



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

August 13, 2025

Ms. Paula Gerfen
Senior Vice President, Generation
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 NUCLEAR POWER PLANT, UNITS 1 AND 2 - ISSUANCE
OF AMENDMENT NOS. 252 AND 254 RE: UTILIZATION OF OPTIMIZED
ZIRLO™ FOR IMPROVED FUEL ROD CLADDING PERFORMANCE
(EPID L-2025-LLA-0059)

Dear Ms. Gerfen:

The U.S. Nuclear Regulatory Commission (NRC, the Commission) has issued the enclosed Amendment No. 252 to Facility Operating License No. DPR-80 and Amendment No. 254 to Facility Operating License No. DPR-82 for the Diablo Canyon Nuclear Power Plant, Units 1 and 2 (Diablo Canyon), respectively. The amendments consist of changes to the technical specifications (TSs) in response to the Pacific Gas and Electric Company (PG&E, the licensee) application submitted by letter dated March 26, 2025 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML25085A409).

The amendments revise Diablo Canyon TS 4.2.1, "Fuel Assemblies," and TS 5.6.5, "Core Operating Limits Report (COLR)," to allow the use of Optimized ZIRLO™ for improved fuel rod cladding performance. In the letter dated March 26, 2025, the licensee also requested an exemption from certain requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors." The NRC staff addressed the exemption request in a separate letter dated August 13, 2025 (ML25171A162).

A copy of the related Safety Evaluation is enclosed. Notice of Issuance will be included in the Commission's monthly *Federal Register* notice.

Sincerely,

/RA/

Samson S. Lee, Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-275 and 50-323

Enclosures:

1. Amendment No. 252 to DPR-80
2. Amendment No. 254 to DPR-82
3. Safety Evaluation

cc: Listserv



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

PACIFIC GAS AND ELECTRIC COMPANY

DOCKET NO. 50-275

DIABLO CANYON NUCLEAR POWER PLANT, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 252
License No. DPR-80

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Pacific Gas and Electric Company (the licensee), dated March 26, 2025, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. DPR-80 is hereby amended to read as follows:

- (2) Technical Specifications

The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 252, are hereby incorporated in the license. Pacific Gas & Electric Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan, except where otherwise stated in specific license conditions.

3. This license amendment is effective as of its date of issuance and shall be implemented during the spring 2028 Unit 1 Refueling Outage 27 (1R27).

FOR THE NUCLEAR REGULATORY COMMISSION

Tony Nakanishi, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to Facility
Operating License No. DPR-80
and the Technical Specifications

Date of Issuance: August 13, 2025



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

PACIFIC GAS AND ELECTRIC COMPANY

DOCKET NO. 50-323

DIABLO CANYON NUCLEAR POWER PLANT, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 254
License No. DPR-82

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Pacific Gas and Electric Company (the licensee), dated March 26, 2025, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. DPR-82 is hereby amended to read as follows:

- (2) Technical Specifications (SSER 32, Section 8)* and Environmental Protection Plan

The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 254, are hereby incorporated in the license. Pacific Gas & Electric Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan, except where otherwise stated in specific license conditions.

3. This license amendment is effective as of its date of issuance and shall be implemented during the spring 2027 Unit 2 Refueling Outage 26 (2R26).

FOR THE NUCLEAR REGULATORY COMMISSION

Tony Nakanishi, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to Facility
Operating License No. DPR-82
and the Technical Specifications

Date of Issuance: August 13, 2025

ATTACHMENT TO LICENSE AMENDMENT NO. 252

TO FACILITY OPERATING LICENSE NO. DPR-80

AND LICENSE AMENDMENT NO. 254 TO FACILITY OPERATING LICENSE NO. DPR-82

DIABLO CANYON NUCLEAR POWER PLANT, UNITS 1 AND 2

DOCKET NOS. 50-275 AND 50-323

Replace the following pages of the Facility Operating License Nos. DPR-80 and DPR-82, and the Appendix A, Technical Specifications, with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Facility Operating License No. DPR-80

REMOVE
-3-

INSERT
-3-

Facility Operating License No. DPR-82

REMOVE
-3-

INSERT
-3-

Technical Specifications

REMOVE
4.0-1
5.0-20

INSERT
4.0-1
5.0-20

- (4) Pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess, and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components; and
- (5) Pursuant to the Act and 10 CFR Parts 30, 40, and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. This License shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

The Pacific Gas and Electric Company is authorized to operate the facility at reactor core power levels not in excess of 3411 megawatts thermal (100% rated power) in accordance with the conditions specified herein.

(2) Technical Specifications

The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 252 are hereby incorporated in the license. Pacific Gas & Electric Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan, except where otherwise stated in specific license conditions.

(3) Initial Test Program

The Pacific Gas and Electric Company shall conduct the post-fuel-loading initial test program (set forth in Section 14 of Pacific Gas and Electric Company's Final Safety Analysis Report, as amended), without making any major modifications of this program unless modifications have been identified and have received prior NRC approval. Major modifications are defined as:

- a. Elimination of any test identified in Section 14 of PG&E's Final Safety Analysis Report as amended as being essential;

- (4) Pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess, and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components; and
 - (5) Pursuant to the Act and 10 CFR Parts 30, 40, and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.
- C. This License shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:
- (1) Maximum Power Level
The Pacific Gas and Electric Company is authorized to operate the facility at reactor core power levels not in excess of 3411 megawatts thermal (100% rated power) in accordance with the conditions specified herein.
 - (2) Technical Specifications (SSER 32, Section 8)* and Environmental Protection Plan
The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 254, are hereby incorporated in the license. Pacific Gas & Electric Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan, except where otherwise stated in specific license conditions.
 - (3) Initial Test Program (SSER 31, Section 4.4.1)
Any changes to the Initial Test Program described in Section 14 of the FSAR made in accordance with the provisions of 10 CFR 50.59 shall be reported in accordance with 50.59(b) within one month of such change.

