



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

February 15, 2018

Mr. James M. Welsch
Vice President, Nuclear 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 POWER PLANT, UNITS 1 AND 2 – REQUEST FOR RELIEF TO THE ASME CODE, SECTION XI, EXAMINATION REQUIREMENTS FOR CLASS 1 AND CLASS 2 PIPING WELDS FOR THE FOURTH 10-YEAR INSERVICE INSPECTION INTERVAL (CAC NOS. MF9706 AND MF9707; EPID L-2017-LLR-0030)

Dear Mr. Welsch:

By letter dated May 18, 2017 (Agencywide Documents Access and Management System Accession No. ML17139C628), Pacific Gas & Electric Company (the licensee) submitted alternatives to the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, examination requirements for Class 1 and Class 2 piping welds for the fourth inservice inspection (ISI) interval for the Diablo Canyon Power Plant (DCPP), Units 1 and 2.

Specifically, the licensee has requested for relief to continue applying the risk-informed inservice inspection (RI-ISI) criteria of Electric Power Research Institute Topical Report (TR) 112657, Revision B-A, "Revised Risk-Informed Inservice Inspection Evaluation Procedure," Final Report, December 1999, to Class 1 and Class 2 piping welds during the fourth 10-year ISI interval. The licensee has submitted relief requests RI-ISI-1 and RI-ISI-2 for DCPP, Units 1 and 2, respectively. Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) paragraph 50.55a(z)(1), the licensee requested approval for the proposed alternatives on the basis that the proposed alternatives provide an acceptable level of quality and safety.

The U.S. Nuclear Regulatory Commission (NRC) staff reviewed licensee's request and determined that the proposed alternatives provide an acceptable level of quality and safety. Accordingly, the NRC staff concludes, as set forth in the enclosed safety evaluation, that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1). Therefore, the NRC authorizes the use of the alternate RI-ISI program at DCPP, Units 1 and 2, for the fourth 10-year ISI interval, which is currently scheduled to end on May 7, 2025, for DCPP, Unit 1 and March 13, 2026, for DCPP, Unit 2.

All other ASME Code, Section XI requirements for which relief was not specifically requested and approved in the subject requests for relief remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

J. Welsch

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If you have any questions, please contact the Senior Project Manager, Balwant K. Singal, at 301-415-3016 or via e-mail at Balwant.Singal@nrc.gov.

Sincerely,



Robert J. Pascarelli, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-275 and 50-323

Enclosure:
Safety Evaluation

cc: Listserv



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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
ALTERNATIVES RI-ISI-2 AND RI-ISI-2 TO THE
ASME CODE EXAMINATION REQUIREMENTS FOR CLASS 1 AND 2 PIPING WELDS
FOR THE FOURTH INSERVICE INSPECTION INTERVAL
PACIFIC GAS AND ELECTRIC COMPANY
DIABLO CANYON POWER PLANT, UNITS 1 AND 2
DOCKET NOS. 50-275 AND 50-323

1.0 INTRODUCTION

By application dated May 18, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17139C628), the Pacific Gas and Electric Company (PG&E, the licensee) submitted relief requests RI-ISI-1 and RI-ISI-2 for the fourth 10-year inservice inspection (ISI) interval at Diablo Canyon Power Plant (DCPP), Units 1 and 2, respectively. The licensee's requests for relief is to continue applying the risk-informed inservice inspection (RI-ISI) criteria of the Electric Power Research Institute's (EPRI's) Topical Report (TR) 112657, Revision B-A, "Revised Risk-Informed Inservice Inspection Evaluation Procedure," Final Report, dated December 1999 (ADAMS Accession No. ML013470102), to Class 1 and Class 2 piping welds during the fourth 10-year ISI interval in lieu of the requirements of American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (ASME Code), Section XI, Tables IWB-2500-1 and IWC-2500-1.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) paragraph 50.55a(z)(1), the licensee requested to use a proposed alternative on the basis that the proposed alternative would provide an acceptable level of quality and safety.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(g)(4), "Inservice inspection standards requirement for operating plants," throughout the service life of a boiling or pressurized water-cooled nuclear power facility, components (including supports) that are classified as ASME Code Class 1, Class 2, and Class 3 must meet the requirements, except design and access provisions and preservice examination requirements, set forth in Section XI of editions and addenda of the ASME Code that become effective subsequent to editions specified in paragraphs (g)(2) and (3) of 10 CFR 50.55a and that are incorporated by reference in paragraph (a)(1)(ii) of 10 CFR 50.55a, to the extent practical within the limitations of design, geometry, and materials of construction of the components.

