordance with National Fire Protection Association Standard 805 (NFPA 805) on June 24, 2011, as approved by NRC on July 28, 2011, (ML112010657), but has not yet completed the program transition. The inspection team evaluated the implementation of the approved fire protection program in selected risk-significant areas, with an emphasis on the procedures, equipment, fire barriers, and systems that ensure the post-fire capability to safely shutdown the plant.

Inspection Procedure 71111.05T requires the selection of three to five fire areas for review. The inspection team used the fire hazards analysis section of the Diablo Canyon Power Plant's Fire-Induced Risk Model to select the following three risk-significant fire areas in Unit 1 (inspection samples) for review:

- Fire Area 3-BB, Containment Penetration Rooms (all elevations)
- Fire Area 7A, Cable Spreading Room
- Fire Area 5-A-4, 480V Nonvital Switchgear and Hot Shutdown Panel Area

The inspection team evaluated the licensee's fire protection program using the applicable requirements, which included plant Technical Specifications, Operating License Condition 2.C.(5), NRC safety evaluations, 10 CFR 50.48, and Branch Technical Position 9.5-1. The team also reviewed related documents that included the Final Safety Analysis Report (FSAR), Section 9.5; the fire hazards analysis; and the post-fire safe shutdown analysis.

Specific documents reviewed by the team are listed in the attachment. Three inspection samples were completed.

.01 Protection of Safe Shutdown Capabilities

a. Inspection Scope

The team reviewed the piping and instrumentation diagrams, safe shutdown equipment list, safe shutdown design basis documents, and the post-fire safe shutdown analysis to verify that the licensee properly identified the components and systems necessary to achieve and maintain safe shutdown conditions for fires in the selected fire areas. The team observed walkdowns of the procedures used for achieving and maintaining safe shutdown in the event of a fire to verify that the procedures properly implemented the safe shutdown analysis provisions.

For each of the selected fire areas, the team reviewed the separation of redundant safe shutdown cables, equipment, and components located within the same fire area. The team also reviewed the licensee's method for meeting the requirements of 10 CFR 50.48; Branch Technical Position 9.5-1, Appendix A; and 10 CFR Part 50, Appendix R, Section III.G. Specifically, the team evaluated whether at least one post-fire safe shutdown success path remained free of fire damage in the event of a fire. In addition, the team verified that the licensee met applicable license commitments.

b. Findings

No findings were identified.

.02 Passive Fire Protection

a. Inspection Scope

The team walked down accessible portions of the selected fire areas to observe the material condition and configuration of the installed fire area boundaries (including walls, fire doors, and fire dampers) and verify that the electrical raceway fire barriers were appropriate for the fire hazards in the area. The team compared the installed configurations to the approved construction details, supporting fire tests, and applicable license commitments.

The team reviewed installation, repair, and qualification records for a sample of penetration seals to ensure the fill material possessed an appropriate fire rating and that the installation met the engineering design. The team also reviewed similar records for the rated fire wraps to ensure the material possessed an appropriate fire rating and that the installation met the engineering design.

b. Findings

No findings were identified.

.03 Active Fire Protection

a. Inspection Scope

The team reviewed the design, maintenance, testing, and operation of the fire detection and suppression systems in the selected fire areas. The team verified the automatic detection systems and the manual and automatic suppression systems were installed, tested, and maintained in accordance with the National Fire Protection Association code of record or approved deviations, and that each suppression system was appropriate for the hazards in the selected fire areas.

The team performed a walkdown of accessible portions of the detection and suppression systems in the selected fire areas. The team also performed a walkdown of major system support equipment in other areas (e.g., fire pumps and carbon dioxide supply systems) to assess the material condition of these systems and components.

The team reviewed the fire pumps flow and pressure tests to verify that the pumps met their design requirements. The team also reviewed the carbon dioxide suppression system functional tests to verify that the system capability met the design requirements.

The team assessed the fire brigade capabilities by reviewing training, qualification, and drill critique records. The team also reviewed pre-fire plans and smoke removal plans for the selected fire areas to determine if appropriate information was provided to fire brigade members and plant operators to identify safe shutdown equipment and instrumentation, and to facilitate suppression of a fire that could impact post-fire safe shutdown capability. In addition, the team inspected fire brigade equipment to determine operational readiness for fire fighting.

b. Findings

Introduction. The team evaluated a self-revealing finding due to the firewater yard loop being inadvertently isolated for approximately three days. The team determined the finding to be a Green non-cited violation of the licensee's approved fire protection program as defined in License Conditions 2.C(4) for Unit 1 and 2.C(5) for Unit 2.

Description. The firewater yard loop within the protected area is normally supplied by the raw water storage reservoirs with the elevation difference maintaining the firewater yard loop pressure. The firewater yard loop supplies firewater to both the power block and the intake structure. The power block, including safety related areas, have a backup supply from fire water storage tank 0-1 via two electric driven fire pumps which activate on low system pressure. The fire hose stations and two fire sprinklers in the intake structure are only supplied from the firewater yard loop.

The south firewater loop serving additional site facilities outside of the protected area has two additional fire pumps with their own fire water storage tank. The south firewater loop is normally isolated from the firewater yard loop but can be aligned to feed the firewater yard loop. The licensee's Equipment Control Guideline (ECG) 18.1, "Fire Suppression Systems/Fire Suppression Water Systems," Revision 9, requires that if the raw water gravity feed water supply is inoperable, within 7 days either restore the supply or align the south loop fire pumps and fire water storage tank to supply the firewater yard loop.

On September 9, 2012, operators isolated the raw water storage reservoirs from the firewater yard loop and south firewater loop for planned maintenance work. Operators also aligned the south firewater loop to supply the firewater yard loop. On September 12, 2012, operators restored the fire water supply from the raw water storage reservoirs and isolated the south firewater loop from the firewater yard loop.

On September 15, 2012, operators attempted to add water from the raw water storage reservoirs to fire water storage tank 0-2 in the south firewater loop system. Flow to the tank stopped and the firewater yard loop lost pressure, initiating alarms on the fire computer in the control room. Fire pump 0-2 started on low pressure to supply the fire suppression systems in the power block from fire water storage tank 0-1 as designed. Operators aligned the south firewater loop to supply the firewater yard loop and started fire pump 0-3 to restore pressure in the firewater yard loop. Operators rechecked the

system valve alignment and reopened valve MU-0-268, which pressurized the firewater yard loop from the raw water storage reservoir.

During the approximately three day period when valve MU-0-268 was inadvertently left in the closed position, the following fire suppression systems were without a water supply:

- The automatic water spray deluge systems for the main transformers, auxiliary transformers, and startup transformers for both units
- All outdoor fire hydrants in the protected area
- The hose stations and two sprinkler heads in the intake structure

Valve MU-0-268 is a buried 12-inch valve which is manually operated with a "T" handle. This valve is infrequently operated and has no position indication. The operator restoring the valve to the open position turned the "T" handle approximately 20 turns in the open direction and felt an increase in resistance. The operator interpreted the resistance as the valve reaching its fully opened position. The second operator verifying the valve position turned the valve closed a few turns then reopened the valve until the increased resistance was also felt. The licensee's investigation identified that valve MU-0-268 requires approximately 80 turns to fully open. From the fully closed position, approximately 20 turns are required before the disc begins to pull out of its seat. The increased resistance the operators encountered was due to the forces required to pull the disc out of its seat and was not due to the valve being fully open.

