



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

October 12, 2012

Mr. Edward D. Halpin
Senior Vice President and
Chief Nuclear Officer
Pacific Gas and Electric Company
Diablo Canyon Power Plant
P.O. Box 56, Mail Code 104/6
Avila Beach, CA 93424

SUBJECT: DIABLO CANYON POWER PLANT, UNIT NOS. 1 AND 2 – NRC REVIEW OF
SHORELINE FAULT (TAC NOS. ME5306 AND ME5307)

Dear Mr. Halpin:

On January 7, 2011, Pacific Gas and Electric (PG&E, the licensee) provided the U.S. Nuclear Regulatory Commission (NRC) with a report on the analysis of the Shoreline fault. This report can be found in Agencywide Documents Access and Management System (ADAMS) Accession No. ML110140431. This report provided new geological, geophysical, and seismological data to assess the potential seismic hazard of the Shoreline fault.

Based on our review, the NRC has confirmed our preliminary conclusion that the Diablo Canyon Power Plant's (DCPP's) ground motions from the Shoreline fault are at or below those for which the plant was evaluated previously and demonstrated to have reasonable assurance of safety. This letter provides a summary of the results of the NRC's independent assessment of the information found in the January 7, 2011, report. The staff's more complete assessment is documented in Research Information Letter (RIL) 12-01 "Confirmatory Analysis of Seismic Hazard at the Diablo Canyon Power Plant from the Shoreline Fault Zone" (ADAMS Accession No. ML121230035). In addition, this letter places the NRC's review of the Shoreline fault into context with a recent NRC action to have all of its nuclear power reactor licensees conduct seismic reevaluations. This action is documented in the March 12, 2012, request for information that was sent pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.54(f) (ADAMS Accession No. ML12053A340).

Shoreline Fault Report

On November 14, 2008, PG&E informed the NRC that it had identified a zone of seismicity that may indicate a previously unknown fault located offshore of the DCPP. The potential fault was identified as a result of a collaborative research program between PG&E and the U.S. Geological Survey (USGS). This research program, called the PG&E-USGS Cooperative Research and Development Agreement (CRADA), focuses on increasing the understanding of tectonics in the region around the DCPP.

Shortly after PG&E reported the potential for a new fault, the licensee's representatives provided the NRC with sets of initial scientific data and information related to the hypothesized fault in e-mails dated November 20 and 21, 2008 (ADAMS Accession Nos. ML090690193 and

ML090690218, respectively). PG&E named the hypothesized fault the "Shoreline fault." Based on the information provided by PG&E and the USGS, the NRC performed an independent assessment of this information and documented its review in Research Information Letter 09-001 (RIL 09-001) entitled "Preliminary Deterministic Analysis of the Seismic Hazard at Diablo Canyon Nuclear Power Plant from Newly Discovered 'Shoreline Fault'" (ADAMS Accession No. ML090330523). PG&E was informed of the publication of RIL 09-001 by the NRC staff by letter dated April 8, 2009 (ADAMS Accession No. ML090930459). The NRC's letter stated that the preliminary assessment was that the seismic loading levels for the Shoreline fault were below those for which the plant was previously analyzed. The NRC reviewed information on an ongoing basis as the USGS and PG&E continued to obtain new data as a result of ongoing fieldwork.

In the Shoreline Report dated January 7, 2011, PG&E updated the information that it had provided previously to the NRC staff. In reviewing the complete set of seismological, geological, and geophysical data, the NRC staff worked with independent external experts in the areas of paleoseismology, tectonics, and geology to assess the quality and reliability of the data, to address the broader questions related to regional tectonics, and to develop the five principal interpretations described in RIL 12-01. In addition, NRC staff members and their team of experts visited the site in October 2011 to view the geologic and tectonic features first hand. Based on a review of the report dated January 7, 2011, and the site visit, the NRC Review Team developed an independent assessment of the seismic source characteristics of the Shoreline fault¹ and performed an independent Deterministic Seismic Hazard Assessment as documented in RIL 12-01.

