

**BEFORE THE UNITED STATES  
NUCLEAR REGULATORY COMMISSION**

**BEFORE THE ATOMIC SAFETY AND LICENSING BOARD**

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In the Matter of )  
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PACIFIC GAS & ELECTRIC COMPANY )  
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(Diablo Canyon Nuclear Power Plant, Units 1 and 2) \_\_\_\_\_ )

Docket No. 50-275-LR  
Docket No. 50-323-LR

October 10, 2014

(License Renewal Application)

**FRIENDS OF THE EARTH’S REQUEST FOR A HEARING  
AND PETITION TO INTERVENE**

**I. INTRODUCTION**

Petitioner Friends of the Earth (“FoE”) requests a hearing and seeks to intervene in this license renewal proceeding in order to assure a full airing in public adjudicatory hearings of issues affecting the public health and safety before a license renewal is granted for the continued operation of the Diablo Canyon Nuclear Power Plant (“Diablo Canyon” or “Diablo”). The release by Pacific Gas & Electric (“PG&E”) of the Central Coastal California Seismic Imaging Project Report<sup>1</sup> (“PG&E Seismic Report”) on September 10, 2014 raises issues of concern to FoE and its members, which has led to the filing of this Petition.

FoE offers three contentions regarding the proposed license renewal. First, FoE wishes to call to the Commission’s attention a series of new seismic findings in the PG&E Seismic Report that show Diablo Canyon cannot provide the assurances of safe operation required to obtain permission to operate the plant through its sixth decade. Second, Petitioner contends that the licensee has not identified or analyzed the effects of aging on two systems that are crucial to

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<sup>1</sup> See PG&E, Central Coastal California Seismic Imaging Project, <http://www.pge.com/en/safety/systemworks/dcpp/seismicafety/report.page> (last accessed Oct. 1, 2014) (“PG&E Seismic Report”).

the operation of structures, systems, or components (“SSCs”) vital to the safety of the plant.

Third, FoE contends that in light of the new seismic findings PG&E has failed to establish in its aging management plan that the effect of aging on Diablo Canyon will be adequately managed for the period of extended operation. We take up these contentions below.

The Atomic Licensing Appeals Board (“ALAB”) that reviewed the license for Diablo in 1981 stated clearly the objective of the Commission’s seismic review of all nuclear power plants:

[T]he Commission's regulations calling for its application to the siting and design of nuclear plants are complex and perhaps even abstruse. But their purpose is clear: to estimate the magnitude of the strongest earthquake that might affect the site of a nuclear power plant during its operating lifetime; to determine the most intense ground motion that a seismic event could cause there; and to ensure that the nuclear facility is designed and built to survive such an event without undue risk to the public.<sup>2</sup>

In the case of Diablo, the Nuclear Regulatory Commission (“NRC” or “Commission”) approved a Design Basis earthquake based on the potential for seismic activity at the plant. The Double Design Earthquake (“DDE”), the largest earthquake in the plant’s initial seismic design basis, was assumed to have a maximum acceleration of 0.4 g. In line with NRC regulations, the SSCs of the plant were benchmarked against such a rate of acceleration.

Before construction was completed on Diablo, however, an additional fault was discovered just five kilometers from the plant. This fault, which came to be known as the Hosgri fault, was determined to be capable of ground acceleration of 0.75 g, substantially greater than the DDE. When it became clear that application of the same assumptions about the propagation and effect on built materials of seismic events as had been used in the DDE analysis would require reconstruction of Diablo,<sup>3</sup> the Commission accepted an alternative set of assumptions to

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<sup>2</sup> *Pacific Gas & Elec. Co.* (Diablo Canyon Nuclear Power Plant, Units 1 & 2), ALAB-644, 13 NRC 903, 913 (1981).