Analysis. The failure to maintain the fire water system configuration as required in the approved fire protection program was a performance deficiency. The performance deficiency was more than minor because it was associated with the protection against external events (fire) attribute of the Mitigating Systems Cornerstone and it adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The team evaluated this deficiency using Inspection Manual Chapter 0609, Appendix F, "Fire Protection Significance Determination Process." The performance deficiency affected the fire protection defense-in depth strategies involving post-fire safe shutdown systems. However, the Assumptions and Limitations section of Appendix F states, "The SDP approach is intended to support the assessment of known issues only in the context of an individual fire area. A systematic plant-wide search and assessment effort is beyond the intended scope of the fire protection SDP." Therefore, a senior reactor analyst evaluated the significance of this performance deficiency.

The analyst evaluated this finding using the Standardized Plant Analysis Risk Model for Diablo Canyon, Units 1 & 2, Revision 8.15. The analyst noted that the major fire loading in the yard area resulted from the 12 large transformers. Using the generic fire ignition frequency for outdoor transformers (4.2×10^{-3}/year) from NRC Inspection Manual Chapter 0609, Appendix F, Attachment 4, "Fire Ignition Source Mapping Information: Fire Frequency, Counting Instructions, Applicable Fire Severity Characteristics, and Applicable Manual Fire Suppression Curves," the analyst calculated a fire ignition frequency for all 12 transformers of 5.0×10^{-2}/year. For a 3-day exposure period, the analyst calculated a fire ignition probability of 4.1×10^{-4}.

The analyst made the bounding assumption that any transformer fire without suppression would result in an unrecoverable loss of offsite power. Using the SPAR model, the analyst quantified this conditional core damage probability as 2.8×10^{-4}. A bounding value was then calculated by multiplying the fire ignition frequency by the conditional core damage probability. This resulted in a change of core damage frequency of 1.2×10^{-7}. Therefore, the subject finding was of very low safety significance (Green).

This performance deficiency had a cross-cutting aspect in the area of resources associated with providing complete, accurate and up-to-date design documentation, procedures, and work packages, and correct labeling of components. Specifically, the licensee did not provide sufficient details in procedures for operators to successfully align an infrequently operated valve with no position indication. [H.2(c)]

Enforcement. License Conditions 2.C(4) for Unit 1 and 2.C(5) for Unit 2, "Fire Protection Program," require the licensee to implement and maintain in effect all provisions of the approved Fire Protection Program as discussed in the Final Safety Analysis Report Update; in PG&E's December 6, 1984, Appendix R Report; and in the NRC staff's Fire Protection Evaluation in the Supplements to the Diablo Canyon Safety Evaluation Report listed for each unit.

Updated Final Safety Analysis Report Appendix 9.5B, "DCPP Regulatory Compliance Summary," Table B-1, "Comparison of DCPP to Appendix A of BTP APCSB 9.5-1," Section C, "Quality Assurance Program," Sub-Section 2, "Instructions, Procedures, and Drawings," states "Inspections, tests, administrative controls, fire drills, and training that govern the fire protection program should be prescribed by documented instructions, procedures, or drawings and should be accomplished in accordance with these documents." The DCPP Compliance to Commitment states, "Procedures govern inspections, tests, administrative controls, fire drills, and training relating to the FP Program."

Contrary to the above, from September 12, 2012 to September 15, 2012, the licensee failed to implement and maintain in effect the provisions of the approved fire protection program. Specifically, the licensee failed to maintain the required configuration of the fire water system. The performance deficiency was due to the licensee's failure to provide adequate information to operators concerning the operation of Valve MU-0-268 in Clearance 0C18 D-16-005. Because this finding is of very low safety significance and has been entered into the corrective action program (Notification 50513006), this violation is being treated as a non-cited violation, consistent with Section 2.3.2 of the NRC Enforcement Policy: NCV 05000275/2012008-01, 05000323/2012008-01; Failure to Maintain Required Firewater System Configuration

.04 Protection From Damage From Fire Suppression Activities

a. Inspection Scope

The team performed plant walkdowns and document reviews to verify that redundant trains of systems required for hot shutdown, which are located in the same fire area, would not be subject to damage from fire suppression activities or from the rupture or inadvertent operation of fire suppression systems. Specifically, the team verified that:

- A fire in one of the selected fire areas would not directly, through production of smoke, heat, or hot gases, cause activation of suppression systems that could potentially damage all redundant safe shutdown trains.
- A fire in one of the selected fire areas or the inadvertent actuation or rupture of a fire suppression system would not directly cause damage to all redundant trains (e.g., sprinkler-caused flooding of other than the locally affected train).
- Adequate drainage is provided in areas protected by water suppression systems.

b. Findings

No findings were identified.

.05 Alternative Shutdown Capability

a. Inspection Scope

Review of Methodology

The team reviewed the safe shutdown analysis, operating procedures, piping and instrumentation drawings, electrical drawings, the Final Safety Analysis Report, and other supporting documents to verify that hot and cold shutdown could be achieved and maintained from outside the control room for fires that require evacuation of the control room, with or without offsite power available.

Plant walkdowns were conducted to verify that the plant configuration was consistent with the description contained in the safe shutdown and fire hazards analyses. The team focused on ensuring the adequacy of systems selected for reactivity control, reactor coolant makeup, reactor decay heat removal, process monitoring instrumentation, and support systems functions.

The team also verified that the systems and components credited for shutdown would remain free from fire damage. Finally, the team verified that the transfer of control from the control room to the alternative shutdown location would not be affected by fire-induced circuit faults (e.g., by the provision of separate fuses and power supplies for alternative shutdown control circuits).

Review of Operational Implementation

The team verified that licensed and non-licensed operators received training on alternative shutdown procedures. The team also verified that sufficient personnel to perform a safe shutdown were trained and available onsite at all times, exclusive of those assigned as fire brigade members.

The team performed a walkthrough of the post-fire safe shutdown procedure with licensed and non-licensed operators to determine the adequacy of the procedure. The team verified that the operators could be reasonably expected to perform specific actions within the time required to maintain plant parameters within specified limits. Time critical actions that were verified included restoring electrical power, establishing

control at the remote shutdown and local shutdown panels, establishing reactor coolant makeup, and establishing decay heat removal.

The team also reviewed the periodic testing of the alternative shutdown transfer capability and instrumentation and control functions to verify that the tests were adequate to demonstrate the functionality of the alternative shutdown capability.

b. Findings

.1 Introduction. The team identified a violation of Technical Specification 5.4.1.d for the failure to implement and maintain adequate written procedures covering fire protection program implementation. Specifically, the team identified five examples (with a total of eight fire scenarios) where the licensee failed to maintain an alternative shutdown procedure that ensured operators could safely shutdown the plant in the event of a control room or cable spreading room fire. This violation has been screened and determined to warrant enforcement discretion in accordance with the NRC Enforcement Policy, Section 9.1, "Enforcement Discretion for Certain Fire Protection Issues (10 CFR 50.48)", and Inspection Manual Chapter 0305.

Description. Operations personnel would use Procedure OP AP-8A, "Control Room Inaccessibility – Establishing Hot Standby," Revision 31, to shutdown the reactor at the hot shutdown panel, dedicated shutdown panel, and other control stations outside of the control room in the event a fire required evacuation of the control room. This alternative shutdown procedure was developed based on the results of the safe shutdown and thermal hydraulic analyses contained in the following calculations:

- M-680, "10 CFR 50 Appendix R Safe Shutdown Equipment," Revision 18-01
- M-928, "10 CFR 50 Appendix R Safe Shutdown Analysis," Revision 18-02
- M-944, "10 CFR 50 Appendix R Alternate Shutdown Methodology – Time and Manpower Study/Safe Shutdown System Considerations," Revision 7
- STA-251, "RETRAN Evaluation of Appendix R Scenarios with RSGs," Revision 0

The alternative shutdown procedure provided methods to maintain several post-fire safe shutdown functions, including maintaining reactor coolant inventory, controlling decay heat removal, and providing electrical power, from outside the control room. The procedure directed operators to maintain reactor coolant inventory by isolating letdown and maintaining the pressurizer level and pressure within prescribed limits using the emergency core cooling system charging pumps. The procedure directed operators to control decay heat removal by using the motor-driven auxiliary feedwater pumps to inject water into the steam generators. The procedure directed operators to provide electrical power by ensuring the emergency diesel generators started and energized the 4kV and 480V busses.

