



UNITED STATES  
NUCLEAR REGULATORY COMMISSION

REGION IV  
1600 EAST LAMAR BOULEVARD  
ARLINGTON, TEXAS 76011-4511

April 8, 2020

Mr. James M. Welsch  
Senior Vice President, Generation  
and Chief Nuclear Officer  
Pacific Gas and Electric Company  
P.O. Box 56  
Mail Code 104/6  
Avila Beach, CA 93424

SUBJECT: DIABLO CANYON POWER PLANT, UNITS 1 AND 2 – TEMPORARY  
INSTRUCTION 2515/194 REPORT 05000275/2020011 AND 05000323/2020011

Dear Mr. Welsch:

On March 20, 2020, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at Diablo Canyon Power Plant, Units 1 and 2. On March 23, 2020, the NRC inspector discussed the results of this inspection with Ms. Paula Gerfen, Site Vice President, and other members of your staff. The results of this inspection are documented in the enclosed report.

No findings or violations of more than minor significance were identified during this inspection.

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

Sincerely,

*/RA/*

Nicholas H. Taylor, Chief  
Engineering Branch 2  
Division of Reactor Safety

Docket Nos. 05000275 and 05000323  
License Nos. DPR-80 and DPR-82

Enclosure:  
As stated

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DIABLO CANYON POWER PLANT, UNITS 1 AND 2 – TEMPORARY INSTRUCTION 2515/194  
 REPORT 05000275/2020011 AND 05000323/2020011 – April 8, 2020

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**U.S. NUCLEAR REGULATORY COMMISSION  
Inspection Report**

Docket Numbers: 05000275 and 05000323

License Numbers: DPR-80 and DPR-82

Report Numbers: 05000275/2020011 and 05000323/2020011

Enterprise Identifier: I-2020-011-0034

Licensee: Pacific Gas and Electric Company

Facility: Diablo Canyon Power Plant, Units 1 and 2

Location: Avila Beach, CA

Inspection Dates: March 17, 2020, to March 20, 2020

Inspector: S. Graves, Senior Reactor Inspector

Approved By: Nicholas H. Taylor, Chief  
Engineering Branch 2  
Division of Reactor Safety

Enclosure

## **SUMMARY**

The U.S. Nuclear Regulatory Commission (NRC) continued monitoring the licensee's performance by conducting a Temporary Instruction 2515/194 inspection at Diablo Canyon Power Plant, Units 1 and 2, in accordance with the Reactor Oversight Process. The Reactor Oversight Process is the NRC's program for overseeing the safe operation of commercial nuclear power reactors. Refer to <https://www.nrc.gov/reactors/operating/oversight.html> for more information.

### **List of Findings and Violations**

No findings or violations of more than minor significance were identified.

### **Additional Tracking Items**

None.

## INSPECTION SCOPE

Inspection was conducted using the appropriate portion of the temporary instruction (TI) in effect at the beginning of the inspection unless otherwise noted. Currently approved TIs with their attached revision histories are located on the public website at <https://www.nrc.gov/reading-rm/doc-collections/insp-manual/temp-instructions>. Samples were declared complete when the TI requirements most appropriate to the inspection activity were met consistent with Inspection Manual Chapter (IMC) 2515, "Light-Water Reactor Inspection Program - Operations Phase." The inspector reviewed selected procedures and records, observed activities, and interviewed personnel to assess licensee performance and compliance with Commission rules and regulations, license conditions, site procedures, and standards.

## OTHER ACTIVITIES – TEMPORARY INSTRUCTIONS, INFREQUENT AND ABNORMAL

### 2515/194 - Inspection of the Licensee's Implementation of Industry Initiative Associated With the Open Phase Condition Design Vulnerabilities In Electric Power Systems (NRC Bulletin 2012-01)

The inspector reviewed the licensee's implementation of the "Nuclear Energy Institute Voluntary Industry Initiative," (ADAMS Accession No. ML15075A454) dated March 16, 2015. This included a review of the licensee's update of their licensing basis to reflect the need to protect against open phase conditions. The inspector reviewed and discussed the licensee's open phase condition system design, installation, testing and maintenance plans with plant staff, and performed system walkdowns to verify that the installed equipment was supported by the design documentation.

### Inspection of the Licensee's Implementation of Industry Initiative Associated With the Open Phase Condition Design Vulnerabilities In Electric Power Systems (NRC Bulletin 2012-01) (1 Sample)

Pacific Gas and Electric Company had selected the open phase detection system designed and manufactured by Power System Sentinel Technologies, LLC, (PSSTech) as the design vendor for Diablo Canyon Power Plant. The licensee had installed dual-channel open phase detection systems on the main transformer banks for both Unit 1 and 2, as well as on the Standby Startup transformers for both units. In total, the licensee installed eight PSSTech open phase detection systems on four transformers.