<sup>3</sup> See *Opinion of Commissioners Gilinsky and Bradford on Commission Review of ALAB-644 (Diablo Canyon Seismic Proceeding)*, 1982 WL 31523 (Mar. 18, 1982), at 4.

be used to determine the impact of the maximum earthquake from the Hosgri fault.<sup>4</sup> The assumptions for such a “beyond design basis event” involved the assumed length of the Hosgri fault; the magnitude and attributes of the fault; the ground motion prediction equations; damping factors; and a separate “Tau Factor” that reduced the projected effect of low frequency seismic waves on the structure of the power plant.<sup>5</sup> The Commission also required PG&E to develop and implement a Long Term Seismic Program to seek greater understanding of the geological structure of the ocean floor and land near Diablo. That program was completed in 1991.<sup>6</sup>

A key assumption of the Hosgri analysis had to do with the length and interconnectedness of the Hosgri and other faults.<sup>7</sup> Intervenors contended that the Hosgri fault was interconnected with other faults in a way that created a very long fault line with the potential for a correspondingly more powerful earthquake but this concept was rejected by the ASLB.<sup>8</sup>

In 2008, a U.S. Geological Survey geophysicist discovered a previously unknown fault just offshore from Diablo Canyon. Despite its being located just 600 meters from Diablo Canyon’s intake structure, NRC and PG&E scientists had failed to discover the fault during the approximately 30 years since Diablo Canyon began operations or in the approximately 45 years since the plant’s construction permits were issued. Six years after the discovery of this fault, later named the Shoreline fault, PG&E has not demonstrated that the plant can be safely operated under its existing operating license.

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<sup>4</sup> *Pacific Gas & Elec. Co.* (Diablo Canyon Nuclear Power Plant (Units 1 and 2)), LBP-79-26, 10 NRC 453, 490-91 (1979). Petitioner’s view, as described further herein, is that this exception has limited application and, as stated in the Final Safety Analysis Report (Rev. 21) section 2.5.3.10.4 for Diablo Canyon, “the seismic qualification basis for Diablo Canyon will continue to be the *original design basis plus* the Hosgri evaluation basis” (emphasis supplied). See also *Opinion of Gilinsky and Bradford*, at 5-6 (“Every advantage was taken of slack in safety margins left in the pre-Hosgri analysis, both in developing the response spectrum and in its application.”).

<sup>5</sup> *Pacific Gas & Elec. Co.*, 10 NRC at 494-495. See also *Pacific Gas & Elec. Co.*, 13 NRC 903 (1981).

<sup>6</sup> Again, the Long Term Seismic Program did not remove the Double Design Earthquake from the seismic qualification basis for Diablo Canyon. See note 4.

<sup>7</sup> *Pacific Gas & Elec. Co.*, 13 NRC at 919 (“[F]ault length is one key factor considered in determining its maximum earthquake potential.”).

<sup>8</sup> *Id.* at 922 (“The Board below relied on [evidence submitted by other parties], among other things, in rejecting the combined fault theory that was central to intervenors’ case on fault length.”).

The 2014 PG&E Seismic Report containing new information on the Shoreline fault indicates that the Shoreline fault and the nearby Los Osos and San Luis Bay faults are capable of producing an earthquake with ground acceleration that far exceeds the limits in the plant's current licensing basis, posing a serious safety risk to the public and environment near the plant. The licensee initially responded to this information by proposing a license amendment that would have inserted the special Hosgri "beyond design basis" analysis, with its less conservative assumptions, into its license as the design basis for analyzing the Shoreline fault. NRC's regional office, including the resident inspector at the Diablo plant, took the position that without such an amendment, the original DDE analysis would be the yardstick by which the plant's ability to withstand a Shoreline fault earthquake would be judged.<sup>9</sup> But PG&E subsequently withdrew the proposed amendment "at the NRC's request."<sup>10</sup> Since then, the Commission staff has taken the position that the analytical structure, including all the "beyond design basis" assumptions, made in the Hosgri analysis have been incorporated into the Diablo license without a license amendment.<sup>11</sup> Thus the Commission's current position is that the licensee may demonstrate the plant's seismic safety by reference to either the method and assumptions used originally to demonstrate that Diablo could withstand a DDE; or by reference to the less conservative method and assumptions used to determine the plant could withstand the strongest earthquake that could result from the Hosgri fault.

On September 10, 2014, PG&E released its Seismic Report, which was ordered by legislation enacted by the California legislature. Based on new geophysical information gathered for faults near the Diablo plant, including the Hosgri, Shoreline, San Simeon, San Luis Bay, and

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<sup>9</sup> Michael Peck, Senior Resident Inspector, *Differing Professional Opinion*, DPO-2013-002 (July 18, 2013), at 13, 20.

<sup>10</sup> *Id.* at 25.

<sup>11</sup> This regulatory sleight of hand is opposed in a separate petition filed with the Commission by Petitioners on August 26, 2014.