The team performed a timed walkdown of the alternative shutdown procedure. Based on the timed walkdown results, the team identified five examples (with a total of eight fire scenarios) where the licensee failed to maintain an alternative shutdown procedure that ensured operators could safely shutdown the plant in the event of a control room or cable spreading room fire. These examples included scenarios where the licensee failed to ensure charging pumps remained available to maintain reactor coolant

inventory, steam generators remained available to remove decay heat, 480V equipment remained available to shutdown the plant, and the pressurizer level remained within the indicating region (both high and low). For each example, the licensee implemented corrective actions to revise their procedures and establish compensatory fire patrols, as appropriate.

Example 1: Potential Loss of the Emergency Core Cooling System Charging Pumps

The first example involved a control room or cable spreading room fire with the spurious closure of one of the volume control tank outlet valves (LCV-112B or LCV-112C) combined with a loss of offsite power. In this scenario, the expected plant response to the loss of offsite power causes both emergency core cooling system charging pumps to start, and the spurious closure of one of the volume control tank outlet valves results in the loss of both pumps.

Westinghouse examined this scenario and provided an evaluation in Letter PGE-92-621, "Diablo Canyon Appendix R Charging Pump Evaluation," dated July 14, 1992. Their evaluation stated that severe pump damage and failure could occur within approximately 30 seconds after a loss of suction, but most likely would not occur for an additional one or two minutes. Based on this evaluation, the team concluded that operators need to stop all running charging pumps within 2.5 minutes of the loss of suction for the charging pumps to maintain reactor coolant inventory.

The team determined that operators could mitigate this scenario by opening the refueling water storage tank outlet valves or stopping the pumps prior to pump damage. The alternative shutdown procedure provided steps for operators to transfer the suction for the charging pumps from the volume control tank to the refueling water storage tank. Based on the timed walkdown, the team determined that operators would begin opening the refueling water storage tank outlet valves 5.5 minutes after the reactor trip and complete this action within 3 minutes. Since this time exceeded 2.5 minutes, the team concluded that the alternative shutdown procedure was inadequate to ensure that the charging pumps remained available to maintain reactor coolant inventory under all alternative shutdown fire scenarios.

The team noted that the licensee had a third charging pump which received power from an emergency diesel generator, but would not automatically start on a loss of offsite power. The team reviewed the alternative shutdown procedure and determined that the procedure did not provide operators with instructions on using the third charging pump in the event the other two pumps were damaged.

Example 2: Potential Overfilling of the Steam Generators

The second example involved a control room or cable spreading room fire where fire damage prevents the feedwater isolation on a reactor trip and low T_{avg} signal, resulting in the turbine-driven main feedwater pumps continuing to inject feedwater into the steam generators and a loss of decay heat removal and overcooling.

The licensee performed a preliminary analysis of this scenario and concluded that operators had approximately 3 minutes to stop the main feedwater injection prior to overfilling the steam generators.

The team determined that operators could mitigate this scenario by closing the main feedwater isolation valves or the main steam isolation valves. The alternative shutdown procedure provided steps for operators to close the main steam isolation valves from the control room prior to evacuation; however, the team determined that the approved fire protection program did not credit this action. The team noted that the alternative shutdown procedure provided steps for operators to close the main steam isolation valves outside the control room, but did not provide steps for operators to close the main feedwater isolation valves. As noted in the next violation, (1R05.05.b.2), the safe shutdown analysis determined that operator actions were required to isolate main feedwater, but this requirement was not carried forward to the alternative shutdown procedure.

Based on the timed walkdown, the team determined that operators would begin closing the main steam isolation valves approximately 11 minutes after the reactor trip and complete this action within 15 minutes. Since this time exceeded 3 minutes, the team concluded that the alternative shutdown procedure was inadequate to ensure that the steam generators remained available to remove decay heat under all alternative shutdown fire scenarios.

Example 3: Potential Loss of 480V Safe Shutdown Equipment

The third example involved a control room or cable spreading room fire where fire damage causes the 480V feeder breakers (52HF10, 52GH10, and 52HH10) to open, resulting in a loss of the following 480V safe shutdown equipment:

- E-103 Auxiliary Salt Water Pump 1-1 Room HVAC
- ED11 Vital Battery Charger
- PP0-2 Fuel Oil Transfer Pump 0-2
- E-101 Auxiliary Salt Water Pump 1-2 Room HVAC
- HTR1-2 Pressurizer Heater Group 1-2
- ED12 Vital Battery Charger
- LCV-85 Day Tank 1-1 Level
- LCV-86 Day Tank 1-2 Level
- LCV-87 Day Tank 1-3 Level
- PP0-1 Fuel Oil Transfer Pump 0-1
- HTR1-3 Pressurizer Heater Group 1-3
- ED132 Vital Battery Charger
- LCV-88 Day Tank 1-1 Level
- LCV-89 Day Tank 1-2 Level
- LCV-90 Day Tank 1-3 Level

The team determined that none of the affected equipment was required immediately, and operators could mitigate this scenario by ensuring the breakers were closed after placing the respective transfer switches to “Local.” The team reviewed the alternative

shutdown procedure and determined that the procedure did not provide operators with instructions on ensuring the 480V feeder breakers were closed. As noted in the next violation, (1R05.05.b.2), the safe shutdown analysis determined that operator actions were required to ensure the 480V feeder breakers were closed, but this requirement was not carried forward to the alternative shutdown procedure.

Example 4: Potential Overfilling of the Pressurizer

The fourth example involved three fire scenarios that could result in overfilling the pressurizer. Two of these scenarios could also result in voiding in the core due to rapid depressurization of the reactor coolant system.

The first scenario involved a control room or cable spreading room fire with a spurious safety injection signal. The second scenario involved a control room or cable spreading room fire with the spurious actuation of a pressurizer power-operated relief valve, resulting in a rapid depressurization of the reactor coolant system and subsequent safety injection signal within approximately one minute. The third scenario involved a control room or cable spreading room fire with the spurious opening of a pressurizer auxiliary spray valve (8145 or 8148), resulting in a slightly slower depressurization of the reactor coolant system and subsequent safety injection signal within a maximum of four minutes (depending of the number of charging pumps running). In all three scenarios, the safety injection signal results in the two emergency core cooling system charging pumps starting and injecting water into the reactor coolant system through the charging injection valves (8801A, 8801B, 8803A, and 8803B).

The licensee examined the spurious actuation of the safety injection system in the Final Safety Analysis Report Section 15.2.15. The licensee's analysis assumed the safety injection signal occurred at 100 percent power, the emergency core cooling system actuated, letdown isolated, and offsite power was lost. The licensee concluded that operators had 8.5 minutes to control charging prior to the pressurizer reaching a water solid condition.

The team determined this time limit was not conservative for all three scenarios. First, the time limit was based on reaching a water solid condition in the pressurizer, not maintaining the level within the indicating region, as required by the approved fire protection program. Second, the analysis was based on an injection from the charging pumps. In the second and third scenarios, the depressurization of the reactor coolant system could lower the pressure quickly enough that the safety injection pumps would also be able to inject water into the reactor coolant system, thereby reducing the amount of time available prior to exceeding the indicating region of the pressurizer or reaching a water solid condition in the pressurizer.

