Pacific Gas and Electric Company®

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

April 24, 2018

PG&E Letter DCL-18-026

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

10 CFR 50.4
10 CFR 50.155

Docket No. 50-275, OL-DPR-80
Docket No. 50-323, OL-DPR-82
Diablo Canyon Power Plant Units 1 and 2
NEI 12-06, Appendix H, Revision 4, H.4.5 Path 5: GMRS > 2 X SSE, Mitigating Strategies Assessment (MSA) report for the New Seismic Hazard Information

References:

1. NEI 12-06, Revision 4, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," December 2016, ADAMS Accession Number ML16354B421

2. NRC Interim Staff Guidance JLD-ISG-2012-01, Revision 2, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigating Strategies for Beyond-Design-Basis External Events," February 2017, ADAMS Accession Number ML17005A188

3. PG&E Letter DCL-15-035, "Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding the Seismic Aspects of Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident: Seismic Hazard and Screening Report," dated March 11, 2015, ADAMS Accession Number ML15071A046

4. PG&E Letter DCL-15-154, "Response to NRC Request for Additional Information dated October 1, 2015, and November 13, 2015, Regarding Recommendation 2.1 of the Near-Term Task Force Seismic Hazard and Screening Report," dated December 21, 2015, ADAMS Accession Numbers ML15355A550 and ML15355A551

5. NRC Letter, "Diablo Canyon Power Plant, Unit Nos. 1 and 2 - Staff Assessment of Information Provided under Title 10 of the Code of Federal Regulations Part 50, Section 50.54(f), Seismic Hazard Reevaluations for Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident," dated December 21, 2016, ADAMS Accession Number ML16341C057

A010
NRR

6. PG&E Letter DCL-18-027, "Seismic Probabilistic Risk Assessment for the Diablo Canyon Power Plant, Units 1 and 2 - Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1: Seismic of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident," April 24, 2018

Dear Commissioners and Staff:

The purpose of this letter is to provide the results of the assessment for the Diablo Canyon Power Plant (DCPP) to demonstrate that Seismic Probabilistic Risk Assessment (SPRA) based alternate mitigating strategy can be implemented considering the impacts of the reevaluated seismic hazard. The assessment was performed in accordance with the guidance provided in Appendix H of Reference 1, which was endorsed by the NRC in Reference 2.

The Mitigating Strategies Seismic Hazard Information (MSSHI) is the licensee's reevaluated seismic hazard information at DCPP, developed using Probabilistic Seismic Hazard Analysis. In response to the NRC Letter "Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," dated March 12, 2012, Pacific Gas and Electric Company (PG&E) submitted the reevaluated seismic hazard information for DCPP including the uniform hazard response spectrum, ground motion response spectrum and the hazard curves to the NRC on March 11, 2015, and December 21, 2015 [References 3 and 4]. The NRC staff concluded that the MSSHI that was submitted adequately characterizes the reevaluated seismic hazard for DCPP [Reference 5]. Further, DCPP is submitting the updated SPRA to the NRC concurrently with this submittal [Reference 6].

Based upon the mitigating strategies assessment in the Enclosure, the mitigating strategies for DCPP can be implemented as designed without modifications.

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.

I state under penalty of perjury that the foregoing is true and correct.

Executed on April 24, 2018.

Sincerely,

James M. Welsch
Vice President, Nuclear Generation and Chief Nuclear Officer

Mjr/50702923
Enclosure
cc: Diablo Distribution
cc/enc:
Brian E. Holian, NRC/NRR Director (Acting)
Kriss M. Kennedy, NRC Region IV Administrator
Christopher W. Newport, NRC Senior Resident Inspector
Balwant K. Singal, NRR Senior Project Manager
Brett A. Titus, NRR Senior Project Manager

Pacific Gas and Electric Company

Diablo Canyon Power Plant
Units 1 and 2

License Nos. OL-DPR-80 and OL-DPR-82

Mitigating Strategies Assessment for the Diablo Canyon Power Plant

Mitigating Strategies Assessment

The purpose of this Mitigating Strategies Assessment (MSA) is to evaluate and demonstrate that the Diablo Canyon Power Plant (DCPP) can mitigate the effects of the reevaluated seismic hazard information developed pursuant to the NRC's 10 CFR 50.54(f) letter dated March 12, 2012 [Reference 1]. The assessment was performed in accordance with the guidance provided in [Reference 2] which discusses a method to develop an alternate mitigating strategy (AMS) to address the mitigating strategies seismic hazard information (MSSHI). NRC Interim Staff Guidance JLD-ISG-2012-01 [Reference 3] provides an NRC staff position that the method described in Section H.4.5 (in combination with Section H.4.6) of Reference 2 for an AMS is acceptable for mitigating a beyond-design-basis external event.