Los Osos faults, the new study makes findings dramatically at odds with the findings of the Atomic Safety and Licensing Board in 1979 and the Atomic Licensing Appeals Board in 1981, as well as subsequent reports regarding the Shoreline fault.<sup>12</sup>

In direct contradiction to those previous findings, the PG&E Seismic Report states that the Hosgri and San Simeon faults are interconnected.<sup>13</sup> Moreover, the two faults are so closely connected that it is assumed they will rupture together rather than separately. The consequence of such a rupture over the entire 171-km fault line could be a maximum earthquake of magnitude 7.3, producing an estimated ground motion at the Diablo Canyon facility that is larger than the estimates for Hosgri, Shoreline, or San Luis Bay faults.<sup>14</sup>

The Report states that the Shoreline fault is now assumed to be 45 km long, twice the length assumed in the 2011 Shoreline Fault Zone Report, and almost three times as long as thought in 2009, and is capable of generating a magnitude 6.7 earthquake, occurring within only 600 meters of the Diablo Canyon intake. Such an earthquake would produce greater ground motion than estimated previously for the Hosgri fault, which is located nearly 5 kilometers from the plant.

The Report also concludes that the San Luis Bay fault is capable of generating a magnitude 6.4 earthquake, which is larger than estimated in PG&E's 2011 report.

Thus the PG&E Seismic Report establishes that the earthquake caused by the Hosgri fault, as identified and analyzed in the Hosgri part of the original licensing proceeding, is no longer the largest or most powerful threat to the Diablo plant. Nor can a rupture on the Hosgri fault be described in any way as the "bounding" scenario. A joint rupture on the Hosgri-San

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<sup>12</sup> Pacific Gas and Electric Company (PG&E), 2011. *Shoreline Fault Zone Report: Report on the Analysis of the Shoreline Fault Zone, Central Coastal California*, report to the U.S. Nuclear Regulatory Commission, January; [www.pge.com/myhome/edusafety/systemworks/dcpp/shorelinereport/](http://www.pge.com/myhome/edusafety/systemworks/dcpp/shorelinereport/).

<sup>13</sup> PG&E Seismic Report, Ch. 13 at 17.

<sup>14</sup> *Id.* at 17.

Simeon and Shoreline faults now accounts for the maximum vibration to which Diablo could be subjected.

The PG&E Seismic Report nonetheless takes the position that the risk of earthquake damage to Diablo from the increased energy discharge expected from a joint rupture of the Hosgri-San Simeon and Shoreline faults is not as great as identified in its previous report. This seemingly illogical conclusion is reached through adjustments to the previously used ground motion prediction equations that have the effect of attenuating the calculated flow of energy transmitted from the faults to the Diablo plant. These equations are the newest iteration of a series of ground motion equations used in recent years by PG&E that have not been peer reviewed or approved for use by the NRC, and are not part of the Diablo license. It follows that, since entirely different ground motion prediction equations have been used to calculate the energy transmitted to the plant from the ones used for either the DDE or the Hosgri calculation, and since the new equations are not a part of the licensing basis for Diablo, they cannot be used in this proceeding to justify an extension of the license for Diablo Canyon for an additional 20 years of operation.<sup>15</sup>

The findings of the PG&E Seismic Report raise issues related to the aging of Diablo Canyon that are not addressed in the applicant's license renewal application. First, the Report demonstrates that the seismic energy that could strike the aging plant is significantly more than was assumed when the plant was brand new. This new information means that the aging analysis of the plant must ask whether, taking account of the aging of the facility, it can withstand the magnitude of seismic challenge that has been identified by the PG&E Seismic Report. Second,

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<sup>15</sup> Petitioner's view is that the DDE is the relevant point of comparison. To the extent the Commission and/or licensee takes the position that the Hosgri evaluation is the "bounding" analysis, for the reasons described in Contention 1, below, this position is unsupported. For instance, the fact that entirely different ground motion prediction equations have been used rules out any comparison of the Hosgri fault calculation made in the 1970s with the current analysis, barring any claim that Hosgri analysis is "bounding."

we identify two systems – relay switches and snubbers – that are crucial to the functioning of safety-related SSCs whose performance is related both to their aging and to the seismic environment in which they must function. Neither of the time-limited aging analyses for these systems has been evaluated, using the new seismic data, to assure they will continue to operate and protect the major safety-related SSCs of the plant.