The team determined that operators could mitigate all three scenarios by controlling charging at the hot shutdown panel. The alternative shutdown procedure provided steps for operators to control charging and maintain the pressurizer level between 22 percent and 70 percent, and it provided steps to stop the charging pumps if level could not be maintained. Based on the timed walkdown, the team determined that operators would reach this step nearly 30 minutes after the reactor trip. Since this time exceeded the amount of time allowed for all three scenarios (even though this limit was not

conservative), the team concluded that the alternative shutdown procedure was inadequate to ensure the pressurizer level remained within the indicating region and the pressurizer did not overfill under all alternative shutdown fire scenarios.

Example 5: Potential Draining of the Pressurizer

The fifth example involved two fire scenarios that could result in draining of the pressurizer and the potential to develop a bubble outside of the pressurizer. The first scenario involved a control room or cable spreading room fire with the spurious opening of a 10 percent atmospheric dump valve.

The licensee examined this scenario in Calculation STA-251 and concluded that operators had approximately 4.5 minutes to close the atmospheric dump valve prior to the pressurizer reaching 0 percent indicated level. The team noted that this number was not conservative since it assumed that the reactor coolant pumps remained running and main feedwater was isolated shortly after the reactor trip, adding heat to the reactor coolant system and lengthening the plant cooldown.

The team determined that operators could mitigate this scenario by closing the atmospheric dump valves. The alternative shutdown procedure provided steps for operators to close the atmospheric dump valves. Based on the timed walkdown, the team determined that operators would begin closing the atmospheric dump valves approximately 20 minutes after the reactor trip and complete this action within 15 additional minutes. Since this time exceeded 4.5 minutes, the team concluded that the alternative shutdown procedure was inadequate to ensure that the pressurizer remained within the indicating region and a bubble did not develop outside of the pressurizer under all alternative shutdown fire scenarios.

The second scenario involved a control room or cable spreading room fire with the spurious opening of a steam dump valve combined with a loss of offsite power. The licensee examined this scenario in Calculation STA-251 and concluded that operators had less than 24.5 minutes to close the main steam isolation valves prior to the pressurizer reaching 0 percent indicated level.

The team determined that operators could mitigate this scenario by closing the main steam isolation valves. The alternative shutdown procedure provided steps for operators to close the main steam isolation valves. Based on the timed walkdown, the team determined that operators would begin closing the main steam isolation valves within 11 minutes and complete this action within 15 additional minutes. Since this time exceeded 24.5 minutes, the team concluded that the alternative shutdown procedure was inadequate to ensure that the pressurizer remained within the indicating region and a bubble did not develop outside of the pressurizer under all alternative shutdown scenarios.

Analysis. The failure to maintain adequate written procedures covering fire protection program implementation was a performance deficiency. The performance deficiency was more than minor because it was associated with the protection against external events (fire) attribute of the Mitigating Systems cornerstone and it adversely affected the

cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences.

A senior reactor analyst performed a hand calculation to bound the risk significance of this finding. The senior reactor analyst determined that the change in core damage frequency was less than 1E-4, so the finding was not of high safety significance (Red). Therefore, this finding qualified for enforcement discretion using Section 9.1 of the Enforcement Policy, "Enforcement Discretion for Certain Fire Protection Issues (10 CFR 50.48)."

This finding did not have a cross-cutting aspect because it qualified for enforcement discretion.

Enforcement. Technical Specification 5.4.1.d states that written procedures shall be established, implemented, and maintained covering fire protection program implementation. Contrary to this requirement, prior to November 8, 2012, the licensee failed to establish, implement, and maintain adequate written procedures covering fire protection program implementation. Specifically, the team identified five examples involving the potential loss of the emergency core cooling system charging pumps, overfilling of the steam generators, loss of 480V safe shutdown equipment, overfilling of the pressurizer, and draining of the pressurizer where the licensee failed to maintain an alternative shutdown procedure that ensured operators could safely shutdown the plant in the event of a control room or cable spreading room fire.

Because the licensee committed to adopting National Fire Protection Association Standard 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," and committed to changing their fire protection program license basis to comply with 10 CFR 50.48(c) by submitting a license amendment request to the NRC, this violation was eligible for enforcement discretion as described in Section 9.1 of the Enforcement Policy, "Enforcement Discretion for Certain Fire Protection Issues (10 CFR 50.48)." Under this Enforcement Policy, the NRC will normally not take enforcement action for a violation of 10 CFR 50.48(b) (or the requirements in a fire protection license condition) involving a problem in an area such as engineering, design, implementing procedures, or installation if the violation is documented in an inspection report and meets all of the following criteria:

- The licensee identified the violation as a result of a voluntary initiative to adopt the risk-informed, performance-based fire protection program under 10 CFR 50.48(c), or, if the NRC identified the violation, the NRC found it likely that the licensee would have identified the violation in light of the defined scope, thoroughness, and schedule of its transition to 10 CFR 50.48(c).
- The licensee corrected the violation or will correct the violation after completing its transition to 10 CFR 50.48(c). Also, the licensee took immediate corrective action or compensatory measures or both within a reasonable time commensurate with the risk significance of the issue following identification; this action should involve expanding the initiative, as necessary, to identify other issues caused by similar root causes.
- Routine licensee efforts, such as normal surveillance or quality assurance activities, were not likely to have previously identified the violation.

- The violation was not willful.
- The violation is not associated with a finding of high safety significance.

Specifically, the team determined that the licensee: (1) would have identified the violation in light of the defined scope, thoroughness, and schedule of its transition to 10 CFR 50.48(c) because the licensee was performing new analyses and developing a new alternative shutdown procedure for the transition to NFPA-805; (2) the licensee will correct the violation after completing its transition to 10 CFR 50.48(c) and took immediate corrective action or compensatory measures or both within a reasonable time commensurate with the risk significance of the issue following identification; (3) routine licensee efforts (such as normal surveillance or quality assurance activities) were not likely to have previously identified the violation; (4) the violation was not willful; and (5) the team determined that this violation was not of high safety significance (Red).

The licensee entered these issues into their corrective action program as Notification 50522666 and implemented appropriate compensatory measures. Since all the criteria for enforcement discretion were met, the NRC is exercising enforcement discretion for this issue. (EA-13-021)

.2 Introduction. The team identified a violation of License Condition 2.C(5) for the failure to implement and maintain in effect all provisions of the approved fire protection program. Specifically, the team identified four examples where the licensee failed to maintain the fire protection program design basis documents (e.g., fire hazards analysis, safe shutdown analysis, and thermal hydraulic analysis) and the alternative shutdown procedure to adequately implement the approved fire protection program. This violation has been screened and determined to warrant enforcement discretion in accordance with the NRC Enforcement Policy, Section 9.1, "Enforcement Discretion for Certain Fire Protection Issues (10 CFR 50.48)", and Inspection Manual Chapter 0305.

Description. Operations personnel used Procedure OP AP-8A, "Control Room Inaccessibility – Establishing Hot Standby," Revision 31, to shutdown the reactor at the hot shutdown panel, dedicated shutdown panel, and other control stations outside of the control room in the event a fire required evacuation of the control room. This alternative shutdown procedure was developed based on the results of the safe shutdown and thermal hydraulic analyses contained in the following calculations:

- M-680, "10 CFR 50 Appendix R Safe Shutdown Equipment," Revision 18-01
- M-928, "10 CFR 50 Appendix R Safe Shutdown Analysis," Revision 18-02
- M-944, "10 CFR 50 Appendix R Alternate Shutdown Methodology – Time and Manpower Study/Safe Shutdown System Considerations," Revision 7
- STA-251, "RETRAN Evaluation of Appendix R Scenarios with RSGs," Revision 0

The team reviewed the alternative shutdown procedure, safe shutdown equipment list (Calculation M-680), safe shutdown analysis (Calculation M-928), time and manpower study (Calculation M-944), thermal hydraulic analysis (Calculation STA-251), and the fire hazards analysis. During this review, the team identified four examples of errors and inconsistencies between these documents. Some of these errors led to examples of the inadequate alternative shutdown procedure described above in Section 1R05.05.b.1.