Pursuant to 10 CFR 50.55a(g)(4)(ii), "Applicable ISI Code: Successive 120-month intervals," inservice examination of components and system pressure tests conducted during successive 120-month inspection intervals must comply with the requirements of the latest edition and addenda of the ASME Code incorporated by reference in paragraph (a) of 10 CFR 50.55a 12 months before the start of the 120-month inspection interval (or the optional ASME Code Cases listed in Regulatory Guide (RG) 1.147, Revision 18,¹ "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," (ADAMS Accession No. ML16321A336) when using ASME Code, Section XI, as incorporated by reference in paragraph (a)(3)(ii) of 10 CFR 50.55a, subject to the conditions listed in paragraph (b) of 10 CFR 50.55a. However, a licensee whose ISI interval commences during the 12 through 18-month period after August 17, 2017, may delay the update of their Appendix VIII program by up to 18 months after August 17, 2017. Alternatively, licensees may, at any time in their 120-month ISI interval, elect to use the Appendix VIII in the latest edition and addenda of the ASME Code incorporated by reference in paragraph (a) of 10 CFR 50.55a, subject to any applicable conditions listed in paragraph (b) of 10 CFR 50.55a. Licensees using this option must also use the same Edition and Addenda of Appendix I as Appendix VIII of the ASME Code, including any applicable conditions listed in paragraph (b) of 50.55a.

Pursuant to 10 CFR 50.55a(z), "Alternatives to codes and standards requirements," alternatives to the requirements of paragraphs (b) through (h) of 10 CFR 50.55a or portions thereof may be used when authorized by the Director, Office of Nuclear Reactor Regulation, or Director, Office of New Reactors, as appropriate. A proposed alternative must be submitted and authorized prior to implementation. The applicant or licensee must demonstrate that: (1) the proposed alternative would provide an acceptable level of quality and safety; or (2) compliance with the specified requirements of 10 CFR 50.55a would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(z)(1), the licensee has requested approval to continue use of RI-ISI program as an alternative to the requirements of 10 CFR 50.55a during the fourth 10-year ISI interval at DCCP, Units 1 and 2, on the basis that the proposed alternative would provide an acceptable level of quality and safety.

Based on the above, and subject to the following technical evaluation, the U.S. Nuclear Regulatory Commission (NRC) staff finds that regulatory authority exists for the licensee to request and the NRC to authorize the alternative requested by the licensee.

3.0 TECHNICAL EVALUATION

3.1 ASME Code Components

All Class 1 and Class 2 piping welds previously subject to the requirements of ASME Code Section XI, Table IWB-2500-1 (Examination Categories B-F² and B-J) and Table IWC-2500-1 (Examination Categories C-F-1 and C-F-2) for DCCP, Units 1 and 2.

¹ *Federal Register* Notice dated January 17, 2018 (83 FR 2331), was issued to amend the NRC staff regulations to incorporate by reference RG 1.147, Revision 18, with effect from February 16, 2018.

² As stated by the licensee in its letter dated May 18, 2017, although Examination Category B-F welds are included in the RI-ISI program for other damage mechanisms, Alloy 600/82/182 examinations in the third interval were conducted per Code Cases N-722-1 and N-770-1. In the fourth interval, these examinations will be performed in accordance with the versions of the applicable Code Cases that are referenced in the published version of 10 CFR 50.55a.

3.2 Applicable ASME Code Requirements

The selection of Code Class 1 and Code Class 2 pipe welds to be examined in the fourth inspection interval is required to be prescriptively determined in accordance with Table IWB-2500-1, Examination Categories B-F and B-J, and Table IWC-2500-1, Examination Categories C-F-1 and C-F-2. The ASME Code of record for DCP, Units 1 and 2, fourth 10-year ISI interval is the 2007 Edition through 2008 Addenda of the ASME Code, Section XI.