As documented in RIL 12-01, the NRC staff's assessment is that deterministic seismic-loading levels predicted for all the Shoreline fault earthquake scenarios developed and analyzed by the NRC are at, or below, those levels for the Hosgri earthquake (HE) ground motion and the long-term seismic program (LTSP) ground motion. The HE ground motion and the LTSP ground motion are those for which the plant was evaluated previously and demonstrated to have reasonable assurance of safety. Therefore, the staff has concluded that the Shoreline scenario should be considered as a lesser included case under the Hosgri evaluation and the licensee should update the final safety analysis report (FSAR), as necessary, to include the Shoreline scenario in accordance with the requirements of 10 CFR 50.71(e).

Diablo Canyon Seismic Design and Licensing Bases

Three design basis earthquakes were used to develop the seismic qualification basis for plant structures, systems, and components at DCCP:

- *Design Earthquake (DE)* (0.2g) - The amount of vibratory ground motion for which those plant features necessary for continued operation remain functional without undue risk to the health and safety of the public. This is considered to be the equivalent of the operating basis earthquake (OBE) in the licensing basis of the plant.

¹ Based on the data and analysis that the licensee provided, and a determination by the USGS, the "potential" Shoreline fault is treated as a fault for the deterministic analysis documented in RIL 12-01.

- *Double Design Earthquake (DDE) (0.4g)* - The evaluation of the maximum earthquake potential (producing the maximum vibratory ground motion) for which structures, systems, and components needed to prevent or mitigate an accident will remain functional. This evaluation includes all earthquake epicenters within 200 miles and faults within 75 miles of the plant and is considered to be the equivalent to the safe shutdown earthquake (SSE) as described in 10 CFR Part 100, Appendix A.
- *Hosgri Earthquake (HE) (0.75g)* - A postulated 7.5 M earthquake (unique to DCPP) assumed to occur on the Hosgri Fault line. Equipment credited in the HE shutdown path is required to remain functional following a Hosgri design basis earthquake.

Consistent with the DCPP Final Safety Analysis Report Update, Revision 20, the DDE is the equivalent of the SSE at DCPP. When the DCPP Unit 1 license was issued, it included a license condition for PG&E to implement a program to reevaluate the seismic design bases used for DCPP. This license condition led to the development of the LTSP.

Long Term Seismic Program

In compliance with the seismic license condition, PG&E performed a full seismic reevaluation of the DCPP between 1985 and 1988. The licensee performed a seismic margins assessment (SMA) and a seismic probabilistic risk assessment (SPRA) as detailed in the Final Report of the Diablo Canyon Long-Term Seismic Program. The NRC staff's evaluation of this material is documented in NUREG-0675, "Safety Evaluation Report Related to the Operation of Diablo Canyon Nuclear Power Plant, Units 1 and 2," Supplement 34, June 1991. During that reevaluation, the licensee continued to conclude that the Hosgri fault was capable of producing the largest ground motion at DCPP, and, therefore, remained the controlling fault for the seismic design.

The DCPP Final Safety Analysis Report Update states in Section 2.5, "The LTSP contains extensive databases and analyses that update the basic geologic and seismic information in this FSAR Update. However, the LTSP material does not alter the design bases for DCPP." In SSER 34, the NRC states, "The Staff notes that the seismic qualification basis for Diablo Canyon will continue to be the original design basis plus the Hosgri evaluation basis, along with associated analytical methods, initial conditions, etc." The NRC staff concluded in SSER 34 that the DCPP seismic margins are adequate to accommodate the LTSP spectrum.

Information Requested in Accordance with 10 CFR 50.54(f)

In the March 12, 2012, request for information, the NRC staff detailed a two-phase approach related to reevaluating seismic hazards at all power reactor licensees in response to recommendations of the Near-Term Task Force review of the accident at Fukushima Dai-ichi nuclear facility. PG&E is required to take the actions described and respond to this letter. The first phase is to perform a reevaluation of the seismic hazards at the DCPP site using updated seismic information and present-day regulatory guidance and methodologies and then compare

the results to the current seismic design basis. The second phase is based on the results of the first phase and consists of the NRC staff determining whether additional regulatory actions are necessary (e.g., update the design basis and structures, systems, and components important to safety) to provide additional protection against the updated hazards.