Example 1: Errors Associated with the 10 percent Atmospheric Dump Valves

The first example involved a discrepancy between the safe shutdown analysis and the time and manpower study. The safe shutdown analysis noted that a fire in the cable spreading room could spuriously open the 10 percent atmospheric dump valves and prevent operation from the hot shutdown panel. The time and manpower study, however, stated that the spurious opening of a 10 percent atmospheric dump valve would not occur due to a fire in the control room or cable spreading room. This study also stated that this scenario was not a credible scenario. As a result, the licensee failed to provide a time limit for operators to close the atmospheric dump valves.

The team disagreed with the licensee's position that the scenario was not credible for an alternative shutdown scenario. The team noted that supplemental guidance, specific for alternative shutdown scenarios, was promulgated in Generic Letter 86-10, Question 5.3.10. In this question, the staff noted that the safe shutdown capability should not be adversely affected by any one spurious actuation or signal resulting from a fire in any plant area. The team noted that the spurious opening of a 10 percent atmospheric dump valve is considered a single spurious actuation and was required to be considered.

Example 2: Errors Associated with the Alternative Shutdown Procedure

The second example involved a discrepancy between the safe shutdown analysis and the alternative shutdown procedure. The safe shutdown analysis included requirements for operators to close the 480V feeder breakers as well as isolate the main feedwater system by closing the main feedwater isolation valves and their bypasses.

As discussed above in Section 1R05.05.b.1, the team determined that these actions were not carried forward from the safe shutdown analysis into the alternative shutdown procedure. Further, the team noted that the requirement to close the 480V feeder breakers was described in the fire hazards analysis, but the licensee failed to carry forward the requirement to isolate the main feedwater system from the safe shutdown analysis to the fire hazards analysis.

Example 3: Errors Associated with Reactor Coolant Pump Seal Cooling

The third example involved a discrepancy between the fire hazards analysis, safe shutdown equipment list, safe shutdown analysis, and the alternative shutdown procedure. The fire hazards analysis stated that Valves 8384A and 8384B would be used to isolate seal injection and component cooling water to the thermal barrier heat exchanger. This requirement was reflected in the logic diagrams contained in the safe shutdown equipment list. The team determined that the licensee modified the safe shutdown analysis and the alternative shutdown procedure at some point to use Valves 8382A and 8382B instead, but failed to update the fire hazards analysis and the safe shutdown equipment list logic diagrams.

Example 4: Errors Associated with the Thermal Hydraulic Analysis

The fourth example involved errors associated with the thermal hydraulic analysis. The time and manpower study was used to determine the amount of time available for operators to perform specific manual actions. This study provided a set of assumptions to be used when calculating the time limits. These assumptions included the consideration of any single spurious actuation, the potential loss of automatic function (signals, logic, etc.), and the potential for a loss of offsite power. These assumptions were consistent with the regulatory guidance.

The team determined that the thermal hydraulic analysis did not properly implement the assumptions contained in the time and manpower study. Specifically, the team determined that the licensee's RETRAN calculations included assumptions that the turbine tripped, main feedwater isolated, and letdown isolated.

The team noted that the incorrect assumptions in the thermal hydraulic analyses led to errors in the safe shutdown analysis. First, the assumption that the turbine tripped provided additional time for the operators to perform their actions and led to the turbine trip not being included as a required manual action. This, in turn, led to a lack of dedicated 8-hour emergency lighting for the operators to perform a manual turbine trip.

The results of the thermal hydraulic analysis indicated that the spurious opening of a single steam dump valve coincident with a loss of offsite power would result in the pressurizer reaching 0 percent indicated level within 24.5 minutes. However, the time and manpower study stated that the spurious opening of a steam dump valve was not a credible scenario. As a result, the licensee failed to provide a time limit for operators to close the main steam isolation valves. Instead, the licensee assumed that operators would perform this task within 30 minutes. The team disagreed with the licensee's position that the scenario was not credible for an alternative shutdown scenario as discussed in Example 1 of this violation.

Analysis. The failure to maintain the fire protection program design basis documents (e.g., fire hazards analysis, safe shutdown analysis, and thermal hydraulic analysis) and the alternative shutdown procedure to adequately implement the approved fire protection program was a performance deficiency. The performance deficiency was more than minor because it was associated with the protection against external events (fire) attribute of the Mitigating Systems cornerstone and it adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences.

A senior reactor analyst performed a hand calculation to bound the risk significance of this finding. The senior reactor analyst determined that the change in core damage frequency was less than 1E-4, so the finding was not of high safety significance (Red). Therefore, this finding qualified for enforcement discretion using Section 9.1 of the Enforcement Policy, "Enforcement Discretion for Certain Fire Protection Issues (10 CFR 50.48)."

This finding did not have a cross-cutting aspect because it qualified for enforcement discretion.

Enforcement. License Condition 2.C.(5) requires, in part, that the licensee shall implement and maintain in effect all provisions of the approved fire protection program as discussed in the Final Safety Analysis Report Update and the staff's fire protection evaluation contained in Supplements 8, 9, 13, 23, and 27 of the Safety Evaluation Report. Supplement 13 of the Safety Evaluation Report stated that the licensee met the requirements of 10 CFR Part 50, Appendix R, Sections III.G, III.J, and III.O. Since the licensee was required to meet the requirements of 10 CFR Part 50, Appendix R, Section III.G, they were also required to meet the requirements of 10 CFR Part 50, Appendix R, Section III.L.

The licensee demonstrated compliance with Sections III.G and III.L of 10 CFR Part 50, Appendix R through the fire hazards analysis and Calculations M-680, M-928, M-944, and STA-251. The results of these calculations were used to develop the alternative shutdown procedure, OP AP-8A, "Control Room Inaccessibility – Establishing Hot Standby," Revision 31. Contrary to the above, prior to November 8, 2012, the licensee failed to implement and maintain in effect all provisions of the approved fire protection program. Specifically, the licensee failed to maintain the fire hazards analysis and Calculations M-680, M-928, M-944, and STA-251 such that the licensee met the requirements of 10 CFR Part 50, Appendix R, Sections III.G and III.L.

The licensee entered these issues into their corrective action program as Notification 50522745 and implemented appropriate compensatory measures. Because the licensee committed to adopting National Fire Protection Association Standard 805, the team evaluated this issue using the process described above in Section 1R05.05.b.1. Since all the criteria for enforcement discretion were met, the NRC is exercising enforcement discretion for this issue. (EA-13-021)

.06 Circuit Analysis

a. Inspection Scope

The team reviewed the post-fire safe shutdown analysis to verify that the licensee identified the circuits that may impact the ability to achieve and maintain safe shutdown. The team verified, on a sample basis, that the licensee properly identified the cables for equipment required to achieve and maintain hot shutdown conditions in the event of a fire in the selected fire areas. The team verified that these cables were either adequately protected from the potentially adverse effects of fire damage or were analyzed to show that fire induced circuit faults (e.g., hot shorts, open circuits, and shorts to ground) would not prevent safe shutdown. The team reviewed the circuits associated with the following components:

- RP086, RP086A and 456 Pressurizer Power-Operated Relief Valves
- RP093, RP093A and 474 Pressurizer Power-Operated Relief Valves
- RP100, RP100A and 455C Pressurizer Power Operated Relief Valves
- F40P00 and 8000A Pressurizer Power-Operated Relief Block Valves
- G46P00 and 8000B Pressurizer Power Operated Relief Block Valves
- H33P00 and 8000C Pressurizer Power Operated Relief Block Valves
- G44P00 and G68P00 Auxiliary Feedwater Pumps Motor Operated Valves

- G69P00 and G70P00 Auxiliary Feedwater Pumps Motor Operated Valves

For this sample, the team reviewed electrical elementary and block diagrams and identified power, control, and instrument cables necessary to support their operation. In addition, the team reviewed cable routing information to verify that fire protection features were in place as needed to satisfy the separation requirements specified in the fire protection license basis. The team also reviewed circuit coordination studies for the safety-related 4160 volt emergency bus.

b. Findings

No findings were identified.

