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PG&E Letter DCL-20-088

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

Docket No. 50-323, OL-DPR-82
Diablo Canyon Unit 2
Response to NRC Request for Additional Information Regarding "Diablo Canyon Unit 2 Fall 2019 Steam Generator Tube Inspection Report"

References: 1. PG&E Letter DCL-20-039, "One Hundred Eighty Day Steam Generator Report for Diablo Canyon Power Plant Unit 2 Twenty-First Refueling Outage," dated May 13, 2020, ADAMS Accession No. ML20134J139

2. E-mail from NRC Senior Project Manager, Samson Lee, "Request for additional information: Diablo Canyon Unit 2 Fall 2019 Steam Generator Tube Inspection Report (EPID: L-2020-LRO-0026)," dated September 17, 2020, ADAMS Accession No. ML20261H423

Dear Commissioners and Staff:

In Reference 1, Pacific Gas and Electric Company (PG&E) submitted a 180-day report for steam generator inspections performed during the Diablo Canyon Power Plant Unit 2 Twenty-First Refueling Outage. In Reference 2, the NRC Staff provided a request for additional information (RAI) via an e-mail, dated September 17, 2020. The enclosure to this letter provides the PG&E responses to the RAI.

This letter does not contain any new or revised regulatory commitments (as defined by NEI 99-04).

If you have any questions or require additional information, please contact Mr. James Morris at (805) 545-4609.

Sincerely,

Paula Gerfen
Site Vice President

rntt/51089396
Enclosure
cc: Diablo Distribution
cc/enc: Donald R. Krause, NRC Senior Resident Inspector
Samson S. Lee, NRR Senior Project Manager
Scott A. Morris, NRC Region IV Administrator
Gonzalo L. Perez, Branch Chief, California Department of Public Health

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3. Westinghouse Report SG-CDMP-19-15, "Diablo Canyon Unit 2 2R21 Condition Monitoring and Operational Assessment," Revision 0, November 2019 (Westinghouse Non-Proprietary Class 3)
4. Westinghouse Letter LTR-CECO-19-064, Revision 0, "Evaluation of Foreign Object in the Secondary Side of Diablo Canyon Unit 2 Replacement Steam Generators – Fall 2019 2R21 Outage," October 18, 2019 (Westinghouse Proprietary Class 2)
5. Westinghouse Report SG-CECO-17-001, Revision 0, "Diablo Canyon Unit 2 Steam Generator Secondary Side Maintenance Optimization Evaluation for Fuel Cycle 20," January 2018 (Westinghouse Proprietary Class 2)
6. "Steam Generator Management Program: Steam Generator Integrity Assessment Guidelines," Revision 4, EPRI Report 3002007571, June 2016
7. "Steam Generator Management Program: Steam Generator Degradation Specific Management Flaw Handbook," Revision 2, EPRI Report 3002005426, October 2015

NRC Request for Additional Information:

1. *Section 1.2 of the report states that the 2R21 (fall 2019) SG tube inspection is the last one planned for the Diablo Canyon Unit 2 SGs, but that a license amendment would be necessary to operate four cycles to retirement in 2025 without inspection. TS Section 5.5.9 currently allows no more than three operating cycles without an SG tube inspection. Referring to Section 4.3 of the report, the feedwater heater appears to be an active source of foreign objects with the ongoing potential to cause wear and affect tube integrity, including an object that remained lodged between two tubes at the end of 2R21. These and*

other foreign objects and loose parts will be a potential source of tube degradation throughout the life of the SGs. Therefore, please provide the following information about meeting the tube integrity performance criteria in TS 5.5.9:

a. *A description of how the operational assessment addresses foreign objects in the SGs.*

b. *A description of any secondary-side inspection and foreign object search and retrieval plans for the remaining refueling outages, even if no primary-side eddy current examinations are performed.*

PG&E Response to RAI 1.a:

As noted in the 180-day report (Reference 1), a license amendment is necessary to operate the Diablo Canyon Power Plant (DCPP) Unit 2 for four cycles without eddy current testing inspections of the steam generators (SGs). PG&E intends to submit a license amendment request to adopt Technical Specifications Task Force Traveler TSTF-577, "Revised Frequencies for Steam Generator Tube Inspections."

