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PG&E Letter DCL-26-007

Dr. Per Peterson
c/o Diablo Canyon Independent Safety Committee
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Supplemental Response to the Nine Seismic Review Team Recommendations provided in the Diablo Canyon Independent Safety Committee Thirty-Fifth Annual Report on the Safety of Diablo Canyon Power Plant Operations - July 1, 2024, to June 30, 2025

Dear Dr. Peterson:

The enclosed supplemental response provides the additional information requested by the Diablo Canyon Independent Safety Committee (DCISC) regarding Pacific Gas and Electric Company's December 18, 2025, submittal addressing the nine recommendations from the Seismic Review Team, as documented in the DCISC Thirty-Fifth Annual Report on the safety of Diablo Canyon operations for the period of July 1, 2024, to June 30, 2025.

Sincerely,

Paula Gerfen

February 12, 2026
Date

Enclosure
cc/enc: Dr. Robert Budnitz
Lisa Darden
Dr. Andrew Kadak
Dr. Mark Kirk
Richard McWhorter, Jr.
Dr. Najmedin Meshkati
Robert Rathie
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BACKGROUND

The Seismic Review Team (SRT) (2025) developed nine recommendations addressed to Pacific Gas and Electric Company (PG&E) as part of its review of filings by Dr. Peter Bird to the U.S. Nuclear Regulatory Commission (NRC), Diablo Canyon Independent Safety Committee (DCISC), and California Public Utilities Commission (CPUC). The recommendations for future research focused on fault system modeling, geodetic modeling and Structures, Systems, and Components (SSC) modeling that the SRT felt could further elucidate and quantify seismic hazard associated with reverse faulting beneath the Irish Hills. The recommendations included:

FAULT SYSTEM MODELING

Recommendation 1: *The SRT recommends the development of a set of kinematically constrained structural models for reverse faults underlying the Irish Hills that can explain the folding observed since 5 Ma.*

Recommendation 2: *The SRT recommends dating of low-stand abrasion platforms offshore, south of the Irish Hills, to further constrain the rate of footwall subsidence and its contribution to the [Southwest Boundary Zone] SWBZ slip rate.*

Recommendation 3: *The SRT recommends monitoring of IRSL-dating efforts and reassessment, if necessary, of the MIS 5 age assignments for the Q1 and Q2 terraces surrounding the Irish Hills.*

Recommendation 4: *The SRT recommends further investigation of potential strike-slip faulting along the Los Osos trend and its impacts on the pattern of marine-terrace uplift.*

GEODETIC MODELING

Recommendation 5: *PG&E should follow up the SRT's preliminary work with a more complete study of the available GPS data.*

Recommendation 6: *The fault slip models that underlie the DCPP SSC should be developed into kinematic and mechanical models that can predict the interseismic deformation and can thus be directly tested against the GPS data.*

Recommendation 7: *PG&E should compute the relative contributions of strike-slip and reverse faulting to the regional deformation predicted by the SSC24 slip models and compare the values with the geodetic constraints.*

Recommendation 8: *Geologic slip-rate information should be acquired from the Rinconada and Huasna faults to permit better modeling of the shear component evident in the GPS data.*

SSC MODELING

> ***Recommendation 9:*** *PG&E should conduct modeling experiments to ascertain the sensitivity of DCPP hazard to the SSC modifications recommended by the SRT.*

The recommendations were accepted by the DCISC during its public meeting on October 23, 2025, and formally documented in DCISC's 35th annual report. PG&E submitted the following response to the recommendations to the DCISC on December 18, 2025:

> *PG&E will evaluate the SRT recommendations to identify items not covered by the LTSP, technically defensible, and likely to yield meaningful results. For qualifying topics, sensitivity studies and assessments will be conducted in 2026 to determine potential impacts on seismic hazard characterization. Findings will guide research prioritization and be reviewed by the DCISC SRT and Independent Peer Review Panel. This approach, discussed with the DCISC in September and October 2025, ensures systematic integration of significant hazard insights into LTSP planning."*

Through an email in January 2026, DCISC representatives asked PG&E to:

> "*Consider supplementing its Response to include additional information that is sufficient for the DCISC's Seismic Review Team to evaluate the technical adequacy of the response.*
>
> *Suggested additional information that could be provided which would support that objective include:*
>
> - *Respond to each of the nine recommendations individually, stating whether PG&E agrees that the Committee's recommendation for further action by PG&E is warranted. If PG&E concludes that no further action is needed on a recommendation, explain why.*
> - *If PG&E plans further action in response to a recommendation, summarize its priority relative to the other recommendations, as well as to the current priorities of the LTSP not considered by the SRT, and provide a timeframe for completing the response.*
> - *Evaluate which recommendations have the potential to make a significant impact on the hazard or have the potential to raise potentially significant uncertainties; i.e., identify which recommendations are "technically defensible" and "likely to yield meaningful results."*

In the supplemental responses below, PG&E addresses recommendations individually or in groups, where recommendations are closely related or have a similar research focus. For some recommendations, PG&E highlights how the proposed research topic is already considered in the PG&E SSC model, or has been prioritized for study based on past,

ongoing or planned research that may or could address the recommendation. If a research recommendation or model improvement has not been considered in the model or Long Term Seismic Program (LTSP), PG&E describes its initial qualitative assessment of the recommendation and the process it will use to evaluate the recommendation, its potential impact to hazard, and the associated time frame. Since the SRT recommendations were accepted by the DCISC, PG&E has developed tornado plots for the SSC and Ground Motion Characterization logic trees used in the 2024 model (PG&E, 2024). These are under review by experts at the B. John Garrick Institute for the Risk Sciences (Garrick Institute) and should be available for review by the DCISC later this year. PG&E has also developed a sensitivity source model focused on faults closest to the plant that can efficiently assess the impact of source parameter changes. This model is under review and may be used to develop sensitivities to evaluate the potential impact of SRT recommended model changes or prioritize SRT-recommended research.

In general, the relative priority of research tasks related to reverse faults beneath the Irish Hills is considered of medium importance based on current information and hazard model results, warranting ongoing LTSP research with the goal of reducing SSC uncertainties over a time frame of multiple years. Research tasks that are currently considered to be of a higher or equal priority under the LTSP, based on evaluation of tornado plots, include (1) projects associated with addressing ground motion model uncertainties, (2) projects addressing uncertainties in the Hosgri fault slip rate, and (3) projects exploring uncertainties related to time dependent behavior of fault sources. Such projects are currently prioritized for research funding. Another LTSP goal is to publish the results of LTSP-funded research focused on hazard significant faults in peer-reviewed journals. Much of this research is currently documented in AB-1632, SSHAC 3 or other reports or presentations.

SUPPLEMENTAL RESPONSES

Recommendation 1: The SRT recommends the development of a set of kinematically constrained structural models for reverse faults underlying the Irish Hills that can explain the folding observed since 5 Ma.

PG&E agrees that developing kinematically constrained structural models for reverse faults beneath the Irish Hills could be useful to support fault geometry models (FGMs) used in the SSC. The most recent work on this topic focused on reducing uncertainty in the subsurface geology and structure beneath the Irish Hills based on new seismic reflection data and revised geologic map information documented in the report for the Central Coastal California Coastal Imaging Project, which was focused on the Irish Hills and did not extend east of San Luis Obispo Creek (PG&E, 2014). While the FGMs in the PG&E SSC model are generally consistent with geologic structure and the uplift pattern of Late Quaternary marine terraces around the Irish Hills, they have not been developed into full kinematically constrained models that extend back to times on the order of 5 Ma (PG&E, 2015; 2024).