*The parenthetical notation following the title of many license conditions denotes the section of the Safety Evaluation Report and/or its supplements wherein the license condition is discussed.

4.0 DESIGN FEATURES

4.1 Site Location

The DCPP site consists of approximately 750 acres which are adjacent to the Pacific Ocean in San Luis Obispo County, California, and is approximately twelve (12) miles west-southwest of the city of San Luis Obispo.

4.2 Reactor Core

4.2.1 Fuel Assemblies

The reactor shall contain 193 fuel assemblies. Each assembly shall consist of a matrix of Zircaloy, ZIRLO[®], or Optimized ZIRLO[™] clad fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO₂) as fuel material. Limited substitutions of zirconium alloy or stainless steel filler rods for fuel rods, in accordance with approved applications of fuel rod configurations, may be used. Fuel assemblies shall be limited to those fuel designs that have been analyzed with applicable NRC staff approved codes and methods and shown by tests or analyses to comply with all fuel safety design bases. A limited number of lead test assemblies that have not completed representative testing may be placed in nonlimiting core locations.

4.2.2 Control Rod Assemblies

The reactor core shall contain 53 control rod assemblies. The control rod material shall be silver, indium, and cadmium, as approved by the NRC.

4.3 Fuel Storage

4.3.1 Criticality

- 4.3.1.1 The permanent spent fuel pool storage racks are designed and shall be maintained with:
- a. Fuel assemblies having a maximum U-235 enrichment of 5.0 weight percent;
 - b. $k_{\text{eff}} < 1.0$ if fully flooded with unborated water, which includes an allowance for uncertainties as described in Section 9.1.2.3 of the FSAR;
 - c. $k_{\text{eff}} \leq 0.95$ if fully flooded with water borated to 806 ppm, which includes an allowance for uncertainties as described in Section 9.1.2.3 of the FSAR;
 - d. A nominal 11 inch center to center distance between fuel assemblies placed in the fuel storage racks;

(continued)

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (COLR) (continued)

- b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:
1. WCAP-10216-P-A, "Relaxation of Constant Axial Offset Control F_Q Surveillance Technical Specification, " (Westinghouse Proprietary),
 2. WCAP-9272-P-A, "Westinghouse Reload Safety Evaluation Methodology," (Westinghouse Proprietary),
 3. WCAP-8385, "Power Distribution Control and Load Following Procedures," (Westinghouse Proprietary),
 4. WCAP-16996-P-A, Revision 1, "Realistic LOCA Evaluation Methodology Applied to the Full Spectrum of Break Sizes (FULL SPECTRUM LOCA Methodology),"
 5. WCAP-17661-P-A, Revision 1, "Improved RAOC and CAOC F_Q Surveillance Technical Specifications,"
 6. WCAP-8567-P-A, "Improved Thermal Design Procedure,"
 7. WCAP-16045-P-A, "Qualification of the Two Dimensional Transport Code PARAGON,"
 8. WCAP-16045-P-A, Addendum 1-A, "Qualification of the NEXUS Nuclear Data Methodology," and
 9. WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™."

(continued)



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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 252 TO FACILITY OPERATING LICENSE NO. DPR-80
AND AMENDMENT NO. 254 TO FACILITY OPERATING LICENSE NO. DPR-82
PACIFIC GAS AND ELECTRIC COMPANY
DIABLO CANYON NUCLEAR POWER PLANT, UNITS 1 AND 2
DOCKET NOS. 50-275 AND 50-323

1.0 INTRODUCTION

By letter dated March 26, 2025 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML25085A409), Pacific Gas and Electric Company (PG&E, the licensee) submitted a license amendment request (LAR) for Diablo Canyon Nuclear Power Plant, Units 1 and 2 (Diablo Canyon, DCCP). The licensee requested to modify Technical Specification (TS) 4.2.1, "Fuel Assemblies," and TS 5.6.5, "Core Operating Limits Report (COLR)," to allow the use of Optimized ZIRLO™ for improved fuel rod cladding performance. The Optimized ZIRLO™ fuel cladding is different from standard ZIRLO™ in two respects: (1) the tin content is lower; and (2) the microstructure is different. The difference in tin content and microstructure can lead to differences in some material properties.

In order to support the TS change, and pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.12, "Specific exemptions," in enclosure 2 to the LAR, PG&E requested an exemption from certain requirements of 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," for Diablo Canyon. The exemption request relates solely to the specific type of cladding material described in the regulation for use in light-water reactors (LWRs), namely ZIRLO™ and Zircaloy-4. The U.S. Nuclear Regulatory Commission (NRC or the Commission) staff addressed the exemption request in a separate correspondence (Package ML25171A144).