.07 Communications

a. Inspection Scope

The team inspected the contents of designated emergency storage lockers and reviewed the alternative shutdown procedure to verify that portable radio communications and fixed emergency communications systems were available, operable, and adequate for the performance of designated activities. The team verified the capability of the communication systems to support the operators in the conduct and coordination of their required actions. The team also verified that the design and location of communications equipment such as repeaters and transmitters would not cause a loss of communications during a fire. The team discussed system design, testing, and maintenance, and conducted a communication system visual inspection with the system engineer.

b. Findings

No findings were identified.

.08 Emergency Lighting

a. Inspection Scope

The team reviewed the portion of the emergency lighting system required for alternative shutdown to verify that it was adequate to support the performance of manual actions required to achieve and maintain hot shutdown conditions, and to illuminate access and egress routes to the areas where manual actions would be required. The team evaluated the locations and positioning of the emergency lights during an in-plant walkthrough of the alternative shutdown procedure.

The licensee received NRC approval in Supplement 23 to the Safety Evaluation Report to credit use of the emergency AC and emergency DC lighting systems, in conjunction with the 8-hour self-contained battery light units described in Appendix R, section III.J. The team verified that the licensee installed emergency lights with an 8-hour capacity, or had credited appropriate emergency AC or emergency DC powered lights to meet the requirements of Appendix R, section III.J. The team verified that the licensee

maintained the emergency light batteries in accordance with industry standards, and tested and performed maintenance in accordance with plant procedures and industry practices. The team verified through a sample of maintenance records that emergency AC lights, emergency DC lights, and battery operated lights were repaired within a 7 day self-imposed commitment. The team verified through in-plant inspections and engineering calculation reviews that required access and egress routes, and manual actions of safe shutdown components were properly illuminated with emergency lighting fixtures.

b. Findings

No findings were identified.

.09 Cold Shutdown Repairs

a. Inspection Scope

The team verified that the licensee identified repairs needed to reach and maintain cold shutdown and had dedicated repair procedures, equipment, and materials to accomplish these repairs. Using these procedures, the team evaluated whether these components could be repaired in time to bring the plant to cold shutdown within the time frames specified in their design and licensing bases. The team verified that the repair equipment, components, tools, and materials needed for the repairs were available and accessible on site.

b. Findings

No findings were identified.

.10 Compensatory Measures

a. Inspection Scope

The team verified that compensatory measures were implemented for out-of-service, degraded, or inoperable fire protection and post-fire safe shutdown equipment, systems, or features (e.g., detection and suppression systems and equipment; passive fire barriers; or pumps, valves, or electrical devices providing safe shutdown functions). The team also verified that the short-term compensatory measures compensated for the degraded function or feature until appropriate corrective action could be taken and that the licensee was effective in returning the equipment to service in a reasonable period of time.

b. Findings

Introduction. The team identified a Green non-cited violation of License Conditions 2.C(4) for Unit 1 and 2.C(5) for Unit 2, “Fire Protection Program,” due to the licensee’s failure to establish or adequately implement compensatory measures for non-compliances with the licensee’s approved fire protection program. These non-compliances were identified during the licensee’s ongoing transition to a new fire

protection program in compliance with National Fire Protection Association Standard 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," (NFPA 805).

Description. The licensee is transitioning to a new fire protection program in compliance with NFPA 805 as allowed by 10 CFR 50.48(c). Corrective actions for non-compliances with the licensee's current approved fire protection program identified during the licensee's transition process may be deferred until implementation of the new NFPA 805 fire protection program. To ensure that adequate safety is maintained, the licensee must establish compensatory measures within a reasonable time commensurate with the risk significance of the issue following identification. Appropriate compensatory measures could be those specified in the plant's Equipment Control Guidelines for fire protection or alternate compensatory measures developed for the specific issue.

The team requested the licensee provide a list of non-compliances identified during the ongoing transition process and the compensatory measures established. Issues were identified where compensatory measures either had not been established or the implementation of the compensatory measures was inadequate. The licensee reported the current unanalyzed condition to the NRC in an event notification (Event Number 48395). The non-compliances identified by the NFPA transition process included errors in the post-fire safe shutdown analysis and inadequate implementing procedures including operator guidance on dealing with the potential effects of fire damage and multiple spurious operations scenarios not addressed in the approved fire protection program. Should a fire have occurred in an area with missing or inadequate compensatory measures, operators might not have had adequate procedural guidance to deal with the effects of fire damage and their ability to achieve safe shutdown could have been challenged.

In September 2008, the NFPA 805 transition project identified four fire areas in Unit 1 and five fire areas in Unit 2 where circuits for redundant HVAC fans for electrical rooms could be damaged. No compensatory measures were established. This issue was identified during the licensee's preparation for the current inspection and hourly fire patrol was established as a compensatory measure in accordance with Equipment Control Guideline 18.7 on October 8, 2012. The licensee's current fire protection program identified the potential loss of normal ventilation to these rooms for other fire locations and has both procedures and equipment available to use portable fans to provide cooling to assure the continued operation of the required electrical equipment.

In January 2008, the NFPA 805 transition project identified two fire areas in each unit containing both power cables to motor-operated valves 8701 and 8702 for the respective unit. Valves 8701 and 8702 are in series in the piping between the reactor coolant system and the residual heat removal system. During normal operation, these valves isolate the low pressure piping from the coolant system, operating at high pressure. Since these are high/low pressure interface valves the potential for 3-phase hot shorts causing spurious operation of the valves must be considered in the fire safe shutdown analysis. Administrative controls maintain the breakers for each valve open during normal operation which prevents the possibility of fire damage to control circuits causing a valve to spuriously open. An open breaker does not address potential spurious

operation due to a 3-phase hot short on a power cable between the breaker and the valve motor.

Analysis. The failure to establish or maintain appropriate compensatory measures for identified deficiencies in the approved fire protection program was a performance deficiency. The performance deficiency was more than minor because it was associated with the protection against external events (fire) attribute of the Mitigating Systems Cornerstone and it adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. The performance deficiency affected the fire protection defense-in depth strategies involving post-fire safe shutdown systems. The team evaluated this deficiency using Inspection Manual Chapter 0609, Appendix F, "Fire Protection Significance Determination Process." However, the Assumptions and Limitations section of Appendix F states, "The SDP approach is intended to support the assessment of known issues only in the context of an individual fire area. A systematic plant-wide search and assessment effort is beyond the intended scope of the fire protection SDP." Therefore, a senior reactor analyst evaluated the significance of this performance deficiency.

Failure to Compensate for Ventilation System Failure

A fire in Fire Areas 3BB-100, 3BB-115, 5A1, 5A3, 3CC-100, 3CC-115, 5B1, 5B3, and 6B5 containing cables associated with the redundant 480 V switchgear, dc panels, and battery chargers could result in loss of ventilation systems for the affected rooms which could require non-proceduralized use of portable fans to maintain adequate cooling of the electrical equipment necessary to perform the Appendix R safe shutdown function.

A fire that results in the loss of switchgear room ventilation would cause a loss of all ac and dc power if operators did not take action to recover cooling. The analyst determined that the licensed operators would have at least two clear annunciators indicating that ventilation had been lost and that room temperatures were increasing. Additionally, Procedure CP-M10, Fire Protection of Safe Shutdown Equipment", was available to assist in providing portable fan cooling to the rooms. Using the SPAR-H method, the analyst approximated the failure of operators to provide portable cooling to the ac switchgear and dc equipment as 6.0×10^{-3}. This approximation compares well with the licensee's human error probability of 3.2×10^{-3}.