## II. LEGAL STANDARDS REGARDING ADMISSIBILITY OF CONTENTIONS

Commission regulations require that an admissible contention include (1) a specific statement of the legal or factual issue proposed; (2) a brief explanation of its basis; (3) a demonstration that the issue is within the scope of the proceeding; (4) a demonstration that the issue is material to the findings the NRC must make to support the action involved in the proceeding; (5) a concise statement of the alleged facts or expert opinions; and (6) sufficient information to show that a genuine dispute exists with regard to a material issue of law or fact.<sup>16</sup> This standard “does not call upon the intervenor to make its case at [the contention] stage of the proceeding, but rather to indicate what facts or expert opinions, be it one fact or opinion or many, of which it is aware at that point in time which provide the basis for its contention.”<sup>17</sup> “The requirement generally is fulfilled when the sponsor of an otherwise acceptable contention provides a brief recitation of the factors underlying the contention or references to documents and texts that provide such reasons.”<sup>18</sup>

In addition, a contention of “omission” that focuses on the absence of a required analysis in the application is admissible and will not be deemed speculative because of any lack of detail

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<sup>16</sup> 10 C.F.R. § 2.309(f).

<sup>17</sup> *Entergy Nuclear Generation Co. and Entergy Nuclear Operations, Inc.* (Pilgrim Nuclear Power Station), LBP-06-23, 64 NRC 257, 356 (2006) (internal quotation marks omitted).

<sup>18</sup> *Id.* (internal quotation marks and footnotes omitted).

regarding the potential content of the missing information.<sup>19</sup> Indeed, “[a] contention may be plausible enough to meet the admission standards even if it is ultimately denied on the merits.”<sup>20</sup>

### III. CONTENTIONS

#### CONTENTION 1

#### **PG&E’S OPERATING LICENSE FOR DIABLO CANYON SHOULD NOT BE RENEWED UNLESS AND UNTIL PG&E ESTABLISHES THAT THE PLANT CAN WITHSTAND AND BE SAFELY SHUT DOWN FOLLOWING AN EARTHQUAKE ON THE HOSGRI-SAN SIMEON, SHORELINE, LOS OSOS, OR SAN LUIS BAY FAULTS.**

##### **a. Statement of Basis**

In 1981, the ASLB Appeal Board found that the Hosgri fault, located roughly 5 kilometers from the plant and not known at the time to be connected to any other fault or to be likely to jointly rupture with any other fault, to be the “geologic feature capable of triggering the largest seismic event at Diablo Canyon.”<sup>21</sup> According to the PG&E Seismic Report, this conclusion is now known to be inaccurate. As a result, the NRC no longer has a basis for any conclusion that there is a reasonable assurance that the aging equipment in the Diablo Canyon reactors can withstand the effects of the maximum possible earthquake. PG&E’s operating licenses for Diablo Canyon should thus not be renewed until PG&E can demonstrate that the plant can be safely shut down in light of the significant new information about the seismic energy to which Diablo Canyon could be exposed.

##### *i. Regulatory Framework And Diablo Canyon Design Basis*

As the Atomic Safety and Licensing Appeal Board explained in 1981, “all nuclear power plants must be designed and built to protect the public from the hazards of radioactive releases

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<sup>19</sup> *Entergy Nuclear Operations, Inc.* (Indian Point Nuclear Generating Units 2 and 3), LBP-08-13, 68 NRC 43, 86, n.194 (2008).

<sup>20</sup> *Entergy Nuclear Vermont Yankee, LLC, and Entergy Nuclear Operations, Inc.* (Vermont Yankee Nuclear Power Station), LBP-06-20, 64 NRC 131, 160 (2006), *rev’d in part*, CLI-07-16, 65 NRC 371 (2007).

<sup>21</sup> *Pacific Gas & Electric Co.* (Diablo Canyon Nuclear Power Plant, Unit 1 & 2), ALAB-644, 13 NRC 903, 913 (1981).



should the plant be subjected to movements in the earth's crust."<sup>22</sup> Indeed, 10 C.F.R. Part 100, Appendix A and 10 C.F.R. Part 50, Appendix A, General Design Criterion 2 require licensees to determine and evaluate the "maximum earthquake potential considering the regional and local geology and seismology and specific characteristics of local subsurface material."<sup>23</sup> Part 100, Appendix A describes the maximum earthquake as that which "produces the maximum vibratory ground motion for which certain structures, systems, and components are designed to remain functional."<sup>24</sup> The seismic design basis for Diablo Canyon Power Plant described, and continues to describe, the ground acceleration from the maximum possible earthquake, the Double Design Earthquake (DDE) or Safe Shutdown Earthquake (SSE), as 0.4g, during which the plant can be safely shut down. Neither the SSE nor the DDE took into account the existence of the Hosgri, Shoreline, San Luis Bay, or Los Osos faults and neither assumed any connections between the Hosgri and either of the San Simeon or Shoreline faults, now both known to connect to the Hosgri fault.

