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

April 3, 2017

Mr. Edward D. Halpin
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 POWER PLANT, UNIT 2 – RELIEF REQUEST NDE-SIF-U2, IMPRACTICALITY OF FULL EXAMINATION VOLUME COVERAGE REQUIREMENTS REQUIRED BY AMERICAN SOCIETY OF MECHANICAL ENGINEERS BOILER AND PRESSURE VESSEL CODE SECTION XI FOR SEAL INJECTION FILTER VESSEL SHELL-TO-FLANGE AND SHELL-TO-HEAD WELDS (CAC NO. MF8818)

Dear Mr. Halpin:

By letter dated November 10, 2016 (Agencywide Documents Access and Management System Accession No. ML16315A341), Pacific Gas & Electric Company (the licensee) submitted Relief Request (RR) NDE-SIF-U2 for relief from the examination requirements set forth in American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, for the Diablo Canyon Power Plant (DCPP), Unit 2, seal injection filter vessel shell-to-flange and shell-to-head welds. Specifically, the relief is requested from the requirement of essentially 100 percent coverage of the ASME Code, Section XI required examination volume. Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), paragraph 50.55a(g)(5)(iii), the licensee requested relief on the basis that meeting the Code requirement would be impractical for the facility due to the weld configurations.

The U.S. Nuclear Regulatory Commission (NRC) staff reviewed the licensee's submittal and determined that the ASME Code examination coverage requirements for the subject seal injection filter shell-to-flange and shell-to-head welds are impractical and considered the burden upon the licensee if the ASME Code requirement was imposed. Accordingly, the 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(g)(6)(i). Furthermore, the NRC staff concludes that the weld examination coverages obtained by the licensee provide reasonable assurance of the structural integrity and leak tightness of the subject welds. Therefore, the NRC staff grants relief for the subject examinations of the items contained in RR NDE-SIF-U2, as requested for DCPP, Unit 2, for the third 10-year inservice inspection interval, which ended June 2, 2016. No alternative requirements beyond those specified in the relief request are being imposed by the NRC staff.

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

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 No. 50-323

Enclosure:
Safety Evaluation

cc w/encl: Distribution via Listserv

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST NDE-SIF-U2

FOR THE THIRD INSERVICE INSPECTION PROGRAM

PACIFIC GAS AND ELECTRIC COMPANY

DIABLO CANYON POWER PLANT, UNIT 2

DOCKET NO. 50-323

1.0 INTRODUCTION

By letter dated November 10, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16315A341), Pacific Gas and Electric Company (the licensee) requested relief from the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," for the Diablo Canyon Power Plant (DCPP), Unit 2, seal injection filter shell-to-flange and shell-to-head welds. The ASME Code requires that essentially 100 percent of each subject weld and adjacent base metal be volumetrically examined once during each inservice inspection (ISI) interval in accordance with the requirements of Appendix I, I-2210 of the ASME Code, Section XI. Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), paragraph 50.55a(g)(5)(iii), "ISI program update: Notification of impractical ISI Code requirements," the licensee requested relief from this requirement on the basis that meeting the Code requirement would be impractical for the facility due to the weld configurations.

2.0 REGULATORY EVALUATION

ISI of ASME Code Class 1, 2, and 3 components is to be performed in accordance with Section XI of the ASME Code and applicable addenda as a way to detect anomaly and degradation indications so that structural integrity of these components can be maintained. ISI is required by 10 CFR 50.55a(g), except where specific relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i), "Impractical ISI requirements: Granting of relief." Paragraph 50.55a(g)(5)(iii) of 10 CFR states that the licensee must notify the U.S. Nuclear Regulatory Commission (NRC) and submit information to support its determinations that conforming with an ASME Code requirement is impractical for its facility. Determinations of impracticality in accordance with this section must be based on the demonstrated limitations experienced when attempting to comply with the Code requirements during the ISI interval for which the request is being submitted.