An existing LTSP goal is to develop and publish one or more structural models that explain Late Quaternary uplift of the Irish Hills. This goal is consistent with the SRT's recommendation. In late 2025, a preliminary review of available data that could be used to develop and constrain structural models found that the eastern part of the Pismo Basin between San Luis Obispo Creek and Arroyo Grande has geologic conditions and

relationships that have the potential to improve the understanding of the structural evolution and Quaternary deformation of the area, including to the west, beneath the Irish Hills. These geologic conditions and structural relationships appear to be clearer in the eastern Pismo Basin than in the vicinity of the Irish Hills and include: (1) a preserved Miocene to Pliocene geologic section, (2) more abundant subsurface data from hydrocarbon exploration (e.g. well logs, seismic reflection lines), and (3) potential preservation of fluvial terraces along multiple drainages that cross the eastern Pismo Basin and may be used to evaluate patterns of Pleistocene uplift. Using these data to develop cross sections across the eastern Pismo Basin to compare with cross sections beneath the Irish Hills would address the SRT's recommendation. The potential for developing useful models of post-5 Ma deformation of the Irish Hills can be evaluated as part of this process.

Development of new FGMs based on this work, or new information that can reject or down-weight existing FGMs, could increase or decrease seismic hazard. The impact will not be known until the new or revised models are developed and tested. If this work results in the validation of all or part of the existing FGMs in the PG&E SSC model, there would be little to no impact on hazard, and the result of making minor modifications to existing models would likely have little impact on hazard.

PG&E plans to continue work on this task in 2026, with a focus on compiling data for the analysis and establishing university or United States Geological Survey (USGS) research partners to collaborate on this research. A graduate student research project would take several years to complete.

Recommendation 2: The SRT recommends dating of low-stand abrasion platforms offshore, south of the Irish Hills, to further constrain the rate of footwall subsidence and its contribution to the SWBZ slip rate.

PG&E does not consider a program of dating low-stand abrasion platforms south of the Irish Hills to be a priority for LTSP funding for the following reasons:

- Direct dating of the platforms is not feasible: The lack of deposits overlying the offshore low-stand abrasion platforms precludes direct dating of the platforms. An alternative method to assess the platform ages is suggested below.
- Slip rate for the San Luis Bay fault is well-constrained: The slip rate for the San Luis Bay fault, which represents the section of the Southwest Boundary Zone closest to the plant, is based on vertical separation of the same datum – the Q2 marine terrace – across the hanging wall and footwall of the fault rather than hanging wall uplift relative to sea level. Little to no vertical separation has been found where the Shoreline fault crosses the platform.
- Footwall subsidence is a minimal contributor to total vertical deformation across the San Luis Bay fault: The exposure of bedrock in the footwall of the SWBZ offshore of the Irish Hills and lack of a footwall basin are consistent with little to no footwall subsidence. Thus, the majority of the vertical deformation signal is centered in the immediate vicinity of the fault.

- Low hazard implications: PG&E anticipates that minor amount of footwall subsidence would have no meaningful impact on hazard.

Although PG&E does not plan to date low stand abrasion platforms in the footwall of the SWBZ, the SRT's footwall subsidence model can be tested using the following datasets and models that are in development:

- An updated sequence stratigraphy model that incorporates new and reprocessed USGS offshore geophysics data and age constraints from sediments surrounding the footwall platform. A manuscript on this work is in process, with the goal of submitting to a journal for publication in 2026.
- Strand lines evaluated in the footwall of the San Luis Bay fault as part of the Shoreline fault studies (PG&E, 2011). A manuscript on documenting this work is planned, with the goal of submitting for publication in 2027.

The following datasets can be used to understand the relative ages and elevations of the footwall platform and to estimate the contribution from footwall subsidence.

- Existing 3D Seismic Data of the northern part of the Oceano fault collected as part of the Central Coastal California Coastal Imaging Project (PG&E, 2014)
- New CHIRP lines collected by the USGS across the Oceanic fault in late 2025 (USGS, Personal Communication). These data are currently being processed, and may show footwall deformation in sediments above the LGM erosion surface.

These datasets can be used to estimate footwall subsidence using dated or correlated low stand unconformities or deposits.

For aspects of this work that are not already in progress, the priority is low compared to other LTSP research tasks and will likely take several years. PG&E will provide updates on the development of these models and datasets and any findings related to footwall subsidence across the Southwest Boundary Zone as they become available.

Recommendation 3: The SRT recommends monitoring of IRSL-dating efforts and reassessment, if necessary, of the MIS 5 age assignments for the Q1 and Q2 terraces surrounding the Irish Hills.

