

James M. Welsch Vice President Nuclear Generation and Chief Nuclear Officer Diablo Canyon Power Plant P.O. Box 56 Avila Beach, CA 93424

805.545.3242 E-Mail: James.Welsch@pge.com

November 7, 2018

PG&E Letter DCL-18-090

U.S. Nuclear Regulatory Commission ATTN: Document Control Desk Washington, D.C. 20555-0001

Docket No. 50-275; OL DPR-80 Docket No. 50-323; OL DPR-82 Diablo Canyon Units 1 and 12 <u>ASME Section XI Inservice Inspection Program Relief Request NDE-SG-PZR-IRS</u> <u>Steam Generator and Pressurizer Nozzle Inside Radius Sections</u>

Dear Commissioners and Staff:

Pursuant to 10 CFR 50.55a(z)(2), Pacific Gas and Electric Company (PG&E) hereby requests NRC approval of Inservice Inspection (ISI) Relief Request NDE-SG-PZR-IRS for the Diablo Canyon Power Plant (DCPP) Units 1 and 2 fourth ISI interval. The request is associated with the hardship of applying the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI, examination requirements for the inside radius sections of Code Class 1 pressure retaining nozzles in the steam generators and pressurizer at DCPP Units 1 and 2. The details of the request are included in the enclosure to this letter.

PG&E requests approval of the attached relief request by August 1, 2019, to support the upcoming refueling outage in late 2019.

PG&E makes no new or revised regulatory commitments (as defined by NEI 99-04) in this letter. If you have any questions or require additional information, please contact Mr. Hossein Hamzehee at (805) 545-4720.

10 CFR 50.55a

Enclosure PG&E Letter DCL-18-090

## Diablo Canyon Power Plant Unit 1 and Unit 2

## 10 CFR 50.55a Relief Request NDE-SG-PZR-IRS

ASME Section XI Inservice Inspection Program Relief Request NDE-SG-PZR-IRS Steam Generator and Pressurizer Nozzle Inside Radius Sections

## 10 CFR 50.55a Relief Request NDE-SG-PZR-IRS

## Diablo Canyon Power Plant Unit 1 and Unit 2 ASME Code Relief Request In Accordance with 10 CFR 50.55a(z)(2)

## - Hardship Without a Compensating Increase in Quality and Safety -

## 1. American Society of Mechanical Engineers (ASME) Code Components Affected

ASME Code Class 1 Steam Generator and Pressurizer Nozzle Inside Radius Sections; ASME Section XI, Table IWB-2500-1, Category B-D, Items B3.120 and B3.140 (Inspection Program B) of the 1998 Edition, as specified in 10 CFR 50.55a(b)(2)(xxi)(A).

## 2. Applicable Code Edition and Addenda

The Code Edition and Addenda applicable to the Diablo Canyon Power Plant (DCPP) Unit 1 and Unit 2 fourth inservice inspection intervals is ASME Section XI, 2007 Edition with Addenda through 2008. Use of Table IWB-2500-1, Category B-D, Items B3.120 and B3.140 (Inspection Program B) of the 1998 Edition is required by 10 CFR 50.55a(b)(2)(xxi)(A).

#### 3. Applicable Code Requirement

Volumetric examination of the volume depicted in Figure IWB-2500-7(a) through (d), as applicable, once during the inspection interval for all steam generator nozzle inside radius sections and all pressurizer nozzle inside radius sections, with acceptance standard IWB-3512 is required by the 1998 edition as referenced in 10 CFR 50.55a(b)(2)(xxi)(A).

Per 10 CFR 50.55a(b)(2)(xxi)(A), a visual examination with magnification that has a resolution sensitivity to resolve 0.044 inch (1.1mm) lower case characters without an ascender or descender (e.g., a, e, n, v), utilizing the allowable flaw length criteria in Table IWB-3512-1, 1997 Addenda through the latest edition and addenda incorporated by reference in 10 CFR 50.55a(a)(1)(ii), with a limiting assumption on the flaw aspect ratio (i.e.,  $a/\ell = 0.5$ ), may be performed instead of the ultrasonic examination.

#### 4. <u>Reason for Request</u>

ASME Code Case N-619, which eliminated the ASME Code requirement for nozzle inside radius examinations on Class 1 steam generators and pressurizers, was approved by ASME on February 15, 1999. Also at that time, ASME Section XI eliminated the requirement to examine steam generator and pressurizer nozzle inside

radius sections in all editions and addenda of Table IWB-2500-1, Category B-D, after the 1998 edition. No relevant detections had been found at U.S. pressurized water reactor (PWR) facilities at that time, which remains the case today.

All Class 1 steam generator and pressurizer nozzle inside radius sections are covered with corrosion resistant, welded stainless steel cladding which is not credited as part of the pressure retaining boundary. During visual examinations conducted per 10 CFR 50.55a(b)(2)(xxi)(A), the actual pressure boundary is thus not visible due to the presence of the protective cladding.