Because DCPD is unique in having three earthquake scenarios (DE, DDE, and HE) in its design and licensing basis rather than the normal two (OBE and SSE), the NRC staff expects that the PG&E's response to the March 12, 2012, request for information will compare the updated probabilistic ground motion (i.e., the ground motion response spectrum (GMRS)) with the ground motion in the plant's current licensing basis that is stated as the equivalent of the SSE ground motion. Consistent with the DCPD Final Safety Analysis Report Update, Revision 20, the DDE is the equivalent of the SSE at DCPD. Therefore, for purposes of the response to the March 12, 2012, request for information, the NRC staff expects PG&E to use the DDE for comparison with the reevaluated seismic hazard GMRS.

NRC Staff's Shoreline Fault Assessment in the Context of the March 12, 2012, Request for Information

The NRC recognizes that using the DDE as the basis of comparison will most likely result in the Shoreline fault and the Hosgri earthquake being reported as having greater ground motion than the SSE. The staff has concluded that it is appropriate to include these scenarios, along with any new seismic information that may be developed, in the risk-informed, performance-based GMRS and then follow the process set forth in the March 12, 2012, request for information, to determine whether any additional regulatory action is needed. Changes to the licensing basis may be appropriate to capture the information developed in response to the March 12, 2012, request for information.

It should be reiterated that the NRC staff has concluded that deterministic seismic-loading levels predicted for all the Shoreline fault earthquake scenarios developed and analyzed by the NRC are at, or below, those levels for the HE ground motion and the LTSP ground motion. The HE ground motion and the LTSP ground motion are those for which the plant was evaluated previously and demonstrated to have reasonable assurance of safety. Therefore, the existing design basis for the plant already is sufficient to withstand those ground motions.

The NRC staff understands that the seismic evaluations described in the March 12, 2012, request for information are currently in progress at DCPD, and PG&E plans to acquire new offshore and onshore two- and three-dimensional seismic reflection data to identify and characterize faults in the vicinity of DCPD. If during the collection of the data, new faults are discovered or information is uncovered that would suggest the Shoreline fault is more capable than currently believed, the staff expects that the licensee will provide the NRC with an interim evaluation that describes actions taken or planned to address the higher seismic hazard relative to the design basis, as appropriate, prior to completion of the evaluations requested in the NRC staff's March 12, 2012, request for information. The staff will use this information to independently assess whether the new fault or new information related to the Shoreline fault challenges or changes the staff's current position that the motions associated with the Shoreline fault are at or below those levels of the HE and LTSP ground motions.

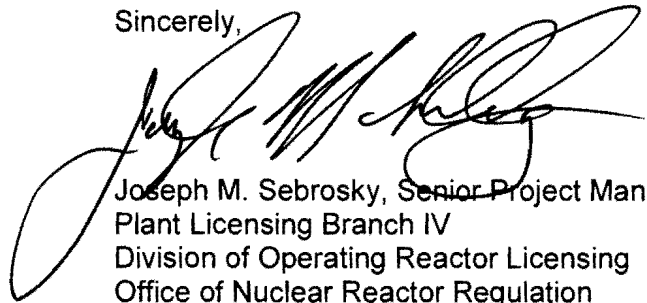
E. Halpin

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For the longer term, consistent with the March 12, 2012, request for information, based on the information from the first phase, the NRC staff will determine whether additional regulatory actions are necessary.

The NRC plans to inform stakeholders of its review of the Shoreline fault and on its continuing review of this matter as additional information becomes available. If you have any questions regarding these evaluations, please contact me at 301-415-1132 or via e-mail at joseph.sebrosky@nrc.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Joseph M. Sebrosky". The signature is fluid and cursive, with a large initial "J" and "S".

Joseph M. Sebrosky, Senior Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-275 and 50-323

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E. Halpin

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Sincerely,

/RA/

Joseph M. Sebrosky, Senior Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-275 and 50-323

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