An evaluation has been performed for DCPP in accordance with H.4.5.5 of Reference 2. The approach uses the updated DCPP seismic probabilistic risk assessment (SPRA) results and insights regarding extended loss of AC power (ELAP) and loss of normal access to the ultimate heat sink (LUHS) scenarios for which the mitigating strategies are targeted to identify the degree to which the mitigating strategies are effective for MSSHI, and to determine if enhancements to the mitigating strategies are warranted. The SPRA is used to help determine whether modifications to mitigating strategies are needed to enhance plant safety and reduce the risk from ELAP/LUHS scenarios. The focus is on the safety benefit in terms of the potential risk reduction (delta seismic core damage frequency (SCDF) and delta seismic large early release frequency (SLERF)) that would be obtained by modifying mitigating strategies structures, systems, and components (SSCs), considering all sequences in which mitigating strategies SSCs contribute. If the risk reduction that would be obtained is small, then the mitigating strategies are effective for the MSSHI without changes, since changes would not provide a meaningful improvement in protection against the impacts of the MSSHI. If the risk reduction is not small, then the SPRA is used to identify effective improvements to provide reasonable protection of the integrated plant mitigating capability. The process and significant results are described in the following paragraphs.

Consistent with Section H.4.5.5 of Reference 2, the DCPP base SPRA (Reference 11), which is being submitted to NRC for review concurrently with this MSA, has been peer reviewed in accordance with the expectations set forth in Electric Power Research Institute (EPRI) Report No. 1025287 (Reference 8), and reflects the resolution of peer review findings. The SPRA scenarios account for long term supply of consumables for mitigating strategies, (e.g., long-term supply of water for steam generator cooling).

The base results of the SPRA for DCPP are: 2.78×10^{-5}/yr. Base SCDF and 5.37×10^{-6}/yr. Base SLERF. Thus, the DCPP SPRA meets the criteria of SCDF $\leq 1 \times 10^{-4}$/yr. and SLERF $\leq 1 \times 10^{-5}$/yr., including the impacts of earthquake-induced consequential events (e.g., internal flooding), such that the mitigating strategies and plant features are sufficient

to limit risk from the spectrum of impacts to an acceptable level as defined by Section H.4.5.5 of Reference 2.

Section H.4.5.5 of Reference 2 requires calculation of a future "Base ELAP/LUHS SCDF" and future "Base ELAP/LUHS SLERF," which reflect the future plant configuration (see the DCPP SPRA submittal (Reference 7) for a discussion of the assumptions used in the as-built/as-operated model[1]). It also requires calculation of a "Reference ELAP/LUHS SCDF" and a "Reference ELAP/LUHS SLERF." In this process, both the Base and Reference cases reflect the contributions of ELAP/LUHS sequences modeled in the SPRA, and also any non-ELAP/LUHS sequences that are mitigated by mitigating strategies SSCs that appear in ELAP/LUHS sequences. These combined SCDF and SLERF impacts are referred to as the "expanded ELAP/LUHS sequence Base" and "expanded ELAP/LUHS sequence Reference" cases. The difference between the expanded ELAP/LUHS sequence Base SCDF and the expanded ELAP/LUHS sequence Reference SCDF is the ELAP/LUHS delta SCDF of interest (and similar for ELAP/LUHS delta SLERF).