Pursuant to 10 CFR 50.55a(g)(4), "Inservice inspection standards requirement for operating plants," 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, to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during successive 120-month inspection intervals (following the initial 120-month inspection interval) must comply with the requirements in the latest edition and addenda of the ASME Code, which was incorporated by reference in 10 CFR 50.55a(a) 12 months before the start of the 120-month interval (or the optional ASME Code Cases listed in NRC Regulatory Guide (RG) 1.147, Revision 17, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1" (ADAMS Accession No. ML13339A689)), subject to the conditions listed in 10 CFR 50.55a(b).

3.0 TECHNICAL EVALUATION

3.1 ASME Code Components Affected

The following table lists the two affected DCPP Unit 2, ASME Section XI, Code Class 2, seal injection filter pressure vessel welds that are addressed by this relief request. Both welds were examined in the DCPP, Unit 2, 19th refueling outage (2R19).

Code Category	Item Number	Description	Weld Number
C-A	C1.10	Seal Injection Filter Shell-to-Flange Weld	Item No. 1
C-A	C1.20	Seal Injection Filter Shell-to-Head Weld	Item No. 2

3.2 ASME Code Requirement

As stated by the licensee in its letter dated November 10, 2016;

> ASME Section XI, Table IWC-2500-1, Category C-A, Item No. C1.10 and Item No. C1.20 each require that seal injection filter vessel welds be volumetrically examined once during each ISI interval. Essentially 100 percent of the full volume of the weld and adjacent base material is to be examined in accordance with the requirements of Appendix I, 1-2210. The applicable examination volume is defined in Figure IWC-2500-1 and the examination is to be performed per ASME Section XI, Appendix III, as supplemented by Table 1-2000-1.

The DCPP Unit 2 third interval ISI program is based on the 2001 Edition through 2003 Addenda of the ASME Code, Section XI.

3.3 Licensee's Proposed Alternative and Basis

The licensee proposed that performing the ultrasonic examinations to the maximum extent practical provides reasonable assurance that the structural integrity of the subject welds will be maintained. Utilizing axial up-and-down scans, the licensee obtained 64.9 percent and 96.1 percent coverage of the shell-to-flange and shell-to-head welds, respectively. Furthermore, due to additional limitations, the accessible circumference of the welds were limited to 76.3 percent and 53.3 percent, respectively. There were no obstructions preventing the clockwise and counterclockwise circumferential examinations, therefore a total combined examination coverage of 62.8 percent and 52.2 percent was obtained for the subject welds.

The seal injection filter is approximately 51.25 inches tall and has a circumference of 33.77 inches.

The examinations utilized manual scan techniques, supplemented by an additional 60-degree longitudinal wave search unit, to obtain the greatest possible coverage of the required examination volume.

The proximity of the shell-to-flange weld to the transition of the flange creates a geometric restriction, which limits the ability to perform axial examination from the flange and ultimately precludes full examination coverage of the required volume from the outside surface. Additionally, the presence of a nameplate and davit support arm, which are welded to the vessel prevent examination of the full circumference of the weld.

Axial examination from the head side of the shell-to-head weld was limited due to the transition of the seal injection filter vessel to the curvature of the head. This curvature creates a loss of contact for the transducer, which adjusts the sound angle and ultimately precludes full examination coverage of the required volume from the outside surface. Furthermore, three support legs and an inlet nozzle are welded to the vessel, which prevent examination of certain sections of the subject welds.

3.4 Burden Caused by Compliance

The licensee discussed the impracticality of obtaining additional coverage by referring to the difficulties in performing further outer and inner surface examinations. Obtaining greater axial coverage of the "essentially 100 percent" examination volume from the outer surface would require either replacement or redesign and rework of the seal injection filter vessel to move the shell-to-flange welds farther from the flange and head, or eliminate the weld by integrally incorporating the flange into the shell. Furthermore, obtaining coverage of the full circumference of the weld would require relocating the welded supports and the inlet nozzle. Performing examinations from the inside of the seal injection filter would require accessing the 10-inch nominal diameter vessel below an external shielding structure and work in a high-contamination, high-risk, foreign material exclusion area. Additionally, an internal filter support structure limits access to the shell-to-head weld.