NRC made an exception to the seismic design basis to accommodate the risk presented by the Hosgri fault shortly after it was discovered. That exception was limited to activity on the Hosgri fault. NRC's statement in Supplemental Safety Evaluation Report No. 34, Section 1.4 is incorporated into the Final Safety Analysis Report (Revision 21) for Diablo Canyon. NRC determined that:

...[T]he seismic qualification basis for Diablo Canyon will continue to be the original design basis *plus the Hosgri evaluation basis*, along with the associated analytical methods, initial conditions, etc. The [Long Term Seismic Program] has served as a useful check of the adequacy of the seismic margins and has generally confirmed that the margins are acceptable.<sup>25</sup>

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<sup>22</sup> *Id.* at 909.

<sup>23</sup> 10 C.F.R. Part 100, App. A at III (c).

<sup>24</sup> *Id.*

<sup>25</sup> FSAR Section 2.5.3.10.4 (Rev. 21) (emphasis added).

Thus, after PG&E closed out the Long Term Seismic Program in 1991, the DDE continued to be the SSE for purposes of demonstrating compliance with Part 100, Appendix A, and activity in the Hosgri Fault Zone continued to be a named exception to the seismic qualification basis.

The new seismic information provided in PG&E's Seismic Report about the Hosgri-San Simeon, Shoreline, San Luis Bay, and Los Osos faults shows that the seismic energy associated with seismic activity just 600 meters from Diablo Canyon is far greater than previously known. The PG&E Seismic Report has increased the estimated magnitude of possible earthquakes on the Hosgri, Shoreline, and San Luis Bay faults and the known length of the Shoreline and Hosgri faults has increased significantly. In addition, the Shoreline and Hosgri faults are now assumed to be connected, resulting in a fault at least 145 km<sup>26</sup> in length that can produce a magnitude 7.3 earthquake within 600 meters of the plant. PG&E has not demonstrated that the plant can be safely shut down following an earthquake on one or more of these faults. The Board should not grant PG&E's license renewal request unless and until PG&E can do so.

The seismic knowledge of Diablo Canyon has so dramatically changed for the worse during the 30 years of operating the plant that any failure to consider this issue in a public hearing in this proceeding as provided in the Atomic Energy Act would be patently arbitrary. The seismic issue goes to the heart of the public safety concerns for which the NRC is responsible and for which its enabling statute requires a public hearing.

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<sup>26</sup> PG&E Seismic Report, Ch. 13 at 18. PG&E states: "The rupture length for this scenario is computed using the part of the Hosgri/San Simeon fault that is north of the intersection of the Shoreline fault and the Hosgri fault (100 km) and the full length of the Shoreline fault (45 km) for a total length of 145 km." It is unclear whether a joint rupture is possible on the entire length of the reanalyzed Hosgri-San Simeon fault (171 km) *and* the Shoreline fault (45 km).

ii. *PG&E's Seismic Report Shows A Potential For More Powerful Seismic Activity Near Diablo Canyon Than Previously Known.*

Chapters 1 through 12 of the PG&E Seismic Report describe new geophysical data gathered for faults near Diablo Canyon including the Hosgri, Shoreline, San Simeon, San Luis Bay, and Los Osos faults. Three new important findings in the PG&E Seismic Report bear directly on the potential seismic activity in the area surrounding Diablo Canyon.

