

RESOLUTION NO. 2023- 11

**RESOLUTION OF THE DIABLO CANYON INDEPENDENT SAFETY COMMITTEE
APPROVING REPORT ON FACT-FINDING MEETING
AT DIABLO CANYON POWER PLANT (DCPP)
ON MAY 5, 2023**

**THE DIABLO CANYON INDEPENDENT SAFETY COMMITTEE HEREBY
RESOLVES AS FOLLOWS:**

WHEREAS, the above-caption draft report having come regularly before the Committee on the agenda for consideration at the Committee's public meeting on June 28, 2023; and

WHEREAS, the Committee Members received and discussed the report;
and

WHEREAS, an opportunity was provided for public comment on the report.

NOW, THEREFORE, the Diablo Canyon Independent Safety Committee hereby approves that certain report entitled "Report on Fact-Finding Meeting at DCPP on May 5, 2023 by Robert J. Budnitz, Member, and Richard D. McWhorter and R. Ferman Wardell Consultants," copy on file in the office of the Committee's Legal Counsel, and a copy of the approved report was made available to the public at the public meeting and is attached to this resolution as Exhibit A.

THE FOREGOING RESOLUTION WAS ADOPTED at a regular meeting of the Diablo Canyon Independent Safety Committee held on the 28th day of June, 2023, by the following vote:

AYES: *BUDNITZ. LAM. PETERSON*

NOES: *0*

ABSENT: *0*

ABSTAIN:



Peter Lam, Chair

ATTEST:



Robert Rathie, Asst. Legal Counsel

Exhibit A

DIABLO CANYON INDEPENDENT SAFETY COMMITTEE

Report on

Fact-Finding Meeting on May 5, 2023 and Comprehensive Seismic Safety Update

by

**Robert J. Budnitz, Member, and
Richard D. McWhorter and R. Ferman Wardell, Consultants**

1.0 SUMMARY

The results of the DCISC May 5, 2023, Fact-Finding Meeting for the Diablo Canyon Power Plant (DCPP) are presented. The activities of the Fact-Finding Team (FFT) for this Fact-Finding Meeting were all performed remotely. They consisted of participating in an open and public meeting of the Independent Peer Review Panel (IPRP) and then of accounting for IPRP comments by developing a comprehensive update of earlier DCISC Fact Finding reports on the topic of seismic safety. The subjects addressed and summarized in Section 3 are as follows:

1. Independent Peer Review Panel Meeting on May 5, 2023
2. Comprehensive Seismic Safety Update

2.0 INTRODUCTION

This Fact-Finding Meeting for the DCPP was held to evaluate specific safety matters for the DCISC. The objective of the evaluation was to determine if PG&E's performance is appropriate and whether any areas revealed observations which are important enough to warrant further review, follow-up, or presentation at a public meeting. These safety matters include follow-up and/or continuing review efforts by the Committee, as well as those identified as a result of reviews of various safety-related documents.

Section 4 – Conclusions, highlights the conclusions of the FFT based on items reported in Section 3 - Discussion. These highlights also include the team's suggested follow-up items for the DCISC, such as scheduling future Fact-Finding Meetings on the topic, presentations at future public meetings, and requests for future updates or information from DCPP on specific areas of interest, etc.

Section 5 – Recommendations, presents specific recommendations to PG&E proposed by the FFT. These recommendations will be considered by the DCISC. After review and approval by the DCISC, this Fact-Finding Report, including its recommendations, will be provided to PG&E. The Fact-Finding Report will also appear in the DCISC Annual Report. It is expected that this report

will be considered for full DCISC approval at its Public Meeting on June 28-29, 2023. Contingent upon approval, it will represent the Committee's position.

3.0 DISCUSSION

3.1 Independent Peer Review Panel Meeting on May 5, 2023

DCISC Members Dr. Robert Budnitz and Dr. Per Peterson; Consultants Ferman Wardell, Richard McWhorter, and Andrew Kadak; and Counsel Robert Rathie attended the May 5, 2023, remote public meeting of the State of California's Independent Peer Review Panel (IPRP)¹ for seismic studies at DCP. However, only Dr. Budnitz participated actively in this public meeting and as part of the scheduled program. The DCISC last observed an IPRP meeting on October 26, 2022, when it concluded the following:

The Independent Peer Review Panel (IPRP) meeting was successful in clarifying its future role in light of Senate Bill 846. The DCISC should continue to attend future IPRP meetings and follow the IPRP's deliberations, findings, and recommendations.

This meeting's agenda was as follows:

1. Introduction of meeting attendees, announcements, and agenda
2. IPRP comments and questions on the DCISC's report on Diablo Canyon
3. Electric Power Research Institute review
4. PG&E Updates:
 - a. Selected Long Term Seismic Program (LTSP) research activities
 - b. Turkey-Syria earthquake
 - c. Questions
5. Open floor
 - a. San Luis Obispo Mothers for Peace – Dr. Peter Bird declaration

The meeting was called to order and chaired by Mr. David Zizmor, California Public Utilities Commission Regulatory Analyst. Besides the several IPRP members from various California government agencies, the attendees included several PG&E experts on seismology and seismicity, who collectively gave the PG&E presentation. In addition, there were about 20 other attendees, who were members of the public or representatives of various other organizations.

At the outset, Mr. Zizmor noted that because of directives contained in recent California legislation, Senate Bill 846 (SB846),² the IPRP and the DCISC now have a specific mandate to

¹ In 2015 the California State Legislature by enacting Public Utilities Code §712 directed the California Public Utilities Commission to convene and continue until August 26, 2025, an independent peer review panel to conduct an independent review of enhanced seismic studies and surveys of DCP Units 1 and 2, including the surrounding area of the facility and areas of nuclear waste storage.

² On September 2, 2022, Governor Newsom signed SB846 which allows for the potential expansion of operations at DCP beyond the current retirement dates, up to five additional years under specific conditions as provided. On

interact in the context of evaluating seismic-safety aspects of the proposal to extend the Diablo Canyon plant's licenses beyond the current expiration dates in 2024 and 2025. Specifically, SB846 by its enactment of Public Utilities Code §712.1 includes language that reads, "The DCISC shall ... consult with and incorporate into its assessments and recommendations the independent peer review panel established pursuant to Section 712."