The licensee plans to load Optimized ZIRLO™ clad fuel rods in Unit 2 refueling outage 26 (2R26) and in Unit 1 refueling outage 27 (1R27), currently scheduled for spring 2027 and spring 2028, respectively.

1.1 Proposed Changes

The licensee requested to modify TSs 4.2.1 and 5.6.5 to allow the use of Optimized ZIRLO™ as an approved fuel rod cladding material. In addition, several editorial changes are proposed to correct the spelling of the word "Zircaloy," add a registered trademark designator to the word

“ZIRLO,” remove the “Not used” references from the list of COLR references in TS 5.6.5.b, and enclose the titles for COLR references in quotation marks.

The specific proposed changes to the TSs are shown below where **bold text** indicates additions and ~~strikeout text~~ indicates deletions.

4.2.1 Fuel Assemblies

The reactor shall contain 193 fuel assemblies. Each assembly shall consist of a matrix of ~~Zircaloy~~ **Zircaloy**, ~~or ZIRLO~~ **ZIRLO®**, **or Optimized ZIRLO™** clad fuel rods with an initial composition of natural or slightly enriched uranium dioxide (UO₂) as fuel material. Limited substitutions of zirconium alloy or stainless steel filler rods for fuel rods, in accordance with approved applications of fuel rod configurations, may be used. Fuel assemblies shall be limited to those fuel designs that have been analyzed with applicable NRC staff approved codes and methods and shown by tests or analyses to comply with all fuel safety design bases. A limited number of lead test assemblies that have not completed representative testing may be placed in nonlimiting core locations.

5.6.5 CORE OPERATING LIMITS REPORT (COLR)

- b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:
1. WCAP-10216-P-A, “Relaxation of Constant Axial Offset Control F_Q Surveillance Technical Specification,” (Westinghouse Proprietary),
 2. WCAP-9272-P-A, “Westinghouse Reload Safety Evaluation Methodology,” (Westinghouse Proprietary),
 3. WCAP-8385, “Power Distribution Control and Load Following Procedures,” (Westinghouse Proprietary),
 4. WCAP-16996-P-A, Revision 1, “Realistic LOCA Evaluation Methodology Applied to the Full Spectrum of Break Sizes (FULL SPECTRUM LOCA Methodology),”
 5. WCAP-17661-P-A, Revision 1, “Improved RAOC and CAOC F_Q Surveillance Technical Specifications,”
 6. ~~Not used.~~ **WCAP-8567-P-A, “Improved Thermal Design Procedure,”**
 7. ~~Not used.~~ **WCAP-16045-P-A, “Qualification of the Two Dimensional Transport Code PARAGON,”**
 8. ~~Not used.~~ **WCAP-16045-P-A, Addendum 1-A, “Qualification of the NEXUS Nuclear Data Methodology,” and**

9. ~~WCAP-8567-P-A, "Improved Thermal Design Procedure,"~~ **WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, Optimized ZIRLO™.**
10. ~~WCAP-16045-P-A, "Qualification of the Two Dimensional Transport Code PARAGON," and~~
11. ~~WCAP-16045-P-A, Addendum 1-A, "Qualification of the NEXUS Nuclear Data Methodology."~~

2.0 REGULATORY EVALUATION

The NRC staff considered the following regulatory requirements, guidance, and licensing and design-basis information during its review of the proposed changes.

2.1 Regulatory Requirements

The NRC's regulatory requirements related to the content of the TSs are set forth in 10 CFR 50.36, "Technical specifications." The regulations in 10 CFR 50.36 require that TSs include: (1) safety limits, limiting safety system settings and limiting control settings, (2) limiting conditions for operation, (3) surveillance requirements, (4) design features, and (5) administrative controls.

The regulation in 10 CFR 50.36(c)(4) requires TS to include items in the "Design features" category, and states that,

Design features to be included are those features of the facility such as materials of construction and geometric arrangements, which, if altered or modified, would have a significant effect on safety and are not covered in categories described in [10 CFR 50.36(c)(1), "Safety limits, limiting safety system settings, and limiting control settings"; 10 CFR 50.36(c)(2), "Limiting conditions for operation"; and 10 CFR 50.36(c)(3), "Surveillance requirements."]

The regulation in 10 CFR 50.36(c)(5) requires TS to include items in the "Administrative controls" category, and states, in part, that,

Administrative controls are the provisions relating to organization and management, procedures, recordkeeping, review and audit, and reporting necessary to assure operation of the facility in a safe manner.

The key regulatory requirement specified in 10 CFR 50.46(a)(1)(i) that is relevant to the proposed LAR is as follows:

Each boiling or pressurized light-water nuclear power reactor fueled with uranium oxide pellets within cylindrical zircaloy or ZIRLO cladding must be provided with an emergency core cooling system (ECCS) that must be designed so that its calculated cooling performance following postulated loss-of-coolant accidents conforms to the criteria set forth in paragraph (b) of this section.

Appendix A to 10 CFR Part 50, "General Design Criteria for Nuclear Power Plants," (hereinafter referred to as GDC), establishes the minimum requirements for the principal design criteria for water-cooled nuclear power plants. The principal design criteria establish the necessary design, fabrication, construction, testing, and performance requirements for structures, systems, and components important to safety.

The GDC that are relevant to this LAR are as follows.