#### Inspection of steam generators nozzles inside radius sections

The DCPP steam generator nozzles are SA-508 Grade 3 Class 2 carbon steel, integrally forged with the channel head and then clad with weld-deposited stainless steel. Pipe weld distances from the edge of the inside radius examination volume are presented in Table 1. The data presented in Table 1 indicate that the locations of the nozzle-to-pipe welds have no impact on the scope of the inside radius examinations since the heat-affected zone is well removed from the examination area. The steam generator nozzle inside radius sections are challenging to examine ultrasonically due to the varying external geometry and surface contours around the nozzle circumference. In past inspection intervals, relief from conducting volumetric examination of steam generator nozzle inside radius sections had been granted due to the continuously variable external geometry and surface contours making ultrasonic examination impractical. PG&E believes the provision for alternate visual inspection in 10 CFR 50.55a(b)(2)(xxi)(A) was intended to make these steam generator examinations physically practicable by using a non-volumetric technique.

Visual examinations performed in the third interval per 10 CFR 50.55a(b)(2)(xxi)(A) required personnel to wear special protective suits and respiratory protection to accomplish the following: (1) enter the steam generator bowl to install and accurately position a locating fixture and a remotely operated camera system that is capable of the required resolution; (2) exit the steam generator bowl and stand by the open manway outside the steam generator as the remotely controlled camera system scanned the inspection area; (3) re-enter the steam generator bowl to remove the camera system and fixture; and (4) re-exit the bowl. The steam generator bowl entries put examination personnel at risk of physical injury both during passage through the manways and while handling the camera system components inside the confines of the steam generator bowl. Based on the third interval experience, the cumulative radiation exposure required to examine all steam generator nozzles during the fourth interval would be approximately 800 millirem for each unit (i.e., 1600 millirem for both Unit 1 and Unit 2). Additional dose would be incurred for data recording and incidental support. These totals do not include the dose required for installing nozzle dams, which also support other activities.

The Unit 1 steam generators were installed during the Unit 1 Fifteenth Refueling Outage in 2009. The Unit 2 steam generators were installed during the Unit 2 Fourteenth Refueling Outage in 2008. Extensive construction and preservice inspections were conducted prior to service, including the nozzle inside radius sections, with no flaws identified.

Despite the attendant difficulties, required visual examinations of steam generator and pressurizer nozzle inside radius sections were performed during subsequent outages in the third inspection interval with no recordable indications and no degradation detected.

## Inspection of original steam generators – operating experience (OE)

The original steam generators had nozzle dam rings welded to the stainless steel cladding after construction was complete. This welding caused local fissures in the cladding near the nozzle inside radius sections that was determined to be arrested in the cladding. Those local fissures did not propagate into the base material. In the new steam generators, nozzle dam rings were incorporated during vessel fabrication and did not cause conditions that were observed in the original steam generators. The radius of the nozzles in the original steam generators and the current steam generators are approximately the same. In summary, no service-related degradation was identified in the nozzle inside radius sections of the original steam generators. This OE was consistent with the overall industry experience.

#### Inspection of pressurizer nozzle inside radius sections

The Unit 1 pressurizer nozzles are SA-216 Grade WCC carbon steel, integrally cast with the vessel heads and then clad with stainless steel. The Unit 2 pressurizer nozzles are SA-508 Class 2 carbon steel similar to Section XI Figure IWB-2500-7(b), welded into the vessel heads and then clad with stainless steel. The spray and surge nozzles in both units each have stainless steel thermal sleeves. Head weld (for Unit 2) and pipe weld distances from the edge of the inside radius examination volume are presented in Table 1. The data presented in Table 1 indicate that the locations of the nozzle-to-head (for Unit 2) and nozzle-to-pipe welds have no impact on the scope of the inside radius examinations since the heat-affected zone is well removed from the examination area. Pressurizer nozzle inside radius sections are not practical to examine visually due to no practicable way to mount a camera system in the upwardoriented spray, safety, or relief nozzles, or in the surge line nozzle, which is obstructed from the manway by the internal heater support structure and the heater penetrations. Additionally, there is no other reason to open the pressurizer, and the process of manway cover removal would entail additional unnecessary radiation exposure to personnel and potential equipment damage. Accordingly, the ultrasonic examinations specified in the 1998 edition of Section XI were performed in the third inspection interval.

Ultrasonic examination personnel (including insulation removal, radiation protection and inspection) conducting the pressurizer nozzle inside radius section examinations receive added radiation exposure (dose rates estimated to be 330 millirem per hour at the surge line, 65 millirem per hour at the spray line, and 10 millirem per hour at the safety and relief nozzles) at the pressurizer head areas while conducting the examinations. Cumulative dose during October 2014 for ultrasonic examination of the Unit 2 surge line, spray line, and one (of four) relief line nozzles completed at that time was 198 millirem.