The second item on the agenda was then introduced by Mr. Zizmor, who noted that the day before this meeting the IPRP had released to the public a new document (Reference 6.1.1), whose substance was comments and questions for the DCISC based on the IPRP's review of the DCISC's November 2022 Fact-Finding Report (Reference 6.1.2).³ Mr. Zizmor also introduced Dr. Robert Budnitz and noted that he would be the DCISC's spokesperson during this IPRP meeting. Dr. Budnitz in turn stated that although he would attempt to reply to the IPRP's technical questions and input, he was not in a position to speak formally for the DCISC. His remarks were to be understood as his own, not the DCISC's, although of course they were also understood to be his broad interpretations of the DCISC's positions and thinking. The DCISC responses to the IPRP comments and questions are incorporated into the DCISC's assessments and conclusions below in Section 3.2.

The principal discussion during the meeting covered a series of questions, remarks, and elaborations based on the individual items in the IPRP's document regarding a review of the November 2022 DCISC Fact-Finding Report. Some of the IPRP feedback to the DCISC was seeking modifications to the Fact-Finding Report to provide more detail, or more references, or more explanations. Some of it was a set of requests for access to the underlying reports and documents that the DCISC relied on in reaching its conclusions. And some of the IPRP feedback led to technical back-and-forth discussion to explore a few technical questions raised by the IPRP, mostly to elaborate orally on what had been written in the IPRP's document cited above. For some of the questions raised, PG&E's representatives made informational comments and they provided an update, including a timeline, on plans for performing the new seismic-safety assessment that PG&E itself must perform as one of the mandates in SB846. Dr. Budnitz stated that the DCISC would try to reply to requests for information and further explanations and would supplement the Fact-Finding Report as appropriate.

The next agenda item was a discussion of a recent project performed by the Electric Power Research Institute (EPRI). In a nuclear power plant, Nuclear Regulatory Commission (NRC) regulations require that certain specified structures and equipment that play important roles in maintaining nuclear safety in large earthquakes must be designed to a design-basis earthquake, the site-specific specification for which is contained in NRC regulations. Other structures and equipment are not required to be designed for the same site-specific specification for large earthquakes, and they are usually designed to other industry codes and standards. The EPRI study examined the behavior in earthquakes for this latter category of other structures and equipment.

January 20, 2023, the California Public Utilities Commission issued an Order Instituting Rulemaking (Rulemaking 23-01-007).

³ The November 8,9,10, 2022 Fact-finding Report was approved at the DCISC public meeting held on February 15-16, 2023 public meeting and incorporated, together with the other Fact-Finding Reports approved at the February public meeting, into the record of Rulemaking 23-01-007 by the Administrative Law Judge's Ruling filed on April 20, 2023.

The next agenda topic consisted of a technical presentation by PG&E experts on their Long-Term Seismic Program (LTSP), a technical research program that is mandated as a license condition as part of the NRC's operating license for DCP. PG&E described several ongoing LTSP technical research projects and their results, insights, and schedules. They described the principal motivation for this ensemble of projects as being to understand the various underlying seismic phenomena better and to reduce the uncertainties wherever they could. The IPRP noted that each previous IPRP meeting had an agenda item in which PG&E described elements of their LTSP, and that this presentation was mainly an update for some of the LTSP projects. PG&E's representatives agreed.

PG&E next described their recent activities to learn from the large earthquake in February 2023 in southern Turkey. PG&E explained that their lessons-learned work will go on for many months and will cover not only an investigation of how the earthquake source rupture and ground-motion propagation occurred but also how and why damage ensued for various items of equipment or various structures. PG&E's emphasis in learning from the damage information was to inform an evaluation as to whether PG&E might need to make any changes to DCP or other PG&E facilities based on insights gained. PG&E noted that the lessons-learned work in Turkey involves many different groups of experts from around the world, and that ultimately there will be the need to gather all the information and insights into one or more comprehensive reports. PG&E noted that its experts will play an active role in this latter activity.

The PG&E technical presentation was accompanied by several question-and-answer interactions with IPRP members. The overall tone of the IPRP meeting's technical discussions of the LTSP program and the Turkish earthquake studies was respectful and technically inquisitive.

The final agenda item was a discussion of a recent filing by San Luis Obispo Mothers for Peace (SLOMFP) with the NRC (Reference 6.1.3) in an NRC generic environmental-impact proceeding. The filing contained a declaration by Dr. Peter Bird which said, in part, that PG&E's seismic-hazard analysis for Diablo Canyon completed in 2015 (Reference 6.1.4) underestimated the seismic hazard.

Several technical issues raised in the SLOMFP document were discussed briefly by PG&E and IPRP attendees. The general tenor of the IPRP meeting's discussion was that there had not been enough time for it to be reviewed thoroughly, because this new filing had only been made public and come to the IPRP about a day before this meeting. It was clear from the discussion that PG&E would be reviewing the document, and that the IPRP probably would be reviewing it too, although no commitments were made. Following the meeting, PG&E informed the DCISC that it plans to review Dr. Bird's declaration as a part of their upcoming new seismic-safety evaluation that is mandated by SB846. The DCISC will review PG&E's evaluation of Dr. Bird's declaration after the PG&E SB846 seismic-safety evaluation is complete.

As the meeting came to a close there was a brief discussion of the date for the next IPRP meeting. Although no specific date was announced, a next meeting was mentioned as likely in the late autumn of 2023, perhaps in November.

Conclusions: The Independent Peer Review Panel (IPRP) meeting was successful in discussing the major items on its agenda, including providing feedback and comments from the IPRP to the DCISC about the DCISC's November 2022 Fact-Finding Report on seismic safety. The DCISC should take account of IPRP input as it finalizes its positions and conclusions on DCPD seismic safety. The DCISC should also continue to attend future IPRP meetings and consult with the IPRP concerning the IPRP's deliberations, findings, and recommendations.

Recommendations: None

3.2 Comprehensive Seismic Safety Update

3.2.0 Background

On November 8, 2022, a DCISC Fact Finding Team (FFT) comprised of Robert Budnitz (member) and Richard McWhorter (consultant) met in person at the DCPD plant with Jeff Bachhuber, Director, Geosciences; Nathan Barber, Supervisor, Risk and Regulatory Initiatives; Bill Horstman, Principal Civil Engineer; Nozar Jahangir, Manager, Seismic Engineering; Albert Kottke, Geotechnical Earthquake Engineer; and Chris Madugo, Geosciences Consultant, for a briefing on the current understanding of overall seismic safety at DCPD. The scope included reviewing the current understanding of the seismic hazard, of the seismic ground motion at the site, of how seismic energy propagates within individual structures, of the seismic capacities and fragilities of structures and components, and of the overall systems response to postulated earthquakes as captured in the plant's Seismic Probabilistic Risk Assessment (SPRA) (Reference 6.2.1).