- **CASE 1 - Plant SPRA Model Includes FLEX:**

  The DCPP SPRA model includes limited modeling of diverse and flexible coping strategies (FLEX). Two recovery actions from the FLEX ELAP guidelines were utilized. These actions are to extend vital battery life and to manually control the turbine driven auxiliary feedwater pump for ELAP scenarios. No FLEX mobile equipment was credited. The expanded ELAP/LUHS sequence Reference Case assumes that the seismic $C_{10\%}$ capacities of the mitigating strategies SSCs can be made at least equal to the ground motion response spectrum (GMRS). To determine the expanded ELAP/LUHS sequence Reference Case, the fragilities in the SPRA are adjusted to be based on a seismic $C_{10\%}$ capacity equal to the GMRS for the ELAP/LUHS SSCs modeled in the SPRA, for those SSCs for which the capacities are not already greater than or equal to the GMRS. See Reference 12 for comparison of $C_{10\%}$ capacities.

- **CASE 2 - Plant SPRA Model Does Not Include FLEX:**

  Case 2 is not applicable to DCPP since the DCPP SPRA model includes FLEX.

- **RESULTS of CASE 1:**

  The following two components were identified that have a value of $C_{10\%}$ which is below the DCPP GMRS:

  - 230kV Offsite Power System
  - Firewater Piping in the Auxiliary Building

[1] These results are based on the commitment to modify the vital 480V switchgear room ventilation system ducts that is discussed in Section 6 and Section A.7 of the DCPP SPRA submittal report (Reference 7).

Of these, only the firewater piping is considered an ELAP/LUHS mitigating SSC, due to its impact on a credited water supply for steam generator cooling. The fragility for firewater piping was adjusted to perform the Reference Case calculation.

The results for the Base Case and Reference Case calculations are shown in Table 1. The Reference Case results are documented in the DCPP MSA Path 5 Assessment calculation (Reference 12). The Base Case results are documented in the DCPP SPRA quantification calculation (Reference 11).

Table 1 – Results of Base and Reference Case Model Calculations

Case	SCDF	SLERF	Delta SCDF	Delta SLERF
Base Case	2.78×10^{-5}	5.37×10^{-6}	N/A	N/A
Reference Case	2.77×10^{-5}	5.35×10^{-6}	1.00×10^{-7}	2.00×10^{-8}

The results of these model calculations show that the difference between the Base Case and Reference Case is less than the small residual risk criterion defined in Section H.4.5.4 and used in Section H.4.5.5 of Reference 2 of 1×10^{-5}/yr. for CDF and 1×10^{-6}/yr. for LERF.

The expanded ELAP/LUHS sequence delta SCDF and the expanded ELAP/LUHS sequence delta SLERF values determined for DCPP are 1×10^{-7}/yr. and 2×10^{-8}/yr., respectively, and are less than the small residual SCDF and SLERF values defined in Section H.4.5.4 and used in Section H.4.5.5 of Reference 2. Therefore, the mitigating strategies are capable of addressing the MSSHI without changes.

- **RESULTS of CASE 2:**

  Case 2 is not applicable to DCPP since the DCPP SPRA model includes FLEX.

Spent Fuel Pool Cooling Evaluation

The evaluation of spent fuel pool (SFP) cooling for DCPP was performed based on the initial conditions established in NEI 12-06 (Reference 2) for SFP cooling coping in the event of an ELAP/LUHS. If the beyond-design-basis external event (BDBEE) is seismic in origin, it is possible that a maximum of 16.4 inches of the water inventory from the SFP will be lost due to sloshing (Reference 9). The evaluation also used the results of pool heat up analyses from the ELAP evaluation as input.

The FLEX for SFP cooling utilizes SFP level monitoring and make-up capability is described in DCPP Final Integrated Plan (FIP) (Reference 9). In accordance with NRC Order EA-12-051, PG&E has installed reliable wide-range SFP instrumentation to monitor SFP level. The primary SFP make-up capability is provided using flexible hoses that

deliver water directly to the SFP. This system is capable of providing sufficient make-up assuming the design basis heat load. The source of make-up water is the plant raw water reservoir (RWR).

Permanently installed plant equipment is not relied on for the implementation of the SFP Cooling FLEX. The SFP integrity evaluations demonstrated inherent seismic margins of the SFP structure above the GMRS level (Reference 10). Because DCPP's FLEX for SFP cooling includes the use of a flexible hose directly from the discharge of the FLEX header to the SFP, an additional evaluation of the permanently installed FLEX make-up connection, plant equipment interfacing with the SFP, or the SFP emergency make-up piping is not required.