Both the DCPP Unit 1 and Unit 2 pressurizers are original equipment, having entered service in 1985 and 1986, respectively. Preservice inspections and follow-up inservice inspections conducted since that time through the third inspection interval have not detected any flaw conditions or degradation in the nozzle inside radius sections.

PG&E performed a detailed review of the recorded industry experience for steam generator and pressurizer nozzle inside radius sections at U.S. PWR facilities. This review did not identify any detected flaw indications and did not find the presence of any degradation mechanism. Therefore, PG&E has not performed any postulated flaw growth calculations for the nozzle inside radius sections.

## 5. Basis for Relief Request

PG&E proposes not to perform the inside radius section examinations on the steam generator and pressurizer nozzles at DCPP Unit 1 and Unit 2 as currently specified in 10 CFR 50.55a(b)(2)(xxi)(A) during the current fourth inservice inspection interval.

The cumulative industry experience has demonstrated that neither the volumetric nor the visual examinations have indicated any evidence of degradation that warrants personnel exposure to the industrial safety hazard and radiation dose inherent in performing these examinations.

## 6. <u>Conclusions</u>

PG&E performed a detailed review of the internal and external OE. This review did not identify any detected flaws in steam generator or pressurizer nozzle inside radius sections at DCPP or any other U.S. PWR facility. The lack of benefit from performing these examinations, the high cumulative radiation exposure of more than 1000 millirem for each unit (i.e., 2000 millirem for both Unit 1 and Unit 2), the potential safety risk to personnel, and the high cost of performing the required examinations constitute a hardship without a compensating increase in quality and safety per 10 CFR 50.55a(z)(2). As a result, PG&E is requesting NRC approval of the proposed relief request.

## 7. Duration of Proposed Relief Request

The proposed relief would apply for the duration of the current fourth inservice inspection interval through the termination of the operating licenses. For Unit 1, the fourth interval started in May 2015 and the license expires in November 2024. For

Unit 2, the fourth interval started in March 2016 and the license expires in August 2025.

## 8. Precedents

On July 30, 2018, NRC staff hosted a meeting to present proposed changes to 10 CFR 50.55a that NRC staff may incorporate into proposed rulemaking in the future. Topics addressed included incorporation by reference of 2015 – 2017 ASME Code editions and changes to additional requirements on the use of ASME Code editions currently specified in the regulation (ADAMS Accession No. ML18205A385). The subject of "Section XI Removing Conditions" was discussed on p. 24 of the Staff presentation, where several topics were listed. One of those listed topics was "Table IWB-2500-1 examination requirements pressurizer and steam generator IRS [inside radius section] examinations," indicating that these examinations are being considered for removal from the regulation.

PG&E is submitting this request in advance of publication of the proposed regulation because inside radius examinations are nominally scheduled for the Unit 2 Twenty-First Refueling Outage in late 2019.

## 9. <u>References</u>

- 1) ASME B&PV Code Section XI, 2007 Edition through 2008 Addenda, Table IWB-2500-1, Category B-D.
- 2) 10 CFR 50.55a(b)(2)(xxi)(A).
- 3) ASME B&PV Code Section XI, 1998 Edition, Category B-D, items B3.120 and B3.140 (Inspection Program B) per Reference 2.
- 4) NRC Public Meeting "Proposed Rule to Incorporate by Reference the 2015 and 2017 Editions of ASME Codes into 10 CFR 50.55a," dated July 30, 2018 (ADAMS Accession No. ML18205A385), pages 9 and 24, "Section XI Removing Conditions."

# Table 1: Head Weld and Pipe Weld Distances from Edge of Inside RadiusExamination Volume (estimated based on vendor drawings)

Edge of Inside Radius Examination Volume	Head Weld Distance (inches)	Pipe Weld Distance (inches)
Unit 1 and Unit 2 Steam Generators Hot and Cold Legs Nozzles	Not Applicable <sup>(1)</sup>	7.8 in.
Unit 1 Pressurizer Surge Line Nozzle	Not Applicable <sup>(1)</sup>	11.0 in.
Unit 1 Pressurizer Safety and Relief Nozzles	Not Applicable <sup>(1)</sup>	5.5 in.
Unit 1 Pressurizer Spray Nozzle	Not Applicable <sup>(1)</sup>	6.2 in.
Unit 2 Pressurizer Surge Line Nozzle	2.7 in.	13.0 in.
Unit 2 Pressurizer Safety and Relief Nozzles	2.5 in.	6.7 in.
Unit 2 Pressurizer Spray Nozzle	2.6 in.	7.7 in.

NOTE (1): Nozzle is integrally formed with vessel head (not welded)