Following that meeting, the DCISC prepared a Fact Finding Report (Reference 6.1.2) that was reviewed and approved by the full DCISC at its Public Meeting on February 15, 2023. That DCISC November 2022 report also covered several other technical topics, but of relevance here is the seismic-safety section of that report, Section 3.4, "Comprehensive Review of the Seismic Safety Program." The November 2022 approved report represented the DCISC's then-current position on the technical issues within its scope. The report was provided to the public after its approval and was forwarded to the Independent Peer Review Panel (IPRP) for its review, in conformance with recent California legislation, Senate Bill 846 (SB846).

The IPRP, in turn, reviewed the seismic-safety sections of the DCISC's November 2022 report and forwarded to the DCISC a document (Reference 6.1.1) containing technical comments and observations for DCISC consideration. These comments were then the subject of one of the principal agenda items during the IPRP's public meeting on May 5, 2023, as discussed above in Section 3.1.

In this report, the DCISC has revised and updated the seismic-safety section of its November 2022 report after considering the IPRP comments and also after accounting for other information reviewed since November 2022. The revised and updated November 2022 seismic-safety report is this section (Section 3.2) of this report.

This review (as is true of all similar DCISC safety reviews) was based on the experience and judgment of the DCISC members, assisted by the Committee's consultants. The plant's operational safety is the primary focus of the DCISC's work, and the DCISC does not use as a criterion a specific set of NRC safety regulations or guidance documents. Also, even though high reliability for many major equipment items may contribute to achieving safety, whether the plant achieves high reliability in producing electricity is not a primary factor that informs the DCISC's judgments, findings, or recommendations.

The scope of the DCISC's review of seismic safety is limited, based on its charter, to those aspects of Diablo Canyon's seismic design and seismic performance that are related to whether a major radiological accident, involving potential radioactive releases, will occur. As noted above, the DCISC believes that its scope in reviewing seismic safety does not extend to evaluating seismic damage that can significantly disrupt the plant's ability to produce electricity, if the scenario of concern poses little or no threat to the radiological safety of the public. That said, the DCISC has concluded that to the extent that workspace seismic safety could affect the response to a radiological accident, it is important to operational safety, so seismic safety in some non-safety-related structures and workspaces has been regularly evaluated by the DCISC.

Another issue about the scope of the DCISC's safety reviews is important to emphasize. To wit, the DCISC has always understood its charter as reviewing the safety of the plant as it sits today and as it is operated today. Whether the plant met a specific regulatory requirement in times past, such as a design-basis requirement while it was under construction, has not generally been a question that the DCISC has considered as within its purview, except insofar as understanding the original design criteria or the original regulatory requirements can help a reviewer today to understand how safe the plant is today.

In the past the DCISC has extensively reviewed the DCPD plant's seismic safety in multiple Fact-Finding Meetings and through presentations at numerous DCISC Public Meetings. Also, the DCISC has had the benefit of presentations by PG&E on the seismic-hazard and seismic ground-motion aspects at several meetings in recent years of the IPRP. However, the review during the DCISC Fact Finding meeting on November 8, 2022, was the DCISC's first formal review of the overall program and was prompted by the proposed extension of power operations and directives contained in recent California legislation, SB846.

3.2.1 Senate Bill 846 Direction

The motivation for the comprehensive review in November 2022 was that recent legislation, SB846, enacted into law in early September 2022, directed the DCISC to review and evaluate seismic safety in the context of inquiring as to whether important seismic-safety upgrades would be needed to support safe operation if the plant's operating period were to be extended beyond the current NRC licenses that end in 2024 (Unit 1) and 2025 (Unit 2). The November 2022 Fact Finding meeting was intended to provide important information to support the DCISC review and evaluation required by SB846. The scope of this report not only includes a report on that Fact-Finding Meeting and of insights gained from considering the IPRP panel's comments and review, but also includes the broad conclusions of the DCISC on the question raised by SB846, which is whether important seismic safety upgrades would be needed to support safe operation after 2025.

3.2.2 Seismic Safety Analysis Process

To analyze the level of seismic safety achieved by the design of a complex nuclear power reactor one needs the following types of information:

- a. The analysis needs to identify each potential accident sequence that could be initiated by a large earthquake and that could lead to a core-damaging accident.
- b. The analysis needs to be able to differentiate among the core-damaging sequences so as to identify, for each one, whether it would lead to a small or no release of radioactivity, or would lead to a significant release of radioactivity (what the NRC has called a “large release”), and if so whether that large release would occur relatively quickly (what the NRC has called a “large early release”) or would occur only after a significant delay.
- c. For those seismic-initiated accident sequences of concern that are associated with a radioactive release, the analysis needs to characterize the release in terms of timing, energy content, radioactivity content, and a few other parameters required to fully describe how the potential release would ensue and why.
- d. The analysis needs to identify, for each sequence being analyzed, the “size” of the earthquake ground motion at the site that causes the sequence. Here the word “size” is intended as shorthand for a variety of different characteristics of the earthquake ground motion at the site, such as the amplitude of the acceleration, its duration, its frequency spectrum, whether the acceleration is associated with significant displacement or velocity, and a few other features.
- e. Because earthquake ground motion can arrive at the site with different “sizes,” the analysis needs to include the likelihood of occurrence as a function of “size,” which is commonly known as and tabulated or displayed as the family of “seismic hazard curves.” This likelihood is generally characterized by its annual probability of occurrence.
- f. For each seismic accident sequence of interest, the analysis needs to include the various contributing failures, including not only the seismic-caused failures but also any human errors or non-seismic failures that contribute or participate in the accident sequence.
- g. The accident sequence and their temporal relationships need to be described in the analysis; also, each failure of a structure or component needs to be characterized in a way that allows an understanding of how and why it participates in the sequence of events, which specific failure mode of each earthquake-damaged item is the issue, and any correlations among the various failures. The general understanding of what “failure” means for a structure or component is a failure to perform the item’s safety function or cause another structure or component to fail to perform its safety function.

- h. Crucially, for each identified accident sequence, the analysis needs to quantify the sequence's likelihood, characterized by its annual probability of occurrence.
- i. Because each of the many issues mentioned above is typically not known exactly, but only known with some uncertainty, the analysis needs to include a quantification of the uncertainty, how it arises, what is its character, and why. Unless the characterization of the uncertainties is done appropriately, the usefulness of the analysis information for decision-making about safety can in some circumstances be seriously diminished.