- GDC 10, "Reactor design," states that,

The reactor core and associated coolant, control, and protection systems shall be designed with appropriate margin to assure that specified acceptable fuel design limits are not exceeded during any condition of normal operation, including the effects of anticipated operational occurrences.

- GDC 27, "Combined reactivity control systems capability," states that,

The reactivity control systems shall be designed to have a combined capability, in conjunction with poison addition by the emergency core cooling system, of reliably controlling reactivity changes to assure that under postulated accident conditions and with appropriate margin for stuck rods the capability to cool the core is maintained.

- GDC 35, "Emergency core cooling," states, in part, that,

A system to provide abundant emergency core cooling shall be provided. The system safety function shall be to transfer heat from the reactor core following any loss of reactor coolant at a rate such that (1) fuel and clad damage that could interfere with continued effective core cooling is prevented and (2) clad metal water reaction is limited to negligible amounts.

2.2 Guidance Documents

Section 4.2, Revision 3, "Fuel System Design," of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," March 2007 (ML070740002), provides regulatory guidance, in part, to the NRC staff for the review of fuel rod cladding materials and fuel system. Section 4.2, states, in part that,

The fuel system safety review provides assurance that (1) the fuel system is not damaged as a result of normal operation and anticipated operational occurrences (AOOs), (2) fuel system damage is never so severe as to prevent control rod insertion when it is required, (3) the number of fuel rod failures is not underestimated for postulated accidents, and (4) coolability is always maintained.

3.0 TECHNICAL EVALUATION

The NRC staff evaluated the licensee's application to determine whether the proposed changes are consistent with the guidance, regulations, and plant-specific design and licensing basis discussed in section 2.0 of this safety evaluation (SE). The NRC staff reviewed the licensee's statements in the LAR and its enclosures, relevant sections of the Diablo Canyon TSs and the Updated Final Safety Analysis Report (UFSAR) (Package ML24323A239). The NRC staff

reviewed all conditions and limitations for use of Westinghouse Electric Company Topical Report (TR) WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™" (ML062080569 (public version), ML062080576 (not publicly available, proprietary information)) to assure they were met satisfactorily.

The NRC staff approved Optimized ZIRLO™ fuel cladding in TR WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A based upon (1) similarities with standard ZIRLO™, (2) demonstrated material performance, and (3) a commitment to provide irradiated data and validate fuel performance models ahead of burnups achieved in batch applications.

3.1 Limitations and Conditions on WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™"

The NRC staff's SE for TR WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A includes ten conditions and limitations. The licensee has documented compliance with these ten conditions and limitations in section 3.1 of the enclosure to the LAR. The ten conditions and limitations are discussed below along with the PG&E response and the NRC staff evaluation.

- NRC Condition and Limitation 1

Until rulemaking to 10 CFR Part 50 addressing Optimized ZIRLO™ has been completed, implementation of Optimized ZIRLO™ fuel clad requires an exemption from 10 CFR 50.46 and 10 CFR Part 50 Appendix K.

PG&E Response to Condition and Limitation 1

A request for the required exemption from 10 CFR 50.46 is provided in Enclosure 2.

It should be noted that the NRC Staff amended the requirements of 10 CFR 50.46 and Appendix K, "ECCS Evaluation Models," in 1988 to permit the use of a realistic evaluation methodology (EM) to analyze the performance of the ECCS during a hypothetical loss-of-coolant accident (LOCA). Under the amended rules, best-estimate thermal-hydraulic models may be used in place of models with Appendix K features. The use of these models in the DCPD Units 1 and 2 licensing basis was submitted by PG&E in References 18¹ and 19² and was approved by the NRC in Reference 20.³ Therefore, the exemption from 10 CFR Part 50, Appendix K is not required for the proposed LAR.

¹ Reference 18 in the LAR is: Pacific Gas and Electric Company letter to NRC, "License Amendment Request 18-02, License Amendment Request to Revise Technical Specification 5.6.5b 'Core Operating Limits Report (COLR)' for Full Spectrum Loss-of-Coolant Accident Methodology," dated December 26, 2018 (ML19003A196).

² Reference 19 in the LAR is: Pacific Gas and Electric Company letter to NRC, "Diablo Canyon, Units 1 and 2 - Supplement to 'License Amendment Request 18-02, License Amendment Request to Revise Technical Specification 5.6.5b, 'Core Operating Limits Report (COLR)' for Full Spectrum Loss-of-Coolant Accident Methodology,'" dated October 24, 2019 (ML19297H634).

³ Reference 20 in the LAR is: NRC letter to Pacific Gas and Electric Company, "Diablo Canyon Power Plant, Units 1 and 2 – Issuance of Amendment Nos. 234 and 236 to Revise Technical Specification 5.6.5b, 'Core Operating Limits Report (COLR),' for Full Spectrum Loss-of-Coolant Accident Methodology (EPID L-2018-LLA-0730)," dated January 9, 2020 (ML19316A109).

NRC Staff Evaluation

PG&E has submitted a request for the required exemption from portions of 10 CFR 50.46 as enclosure 2 to the LAR. The NRC staff reviewed the exemption request separately from this LAR. As to Appendix K to 10 CFR Part 50, PG&E uses the NRC-approved LOCA methodology contained in WCAP-16996-P-A, Revision 1, "Realistic LOCA Evaluation Methodology Applied to the Full Spectrum of Break Sizes (FULL SPECTRUM LOCA Methodology)," dated November 2016 (Package ML17277A130). Given that this methodology uses best estimate plus uncertainty, the staff finds that an exemption from Appendix K to 10 CFR Part 50 is not required. Therefore, the NRC staff finds that this condition and limitation has been met as the required exemption request has been submitted and approved (Package ML25171A144).