Westinghouse performed the Unit 2 twenty-first refueling outage (2R21) operational assessment (OA) (Reference 3). This OA was performed for the four-cycle operating interval from 2R21 to the end of the Unit 2 operating license in 2025, estimated to be 5.36 effective full power years (EFPY).

The Westinghouse OA (Reference 3) addresses foreign object wear in accordance with the guidance of the Electric Power Research Institute (EPRI) Steam Generator Integrity Assessment Guidelines (IAGL) (Reference 6). The IAGL in Section 8, Operational Assessment, states that the results of secondary side inspections should be evaluated if tube integrity can be impacted. The IAGL in Section 10, Maintenance of Secondary Side Integrity, states that the OA shall include aspects of secondary side conditions that could affect tube integrity, such as foreign material remaining in the SGs, material degradation that could generate foreign objects during operation, and degradation of support structures.

The Westinghouse OA (Reference 3) provides the following information regarding foreign object wear.

Foreign object wear has not been detected within the DCPP Unit 2 SGs through the 2R21 SG inspections. Foreign object wear is categorized as a potential degradation mechanism by the 2R21 Degradation Assessment. Section 10 of the EPRI Steam Generator IAGL (Reference 6) states the following:

The SG secondary side integrity assessment shall determine an appropriate Foreign Object Search and Retrieval (FOSAR) inspection interval. FOSAR should be performed each time sludge lancing is performed and/or when loose

parts are identified or there is reason to expect that foreign material was introduced in the SG secondary side. The FOSAR interval is determined based on the plant's historical foreign objects, foreign object wear indications (none for DCPP Unit 2), maintenance activities, and planned primary side inspection intervals (2R21 is the last planned primary side inspection for DCPP Unit 2). The evaluation should consider the following elements:

- location and description of historical foreign objects
- description of foreign objects with associated wear indications
- high secondary side fluid flow, or other susceptible areas
- secondary side inspection limitations
- the type of material entering the SGs and potential for tube degradation
- plant specific and industry trends for foreign object wear
- foreign material collection or trapping system. (As noted in the 180-day report [Reference 1], each SG feedwater feedring contains 38 spray nozzles to distribute the feedwater into the SG, and the spray nozzles have small, 0.27-inch diameter holes to help prevent the introduction of foreign material of significant size.)

Table 1 below, from the Westinghouse OA (Reference 3), lists the foreign material found during the 2R21 FOSAR activities. This material found is also representative of the material found on the sludge lancing grit tank screens from 2R21 and prior outages. The table also identifies the foreign material remaining in the SGs that was found during the 2R21 FOSAR activities. The OA provides dispositions of these objects for the remaining life of DCPP Unit 2 SGs and no further FOSAR is recommended for these objects.

In support of the assessment of Object 7 (feedwater heater [FWH] tube support/baffle plate fragment wedged between hot leg tubes R51C65 and R52C66 in SG 2-4), a separate Westinghouse analysis (Reference 4) was completed. This Westinghouse analysis evaluated Object 7 to be acceptable for the remaining life of DCPP Unit 2. If this object became dislodged during operation, it would likely migrate to lower flow regions of the bundle (in the direction of the flow), which is also acceptable for the remaining life of Unit 2. This Westinghouse analysis also evaluated tube wear for similar sized FWH tube support/baffle plate fragments that could exist in other areas of the top of the tubesheet of the SGs. In all top of tubesheet areas of the SG, similar size objects are acceptable for 5.36 EFPY and may remain in the SGs without tube plugging. Therefore, no FOSAR for these potential objects is recommended for the remaining four cycles of DCPP Unit 2.

The Westinghouse calculation performed in support of Reference 4 includes the following conservatisms:

- An existing foreign object wear flaw of 20 percent through-wall (TW) is assumed to exist starting at 2R21. This is conservative for the fragment wedged in SG 2-4 because +POINT probe inspection reported no tube

degradation. This assumption is also appropriate for top of tubesheet areas that were not inspected by +POINT probe. As discussed in the 180-day report (Reference 1), a bobbin coil 3-frequency mix ("turbo" mix) was used for the detection of foreign object wear at the top of the tubesheet expansion transition, and the turbo mix has a high likelihood of detecting potential wear flaws from fragments that are 20 percent TW and greater.