After each seismic accident sequence has been identified and analyzed as above, the analysis needs to “roll up” the ensemble – essentially summing up the various accident sequences. The result is the development of broad measures of seismic safety such as the overall annual frequency of sequences that involve seismic-induced core damage, approaches by which FLEX⁴ equipment and other recovery capabilities could mitigate damage and prevent core damage, the overall annual frequency of a large seismic-caused radiological release, and any other figures-of-merit that a decision-maker might wish to know about.

One crucial use of the information is that, depending on the risk level, possible improvements in the seismic safety of the design and operation can be identified, including specific actions that could be taken under the FLEX program. Insights such as these are very important outputs of the analysis described above.

3.2.3 Background on Previous DCPD Seismic Safety Analyses

a. DCPD Probabilistic Seismic Hazard Analysis

The most comprehensive information about the various sources of earthquakes that might threaten the plant (Sections 3.2.2.d. and e. above), about the ground motion at the site arising when any of those earthquakes might occur, and about the uncertainties in the various aspects of the analysis is found in PG&E's most recent seismic study, the “Diablo Canyon Probabilistic Seismic Hazard Analysis” (PSHA) study published in 2015 (Reference 6.2.2). Since that study was completed, additional research has been completed to supplement that study which provides additional valuable information.

b. DCPD Seismic Probabilistic Risk Assessment

The rest of the needed information (Sections 3.2.2.a. to c. and f. to h. above) is found in PG&E's “Diablo Canyon Seismic Probabilistic Risk Assessment” (SPRA), published in 2018 (Reference 6.2.1). The SPRA's analysis has information about how the earthquake ground motion affects (and damages) each important structure and component at DCPD; about how likely that damage is, as a function of the “size” of the ground motion; about each seismic-initiated accident sequence, including the contributing failures, the timing,

⁴ FLEX is not an acronym but describes a strategy developed by the nuclear industry to provide diverse and flexible coping strategies to address the loss of safety-related systems due to certain beyond design basis events. It is a group of supplemental components, many of them portable, which are seismically stored, and can be made available for timely attachment to permanent plant systems for accident mitigation.

and the phenomena; about whether each sequence involves important radioactive releases, and if so how those releases are characterized; and about the uncertainties in the various aspects of the analysis.

As discussed below, both the PSHA and the SPRA were subject to extensive outside peer review during their development and were reviewed by the NRC and the DCISC after their completion.

c. DCPD Long Term Seismic Program

Since the plant started operation in the 1980s, PG&E has been carrying out a Long-Term Seismic Program (LTSP), a program under which PG&E has undertaken a large number of projects to assure that the Diablo Canyon Power Plant is adequately designed and operated to provide safety against potential very large earthquakes. The LTSP is required by the NRC as a license condition for operating DCPD. The DCISC has reviewed the LTSP several times in recent years (References 6.2.3 and 6.2.4), as has the State of California's IPRP.

The LTSP program involves four different technical areas, covering an understanding of the following:

1. The seismic hazard (the various seismic sources)
2. The seismic ground motion arising at the site and the in-structure energy propagation
3. The seismic fragility of components and structures
4. The plant seismic response (an analysis of the plant's various systems and the role of the operators)

d. Nuclear Industry Activities Affecting DCPD Seismic Programs

In addition to the above, important activity in the broader nuclear industry has occurred over the years to inform and support the development of Diablo Canyon's PSHA and its SPRA. To wit:

In the mid-1990s, a major advance occurred when a new methodology, known now as the Senior Seismic Hazard Analysis Committee (SSHAC) methodology was developed (Reference 6.2.5). It has since been used and adopted worldwide for the performance of major PSHA studies like that done at DCPD. This methodology includes specific guidance on how to structure a peer review, which the methodology requires. The SSHAC methodology has been endorsed by the NRC for such use (References 6.2.6 and 6.2.7), and the DCISC agrees that this endorsement is appropriate.

Starting in the early 1990s, another major advance occurred when the American Society of Mechanical Engineers (ASME), later joined by the American Nuclear Society (ANS), developed standards with requirements for performing a nuclear

power reactor PRA, including an SPRA (Reference 6.2.8). It too has been used and adopted worldwide for the performance of major SPRA studies like that done at DCP. This standard also includes specific requirements on peer reviews. It has also been endorsed by the NRC for such use (Reference 6.2.9), and the DCISC agrees that this endorsement is appropriate.

Also, significant research activity worldwide has occurred over the years, and continues today, that has provided additional understanding of each of the major technical areas involved in the above. Keeping abreast of that activity is important, and the DCISC believes that the PG&E scientists and engineers involved in the various seismic studies have done that (and are and have long been acknowledged as being among the industry leaders in both the PSHA and the SPRA areas).

3.2.4 Topics Reviewed During the November 2022 Fact-Finding Meeting

The DCISC Fact Finding Team requested that PG&E discuss two broad topics during the November 2022 Fact-Finding Meeting:

- Provide a general update on the status of seismic hazard evaluations, seismic fragility evaluations, and the SPRA for DCP.
- Provide any new information or developments in this area that could affect license renewal and/or the proposed extension of operations beyond 2025.

Most of the technical topics are covered within the scope of the LTSP. Also, most of the technical topics are encompassed in various major PG&E technical reports developed several years ago in response to a 2012 NRC request for information (Reference 6.2.10) after the Fukushima nuclear accident in Japan.

Specifically, as mentioned above, the plant undertook a major and comprehensive new evaluation of the seismic hazard, known as the Diablo Canyon Probabilistic Seismic Hazard Assessment (PSHA), published in 2015 (Reference 6.2.2). That evaluation, which was performed according to the universally adopted methodology for such PSHA studies (References 6.2.5, 6.2.6 and 6.2.7), was reviewed by the NRC, and also by the DCISC. The NRC review was published in 2016 (Reference 6.2.11). The NRC's overall conclusion in that review was, "Based on this review, the NRC staff concludes that the licensee conducted the seismic hazard reevaluation using present-day methodologies and regulatory guidance, it appropriately characterized the DCP site given the information available, and it met the intent of the guidance for determining the reevaluated seismic hazard." The DCISC's review was also favorable (References 6.2.12 and 6.2.13).