- NRC Condition and Limitation 2

The fuel rod burnup limit for this approval remains at currently established limits: 62 GWd/MTU [gigawatt days per metric ton of uranium] for Westinghouse fuel designs and 60 GWd/MTU for CE [Combustion Engineering] fuel designs.

PG&E Response to Condition and Limitation 2

For any fuel using Optimized ZIRLO™ fuel rod cladding, the maximum fuel rod burnup limit for Westinghouse fuel designs will continue to be 62 GWd/MTU until such time that a new fuel rod burnup limit is approved for use. DCPD Units 1 and 2 use Westinghouse fuel designs. The fuel burnup limit will be confirmed as part of the normal reload design process.

NRC Staff Evaluation

The NRC staff concludes that since PG&E has specified that it will continue to use the 62 GWd/MTU rod burnup limit until a new fuel rod burnup limit is approved for use by the NRC, and they confirm the fuel burnup limit as part of the normal reload design process, this condition and limitation has been satisfied.

- NRC Condition and Limitation 3

The maximum fuel rod waterside corrosion, as predicted by the best-estimate model, will [satisfy proprietary limits (included in the topical report and proprietary version of the NRC SE)] for TR WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A (ML062080576 (non-public, proprietary)) of hydrides for all locations of the fuel rod.

PG&E Response to Condition and Limitation 3

The maximum fuel rod waterside corrosion for fuel using Optimized ZIRLO™ fuel rod cladding will be confirmed to be less than the specified proprietary limits for all locations of the fuel rod. Evaluations will be performed to confirm that the appropriate corrosion limits are satisfied as part of the normal reload design process.

NRC Staff Evaluation

PG&E has confirmed that the maximum fuel rod waterside corrosion limit for fuel using Optimized ZIRLO™ cladding will be confirmed to be less than the specified proprietary limits for all locations on the fuel rod as part of the normal reload design process. Therefore, the NRC staff concludes that this condition and limitation has been satisfied.

- NRC Condition and Limitation 4

All the conditions listed in previous NRC SE approvals for methodologies used for standard ZIRLO™ and Zircaloy-4 fuel analysis will continue to be met, except that the use of Optimized ZIRLO™ cladding in addition to standard ZIRLO™ and Zircaloy-4 cladding is now approved.

PG&E Response to Condition and Limitation 4

The Optimized ZIRLO™ fuel rod analysis will continue to meet all conditions associated with approved methods. Confirmation of these conditions is required as part of the normal reload design process.

NRC Staff Evaluation

Given that PG&E stated that Optimized ZIRLO™ fuel rod analysis will continue to meet all conditions associated with approved methods and that the confirmation of these conditions is required as part of the normal reload design process, the NRC staff concludes that this condition and limitation has been satisfied.

- NRC Condition and Limitation 5

All methodologies will be used only within the range for which ZIRLO™ and Optimized ZIRLO™ data were acceptable and for which the verifications discussed in Addendum 1 and responses to RAIs [requests for additional information] were performed.

PG&E Response to Condition and Limitation 5

The application of ZIRLO® and Optimized ZIRLO™ will use approved methodologies consistent with the approach accepted in Reference 1.⁴ Confirmation of these conditions is required as part of the normal reload design process.

NRC Staff Evaluation

Given that PG&E has stated that the application of Optimized ZIRLO™ will be consistent with the approach accepted in WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, and confirmed as part of the normal reload design process, the NRC staff concludes that this condition and limitation has been satisfied.

⁴ Reference 1 in the LAR is: Westinghouse letter to NRC, LTR-NRC-06-45, "Issuance of Approved Version of WCAP-12610-P-A & CENPD-404-P-A, Addendum 1-A (Proprietary) 'Optimized ZIRLO™,'" dated July 10, 2006 (ML062080563, non-proprietary version).

- NRC Condition and Limitation 6

The licensee is required to ensure that Westinghouse has fulfilled the following commitment: Westinghouse shall provide the NRC staff with a letter(s) containing the following information (Based on the schedule described in response to RAI #3 [Reference 3⁵]):

- a. Optimized ZIRLO™ LTA [lead test assembly] data from Byron, Calvert Cliffs, Catawba, and Millstone.
 - i. Visual
 - ii. Oxidation of fuel rods
 - iii. Profilometry
 - iv. Fuel rod length
 - v. Fuel assembly length
- b. Using the standard and Optimized ZIRLO™ database including the most recent LTA data, confirm applicability with currently approved fuel performance models (e.g., measured vs. predicted).

Confirmation of the approved models' applicability up through the projected end of cycle burnup for the Optimized ZIRLO™ fuel rods must be completed prior to their initial batch loading and prior to the startup of subsequent cycles. For example, prior to the first batch application of Optimized ZIRLO™, sufficient LTA data may only be available to confirm the models' applicability up through 45 GWd/MTU. In this example, the licensee would need to confirm the models up through the end of the initial cycle. Subsequently, the licensee would need to confirm the models, based upon the latest LTA data, prior to re-inserting the Optimized ZIRLO™ fuel rods in future cycles. Based upon the LTA schedule, it is expected that this issue may only be applicable to the first few batch implementations since sufficient LTA data up through the burnup limit should be available within a few years.