Consistent with the FIP (Reference 9), the primary FLEX for SFP cooling utilizes the following portable FLEX equipment:

- RWR Pumps
- RWR Discharge Manifolds
- RWR Hose Trailer
- FLEX Suction Headers

This equipment is stored at the Secondary FLEX Equipment Storage Facility (SFESF), which is located at elevation 308-ft., adjacent to the RWRs. The SFESF, including the anchorage for the portable equipment, were evaluated to ensure the equipment required for the SFP cooling strategy were adequate for the MSSHI (Reference 13).

Summary of Modifications

No plant modifications, nor procedure changes, have been identified in the MSA.

References

1. NRC Letter to All Power Reactor Licensees et al., "Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident," dated March 12, 2012, ADAMS Accession Number ML12053A340.

2. NEI Report 12-06, Revision 4, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," December 2016, ADAMS Accession Number ML16354B421.

3. NRC Interim Staff Guidance JLD-ISG-2012-01, Revision 2, "Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigating Strategies for Beyond-Design-Basis External Events," February 2017, ADAMS Accession Number ML17005A188.

4. PG&E Report, "Seismic Hazard and Screening Report - Diablo Canyon Power Plant, Units 1 and 2," Enclosure 1 to PG&E Letter DCL-15-035, "Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding the Seismic Aspects of Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident: Seismic Hazard and Screening Report," dated March 11, 2015, ADAMS Accession Number ML15071A046.

5. PG&E Report, "Response to NRC Request for Additional Information dated October 1, 2015 and November 12, 2015 Regarding DCPP Seismic Hazard and Screening Report," Enclosure to PG&E Letter DCL-15-154, "Response to NRC Request for Additional Information dated October 1, 2015, and November 12, 2015, Regarding Recommendation 2.1 of the Near-Term Task Force: Seismic Hazard and Screening Report," dated December 21, 2015, ADAMS Accession Numbers ML15355A550 and ML15355A551.

6. NRC Letter, "Diablo Canyon Power Plant, Unit Nos. 1 and 2 - Staff Assessment of Information Provided under Title 10 of the Code of Federal Regulations Part 50, Section 50.54(f), Seismic Hazard Reevaluations for Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident," dated December 21, 2016, ADAMS Accession Number ML16341C057.

7. PG&E Report, "Diablo Canyon Power Plant, Units 1 and 2, Seismic Probabilistic Risk Assessment in Response to 50.54(f) Letter with Regard to NTTF 2.1: Seismic Summary Report," Enclosure to PG&E Letter DCL-18-027, "Seismic Probabilistic Risk Assessment for the Diablo Canyon Power Plant, Units 1 and 2 - Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1: Seismic of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident," dated April 24, 2018.

8. EPRI Technical Report No. 105287, "Seismic Evaluation Guidance: Screening, Prioritization and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic," November 2012.

9. PG&E Report, "Final Integrated Plan - Diablo Canyon Power Plant, Units 1 and 2," Enclosure 3 to PG&E Letter DCL-16-077, "Pacific Gas and Electric Company's Notification of Full Compliance with Commission Order Modifying Licenses with Regard to Mitigating Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049) for Diablo Canyon Power Plant," dated July 28, 2016, ADAMS Accession Number ML16221A390.

10. PG&E Report, "Site-Specific Spent Fuel Pool Criteria for Diablo Canyon Power Plant," Enclosure to PG&E Letter DCL-17-108 "Spent Fuel Pool Evaluation Supplemental Report, Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident," dated December 18, 2017, ADAMS Accession Number ML17352A703.

11. PG&E Calculation No. F.6.5, Revision 3, "DCPP Seismic PRA Quantification."

12. PG&E Calculation No. 18-01, Revision 0, "MSA Path 5 Assessment."

13. PG&E Calculation No. EQP-728 (SAP DCA No. 9000041778) Part No. 000, Version No. 002, "Anchorage for FLEX Equipment Located in the Primary FLEX Equipment Storage Facility and the Secondary FLEX Equipment Storage Facility."