3.3 Proposed Alternative and Basis for Use

As an alternative to the Code Requirement, a risk-informed process will continue to be used for selection of Class 1 and Class 2 piping welds for examination.

The licensee proposes to continue applying RI-ISI as an alternative to the requirements of ASME Code, Section XI, Table IWB-2500-1 for Examination Categories B-F and B-J, and Table IWC-2500-1 for Examination Categories C-F-1 and C-F-2 during the fourth 10-year interval at DCP, Units 1 and 2. The licensee stated that its fourth 10-year RI-ISI program would continue to follow the NRC staff approved methodology of RI-ISI criteria of EPRI TR-112657, Revision B-A. The same methodology was used for the prior two ISI intervals. The licensee further stated that the initial RI-ISI program included a requirement for periodic reviews and updates due to significant changes, including relevant plant or industry feedback to appropriately identify safety significant piping locations.

In accordance with Nuclear Energy Institute (NEI) 04-05, "Living Program Guidance: To Maintain Risk-Informed Inservice Inspection Programs for Nuclear Plant Piping Systems," dated April 2004 (ADAMS Accession No. ML041480432), and as stated in the licensee's letter dated May 18, 2017, the following aspects were considered during the reviews:

- Plant Examination Results
- Piping Failures
 - Plant Specific Failures
 - Industry Failures
- Probabilistic Risk Assessment (PRA) Updates
- Plant Design Changes
 - Physical Changes
 - Programmatic Changes
 - Procedural Changes
- Changes in Postulated Conditions
 - Physical Conditions
 - Programmatic Conditions

3.4 Duration of Proposed Alternative

The alternative will be used for DCP, Units 1 and 2, until the end of each unit's fourth 10-year ISI interval, subject to the review and update guidance of NEI 04-05. The fourth 10-year ISI interval began on May 7, 2015 for DCP, Unit 1 and on March 13, 2016 for DCP, Unit 2 and is currently scheduled to end on May 6, 2025 for DCP, Unit 1 and March 12, 2026 for DCP, Unit 2.³

³ In its letter dated May 18, 2017, erroneously, the licensee stated that the fourth 10-year ISI interval is scheduled to end on May 7, 2025 for DCP, Unit 1 and March 13, 2026 for DCP, Unit 2.

3.5 NRC Staff Evaluation

In its review of the proposed RI-ISI program at DCP, Units 1 and 2, the NRC staff used the guidance provided in the safety evaluation report (SER) for EPRI TR-112657 (ADAMS Accession No. ML993190474), along with the guidance provided in the following NRC guidance documents:

- RG 1.174, Revision 2, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," dated May 2011 (ADAMS Accession No. ML100910006).
- RG 1.178, Revision 1, "An Approach for Plant-Specific Risk-Informed Decisionmaking for Inservice Inspection of Piping," dated September 2003 (ADAMS Accession No. ML032510128).
- RG 1.200, Revision 2, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," dated March 2009 (ADAMS Accession No. ML090410014).
- NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR [Light-Water Reactor] Edition" (SRP), Chapter 3.9.8, "Standard Review Plan for the Review of Risk-Informed Inservice Inspection of Piping," dated September 2003 (ADAMS Accession No. ML032510135).

The licensee's proposed alternate RI-ISI program was developed using the methodology described in the EPRI TR-112657, Revision B-A. The NRC staff's SER approving the methodology described in the EPRI TR-112657 concluded that the methodology conforms to guidance provided in RG 1.174 and RG 1.178, and that no significant risk increase should be expected from the changes to the ISI program resulting from applying this methodology.

The NRC staff has reviewed and evaluated the licensee's proposed RI-ISI program, including those portions related to the applicable methodology and processes, based on guidance and acceptance criteria provided in RG 1.174, RG 1.178, and SRP Chapter 3.9.8. An acceptable RI-ISI program plan is expected to meet the five key principles discussed in RG 1.178, SRP Chapter 3.9.8, and EPRI TR-112657, Revision B-A, as stated below:

1. The proposed change meets the current regulations unless it is explicitly related to a requested exemption or rule change.
2. The proposed change is consistent with the defense-in-depth philosophy.
3. The proposed change maintains sufficient safety margins.
4. When proposed changes result in an increase in core damage frequency (CDF) or risk, the increases should be small and consistent with the intent of the Commission's Safety Goal Policy Statement.