PG&E Response to Condition and Limitation 6

Westinghouse has provided the NRC with information related to test data and models. The NRC has confirmed that this condition has been satisfied as stated in Reference 5⁶. No further information is necessary in response to this Condition.

⁵ Reference 3 in the Conditions and Limitations in the SE for Addendum 1 to TR WCAP-12610-P-A and CENPD-404-P-A, "OPTIMIZED ZIRLO™" is: Letter from J. A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission, "Westinghouse Responses to NRC Request for Additional Information (RAIs) on Optimized ZIRLO™ Topical – Addendum 1 to WCAP-12610-P-A," LTR-NRC-04-44, August 4, 2004 (ADAMS Accession No. ML042240408 [not publicly available, proprietary information; ML042240411, public version]).

⁶ In enclosure 1 to the LAR, Reference 5 is: NRC letter to Westinghouse, "Satisfaction of Conditions 6 and 7 of the U. S. Nuclear Regulatory Commission Safety Evaluation for Westinghouse Electric Company Addendum 1 to WCAP-12610-P-A & CENP-404-P-A, "Optimized ZIRLO™," Topical Report," dated August 3, 2016 (ML16173A354).

NRC Staff Evaluation

As stated by the licensee, Westinghouse has provided the NRC staff with information related to test data and models. As a result, the NRC staff has confirmed that this condition has been satisfied generically as specified in the NRC staff's evaluation of the Westinghouse information (ML16173A254, public cover letter; ML16173A358, not publicly available, proprietary information).

- NRC Condition and Limitation 7

The licensee is required to ensure that Westinghouse has fulfilled the following commitment: Westinghouse shall provide the NRC staff with a letter containing the following information (Based on the schedule described in response to RAI #11 [Reference 3⁷]):

- a. Vogtle growth and creep data summary reports.
- b. Using the standard ZIRLO™ and Optimized ZIRLO™ database including the most recent Vogtle data, confirm applicability with currently approved fuel performance models (e.g., level of conservatism in W rod pressure analysis, measured vs. predicted, predicted minus measured vs. tensile and compressive stress).

Confirmation of the approved models' applicability up through the projected end of cycle burnup for the Optimized ZIRLO™ fuel rods must be completed prior to their initial batch loading and prior to the startup of subsequent cycles. For example, prior to the first batch application of Optimized ZIRLO™, sufficient LTA data may only be available to confirm the models' applicability up through 45 GWd/MTU. In this example, the licensee would need to confirm the models up through the end of the initial cycle. Subsequently, the licensee would need to confirm the models, based upon the latest LTA data, prior to re-inserting the Optimized ZIRLO™ fuel rods in future cycles. Based upon the LTA schedule, it is expected that this issue may only be applicable to the first few batch implementations since sufficient LTA data up through the burnup limit should be available within a few years.

PG&E Response to Condition and Limitation 7

Westinghouse has provided the NRC with information related to test data and models. The NRC has confirmed that this condition has been satisfied as stated in Reference 5. No further information is necessary in response to this condition.

NRC Staff Evaluation

As stated by the licensee, Westinghouse has provided the NRC staff with information related to test data and models. As a result, the NRC staff has confirmed that this condition has been

⁷ Reference 3 in the Conditions and Limitations in the Safety Evaluation for Addendum 1 to TR WCAP-12610-P-A and CENPD-404-P-A, "OPTIMIZED ZIRLO™" is: Letter from J. A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission, "Westinghouse Responses to NRC Request for Additional Information (RAIs) on Optimized ZIRLO™ Topical – Addendum 1 to WCAP-12610-P-A," LTR-NRC-04-44, August 4, 2004 (ADAMS Accession No. ML042240408 [not publicly available, proprietary information; ML042240411, public version]).

satisfied generically as specified in the NRC staff's evaluation of the Westinghouse information (ML16173A254, public cover letter; ML16173A358, not publicly available, proprietary information)

- NRC Condition and Limitation 8

The licensee shall account for the relative differences in unirradiated strength (YS [yield strength] and UTS [ultimate tensile strength]) between Optimized ZIRLO™ and standard ZIRLO™ in cladding and structural analyses until irradiated data for Optimized ZIRLO™ have been collected and provided to the NRC staff.

a. For the Westinghouse fuel design analyses:

- i. The measured, unirradiated Optimized ZIRLO™ strengths shall be used for BOL [beginning-of-life] analyses.
- ii. Between BOL up to a radiation fluence of 3.0×10^{21} n/cm² [neutrons/centimeter²] (E>1 MeV [million electron volts]), pseudo-irradiated Optimized ZIRLO™ strength set equal to linear interpolation between the following two strength level points: At zero fluence, strength of Optimized ZIRLO™ equal to measured strength of Optimized ZIRLO™ and at a fluence of 3.0×10^{21} n/cm² (E>1 MeV), irradiated strength of standard ZIRLO™ at the fluence of 3.0×10^{21} n/cm² (E>1 MeV) minus 3 ksi [kilopound per square inch].
- iii. During subsequent irradiation from 3.0×10^{21} n/cm² up to 12×10^{21} n/cm², the differences in strength (the difference at a fluence of 3×10^{21} n/cm² due to tin content) shall be decreased linearly such that the pseudo-irradiated Optimized ZIRLO™ strengths will saturate at the same properties as standard ZIRLO™ at 12×10^{21} n/cm².

b. For the CE fuel design analyses, the measured, unirradiated Optimized ZIRLO™ strengths shall be used for all fluence levels (consistent with previously approved methods).