The analyst determined that the fire ignition frequency for all affected areas in Unit 1 (the higher of the two units) was 5.9×10^{-3}/year. Additionally, the analyst applied a hot short probability of 0.015 for all areas to account for the requirement that the fire cause the failure of 2 trains. The total bounding risk was then calculated to be 1.0×10^{-7}/year without compensation.

Failure to Administratively Control High/Low Pressure Interface Valves

The licensee determined that a high consequence interfacing system loss of coolant accident could occur from the spurious opening of residual heat removal system hot leg suction valves 8701 and 8702.

For a fire to result in an intersystem loss of coolant accident, it would have to cause a 3-phase hot short on both of two shutdown cooling suction valves. Given that each valve is on a different electrical train, the analyst determined that the conditional probabilities of the hot shorts involved would best be modeled as independent. Using the methods in NUREG 6850, the licensee calculated conditional probabilities for a 3-phase proper-polarity hot short on ungrounded ac systems using thermoplastic cables. The bounding high value was 2.25×10^{-4} per occurrence. Therefore, the conditional probability of two independent hot shorts causing both valves to open would be 5.1×10^{-8}.

Evaluating the core damage probability would likely be much lower because this probability would be multiplied by the frequency of the fire scenarios and the conditional core damage probability of the event.

Summary

Accounting for the risk associated with all issues evaluated, the analyst estimated the change in core damage frequency to be 1.5×10^{-7} per unit. Therefore, the performance deficiency was considered to be of very low safety significance (Green).

This finding did not have a cross-cutting aspect because it is not indicative of the licensee's present performance.

Enforcement. License Conditions 2.C(4) for Unit 1 and 2.C(5) for Unit 2, "Fire Protection Program," require the licensee to implement and maintain in effect all provisions of the approved Fire Protection Program as discussed in the Final Safety Analysis Report Update; in PG&E's December 6, 1984, Appendix R Report; and in the NRC staff's Fire Protection Evaluation in the Supplements to the Diablo Canyon Safety Evaluation Report listed for each unit.

Updated Final Safety Analysis Report Appendix 9.5B, "DCPP Regulatory Compliance Summary," Table B-1, "Comparison of DCPP to Appendix A of BTP APCSB 9.5-1," Section C, "Quality Assurance Program," Sub-Section 8, "Corrective Action," states:

> Measures should be established to assure that conditions adverse to fire protection, such as failures, malfunctions, deficiencies, deviations, defective components, uncontrolled combustible material, and nonconformance are promptly identified, reported, and corrected.

The DCPP Compliance to Commitment states, "Policies governing corrective measures relative to fire protection failures, malfunctions, deficiencies, deviations, defective components, uncontrolled combustible material, and nonconformances are addressed in administrative procedures."

Contrary to the above, from 2008 through November 8, 2012, the licensee failed to implement and maintain in effect all provisions of the approved fire protection program. Specifically, the licensee failed to establish and maintain timely and adequate compensatory measures for deficiencies identified in the current fire protection program.

Because this finding is of very low safety significance and has been entered into the corrective action program (Notifications 50521360 and 50521363), this violation is being treated as a non-cited violation, consistent with Section 2.3.2 of the NRC Enforcement Policy: NCV 05000275/2012008-02, 05000323/2012008-02; Inadequate Compensatory Measures for Fire Protection Program Deficiencies.

.11 B.5.b Inspection Activities

a. Inspection Scope

The team reviewed the licensee's implementation of guidance and strategies intended to maintain or restore core, containment, and spent fuel pool cooling capabilities under the circumstances associated with loss of large areas of the plant due to explosions or fire as required by Section B.5.b of the Interim Compensatory Measures Order, EA-02-026, dated February 25, 2002 and 10 CFR 50.54(hh)(2).

The team reviewed licensee's strategies to verify that they continued to maintain and implement procedures, maintain and test equipment necessary to properly implement the strategies, and ensure station personnel are knowledgeable and capable of implementing the procedures. The team performed a visual inspection of portable equipment used to implement the strategy to ensure the availability and material readiness of the equipment, including the adequacy of the fire engines used to implement the strategies. The team also verified the availability of on-site fuel trucks required to refuel the fire engine. The team performed a sample inspection of the B.5.b equipment storage locker and visually inspected a penetration used to implement the mitigation strategy. The strategy and procedure selected for this inspection sample was Containment Flooding with Portable Pump; EDMG EDG-10, "Containment Flooding with Portable Pump," Revision 0.

b. Findings

No findings were identified.

4. OTHER ACTIVITIES [OA]

4OA2 Identification and Resolution of Problems

Corrective Actions for Fire Protection Deficiencies

a. Inspection Scope

The team selected a sample of notifications associated with the licensee's fire protection program to verify that the licensee had an appropriate threshold for identifying deficiencies. In addition the team reviewed the corrective actions proposed and implemented to verify that they were effective in correcting identified deficiencies. The team also evaluated the quality of recent engineering evaluations through a review of notifications, calculations, and other documents during the inspection.

b. Findings

An example of a problem with establishing and maintaining timely and adequate compensatory measures for deficiencies identified in the current fire protection program through the corrective action program is discussed in Section 1R05.10(b).

4OA6 Meetings, Including Exit

Exit Meeting Summary

The team presented the inspection results to Mr. E. Halpin, Senior Vice President and Chief Nuclear Officer, and other members of the licensee staff at an debrief meeting on November 8, 2012. The licensee acknowledged the findings presented.

Following additional in-office review and determination of the safety significance of the findings, an exit meeting was conducted on December 20, 2012, with Mr. E. Halpin, Senior Vice President and Chief Nuclear Officer, and other members of the licensee staff.

The team asked the licensee whether any of the material examined during the inspection should be considered proprietary. No proprietary information was identified.

4OA7 Licensee-Identified Violations

None.

ATTACHMENT: SUPPLEMENTAL INFORMATION

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

B. Allan, Site Vice President
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LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened None

Opened and Closed

05000275/2012008-01 05000323/2012008-01	NCV	Failure to Maintain Required Firewater System Configuration (Section 1R05.03.b)
05000275/2012008-02 05000323/2012008-02	NCV	Inadequate Compensatory Measures for Fire Protection Program Deficiencies (Section 1R05.10.b)

Closed None

LIST OF DOCUMENTS REVIEWED

CABLE ROUTING DATA

Component	Component	Component	Component	Component
RP086A	RP093A	RP100A	F40P00	G46P00
H33P00	ABAN025	H23P00A	H37P00A	H65P01
G44P00	G68P00	G69P00	G70P00	RP086
RP093	RP100	PCV45	PCV455C	PCV474
PORV 8000A	PORV 8000B	PORV 8000C		

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M-680	10 CFR 50 Appendix R Safe Shutdown Equipment	17
M-680	10 CFR 50 Appendix R Safe Shutdown Equipment	18-01
M-912	HVAC Interactions for Safe Shutdown, Room Heat-up Due to Loss of HVAC	5
M-928	10 CFR 50 Appendix R Safe Shutdown Analysis	17
M-928	10 CFR 50 Appendix R Safe Shutdown Analysis	18-01
M-928	10 CFR 50 Appendix R Safe Shutdown Analysis	18-02
M-944	10 CFR 50 Appendix R Alternate Shutdown Methodology – Time and Manpower Study/Safe Shutdown System Considerations	7
M-997, Appendix 2.16	Qualification of Penetration Seal Typical F-1L, A Three A Hour Rated Six Inch Silicone Foam Seal	10
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M-997, Appendix 2.3	Qualification of Penetration Seal Typical F-3, A Three A Hour Rated Silicone Foam Sea Without Permanent Ceramic Damming	10
N-089	Fire Protection Study for Pressurizer PORV Stuck Open	July 29, 1993
STA-207	RETRAN Evaluation of Appendix R Operator Action Times	1
STA-251	RETRAN Evaluation of Appendix R Scenarios with RSGs	0