Also in the same period, PG&E undertook a modern update of their plant SPRA, which had first been developed in the late 1980s, and had been kept up to date throughout the intervening years. That most recent SPRA was published in 2018 (Reference 6.2.1). That SPRA was also reviewed and found acceptable by the NRC staff (Reference 6.2.14). The DCISC also reviewed that report favorably at that time and found it to have been of

excellent quality. Concerning the SB846 direction to the DCISC, it is important to note that the DCISC did not at the time of the SPRA's completion identify any important safety improvements that would be needed, and the plant was judged to be adequately safe in the area of seismic safety (Reference 6.2.15).

Given this history, the purpose of the November 2022 Fact-Finding Meeting was principally to ask and to discuss, in each of the technical areas encompassed by overall seismic safety, *"What is new since those comprehensive and thoroughly-reviewed evaluations were completed in the mid- to late 2010s?"*

3.2.5 Results of the November 2022 Fact-Finding Meeting

The Fact-Finding Team found that in recent years a good deal of new information continues to be developed in the areas of seismic hazard and seismic ground-motion characterization, because those are "fast moving" areas of technical work. This includes both work specifically relevant to the DCPD plant site and its regional setting along with work elsewhere in the US and worldwide that advances the community's understanding and its analysis capabilities. However, rather little new information has been developed in the areas of seismic fragilities and the plant's SPRA model, in part because those are not "fast moving" areas where significant technical advances are occurring now.

a. Understanding of Seismic Hazard and Seismic Site Ground Motion

PG&E, through their LTSP studies, continues to develop new information about several technical topics within the broader scope. The DCISC has reviewed the broader LTSP program several times over the past decade. Concerning the seismic sources, the topics now being studied include:

- Studies of fault locations, geometries, stress distributions, and potential fault linkages
- Research on slip rates on the major nearby faults (mainly but not exclusively the Hosgri and Shoreline Faults)
- Studies of potential earthquakes that could occur off of recognized fault sources
- Seismic fault displacement modeling
- Advances in ground-motion modeling to incorporate non-ergodic approaches and potential time-dependency of the hazard
- Studies of paleoseismic data on the eastern Los Osos Fault
- Studies of deformed marine terraces to constrain the uplift rate of the Irish Hills
- Studies using modern Global Positioning System geodetic data
- Studies of nearby precariously balanced rocks
- Studies and evaluations of the numerous very small earthquakes that continue to occur both near the DCPD site and in the broader region of interest

Concerning characterizing the ground motion as it propagates from source to site, research continues on:

- Using improved data from recent small-magnitude earthquakes
- Improving the models
- Matching models more closely to the regional and local-site data
- Accounting more accurately for various directivity effects

Concerning local site effects, research continues on:

- Using improved data, both local site data from recent small-magnitude earthquakes and information from broader data sets
- Local site characterization
- The effects associated with potentially very long-duration earthquakes

On many of these topics, PG&E's LTSP personnel collaborate with groups and agencies unaffiliated with PG&E that have important research projects and data-gathering programs. Some of these are collaborations with the US Geological Survey or various California state agencies, and some of them are collaborations with other groups around the US and around the world. PG&E also continues to maintain its own network of seismic monitoring instruments both on and offshore in the area near the Diablo Canyon plant and also in the broader region.

As noted above, the DCISC has been reviewing the LTSP program for many years and has also had the benefit of over a decade of meetings and reviews by the State of California's IPRP. The DCISC continues to find this very extensive program to be of excellent quality. The overall approach is satisfactory to the DCISC and has also been reviewed by the NRC (Reference 6.2.11) with the same general conclusion.

Concerning the impact of any recent new information that would supplement the previous work, the DCISC concludes that there is nothing in any recent new information on either seismic hazard or seismic ground motion that would change the broader understanding of those topics as embedded in the earlier 2015 PG&E report (Reference 6.2.2), or that could lead to new safety insights. In each area of study, the DCISC believes that the recent new information has either reinforced previous understanding or added new insights that reinforce earlier conclusions about overall seismic safety. In the DCISC's view, none of the new information that has become available since 2015 has challenged any of the 2015 report's major conclusions. Uncertainties are being reduced, small changes in some technical details have emerged, and some of the research has pointed out where additional studies can help to reduce the uncertainties still further. That work is beneficial and continues, but it does not affect any existing conclusions or insights.

Of course, new seismic data (both local and worldwide) and new analyses and interpretations of existing data emerge continually, as has always been the case and as will continue in the future. The DCISC's review of PG&E's geosciences team and its work has supported the DCISC's conclusion that PG&E is continually and competently working to analyze this new information and respond to it as needed.

One piece of new information that is yet to be reviewed is a document recently filed by the San Luis Obispo Mothers for Peace, a non-profit group concerned with the dangers posed by DCP, with the NRC (Reference 6.1.3) in an NRC generic environmental-impact proceeding. The filing contained a declaration by Dr. Peter Bird which said, in part, that PG&E's seismic-hazard analysis for Diablo Canyon completed in 2015 (Reference 6.2.2) underestimated the seismic hazard. This is a seismic-hazard issue that is of recent vintage that PG&E has informed the DCISC will be reviewed as part of the broader SB846-mandated seismic-safety review that PG&E will be doing in the coming months. The DCISC will review PG&E's evaluation of Dr. Bird's declaration after the PG&E SB846 seismic-safety evaluation is complete and will perform additional reviews as needed. This is a good example of how new information needs to be reviewed and understood as it arises.

b. Understanding of Seismic In-structure Energy Propagation and the Seismic Fragility of Components and Structures

The SPRA of 2018 (Reference 6.2.1) included a reevaluation of the way seismic energy, once it arrives at the base mats (foundations) or anchorages of the various DCP structures, affects those structures and propagates through them to the individual components. It also included a major reanalysis or reevaluation of the probabilistic seismic capacities or fragilities of the many individual structures and components, using standard methodologies and following the requirements of the NRC-endorsed ASME-ANS SPRA standard (Reference 6.2.8), including that standard's peer review requirements. PG&E reported to the Fact-Finding Team that those earlier structural analyses and models along with the data on which they were based remain valid today, in part because the techniques for developing the underlying structural models are considered quite mature and have not changed. PG&E also reported that this is true of the methods now used for analyzing the seismic fragilities of individual structures and components, which provide the likelihood that a given earthquake load would cause enough damage to the item so that it could not perform its safety function. Although there is some irreducible uncertainty due to aleatory variability, arising from the intrinsic irreducible variability in some of the issues or phenomena, PG&E reported that the methodology for analyzing seismic fragilities is well defined, widely used, and very mature. On both of these topics, involving the structural analyses and the fragilities analyses, the DCISC concurs.