During normal operation each unit generates and delivers power to the 500-kV transmission system via the main transformer banks. Each transformer bank has three single-phase transformers connected in a grounded-Wye primary and Delta secondary configuration. Each unit's main generator also provides power to the unit auxiliary loads through two auxiliary transformers. During periods in which the main generator is offline, such as outages, the unit main transformers can be manually realigned in a backfeed configuration. This configuration can also be used to provide offsite power to the unit if the preferred offsite source is unavailable. The licensee identified that this backfeed configuration was susceptible to open phase conditions and installed open phase detection using the common neutral connection to mitigate this condition.

The licensee also installed open phase detection systems on each unit's Startup transformers. Each unit has a 230-kV/12-kV transformer (SUT11, SUT21) connected in a grounded-Wye/Delta configuration. These transformers are part of the preferred offsite power supply and during off-normal conditions supply offsite power to the unit's startup and vital loads.

The licensee's modifications and tests were essentially complete at the start of the inspection; however, due to earlier complications associated with component viability, the licensee expected to remain in a monitoring period through December 2020. The licensee was also performing evaluations associated with using manual actions in lieu of engaging the available automatic trip functions as described in Revision 3 to the Open Phase Condition Initiative, dated June 2019. The licensee entered these issues into their corrective program as SAPN 50976153.

## INSPECTION RESULTS

Observation: Temporary Instruction 2515/194-03.01 - Voluntary Industry Initiative (Part 1)	2515/194
<p>Based on discussions with licensee staff, review of design and testing documentation, and walkdowns of installed equipment, the inspector had reasonable assurance the licensee had appropriately implemented, with noted exception discussed below, the voluntary industry initiative.</p> <p>The inspector determined by design document review, equipment walkdowns, staff discussions, and observations that:</p> <p><u>Detection, Alarms, and General Criteria</u></p> <ol style="list-style-type: none"> <li>1) Open phase conditions will be detected and alarmed in the control room.</li> <li>2) Detection circuits are sensitive enough to identify an open phase condition for all credited loading conditions.</li> <li>3) The PSSTech system was designed and had been tuned to minimize misoperation or spurious action in the range of voltage unbalance normally expected in the licensee's transmission system that could cause separation from an operable offsite power source. The licensee had demonstrated through testing that the actuation circuit design did not result in lower overall plant operation reliability.</li> <li>4) No Class-1E circuits were being replaced with non-Class 1E circuits in the design.</li> </ol> <p><u>Protective Actions Criteria</u></p> <ol style="list-style-type: none"> <li>1) The identified transformers were susceptible to an open phase condition and the licensee had implemented design changes to mitigate the effects.</li> <li>2) With an open phase condition present and no accident condition signal, the PSSTech system would not adversely affect the function of important-to-safety systems, structures, or components. The alarming and detection functions of the system were in operation, and the licensee had annunciator response procedures with compensatory actions to recognize the faulted condition and isolate the affected transformer. Review of the procedures and discussions with Operations staff indicated that these actions would be performed without delay, resulting in an operator-initiated transfer of vital loads to either an alternate source or to the onsite emergency power source. A loss of voltage caused by isolation of the preferred offsite source (startup transformers) or the alternate offsite source in a backfeed</li> </ol>	

condition (main bank transformers) due to an open phase condition would not have an adverse effect on the availability of the onsite emergency power source. When in a normal electrical system lineup and no accident condition signal present, plant auxiliary and safety loads are normally powered from the unit's auxiliary transformers which are supplied from the unit's main generator. An open phase condition on the main generator or main bank transformers would result in protective relay actuation and isolation and automatically transfer station auxiliary and vital loads to either the preferred source or onsite emergency sources.

- 3) Because the open phase detection systems were in a monitoring mode without automatic actuation enabled, the PSSTech system would not automatically isolate the affected transformer due to an open phase condition either with or without an accident signal present; however, an open phase condition would be immediately detected and alarmed in the control room for the startup transformers or the main transformer bank when configured in a backfeed condition. The licensee's annunciator response procedure actions included isolation of the affected transformer and realignment of vital loads to a known good source.

The licensee's open phase condition design solution connected and tested a previously unused feature on existing protective relaying for transformer isolation controls that would isolate the affected transformer if the trip functions were engaged.

- 4) The licensee had developed documentation for periodic testing and inspection for open phase protection equipment. The licensee was also evaluating the use of manual actions in lieu of enabling the automatic trip functions, which could result in changes to procedures and operator actions associated with protective features. Also, the licensee documented that the results of this evaluation would further inform the Maintenance Rule activities for this equipment. The licensee documented these issues in SAPN 50976153.