5. The impact of the proposed change should be monitored by using performance measurement strategies.

Principle 1

The NRC staff reviewed the first principle. The NRC staff notes that the first principle is met in these relief requests because an alternative ISI program may be authorized pursuant to 10 CFR 50.55a(z)(1) and therefore, an exemption request is not required.

Principles 2 and 3

The NRC staff reviewed the second and third principles. These principles require assurance that the alternative program is consistent with the defense-in-depth philosophy and that sufficient safety margins are maintained, respectively. Assurance that the second and third principles are met is based on the application of the approved methodology and not on the particular inspection locations selected. The licensee stated that no changes to the evaluation methodology, as currently implemented under EPRI TR-112657, Revision B-A, are required as part of this interval update. The NRC staff determined that since the methodology used to develop the RI-ISI program for the fourth 10-year interval is unchanged from the methodology approved for development of the prior RI-ISI programs (second and third 10-year ISI intervals), the second and third principles are met.

Principle 4

The NRC staff reviewed the fourth principle. The fourth principle, that any increase in CDF and risk are small and consistent with the Commission's Safety Goal Policy Statement, requires an estimate of the change in risk. RG 1.178 provides that any risk increases that might result from the proposed RI-ISI program and their cumulative effects be small and not exceed NRC safety goals. The change in risk estimate is dependent on the location of inspections in the proposed ISI program compared to the location of inspections that would be performed using the requirements of ASME Code, Section XI.

For the DCCP, Units 1 and 2, fourth ISI interval, the licensee stated that a new risk impact analysis was performed, and the revised program continues to represent a risk reduction when compared to the last deterministic Section XI inspection program. It is expected that implementation of the RI-ISI program should be risk neutral, a decrease in risk, or, at most, an insignificant increase in risk. EPRI TR-112657, Revision B-A, provides guidance on an acceptable risk change of $1 \text{ E-}7/\text{yr}$ for CDF and $1 \text{ E-}8/\text{yr}$ for large early release frequency (LERF) for each system included in the application (regardless of the number of systems) and a total change less than the "very small" guidelines of $1 \text{ E-}6/\text{yr}$ for CDF and $1 \text{ E-}7/\text{yr}$ for LERF in RG 1.174.

The fourth ISI interval results are reported in the tables entitled "Unit 1 Risk Impact Results," and "Unit 2 Risk Impact Results." For Unit 1, the revised program results in an overall reduction of $4.33\text{E-}8/\text{y}$ in CDF and $1.75\text{E-}8/\text{yr}$ in LERF, and for Unit 2 an overall reduction of $4.96\text{E-}8/\text{y}$ in CDF and $2.00\text{E-}8/\text{yr}$ in LERF. The licensee stated that the impact of external events PRAs do not significantly impact the RI-ISI. This is consistent with the previous ISI extensions for DCCP, Units 1 and 2. The NRC staff concludes that the EPRI TR-112675, Revision B-A acceptance criteria are satisfied as shown by the reported results. In addition, per RG 1.174 guidance, the change is considered to have satisfied the relevant principle for CDF and LERF because the change in risk is a decrease.

The fourth principle also requires demonstration of the technical adequacy of the PRA. As discussed in RGs 1.178 and 1.200, an acceptable change in risk evaluation (and risk-ranking evaluation used to identify the most risk significant locations) requires the use of a PRA of appropriate technical quality that models the as-built and as-operated plant. The DCCP, Units 1 and 2, internal events and internal flooding PRA had a full scope peer review in December 2012 using guidance from NEI 05-04, Revision 2, "Process for Performing Internal Events PRA Peer Reviews Using the ASME/ANS PRA Standard," dated November 2008 (ADAMS Accession No. ML083430462);⁴ ASME/ANS PRA Standard ASME/ANS RA-Sa-2009, Addenda to ASME RA-S-2008, "Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications"; and RG 1.200, Revision 2. The application provided the peer review facts and observations (F&Os) and the licensee's dispositions of them for DCCP, Units 1 and 2. The NRC staff reviewed the licensee's dispositions provided in the letter dated May 18, 2017. For some F&Os, the NRC had consulted its review performed previously for the DCCP, Units 1 and 2, National Fire Protection Association (NFPA) 805 transition documented in "Record of Review, Dispositions to Diablo Canyon Nuclear Plant, Units 1 and 2, Internal Events, Internal Flooding, Seismic, and Fire PRA Facts and Observations," dated January 14, 2016 (ADAMS Accession No. ML16019A224), and determined that the disposition given for that application was also sufficient for the PRA technical adequacy of the DCCP, Units 1 and 2, RI-ISI application. The NRC staff concludes the F&Os have been adequately dispositioned in support of the fourth 10-year ISI interval application.