3.5 NRC Staff Evaluation

Section XI of the ASME Code requires essentially 100 percent volumetric examination of all seal injection filter shell-to-flange and shell-to-head welds and adjacent base metal. The licensee stated that obtaining the volumetric requirements for the subject welds at DCPP, Unit 2, was impractical. Pursuant to 10 CFR 50.55a(g)(4), the licensee attributed the inability to achieve the required examinations to the geometry/configuration of the seal injection filter vessel. Therefore, the NRC staff evaluated the licensee's request in accordance with 10 CFR 50.55a(g)(6)(i), which permits the NRC staff to grant such relief and impose such alternative requirements as it determines are authorized by law, will not endanger life or property or the common defense and security, and are otherwise in the public interest giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Based on the licensee's assessment that obtaining essentially 100 percent examination volume coverage would ultimately require redesign and replacement of the entire seal injection filter vessel, the NRC staff concluded that it is impractical for the licensee to comply with this ASME Code requirement and considered the burden upon the licensee if the requirement were to be imposed.

Regarding the shell-to-flange weld (weld #1), a 45-degree angled shear wave and a 60-degree longitudinal wave were utilized to perform axial scans of the required examination volume from the shell side. Geometric configuration of the flange and its proximity to the weld prevented axial examination from the flange side of the weld. Additionally, the 45-degree shear wave was used to perform circumferential examinations in the clockwise and counterclockwise directions. The weld is flat topped, which allows the scans to be performed on the top of the weld as opposed to skewing from the sides; therefore, there were no limitations in the examinations of the weld in the clockwise and counterclockwise directions.

The Enclosure to letter dated November 10, 2016, contained schematics detailing the coverage obtained through the scans, measurements of the examined regions, and the associated calculations of coverage percentages. The licensee reported that 1.28 square inches (in^2)/1.97 in^2 or 64.9 percent coverage of the total cross-sectional examination area was obtained utilizing axial scans. Since there were no factors inhibiting coverage from the circumferential exams, the licensee was able to examine a combined 82.4 percent of the total examination area. With regard to the total circumference of the weld, the placement of a nameplate and a davit support arm prevent 8 inches of a total 33.77 inches from being examined, equating to 76.3 percent of the circumference. Resultantly, the licensee was able to examine 82.4 percent of the accessible sections of the circumference, equating to 62.8 percent of the total examination volume. No reportable flaws were detected during any of the examinations performed during this interval. The NRC staff determined that the licensee performed the examinations to the maximum practical extent and that geometric configurations preclude any additional examination of the weld.

Regarding the shell-to-head weld (weld #2), the 45-degree and 60-degree longitudinal waves were utilized to perform axial scans of the required examination volume. The curvature of the head results in a loss of contact between the vessel and the transducer, which alters the sound angle and the resulting examination area covered. Additionally, the 45-degree shear wave was used to perform circumferential examinations in the clockwise and counterclockwise directions with no limitations.

The licensee reported that 2.142 in^2/2.21 in^2 of the total cross-sectional examination area was covered axially, equating to 96.1 percent coverage. Combined with 100 percent circumferential coverage with no limitations, a total of 98 percent of the cross-sectional area was examined between the axial and circumferential scans. With regard to the circumference of the weld, three support legs and an inlet nozzle, which are welded to the vessel, prevent examination of the total weld length. According to the attached seal injection filter 2-2 weld #2 graphics, the licensee was able to examine 6.5 inches of the weld between each set of support legs and 2.5 inches of the weld from each side of the inlet nozzle to the neighboring support leg, covering 18 inches of the total 33.77 inches or 53.3 percent of the total circumference covered. Resultantly, the licensee was able to examine 98 percent of the accessible sections of the circumference, equating to 52.2 percent of the total examination volume. No reportable flaws were detected during any of the examinations performed during this interval. The NRC staff agrees that the licensee performed the examinations to the maximum practical extent and that geometric configurations preclude any additional examination of the weld.