- The minimum calculated wear time was 6.01 EFPY, until the flaw reached the structural limit. This wear time conservatively bounds the predicted 5.36 EFPY remaining life.

- Wear rates are based on fragment location and secondary side top of tubesheet flow rates. Lodged fragments are assumed to be located above the sludge pile to account for higher potential tube vibration, which is conservative because the actual lodged part is located at the top of tubesheet, and there was no sludge pile observed during 2R21. Flow rates for the lodged fragment are based on the actual tube location, and flow rates for postulated lodged fragments are based on the highest top of tubesheet flow rate. The top of tubesheet areas of the highest flow rates were visually inspected in 2R21 and no fragments were found. Therefore, the analysis conservatively accounts for a potential fragment becoming lodged in the future in the worst-case top of tubesheet location.

- A volumetric wear structural limit of 64 percent TW was applied. This is conservative because 64 percent TW represents the structural limit as calculated by the Westinghouse single flaw model which takes into account a 0.25 inch axial wear scar, the EPRI Flaw Handbook (Reference 7) burst pressure equations for volumetric flaws of limited circumferential and axial extent, and tube material strength property and burst relation uncertainties at a probability of 0.95 at 50 percent confidence (95/50).

PG&E Response to RAI 1.b:

There are no plans for secondary-side inspection and foreign object search and retrieval plans for the remaining refueling outages for DCPP Unit 2.

Westinghouse previously performed a secondary side maintenance optimization evaluation (Reference 5) for the DCPP Unit 2 SGs through the end of the Unit 2 operating license in 2025. That evaluation notes that it satisfies the secondary side integrity assessment requirement from Chapter 10 of the EPRI Steam Generator Integrity Assessment Guidelines (Reference 6). The Westinghouse OA (Reference 3) states that the Reference 5 assessment and the 2R21 inspection findings conclude that secondary side maintenance and inspections—including sludge lancing, top of tubesheet FOSAR, steam drum component visual inspections, sludge collector visual inspections, upper tube bundle inspections, and chemical cleaning—are not recommended through the end of the Unit 2 operating license.

Table 1: DCPP 2R21 SG FOSAR Results (Table 2-8 in Reference 3)

Object ID	SG	Description	Fixity	Elev	Leg	Row	Col	Length, in.	Width, in.	Height, in.	Metallic	Retrieved	Figure No.
1	2-1	Feedwater heater tube support/baffle plate fragment	Loose, pushed to trough	TTS	CL	87	69	0.375	0.1875	0.125	Y	Y	B-9
2	2-1	Tie wrap (zip tie)	Loose	TTS	CL	Trough		2.5	0.3125	0.1875	N	Y	B-10
3	2-3	Feedwater heater tube support/baffle plate fragment	Loose, pushed to trough	TTS	HL	92	62	0.4	0.1875	0.1875	Y	Y	B-11
4	2-3	Gasket foil	Loose	TTS	CL	24	20	0.25	---	---	Y	N	B-4
5	2-3	Gasket foil	Loose	TTS	CL	25	21	0.25	---	---	Y	N	B-5
6	2-4	Glass-like fragment	Loose	TTS	CL	Trough		0.3	0.15	0.15	N	N	B-6
7	2-4	Feedwater heater tube support/baffle plate fragment	Wedged between R51C65 and R52C66	TTS	HL	51	65	0.4	0.25	0.25	Y	N	B-3
8	2-4	Gasket foil	Loose	TTS	HL	86	61	0.3	0.1	0.025	N	N	B-7
9	2-1	Small wire	Loose	TTS	CL	10	105	0.7	0.003	0.003	Y	Y	B-12
10	2-2	Feedwater heater tube support/baffle plate fragment	Initially wedged at R5C47 and R6C48, freed during retrieval	TTS	CL	5	47	0.4	0.25	0.25	Y	Y	B-13
11	2-2	Small wire	Loose	TTS	CL	6	47	0.5	0.003	0.003	Y	N	B-8

Note: Figure No. refers to the picture of the object that is included in the Westinghouse OA (Reference 3). "TTS" is "top of tubesheet."