1. The Shoreline Fault Is Longer Than Known When Diablo Canyon Was Licensed.

The PG&E Seismic Report states: “The southern end of the Shoreline fault in San Luis Obispo Bay is extended 22 km in length beyond the southern end point identified in the Shoreline Fault Zone Report.”<sup>27</sup> In other words, the Shoreline fault is now described as nearly twice as long as previously thought – 45 km, not 23 km as assumed in 2011.<sup>28</sup> The PG&E Seismic Report now states that an estimated magnitude 6.7 earthquake is the maximum possible on the Shoreline fault, rather than the magnitude 6.5 previously described by PG&E in the 2011 report on the Shoreline fault.<sup>29</sup> Retired professor of geophysics Gerhard Jentzsch explains in his accompanying affidavit that an increase of magnitude 0.2 is not to be dismissed as minor; indeed, the increase results in a *doubling* of the seismic energy produced by the event.<sup>30</sup> And the energy released by the fault would originate within 600 meters of Diablo Canyon.<sup>31</sup>

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<sup>27</sup> PG&E Seismic Report, Technical Summary at 6.

<sup>28</sup> *Id.* at 7.

<sup>29</sup> *Id.* at 10.

<sup>30</sup> Affidavit of Gerhard Jentzsch, Attachment 1, at ¶¶ 2, 17 (“Jentzsch Affidavit”).

<sup>31</sup> PG&E Seismic Report, Ch. 13 at 18.

2. The Hosgri And Shoreline Faults May Rupture Together To Produce Greater Ground Motion Than Possible From A Rupture On The Hosgri Fault Alone.

PG&E states: “The new information collected on the geometry of the Shoreline and Hosgri faults shows that within a resolution of a few hundred meters, the two faults intersect.”<sup>32</sup> PG&E finds that a rupture of the section of the Shoreline fault within 5 km of Diablo Canyon could jointly rupture with the Hosgri fault and produce ground motion greater than could be produced by a rupture on the Hosgri fault alone.<sup>33</sup> More specifically, PG&E’s Seismic Report states a joint rupture of the Shoreline and Hosgri faults could result in *a magnitude 7.3 earthquake within 600 meters of the plant.*<sup>34</sup>

3. The Hosgri And San Simeon Faults Are Connected.

The PG&E Seismic Report states: “[A] structural connection most likely exists between the eastern strand of the Hosgri fault and the San Simeon fault” but the connection is “not well imaged.”<sup>35</sup> The two faults are so closely connected that PG&E assumes they will rupture together rather than separately.<sup>36</sup> PG&E states that a rupture, now found to be possible on over 171 km of fault line, could result in a magnitude 7.3 earthquake, a magnitude 0.2 higher than reported in the 2011 Shoreline Fault Zone Report – a doubling of the energy released in an earthquake.

These findings make clear that previous seismic studies by PG&E significantly underestimated the potential seismic energy that could be released near Diablo Canyon. The above three new findings are significant because they demonstrate that the known faults are longer than previously thought and connected in ways not previously understood. As Professor

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<sup>32</sup> *Id.* at 17.

<sup>33</sup> *Id.* at 17.

<sup>34</sup> PG&E Seismic Report, Technical Summary at 10; Ch. 13 at 17-18.

<sup>35</sup> *Id.* at 5.

<sup>36</sup> *Id.* at 10.

Jentzsch states in his accompanying affidavit: “The longer the fault, the more energy can be built up – and the bigger are the magnitudes of the events to be expected.”<sup>37</sup> The PG&E Seismic Report finds that the maximum earthquakes on both the Hosgri and Shoreline faults would release double the energy estimated as recently as 2011.

*iii. PG&E’s Analysis In Its Seismic Report Uses Unproven, Non-Peer-Reviewed, And Untested Assumptions Of The Ground Speed Potential At The Plant From Seismic Activity On The Hosgri-San Simeon, Shoreline, Los Osos, and San Luis Bay Faults*

To determine the amount of ground motion caused by the energy released in the rupture of a particular fault that will reach Diablo, NRC uses certain assumptions called ground motion prediction equations to arrive at the “ground motion response spectra.”<sup>38</sup> These spectra predict how much of the energy from an earthquake, and which frequencies of vibration, will be attenuated as they travel from the fault to Diablo, and therefore, how much of the seismic energy will reach the plant structure. The Double Design Earthquake, which is the Safe Shutdown Earthquake for Diablo Canyon, applies one specification of ground motion spectra to arrive at the conclusion that such an earthquake at a specified distance could produce 0.4 g of ground motion at the plant.

To evaluate an earthquake on the *Hosgri* fault, however, NRC agreed to allow PG&E to apply a different set of ground motion potential equations, which are site-specific to Diablo Canyon (1977 HE spectrum).<sup>39</sup> The analysis in chapter 13 of PG&E’s Seismic Report applies yet another set of new and novel ground motion prediction equations from those used to evaluate either the DDE *or* the Hosgri earthquake. For this analysis, PG&E developed a new set of

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<sup>37</sup> Jentzsch Affidavit at ¶ 15.