PG&E agrees with this recommendation and already monitors developments in age assignments to the Q1 and Q2 marine terraces surrounding the Irish Hills because changes in marine terrace ages would impact slip rate estimates for San Luis Bay and Los Osos faults.

After the SRT began its review work, pIRSL dating results for the Cayucos marine terrace presented at the 2025 Cordilleran Section meeting of the Geological Society of America (Rivera et al., 2025) called into question the accepted MIS 5 age assignment used for correlative marine terraces in the vicinity of Diablo Canyon Power Plant (DCPP) (Hanson et al., 1994).

Since the SRT report in June 2025, the following developments have occurred:

- Muhs et al. (2025) published work reconciling geochronology and paleozoogeography for marine terraces around DCPP, supporting their earlier results indicating that the Q1 terrace likely dates to the MIS 5a high stand and the Q2 terrace has a mixture of ages and fauna that correlate to the MIS 5e and 5c high stands, suggesting reoccupation of the 5e terrace. The 2015 SSC model considered previously published terrace ages from Muhs et al., 2012. Potential impacts to terrace ages and sea level estimates used in the 2024 PG&E model will be assessed by the end of 2026.
- Recent dating of marine terraces by pIRSL at Cayucos, Palos Verdes and San Diego are generally consistent with published U-series ages (Onderdonk, personal communication). Marine terraces on Vandenberg and at the mouth of the Santa Ynez River are younger than coral ages from correlated marine terraces and represent an issue that the researchers need to resolve .

Recent and planned PG&E-sponsored LTSP activities related to monitoring age dating of marine terraces relevant to DCPP include:

- Sponsoring a field trip by Dr. Nate Onderdonk in August 2025 to share recent terrace dating results.
- Planned sponsorship of research to evaluate Dr. Onderdonk's terrace ages using alternative dating methods. This research could involve Dr. Mike Oskin (SRT) as a technical advisor.

This work is medium priority and ongoing, with incremental progress and publications expected over the next few years. PG&E will assess the impacts of any results and findings.

Recommendation 4: ***The SRT recommends further investigation of potential strike-slip faulting along the Los Osos trend and its impacts on the pattern of marine-terrace uplift.***

PG&E generally agrees with this recommendation, which is consistent with the LTSP goal to reduce uncertainty on the kinematics for hazard-significant faults around DCPP. This line of investigation also has a bearing on the alternative FGMs in the SSC model.

The PG&E SSC model already accounts for right lateral slip on the Los Osos fault in the outward vergent FGM. Based an analysis of over 180 channel thalweg fault crossing analyses presented at the 2012 SSHAC 3 Workshop 1, strike slip movement on the onshore section of the Los Osos fault was too small or distributed to register in the channel geomorphology along the northeast margin of the Irish Hills (Lettis, 2012). The channel analysis, based on a systematic evaluation stream channels across the fault zone on lidar bare earth digital elevation models and limited field checking, was only documented in a workshop presentation. Given the SRT and Independent Peer Review Panel's interest in

strike slip faulting on the Los Osos fault, PG&E plans to develop this work into a report by the end of 2026 and potentially publish the results in a peer reviewed journal in the future.

Other relevant ongoing LTSP research on this includes a PG&E-funded USGS Cooperative Research and Development Agreement (CRADA) project to develop a manuscript on the seismotectonics of the late Quaternary active Los Osos fault in Estero Bay that includes an evaluation of fault kinematics along different reaches of the fault. This work builds on CRADA funded research presented at the annual meeting of the American Geophysical Union in 2016 (Watt et al., 2016) and may incorporate findings from 2019 and 2025 USGS CHIRP surveys across the Los Osos fault in San Luis Bay. The project goal is to submit a manuscript for publication in late 2026 or early 2027.

It is PG&E's position that documentation of the stream channel analysis and publication of the seismotectonics of Los Osos faults provides the best opportunity to assess strike slip deformation on the Los Osos fault and addresses the SRT's request. This work is medium priority. PG&E anticipates that the USGS manuscript will be submitted by the end of 2026 or early 2027. Documentation of the stream channel offset analysis in a technical is planned for 2026.