PG&E Response to Condition and Limitation 8

The Optimized ZIRLO™ fuel rod analysis for DCPD will use the YS and UTS as modified per conditions and limitations 8.a.i., 8.a.ii., and 8.a.iii. Confirmation of this condition is required as part of the reload design process.

Condition 8.b does not apply because DCPD uses a Westinghouse fuel design and not a CE fuel design.

NRC Staff Evaluation

PG&E has stated that fuel rod analysis of Optimized ZIRLO™ will use the YS and UTS as modified per conditions 8.a.i, 8.a.ii, and 8.a.iii, and that this is confirmed as part of the normal reload design process. Therefore, the NRC staff has concluded that this condition and limitation has been satisfied.

In addition, since Diablo Canyon uses a Westinghouse fuel design, and not a Combustion Engineering (CE) fuel design, the NRC staff has concluded that condition and limitation 8.b does not apply.

- NRC Condition and Limitation 9

As discussed in response to RAI #21 (Reference 3⁸), for plants introducing Optimized ZIRLO™ that are licensed with LOCBART or STRIKIN-II and have a limiting PCT [peak cladding temperature] that occurs during blowdown or early reflood, the limiting LOCBART or STRIKIN-II calculation will be rerun using the specified Optimized ZIRLO™ material properties. Although not a condition of approval, the NRC staff strongly recommends that, for future evaluations, Westinghouse update all computer models with Optimized ZIRLO™ specific material properties.

PG&E Response to Condition and Limitation 9

Condition 9 does not apply because DCPD is not licensed to use the LOCBART or STRIKIN-11 codes.

NRC Staff Evaluation

The LOCBART code is used to compute the cladding temperature and oxidation transients for the highest-powered fuel rod in the core and the STRIKIN-II code is used to calculate hot channel fuel rod properties during the LOCA transient. However, as stated by PG&E, Diablo Canyon is not licensed to use either LOCBART or STRIKIN-II; therefore, the NRC staff finds that this condition and limitation does not apply.

- NRC Condition and Limitation 10

Due to the absence of high temperature oxidation data for Optimized ZIRLO™, the Westinghouse coolability limit on PCT during the locked rotor event shall... [satisfy proprietary limits as specified in the proprietary version of the NRC staff SE for TR WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A (ML062080576 (non-public, proprietary))].

PG&E Response to Condition and Limitation 10

Confirmation of this condition is required as part of the normal reload design process.

⁸ Reference 3 in the Conditions and Limitations is: Letter from J. A. Gresham (Westinghouse) to U.S. Nuclear Regulatory Commission, "Westinghouse Responses to NRC Request for Additional Information (RAIs) on Optimized ZIRLO™ Topical – Addendum 1 to WCAP-12610-P-A," LTR-NRC-04-44, August 4, 2004 (ADAMS Accession No. ML042240408 [not publicly available, proprietary information; ML042240411, public version]).

NRC Staff Evaluation

Given that PG&E has stated that the PCT limit during the locked rotor event is confirmed as part of the normal reload design process, the NRC staff has concluded that this condition and limitation has been satisfied.

The NRC staff reviewed all of the conditions and limitations for TR WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™" as well as the licensee response. The NRC staff finds that the licensee meets all applicable conditions and limitations of the TR.

3.2 Loss-of-Coolant Accidents

The regulations in 10 CFR 50.46 contain acceptance criteria for ECCS for reactors fueled with Zircaloy or ZIRLO™ cladding, including items such as PCT, maximum cladding oxidation, maximum hydrogen generation, etc. As stated in Westinghouse TR WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™":

Extensive characterization tests performed on Standard and Optimized ZIRLO™ verify that the minor material composition change does not appreciably change the ZIRLO™ physical, mechanical, microstructural or LOCA properties. Therefore, the minor composition change also does not have any impact on analysis models and methods. Standard ZIRLO™ material properties currently utilized in various models and methodologies will be applied to analyses of Optimized ZIRLO™.

The above summary statement is consistent with the LOCA methodology used by Diablo Canyon given in WCAP-16996-P-A, Revision 1, "Realistic LOCA Evaluation Methodology Applied to the Full Spectrum of Break Sizes (FULL SPECTRUM LOCA Methodology)."

Therefore, based on a review of the above information, the NRC staff finds that the use of Optimized ZIRLO™ in Diablo Canyon will meet the requirements of 10 CFR 50.46.

3.3 General Design Criteria

As discussed in the Diablo Canyon UFSAR, Section 3.1, "Conformance with U.S. Atomic Energy Commission General Design Criteria," Diablo Canyon was designed to comply with the Atomic Energy Commission (AEC) General Design Criteria for Nuclear Power Plant Construction Permits, published in July 1967. Appendix 3.1A of the Diablo Canyon UFSAR discusses the extent to which the original Diablo Canyon principal design features (the 1967 GDCs plus additional design features) for plant systems, structures, and components conform to the intent of the AEC "General Design Criteria for Nuclear Power Plants" published in February 1971 as 10 CFR Part 50 Appendix A. In enclosure 1 to the LAR, the licensee stated:

The use of Optimized ZIRLO™ fuel rod cladding will not result in adverse changes to the operation or configuration of the facility. The proposed change does not alter the permanent plant design, nor does it change the assumptions contained in the UFSAR Safety Analyses. There is no reduction in capability or change in operation, design or configuration of any accident mitigating system as a result of the proposed change. Therefore, the plant's ability to respond to a design basis accident is unaffected. The proposed change also does not alter any design basis or safety limit.