As a result of the NRC staff's review of the risk information in Enclosures 1 and 2 of letter dated May 18, 2017, for the continuation of the alternative, the staff concludes that the DCCP, Units 1 and 2, internal events PRA has sufficient technical adequacy to support the risk impact assessment for the proposed alternative, and is consistent with Regulatory Position 2.2, "Probabilistic Risk Assessment," of RG 1.178, Revision 1. Therefore, the NRC staff finds that the licensee's analysis provides reasonable assurance that the fourth key principle is met.

Principle 5

The NRC staff reviewed the fifth principle. The fifth principle of risk-informed decisionmaking requires that the impact of the proposed change be monitored by using performance measurement strategies. As described in the relief request, the RI-ISI program is a living program that requires periodic updating and that, as a minimum, risk ranking of piping segments will be reviewed on an ASME period basis. In its submittal, the licensee stated that as part of its ISI program update for the fourth-10 year ISI interval, it performed an RI-ISI Living Program Evaluation, using the guidance provided in NEI 04-05. The licensee also stated that the evaluation included consideration of plant-specific examination results, PRA updates, and piping failures and changes, as well as industry piping failures.

As a result of these updates, for the fourth 10-year ISI interval, there was at least 50 changes to the EPRI risk categories for weld examinations for each unit. The analyses and changes reported by the licensee in its submittal demonstrate that the DCCP, Units 1 and 2, RI-ISI program is a living program that is being periodically updated. In addition, all of the subject welds will continue to be subject to system leakage testing in accordance with ASME Code,

⁴ The NRC staff found that NEI 05-04 guidance was used when reviewing DCCP, Units 1 and 2, license amendment request for transition to risk-informed, performance-based fire protection program (ADAMS Accession No. ML16035A441).

Section XI, Table IWB-2500-1 for Examination Categories B-F and B-J and Table IWC-2500-1 for Examination Categories C-F-1 and C-F-2. Therefore, the NRC staff concludes that the fifth key principle, which provides that risk-informed applications should include performance monitoring and feedback provisions, is met.

3.5.1 Results of the NRC Staff Evaluation

Based on the above discussion, the NRC staff concludes that the five key principles of risk-informed decisionmaking are met by the licensee's proposed use of the RI-ISI program described in RI-ISI-1 and RI-ISI-2. Therefore the NRC staff concludes that the proposed RI-ISI program for the fourth 10-year ISI interval at DCP, Units 1 and 2, is acceptable and provides an acceptable level of quality and safety.

4.0 CONCLUSION

As set forth above, the NRC staff determines that the proposed alternative provides an acceptable level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1). Therefore, the NRC authorizes the use of the alternate RI-ISI program at DCP, Units 1 and 2, for the fourth 10-year ISI interval, which is currently scheduled to end on May 6, 2025 for Unit 1 and March 12, 2026 for Unit 2.

All other ASME Code, Section XI requirements for which relief was not specifically requested and approved in the subject requests for relief remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

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Date: February 15, 2018

SUBJECT: DIABLO CANYON POWER PLANT, UNITS 1 AND 2 – REQUEST FOR RELIEF TO THE ASME CODE, SECTION XI, EXAMINATION REQUIREMENTS FOR CLASS 1 AND CLASS 2 PIPING WELDS FOR THE FOURTH 10-YEAR INSERVICE INSPECTION INTERVAL (CAC NOS. MF9706 AND MF9707; EPID L-2017-LLR-0030) DATED FEBRUARY 15, 2018

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ADAMS Accession No.: ML18033B257

*SE via email dated January 25, 2018

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