Attaining the full code examination coverage would require redesign of the seal injection filter vessel to distance the welds from the head or flange and repositioning the welded supports and inlet nozzle, or replacing the entire vessel. The licensee stated that the worst possible scenario would be a 360 degree circumferential crack of the weld, which would result in a loss of seal

injection water. In this case, the seal injection filter can be isolated manually and send water through the second redundant seal injection filter vessel. A flaw leading to this outcome would likely be detected under the examinations performed. Furthermore, the affected welds are also subject to the pressure testing requirements of the ASME Code, Section XI, Examination Category C-H, which provides an independent means to evaluate structural integrity and leak tightness; no flaws were detected when these examinations were performed. Therefore, the NRC staff concluded that the examination coverage achieved is sufficient to detect any existing patterns of degradation.

The NRC staff concluded that the licensee adequately demonstrated that the essentially 100 percent ASME Code-required examination requirement is impractical for the subject seal injection filter shell-to-flange welds and surrounding base metal. Furthermore, based on the above, the NRC staff concludes that there is reasonable assurance that the structural integrity and leak tightness of the welds will be maintained by the examination coverage achieved. Therefore, the NRC staff concludes that granting relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security and is otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility.

4.0 CONCLUSION

The NRC staff reviewed the licensee's request and concludes that the ASME Code examination coverage requirements for the subject seal injection filter shell-to-flange and shell-to-head welds are impractical and considered the burden upon the licensee if the ASME Code requirement was imposed. Accordingly, the staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i). Furthermore, the NRC staff concludes that the 62.8 percent and 52.2 percent weld examination coverages obtained by the licensee provide reasonable assurance of the structural integrity and leak tightness of the subject welds. Therefore, the NRC staff grants relief for the subject examinations of the items contained in RR NDE-SIF-U2, as requested for DCPP, Unit 2, for the third 10-year ISI interval, which ended June 2, 2016. No alternative requirements beyond those specified in the relief request are being imposed by the NRC staff.

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

Principal Contributor: Austin Young, NRR/DE/EVIB

Date: April 3, 2017

SUBJECT: DIABLO CANYON POWER PLANT, UNIT 2 – RELIEF REQUEST NDE-SIF-U2, IMPRACTICALITY OF FULL EXAMINATION VOLUME COVERAGE REQUIREMENTS REQUIRED BY AMERICAN SOCIETY OF MECHANICAL ENGINEERS BOILER AND PRESSURE VESSEL CODE SECTION XI FOR SEAL INJECTION FILTER VESSEL SHELL-TO-FLANGE AND SHELL-TO-HEAD WELDS (CAC NO. MF8818) DATED APRIL 3, 2017

DISTRIBUTION:

PUBLIC
LPL4 R/F
RidsACRS_MailCTR Resource
RidsNrrDeEvib Resource
RidsNrrDorlLpl4 Resource
RidsNrrLAPBlechman Resource
RidsNrrPMDiabloCanyon Resource
RidsRgn4MailCenter Resource
JBowen, EDO RIV
AYoung, NRR/DE/EVIB

ADAMS Accession No.: ML17086A013 * SE via email dated 3/2/17

OFFICE	NRR/DORL/LPL4/PM	NRR/DORL/LPL4/LA	NRR/DE/EVIB/BC	NRR/DORL/LPL4/BC
NAME	BSingal	PBlechman	DRudland*	RPascarelli
DATE	3/27/17	3/27/17	3/2/17	4/3/17

OFFICIAL RECORD COPY