From time to time a new analysis is required when a configuration changes, unless a scoping study concludes that the change is unimportant. PG&E reported to the Fact-Finding Team that in all of the relevant areas, nothing new or different has emerged of importance, meaning that the previous safety insights remain valid. The DCISC concludes that there is nothing new with regards to energy propagation in structures or the fragilities of structures and components that would modify the insights of the most recent SPRA in these areas.

c. The Seismic Probabilistic Risk Assessment Systems Model

The information about the seismic hazard, ground motion, and fragilities all feed into the SPRA's systems model, which identifies the many different potential seismic-initiated

accident sequences of concern and analyzes each of them. That work is done using what is called the SPRA systems model. There is an underlying SPRA “internal initiators” systems model for the various accident sequences, most of which can be initiated by non-seismic upset conditions or events (“internal initiators”) as well as by a large earthquake. That systems model then needs to be modified and adapted to analyze each earthquake-initiated sequence of interest. The methodology for this aspect of the overall SPRA analysis is widely used worldwide, quite mature, and embedded in both international and domestic standards. Specifically in regard to the DCPD analysis, the 2018 SPRA analysis (Reference 6.2.1) used standard methodologies and followed the requirements of the NRC-endorsed ASME-ANS PRA Standard (Reference 6.2.8), including the peer review requirements.

As with the seismic-hazard analyses, PG&E reported to the Fact-Finding Team that those earlier analyses are still valid today. Of course, from time to time a new analysis is required when a configuration changes, or a procedure has changed, or the underlying failure rate data (including human-error data) have changed. However, as with the other areas, PG&E reported to the Fact-Finding Team that in the systems-modeling area nothing new has emerged of importance, meaning that the previous safety insights remain valid. The DCISC’s concludes that there is nothing new with regards to system modeling that would modify the insights of the most recent SPRA in that area.

d. Uncertainties in the Analysis

As mentioned above, the overall analysis must deal with and incorporate an analysis and discussion of the various uncertainties. Many of the uncertainties are in the numerical values used in or arising from the analysis, but some of them are more qualitative in nature. In both the PSHA analyses of seismic hazard and the SPRA analyses of overall seismic risk, the various uncertainties are typically divided into two different types, so-called “epistemic” uncertainties (arising from uncertainty in a measurement or from incomplete knowledge about a phenomenon) and “aleatory variability” uncertainties (arising from the intrinsic random variability in some of the issues or phenomena, such as the unknowable time when the next large earthquake might occur on one of the nearby faults). These distinctions are explained and standard methods for their analysis in both the PSHA and the SPRA are contained in the ASME-ANS PRA standard (Reference 6.2.8). Also as noted earlier, if the characterization of the uncertainties is not done appropriately, the usefulness of the analyses can in some circumstances be seriously diminished. The DCISC’s recent reviews continue to conclude that the seismic PRA’s uncertainty analyses are competently performed, clearly explained, and very useful to support decision-making. The current research work that PG&E is performing under the LTSP, as described above, will likely continue to reduce overall uncertainties, fill in gaps, and enhance confidence in the validity of the underlying understanding. And if unexpected new areas of information arise, these will need to be incorporated fully. The DCISC will continue to be alert to these developments in the course of its ongoing safety reviews.

e. Other seismic-safety information

Three other sources of information have provided additional insights to assist the DCISC in this evaluation.

1) One is the PG&E review of the adequacy of the seismic design of Diablo Canyon's spent fuel pools. This review was performed as part of the post-Fukushima analyses required by the NRC and was reported in a separate PG&E report to the NRC in 2017 (Reference 6.2.16). PG&E concluded, using assessment criteria that the NRC had approved, that the new seismic-hazard information developed in the previous few years did not lead to any additional compromises to the seismic safety of the spent fuel pools.

2) Another important analysis was completed in 2020 by B.J. Garrick and D. Wakefield at University of California at Los Angeles (UCLA), supported by PG&E (Reference 6.2.17). That UCLA study examined spent-fuel-pool safety, the safety of on-site transportation of spent fuel and radioactive waste from the reactor area to the Independent Spent Fuel Storage Installation (ISFSI) area, and the safety of the ISFSI facility itself. Its analysis, which evaluated the Holtec system that comprises the existing ISFSI storage system design, covered seismic safety along with other potential accident scenarios and provided important information and insights about risks at the spent fuel pools and the ISFSI arising from large earthquakes. Its broad conclusion regarding seismic safety was that the overall risk to the public arising from challenges to the spent fuel pools or the ISFSI at that time was well within acceptable levels. The DCISC was briefed on this study during a public meeting on July 1, 2020, reviewed it, and concurred in its results (Reference 6.2.18).

3) The third additional source of information is the 2018 PG&E "Mitigating Strategies Assessment" report (Reference 6.2.19). This report, required by the NRC (Reference 6.2.20), asked whether any safety backfits or other changes would be necessary in light of the new seismic-hazard information developed in the previous few years. PG&E's analysis identified none, and this was concurred in by the NRC.

3.2.6 Seismic Events and Reactor Vessel Pressurized Thermal Shock

Among questions asked in the context of the May 5, 2023, IPRP meeting was a question related to reactor vessel material coupons which are used in support of analyses used to understand the radiological damage to the vessel over time and also the susceptibility of the reactor vessel to Pressurized Thermal Shock (PTS). Technical analyses performed in support of NRC rulemaking activities related to PTS have demonstrated that earthquakes are not a significant contributor to the overall risk of occurrence of a PTS event (Reference 6.2.21). The DCISC has reviewed these analyses and concurs with their conclusions. Accordingly, the DCISC believes that the issue of reactor vessel coupons at DCP is being appropriately addressed in other forums not related to seismic issues and need not be addressed as a part of its seismic safety reviews.

3.2.7 Additional DCISC Fact-Finding Meetings Related to Seismic Safety

In the period since the November 2022 DCISC meeting, the DCISC conducted two additional Fact-Finding meetings (in January and March 2023) that included reviews of

topics related to DCPD seismic safety. They were the January 2023 Fact-Finding meeting (Report in Reference 6.2.22) and the March 2023 Fact-Finding meeting (associated with a Report that will be concurrently approved and that is cited here as Reference 6.2.23). The topics covered in these Fact-Finding meetings included (a) details about PG&E's plans to perform the updated seismic assessment required to be completed by SB846 (in the January report); (b) FLEX equipment capabilities during and after a large earthquake (in the January report); and (c) a review of the 2010 Enercon Services report regarding seismic vulnerabilities of non-safety structures and equipment (in the March report). Because those other Fact-Finding reports are already available (the January report) or will be publicly available concurrently with the availability of this report, the technical issues will not be addressed here.