<sup>38</sup> NRC Standard Review Plan 2.5.2.6 Ground Motion Response Spectra; Reg. Guide 1.60 “Design Response Spectra for Seismic Design of Nuclear Power Plants.”

<sup>39</sup> See FSAR Section 2.5.3.10.4 (Rev. 21) (“...[T]he 1991 LTSP ground motion response spectra does not replace or modify the DE, DDE, or 1977 Hosgri response spectra described above.”)

ground motion prediction equations that further differ from those used to arrive at the DDE, Hosgri, and LTSP ground motion prediction equations.

The NRC has not approved the new ground motion prediction equations used by PG&E. The FSAR, part of the licensing basis for Diablo Canyon, provides ground motion prediction equations used to bound DDE (0.4 g) and Hosgri (0.75 g) events.<sup>40</sup> Section 2.5.3.10 (and References 12 and 24) of the FSAR describes these ground motion response spectra. PG&E used neither the DDE nor the Hosgri ground motion prediction equations to calculate the ground motion potential of the new seismic data.

The ground motion prediction equations used to arrive at the DDE of 0.4 g are, and were at the time they were used, peer-reviewed, scientifically accepted, NRC-approved assumptions. In response to NRC questions about how Diablo Canyon would respond to ground motion produced during a Hosgri event, the NRC reviewed and approved a revised set of ground motion potential equations that produced the 0.75 g value for predicted ground motion at the plant. FSAR section 2.5.3.10.3 incorporates NRC Supplement No. 5 to the Safety Evaluation Report (Sept. 1976), which permitted PG&E to use a different set of ground motion potential equations for that fault.<sup>41</sup> However, the ground motion prediction equations used in the 2014 PG&E Seismic Report are an entirely new set of assumptions, and have not been peer-reviewed or approved for use by the NRC.<sup>42</sup> The predictions of the two different sets of equations are not

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<sup>40</sup> NRC Standard Review Plan 2.5.2.6 Ground Motion Response Spectra; Reg. Guide 1.60 “Design Response Spectra for Seismic Design of Nuclear Power Plants” incorporated into the Final Safety Analysis Report as Updated for Diablo Canyon, Rev. 21, section 2.5.3.10; *Pacific Gas & Electric Co.* (Diablo Canyon Nuclear Power Plant, Unit 1 & 2); Atomic Safety and Licensing Appeal Board, 13 NRC 903, 936 (1981) (describing Staff’s decision to apply different ground motion prediction equations to a Hosgri event than the equations required by Reg. Guide 1.60).

<sup>41</sup> It bears noting that the ground motion prediction equations approved for the Hosgri evaluation were found by former Commissioners Bradford and Gilinsky to significantly reduce the safety margin built in to the DDE. *See Opinion of Gilinsky and Bradford*, 1982 WL 31523, at 5-6 (“Every advantage was taken of slack in safety margins left in the pre-Hosgri analysis, both in developing the response spectrum and in its application.”).

<sup>42</sup> Indeed, PG&E was required by the California legislation ordering the seismic review to submit its analysis to an Independent Peer Review Panel (IPRP) formed to review the ongoing seismic studies at Diablo Canyon. It appears

comparable. Thus PG&E compares apples to oranges when it uses the PEER ground-motion prediction equations to argue that the ground motions possible from ruptures on the studied faults are bounded by the 1977 Hosgri and 1991 LTSP ground motion response spectrum.<sup>43</sup>

PG&E's Seismic Report shows that the Hosgri-San Simeon, Shoreline, Los Osos, and San Luis Bay faults would release substantially greater seismic energy toward the plant than assumed in the original licensing process and subsequent seismic assessments, such as the 2011 Shoreline Fault Zone Report. Professor Jentzsch calculates that a magnitude 6.8 earthquake occurring 10 km from Diablo Canyon could produce up to 1.24 g,<sup>44</sup> ground speed 65% higher than projected by the NRC Hosgri equations from a Hosgri event (0.75 g) and more than triple the ground speed of the postulated DDE (0.4 g). PG&E's conclusion that a magnitude 7.3 earthquake from a rupture on the Shoreline fault, at a distance of 0.6 km (only slightly more than *one-seventeenth* the distance in Jentzsch's example) from Diablo Canyon, could produce ground speed of no more than 0.6 g at Diablo Canyon, is not logically sound.<sup>45</sup> The new information in the PG&E Seismic Report shows there is a significant safety risk that should not be overlooked in the license renewal proceeding.