134-DC	Circuit Analysis-Electrical Appendix R Analysis	26
335-DC	Emergency Lighting and Communications	8

CONDITION REPORTS

A0642680	A0646729	A0724491	A0627424	A0635344
A0620761	A0646729	50035114	50408579	50409764
500032962	50513006	50514313	50512140	50512128
50511911	50511896	50511882	50511736	50511729
50510511	5059635	50509560	50507834	50507529
50506331	5050594	50358360	50350593	50340288
50340108	50513995	50474308	50286358	50038548
50515422	50515872	505209828*	502022298*	50521043*
50520533*	50520532*	50520531*	50520530*	50520521*
50520512*	50520493*	50520487*	50520485*	50520371*
50520370*	50520333*	50520332*	50520331*	50520330*
50520299*	50520283*	50520282*	50520149*	50520513*
50520144*	50520096*	50520095*	50520092*	50519958*
50519957*	50519857*	50516460*	50516347*	50507988*
50507455*	50507350*	50507230*	50503976*	50520148*
50518956*	50519957*	50519958*	50520092*	50520144*
50520148*	50520299*	50520330*	50520331*	50520332*
50520333*	50520929*	50520962*	50521394*	50522131*
50522141*	50522145*	50522149*	50522161*	50518721*
50520530*	50520531*	50520532*	50520533*	50521470*
50521471*	50520341*	50522103*	50520531*	50520980*
50520202*	50522666*	50522072*	50522445*	50522478*
50522191*	50522479*	50522273*	50522745*	50521601*

*Issued as a result of inspection activities.

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ENGINEERING INFORMATION RECORDS

Number	Title	Revision
TE-PG&E-113-R001	Multiple Spurious Operation Report dated Nov. 3, 2010	0

MODIFICATIONS

Number	Title	Revision
DCP A-049070	Thermo-Lag Removal/Install 3M Fireproofing	0

PROCEDURES

Number	Title	Revision
AR PK01-08	Annunciator Response CCW Header C	19
AR PK05-01	Annunciator Response RCP Number 11	33
AR PK05-04	Annunciator Response RCP Number 14	31
AWP E-002	10 CFR 50 Appendix R Safe Shutdown Analysis	1A
AWP E-009	Combustible Design Control	1
CP M-6	Fire	33A
CP M-10	Fire Protection of Safe Shutdown Equipment – Unit 1	24
CP M-10	Fire Protection of Safe Shutdown Equipment – Unit 1	25
CP M-10	Fire Protection of Safe Shutdown Equipment – Unit 1	26
CP M-10	Fire Protection of Safe Shutdown Equipment – Unit 2	25
CP M-10	Fire Protection of Safe Shutdown Equipment – Unit 2	26

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DCM No. T-18	Electrical System Protection	13
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DCM No. T-22	Electrical Cable and Raceway	10D
EDMG EDG-6	Makeup to Condensate Storage Tank	1
EDMG EDG-7	Manually Depressurize the SGs to Minimize RCS Inventory Loss	1
EDMG EDG-9	Use of Fire Engine to Supply Water to Steam Generators	0
EDMG EDG-10	Containment Flooding with Portable Pump	0
EDMG EDG-14	EDMG Equipment Annual Inventory	2
MP E-50.30B	Electrical Maintenance Procedure Maintenance Agastat Type ETR Timing Relay maintenance	19
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OP AP-8A	Control Room Inaccessibility – Establishing Hot Standby	31 & 32
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STP I-29	Emergency Signals and Communication Systems Functional Test	41
STP I-34A	Fire Detection System Detector Functional Panel A	24
STP I-34C	Fire Detection System Supervisory Functional	11
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STP M-17C3	Check of the Emergency AC Lighting System	17A
STP M-31A	Continuity Testing of Remote Shutdown Control Transferfr Switches (4KV Pumps)	1
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STP P-FPP-A02	Fire Pump 0-2 Performance Test	5
STP P-FPP-B01	Fire Pump 0-1 Routine Surveillance	12
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VENDOR DOCUMENTS

Number	Title	Revision
RPE E-6653	Vendor Manual – Eaton Cutler Hammer Industrial Related AC/DC Toggle Switch	2
663336	Vendor Diagram-Westinghouse Motor Control Center IF IG & IH Control Center Drawings	8
01914963-WD-04	Nuclear Logistics Inc, Wiring Diagram for 18” NEME Size 3 FVNR Cubicle 52-1F-05	2
01914963-WD-05	Nuclear Logistics Inc, Wiring Diagram for 36” NEME Size 4 FVNR Cubicle 52-1F-66	2
01914963-WD-06	Nuclear Logistics Inc, Wiring Diagram for 18” NEME Size 2 two SPD cubicle 52-1F-50	2
01914963-WD-07	Nuclear Logistics Inc, Wiring Diagram for 12” NEME Size 3 FVNR Cubicle 52-1F-38	2
01914963-WD-08	Nuclear Logistics Inc, Wiring Diagram for 12” NEME Size 2 FVNR Cubicle 52-1F-39	2

WORK ORDERS

64031002	64019502	64066957	64080891	64051343
64020120	64087588	64039494	64021407	64079883
64079086	64083409	R0232602	6009159	C0130254
R0192538	64009147	64008771	64082180	64006554

MISCELLANEOUS DOCUMENTS

Number	Title	Revision
ANSUL Technical Bulletin Number 54	Shelf Life of ANSULITE AFFF Concentrates and Their Premixed Solutions	N/A
A-8	Systems Training Guide, Remote/Hot Shutdown Panels	8
E-6	Systems Training Guide, Salt Water System	14
ECG 18.1	Equipment Control Guideline – Fire Suppression Systems/Fire Suppression Water Systems	9
ECG 18.2	Equipment Control Guideline – Fire Hose Stations	9
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ECG 18.7	Equipment Control Guideline – Fire Rated Assemblies	9
FHARE 110	Separation of Redundant ASW Pump and Exhaust Fan Circuits in the Intake Structure	1
FHARE 150	Administrative Control Requirements for Fire Rated Assemblies	1
FHARE 152	Evaluation of Fire Dampers in 480V Switchgear and Battery Rooms	0
FSAR Section 9.5.1	Fire Protection System	20
IN 92-18	Information Notice "Potential For Loss of Remote Shutdown Capability During a Control Room Fire,"	February 28, 1992
Letter PGE-92-621	Diablo Canyon Appendix R Charging Pump Evaluation	July 14, 1992
Memo	Appendix R Transient Analysis for Stuck Open Pressurizer PORV	August 11, 1993
NFPA Standard 805	Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants	2001 Edition
Operations Crew Watch Bill	October 15 – 21, 2012	39
Operations Crew Watch Bill	October 22 – 28, 2012	33
SSER 23	Supplement 23 of Safety Evaluation Report	June 1984
TE-PG&E-113-R001	Multiple Spurious Operations Report	0
T35110	Appendix R Operability of Emergency Lights	
0C18 D-16-005	Clearance – Equipment ID: 0-16-M-TK-RWOR1A, Raw Water Storage Reservoir West 0-1A	September 9, 2012
13698	Maintenance Item 13698 ASP2 Test and Calibrate Motor	N/A
67997	Set Route Data Raceway Report for Raceway K6958-61	19
N/A	Diablo Canyon Nuclear Power Plant 450 MHz System Coverage Report	October 5, 2004
N/A	Time Critical Operator Action Documentation	39