3.2.8 **Conclusions**

As background, when the DCISC reviewed the PG&E probabilistic seismic hazard analysis (PSHA) in 2016 and the seismic probabilistic risk assessment (SPRA) in 2018, the Committee was satisfied that the seismic safety achieved by DCPD was acceptable at that time – indeed, the DCISC believed that it represented industry-leading performance in the seismic safety achieved by the facility (Reference 6.2.15).

Based on its review as reported here, the DCISC has developed the following broad conclusion:

After reviewing the new and updated information presented by PG&E in the November 2022 Fact-Finding Meeting, supplemented by earlier DCISC Fact-Finding Meetings and Public Meeting presentations, by other industry-wide information, and by information arising from both the October 2022 IPRP meeting and the May 2023 IPRP meeting, the DCISC concludes that the seismic safety of the DCPD reactors is fully adequate now, and requires no additional upgrades or other changes to bring it up-to-date or to improve it. The DCISC also concludes that no upgrades or improvements to seismic safety would be necessary to assure that the seismic safety of the DCPD reactors would be adequate for extended operation beyond 2025, if so authorized.

Based on its review, the DCISC has three recommendations for its own future reviews:

First, the DCISC should review any new seismic-related information that could be forthcoming when PG&E submits a new (updated) License Renewal Application to the NRC at the end of 2023. The DCISC should undertake a thorough review of that submittal's sections relevant to seismic safety, as well as any underlying information that PG&E will rely on in that submittal.

Second, the DCISC should review the seismic-safety review that PG&E will conduct as required by California legislation SB846.

Third, the DCISC should review any analyses that may be performed by the NRC or other entities in response to the May 2, 2023, SLOMFP filing with the NRC claiming that PG&E has underestimated the seismic hazard at DCP. It is currently understood that this filing will be evaluated by PG&E as a part of the SB846-mandated seismic-safety review and the DCISC should review PG&E's evaluation of this filing following its completion.

3.2.9 Recommendations

None.

4.0 CONCLUSIONS

4.1 The Independent Peer Review Panel (IPRP) meeting was successful in discussing the major items on its agenda, including providing feedback and comments from the IPRP to the DCISC about the DCISC's November 2022 Fact-Finding Report on seismic safety. The DCISC should take account of IPRP input as it finalizes its positions and conclusions on DCP seismic safety. The DCISC should also continue to attend future IPRP meetings and consult with the IPRP concerning the IPRP's deliberations, findings, and recommendations.

4.2 As background, when the DCISC reviewed the PG&E probabilistic seismic hazard analysis (PSHA) in 2016 and the seismic probabilistic risk assessment (SPRA) in 2018, the Committee was satisfied that the seismic safety achieved by DCP was acceptable at that time – indeed, the DCISC believed that it represented industry-leading performance in the seismic safety achieved by the facility (Reference 6.2.15).

Based on its review as reported here, the DCISC has developed the following broad conclusion:

After reviewing the new and updated information presented by PG&E in the November 2022 Fact-Finding Meeting, supplemented by earlier DCISC Fact-Finding Meetings and Public Meeting presentations, by other industry-wide information, and by information arising from both the October 2022 IPRP meeting and the May 2023 IPRP meeting, the DCISC concludes that the seismic safety of the DCP reactors is fully adequate now, and requires no additional upgrades or other changes to bring it up-to-date or to improve it. The DCISC also concludes that no upgrades or improvements to seismic safety would be necessary to assure that the seismic safety of the DCP reactors would be adequate for extended operation beyond 2025, if so authorized.

Based on its review, the DCISC has three recommendations for its own future reviews:

First, the DCISC should review any new seismic-related information that could be forthcoming when PG&E submits a new (updated) License Renewal Application to the NRC at the end of 2023. The DCISC should undertake a thorough review of that submittal's sections relevant to seismic safety, as well as any underlying information that PG&E will rely on in that submittal.

Second, the DCISC should review the seismic-safety review that PG&E will conduct as required by California legislation SB846.

Third, the DCISC should review any analyses that may be performed by the NRC or other entities in response to the May 2, 2023, SLOMFP filing with the NRC claiming that PG&E has underestimated the seismic hazard at DCP. It is currently understood that this filing will be evaluated by PG&E as a part of the SB846-mandated seismic-safety review and the DCISC should review PG&E's evaluation of this filing following its completion.

5.0 RECOMMENDATIONS

5.1 None.

6.0 REFERENCES

- 6.1.1 "May 5, 2023, IPRP Comments and Questions on DCISC February 2023 Fact Finding Reports," available at URL as follows: <https://www.cpuc.ca.gov/industries-and-topics/electrical-energy/electric-costs/diablo-canyon-independent-peer-review-panel>.
- 6.1.2 "Diablo Canyon Independent Safety Committee Thirty-Third Annual Report on the Safety of Diablo Canyon Nuclear Power Plant Operations, July 1, 2022 – June 30, 2023," Approved September 13, 2023, Volume II, Exhibit D.5, Section 3.4, "Comprehensive Review of the Seismic Safety Program."⁵
- 6.1.3 "Comment (0021) from Diane Curran on behalf of San Luis Obispo Mothers for Peace on PR-51 – Renewing Nuclear Power Plant Operating Licenses – Environmental Review," submitted to the US Nuclear Regulatory Commission on May 2, 2023, NRC ADAMS Accession Number ML23123A410.
- 6.1.4 "Seismic Hazard Screening Report, Diablo Canyon Power Plant Units 1 and 2," submitted to the Nuclear Regulatory Commission as an attachment to PG&E letter DCL-15-035,

⁵ In preparing Fact Finding Reports, each of which was or will be approved by the DCISC at either the DCISC September 2022, February, and June 2023 public meetings and which reports will be included as exhibits in the DCISC's 33rd Annual Report (July 1, 2022 through June 30, 2023), the DCISC Members and Technical Consultants follow the DCISC's established practice of including references in those Fact Finding Reports to the section of the 33rd Annual Report where another Fact Finding Report or the Minutes of a public meeting will be included as an exhibit.

“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,” March 11, 2015, NRC ADAMS Accession Numbers ML15070A607 and ML15070A608.