The inspector identified the following exception to the Temporary Instruction criteria:

#### Detection, Alarms, and General Criteria Exceptions

The updated final safety analysis report (UFSAR) had not been modified to include information related to open phase conditions at the conclusion of the onsite inspection. The licensee provided a copy of an approved UFSAR Change Request form which included the updated language that was to be incorporated into the next scheduled revision of the UFSAR. The proposed language was based upon the current NEI template and appropriately captured the issue. The inspector did not identify any issues of concern.

## **EXIT MEETINGS AND DEBRIEFS**

The inspector verified no proprietary information was retained or documented in this report.

- On March 23, 2020, the inspector presented the Temporary Instruction 2515/194 inspection results telephonically to Ms. Paula Gerfen, Site Vice President, and other members of the licensee staff.

## DOCUMENTS REVIEWED

Inspection Procedure	Type	Designation	Description or Title	Revision or Date
2515/194	Calculations	154G-DC	Differential and Overcurrent Settings for StartUp Transformer SUT11/21 Protective Devices 51N/51/87UT11-1 & 51N/51/87UT11-2, and 51N/51/87UT21-1 & 51N/51/87UT21-2	6
2515/194	Calculations	383A-DC	Unit 1 230/12kV SUT11 and Unit 1 Main Transformers TGMA (B) (C) Supply Voltage Imbalance Protection Devices: 46ST11-1, 46ST11-11, 46ST11-2, 46ST11-21 and 46TGM-1, 46TGM-11, 46TGM-2, 46TGM-21	2
2515/194	Calculations	383B-DC	Unit 2 230/12kV SUT21 and Unit 2 Main Transformers TGMA (B) (C) Supply Voltage Imbalance Protection Devices: 46ST21-1, 46ST21-11, 46ST21-2, 46ST21-21 and 46TGM-1, 46TGM-11, 46TGM-2, 46TGM-21	2
2515/194	Corrective Action Documents	SAPN	50976153, 51067349	
2515/194	Corrective Action Documents Resulting from Inspection	SAPN	51070147, 51070148	
2515/194	Drawings	437619	Electrical Schematic Diagram Standby Start-Up Transformer No. 11 and Associated Circuit Breakers	28
2515/194	Drawings	500761	Electrical Arrangement of Main and Auxiliary Transformer	23
2515/194	Drawings	500801	Electrical Arrangement of Main and Auxiliary Transformer	31
2515/194	Drawings	500804	Electrical Arrangement Standby Start-Up Transformers	29
2515/194	Drawings	501140	Electrical Schematic Diagram Main Annunciator Windows PK2013 - PK2025	53
2515/194	Drawings	502110	Electrical Single Line Diagram 500/230/25/12/4.16KV Systems	21
2515/194	Engineering Changes	1000025148	Design Change Package for Unit 1 Open Phase Detection System	0
2515/194	Engineering Changes	1000025149	Design Change Package for Unit 2 Open Phase Detection System	0
2515/194	Engineering	1000025458	Unit 1 Injection Source Replacement Minor Modification	0



Inspection Procedure	Type	Designation	Description or Title	Revision or Date
	Changes			
2515/194	Engineering Changes	2000001631	Unit 1 Open Phase Main Bank Transformer	0
2515/194	Engineering Changes	2000001716	Unit 2 Startup Transformer	0
2515/194	Engineering Changes	DCP 1000025458	Upgrade of Open Phase Protection - Unit 1	0
2515/194	Procedures	AR PK20-24	Alarm Response 230KV SWYD	13
2515/194	Procedures	AR PK20-25	Alarm Response 500KV SWYD	15
2515/194	Procedures	MP E-52.XFMR R12	Transformer Maintenance	12
2515/194	Procedures	MP E-60.11	Relay Functional Test - Standby Start-Up Transformer 11 Protection Scheme	11
2515/194	Procedures	MP E-60.1A	Main Generator Protective Circuit Functional Test - Circuit GM1	23
2515/194	Procedures	MP E-69.230SWYD	230kV Switchyard Inspections	2
2515/194	Procedures	PMT 61.15	Functional Test of the PSSTech Open Phase Protection System for the Main Bank	0
2515/194	Procedures	PMT 61.16	Evaluating the Impact of Commissioning the OPP on the 500/230kV Protection Sys	0
2515/194	Procedures	PMT 61.17	Functional Test of the PSSTech Open Phase Protection System for the Main Bank	0
2515/194	Procedures	PMT 62.32	Functional Test of the Open Phase Detection System for Startup Transformer SUT11	0
2515/194	Procedures	PMT 62.33	Functional Test of the Open Phase Protection System for Startup Xfmr SUT21	0
2515/194	Procedures	STP I-1A	Routine Shift Checks Required by Licenses	141