Based on its review of the above information and the information provided in Diablo Canyon UFSAR Appendix 3.1A for the applicable GDCs, the NRC staff finds the use of Optimized ZIRLO™ does not impact how Diablo Canyon meets the requirements in GDCs 10, 27 and 35. Therefore, NRC staff finds that the requirements of GDCs 10, 27 and 35 will continue to be met with the use of Optimized ZIRLO™ as a fuel cladding material.

3.4 TS Proposed Changes

Diablo Canyon TS 4.2.1, specifies the allowable materials for the fuel rod cladding. PG&E has proposed the addition of Optimized ZIRLO™ to the list of allowable cladding materials. In addition, PG&E has proposed addition of the NRC-approved Westinghouse TR WCAP-12610-P-A and CENPD-404-P-A, Addendum 1-A, "Optimized ZIRLO™" to the list of analytical methods in Diablo Canyon TS 5.6.5.b.

The NRC staff review of this TR in 2005 approved Optimized ZIRLO™ as a fuel cladding material and found that Addendum 1 to WCAP-12610-P-A and CENPD-404-P-A, "Optimized ZIRLO™" is acceptable for referencing in licensing applications and under the limitations delineated in the TR and in the associated SE (ML062080569 (publicly available), ML062080576 (proprietary)). In addition, the previous NRC staff review found that the TR provided reasonable assurance that under both normal and accident conditions, Westinghouse and CE fuel assembly designs implementing Optimized ZIRLO™ fuel cladding would be able to safely operate and comply with NRC regulations, including GDCs 10, 27 and 35.

Based on a review of the above information and the licensee meeting all the conditions and limitations, as described above in section 3.1, the NRC staff finds the proposed changes to add Optimized ZIRLO™ as a fuel cladding material in TS 4.2.1 and the addition of TR WCAP-12610-P-A and CENPD-404-P-A, "Optimized ZIRLO™" to 5.6.5.b acceptable.

In addition to the changes described above, the licensee also proposed several editorial changes to TS 4.2.1 and 5.6.5.b. For TS 4.2.1, these changes include correcting the spelling of "Zircaloy" by removing an extraneous 'l,' and addition of a registered trademark designator to the word "ZIRLO." For TS 5.6.5.b, the existing analytical methods numbered 9, 10 and 11 are renumbered to 6, 7 and 8 where items 6, 7 and 8 were "Not used." In addition, quotation marks were added to the titles of the TRs in items 1, 2 and 3. The NRC staff finds that these changes are acceptable as they are editorial in nature, do not impact the methodology or operation of the plant, and do not substantively alter TS requirements.

3.5 Technical Conclusion

Based upon the NRC staff's prior approval of Optimized ZIRLO™, the addition of the NRC-approved methodology in TR WCAP-12610-P-A & CENPD-04-P-A Addendum 1-A, "Optimized ZIRLO™" to the list of analytical methods in TS 5.6.5.b, and the licensee's compliance with the SE conditions and limitations, the NRC staff finds the proposed changes to TS 4.2.1 and TS 5.6.5.b to allow the use of Optimized ZIRLO™ acceptable.

The NRC staff determined that the proposed changes meet the regulatory requirements of 10 CFR 50.36(c)(4), 10 CFR 50.36(c)(5), and 10 CFR 50.46 as referenced in Section 2 of this SE. The staff also determined that the proposed changes would have no impact on the Diablo Canyon design basis and meet the requirements in GDCs 10, 27 and 35. Therefore, the NRC staff finds that the proposed revisions to TSs 4.2.1 and 5.6.5.b are acceptable.

4.0 STATE CONSULTATION

In accordance with the NRC's regulations, the California State official was notified of the proposed issuance of the amendments on June 13, 2025. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendments change requirements with respect to installation or use of facility components located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding published in the *Federal Register* on June 10, 2025 (90 FR 24421). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) there is reasonable assurance that such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: Robert Beaton, NRR/DSS
Richard Fu, NRR/DSS
Clint Ashley, NRR/DSS

Date: August 13, 2025

SUBJECT: DIABLO CANYON NUCLEAR POWER PLANT, UNITS 1 AND 2 - ISSUANCE OF AMENDMENT NOS. 252 AND 254 RE: UTILIZATION OF OPTIMIZED ZIRLO™ FOR IMPROVED FUEL ROD CLADDING PERFORMANCE (EPID L-2025-LLA-0059) DATED AUGUST 13, 2025

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DATE	7/10/2025	7/10/2025	6/12/2025	6/18/2025
OFFICE	NRR/DSS/SFNB/BC	NRR/DORL/LPL4/BC	NRR/DORL/LPL4/PM	
NAME	SKrepel (B Wise for)	TNakanishi	SLee	
DATE	6/18/2025	8/13/2025	8/13/2025	

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