- 6.2.1 “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,” submitted to the US Nuclear Regulatory Commission as an attachment to PG&E letter DCL-18-027, April 24, 2018, NRC ADAMS Accession Number ML18120A201.
- 6.2.2 “Seismic Hazard Screening Report, Diablo Canyon Power Plant Units 1 and 2,” submitted to the Nuclear Regulatory Commission as an attachment 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,” March 11, 2015, NRC ADAMS Accession Numbers ML15070A607 and ML15070A608.
- 6.2.3 “Diablo Canyon Independent Safety Committee Twenty-Ninth Annual Report on the Safety of Diablo Canyon Nuclear Power Plant Operations, July 1, 2018 – June 30, 2019,” Approved October 23, 2019, Volume II, Exhibit D.7, Section 3.4, “Long Term Seismic Program Update.”
- 6.2.4 “Diablo Canyon Independent Safety Committee Thirty-Third Annual Report on the Safety of Diablo Canyon Nuclear Power Plant Operations, July 1, 2022 – June 30, 2023,” Approved September 13, 2023, Volume II, Exhibit D.3, Section 3.5, “Long Term Seismic Program Update.”
- 6.2.5 "Recommendations for Probabilistic Seismic Hazard Analysis: Guidance on Uncertainty and Use of Experts", R.J. Budnitz (chair), G. Apostolakis, D.M. Boore, L.S. Cluff, K.J. Coppersmith, C.A. Cornell, and P.A. Morris (comprising the “Senior Seismic Hazard Analysis Committee,” “SSHAC”), Report NUREG/CR-6372, Lawrence Livermore National Laboratory, sponsored by the U.S. Nuclear Regulatory Commission, U.S. Department of Energy, and Electric Power Research Institute (1997), NRC ADAMS Accession Numbers ML080090003 and ML080090004.
- 6.2.6 "Practical Implementation Guidelines for SSHAC Level 3 and 4 Hazard Studies," US Nuclear Regulatory Commission, Report NUREG-2117 (February 2012), NRC ADAMS Accession Number ML12118A445.
- 6.2.7 “Updated Implementation Guidelines for SSHAC Hazard Studies,” US Nuclear Regulatory Commission, Report NUREG-2213 (October 2018), NRC ADAMS Accession Number ML18282A082.

- 6.2.8 “Standard for Level 1/Large Early Release Frequency Probabilistic Risk Assessment for Nuclear Power Plant Applications,” Standard ASME/ANS RA-Sa-2009, American Society of Mechanical Engineers/American Nuclear Society (2009). *Note: This standard has been updated recently, but the Diablo Canyon PRA, including the Seismic PRA, was done according to this earlier version of the standard, which remains valid.*
- 6.2.9 “An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities,” US Nuclear Regulatory Commission, Regulatory Guide 1.200, Revision 2 (March 2009), NRC ADAMS Accession Number ML090410014.
- 6.2.10 “Request for Information Pursuant to Title 10, 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,” US Nuclear Regulatory Commission letter to all power reactor licensees (March 12, 2012), NRC ADAMS Accession Number ML12053A340.
- 6.2.11 “Diablo Canyon Nuclear 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,” NRC letter to PG&E (December 21, 2016), NRC ADAMS Accession Number ML16341C057.
- 6.2.12 “Diablo Canyon Independent Safety Committee Twenty-Fifth Annual Report on the Safety of Diablo Canyon Nuclear Power Plant Operations, July 1, 2014 – June 30, 2015,” Approved October 20, 2015, Volume II, Exhibit D.7, Section 3.2 “PG&E Seismic Study.”
- 6.2.13 Ibid., Exhibit B.15, “Minutes of the DCISC Public Meeting June 16 and 17, 2015.”
- 6.2.14 “Diablo Canyon Nuclear Power Plant, Unit Nos. 1 and 2 – Staff Review of Seismic Probabilistic Risk Assessment Associated with Reevaluated Seismic Hazard - Implementation of the Near-Term Task Force Recommendation 2.1, Seismic,” US Nuclear Regulatory Commission letter to PG&E (January 22, 2019), NRC ADAMS Accession Number ML18254A040.
- 6.2.15 “Diablo Canyon Independent Safety Committee Twenty-Ninth Annual Report on the Safety of Diablo Canyon Nuclear Power Plant Operations, July 1, 2018 – June 30, 2019,” Approved October 23, 2019, Volume II, Exhibit B.6.
- 6.2.16 “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,” submitted to the US Nuclear Regulatory Commission as an attachment to PG&E letter DCL-17-108 (December 18, 2017), NRC ADAMS Accession Number ML17352A703.
- 6.2.17 “Probabilistic Risk Assessment of Nuclear Power Plant Spent Fuel Handling and Storage Programs: Methodology and Application to the Diablo Canyon Power Plant,” B. John

Garrick and Donald J. Wakefield, Report GIRS-2020-3/L, published by the UCLA B. John Garrick Institute for the Risk Sciences, Los Angeles (February 17, 2020).

- 6.2.18 “Diablo Canyon Independent Safety Committee Thirtieth Annual Report on the Safety of Diablo Canyon Nuclear Power Plant Operations, July 1, 2019 – June 30, 2020,” Approved September 30, 2020, Exhibit B.9.
- 6.2.19 “Mitigating Strategies Assessment (MSA) report for the New Seismic Hazard Information,” submitted to the US Nuclear Regulatory Commission as an attachment to PG&E letter DCL-18-026 (April 24, 2018), NRC ADAMS Accession Number ML18120A119.
- 6.2.20 “Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigating Strategies for Beyond-Design-Basis External Events,” US Nuclear Regulatory Commission, NRC Interim Staff Guidance JLD-ISG-2012-01, Revision 2, (February 2017), NRC ADAMS Accession Number ML17005A188.
- 6.2.21 A. M. Kolaczowski, D. Kelly, and D. W. Whitehead, Sandia Letter Report to the NRC, “Estimate of External Events Contribution to Pressurized Thermal Shock (PTS) Risk” (October 1, 2004), NRC ADAMS Accession Number ML042880476.
- 6.2.22 “Diablo Canyon Independent Safety Committee Thirty-Third Annual Report on the Safety of Diablo Canyon Nuclear Power Plant Operations, July 1, 2022 – June 30, 2023,” Approved September 13, 2023, Volume II, Exhibit D.8, Section 3.9, “FLEX Program Capabilities During a Seismic Event,” and Section 3.14, “California Senate Bill 846 Requirements Regarding an Updated Seismic Assessment.”
- 6.2.23 Ibid., Exhibit D.8, Section 3.9, “Review of the 2010 Enercon Services Report Regarding Seismic Vulnerabilities.”