Before the next DCISC meeting in June 2026, PG&E will meet with its review board to assess the potential to use vertical marine terrace deformation and Morro Bay subsidence to constrain the horizontal slip rate. Modeling exercises that attempt to kinematically link subsidence rates to strike slip rates are extremely sensitive to local fault geometry and will likely result in a modeled rate with significantly larger uncertainties than the stream channel analysis, making it a low research priority.

PG&E will also discuss with the USGS whether targets for horizontal slip rates on the offshore Los Osos fault were identified during CHIRP surveys of the Los Osos fault in fall of 2025.

Based on the SRT's recommendation, work to characterize lateral slip on the Los Osos fault will be prioritized over other research efforts that are focused on characterizing long term dip slip rates on the Los Osos fault at Memorial Terrace and older Quaternary marine terrace.

Recommendation 5: PG&E should follow up the SRT's preliminary work with a more complete study of the available GPS data.

Recommendation 6: The fault slip models that underlie the DCPP SSC should be developed into kinematic and mechanical models that can predict the interseismic deformation and can thus be directly tested against the GPS data.

Recommendation 7: PG&E should compute the relative contributions of strike-slip and reverse faulting to the regional deformation predicted by the SSC24 slip models and compare the values with the geodetic constraints.

Based on the SRT's initial findings and subsequent discussions, PG&E agrees that additional evaluation of GPS data and comparison to kinematic and mechanical models for faults between the San Andreas fault and Hosgri fault is useful confirmatory work for the

geologic rates and fault kinematics used in the PG&E model. PG&E would like to work directly with Scott Marshall starting in 2026 on the tasks listed in recommendations 5 through 7.

Recommendation 8: Geologic slip-rate information should be acquired from the Rinconada and Huasna faults to permit better modeling of the shear component evident in the GPS data.

Based on its discussions with the SRT in September 2025, PG&E agrees with this recommendation, as the Rinconada and Huasna fault slip rates are potentially a significant part of the slip budget west of the San Andreas fault.

Sensitivity studies for the SSHAC 3 project indicated that these faults are not hazard significant to the DCPP on their own, and any reasonably expected slip rate findings would not impact hazard at the plant. Given the low hazard significance of these faults, the research priority would typically be low. However, given the constraints these faults can provide to geodetic modeling, an objective to measure or constrain geologic slip rates of these faults is now considered a medium priority.

Successful Late Quaternary slip rate studies depend on a variety of factors, including the preservation of datable geomorphic features across the fault and site access. Even if these requirements are met, mapping, dating, and documenting results can take several years. A PG&E geologist will complete an initial literature review, geomorphic evaluation for potential sites, and site access review by the end of 2026. If developing slip rate constraints appear feasible, PG&E will potentially team with a university to develop the study into a masters or part of a Ph.D. project. If the study is successful, results are expected over the next several years.

Recommendation 9: PG&E should conduct modeling experiments to ascertain the sensitivity of DCPP hazard to the SSC modifications recommended by the SRT.

As stated above in the *Background* section, PG&E has developed a sensitivity source model focused on faults closest to the plant that can efficiently assess the impact of source parameter changes. This sensitivity source model is under review, and is intended to be used to evaluate the potential impact of alternative models and help prioritize additional research. SRT's recommendation to ascertain the sensitivity of DCPP hazard to the modifications suggested by the SRT's fault model is consistent with PG&E's plans for this sensitivity source model.

PG&E plans to complete its review of the sensitivity source model in early 2026 and use the SRT's recommended fault geometry as one of the initial test cases of the sensitivity model in 2026. PG&E recognizes that there are several components that need to be considered when implementing a sensitivity model that extends beyond the changes in fault dip suggested in the SRT's report. These considerations include how to model fault ramp-flat geometries within the seismogenic crust and how to adjust the frequency-magnitude distribution. Part of conducting the hazard sensitivity analyses for the SRT's model will include exploring and documenting possible alternative ways the model can be implemented in hazard and what the impacts are on hazard. PG&E notes this to underscore the idea that

sensitivity analyses are seldom straightforward, as changes to the progress on these efforts at scheduled public or fact finding meetings.

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