Historical experience of seismic activity south of Diablo Canyon further suggests that even 0.75 g is far too low a ground speed prediction for shaking at the plant in the event of an earthquake on a nearby fault. Professor Jentzsch describes the January 17, 1994 Northridge earthquake, measured at a magnitude 6.7,<sup>46</sup> which resulted in ground acceleration of 1.8 g at a

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that PG&E ignored this requirement and simply released the Seismic Report without submitting the report to the IPRP. See "Critics allege the Diablo Canyon seismic studies lacked proper review," New Times SLO (Oct. 8, 2014), at <http://www.newtimeslo.com/news/11514/critics-allege-the-diablo-canyon-seismic-studies-lacked-proper-review/>

<sup>43</sup> PG&E Seismic Report, Ch. 13 at 12.

<sup>44</sup> Jentzsch Affidavit at ¶ 19.

<sup>45</sup> PG&E Seismic Report, Ch. 13 at 18.

<sup>46</sup> Jentzsch Affidavit at ¶ 25.

point 7 km from the epicenter,<sup>47</sup> more than *double* the ground speed PG&E is predicting for an event on the Hosgri fault. Yet, the Hosgri fault is 2 km closer to the plant than was the Northridge quake to an area that experienced shaking of 1.8 g as a result of the event. A ground acceleration of 1.8 g would be more than four times that of the predicted ground acceleration for a DDE event (0.4 g).

PG&E is required to evaluate these data under the requirements of NRC regulations and the Diablo Canyon license, not their own invented, non-peer reviewed, non-NRC approved methods. PG&E's repeated substitution of revised ground motion equations, each of which seems to systematically counterbalance the increased potential for seismic energy being reported in the fault system around Diablo, does not instill confidence in the utility's conclusions that the plant remains safe. In any case, the ASLB should not grant the license renewal unless and until PG&E can demonstrate, using the ground motion prediction equations contained in Diablo's license, that the plant can be safely shut down even in the face of the potential for significantly increased seismic energy released from the fault systems identified and described in the PG&E Seismic Report. PG&E's license provides two sets of ground motion prediction equations; one approved for use in the DDE analysis and one approved for use in the Hosgri evaluation. It is Petitioner's view that PG&E must demonstrate the seismic safety of Diablo Canyon by reference to the DDE ground motion prediction equations unless and until the Commission approves an amendment to the Diablo FSAR to include revised peer-reviewed equations applicable to the newly discovered seismic information contained in the PG&E Seismic Report. To this end, the Board should order PG&E to perform its additional analysis of the possible ground motion using

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<sup>47</sup> *Id.* at ¶ 26.



NRC-approved, peer-reviewed ground motion prediction equations for PG&E’s final March 2015 report.<sup>48</sup>

If PG&E is prepared to explain and defend publicly a proposal to change the ground motion prediction equations related to the DDE or Hosgri demonstrations, the company should file a revision of the FSAR and amend its license extension proposal to assure public input on the matter.<sup>49</sup>

*iv. Contrary to PG&E’s Assertion In Its Seismic Report, PG&E Fails to Demonstrate That the Ground Motion Possible From Seismic Activity Near Diablo Canyon Is “Bounded” By The Hosgri Spectrum*

PG&E contends in its report that even given this new information, the ground motions predicted for the plant are “bounded by the 1977 Hosgri spectrum” and 1991 LTSP response spectra.<sup>50,51</sup> This statement is erroneous for two reasons: (1) the PG&E Seismic Report substantially and significantly revises the understanding of the seismic landscape near Diablo Canyon; and (2) PG&E’s new assessment of the ground motion potential based on this landscape uses entirely different assumptions than were used in either the DDE, the original seismic design basis, or the Hosgri evaluation.

First, as PG&E’s own report now shows, it had an incomplete picture of the seismic potential in the area around Diablo Canyon in 1977. For example, the Shoreline fault had not yet been discovered. The Shoreline fault is now known to connect to the Hosgri fault in such a way

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<sup>48</sup> PG&E Seismic Report, Ch. 13 at 20. PG&E states that it “will develop a complete set of ground-motion models and weights for application to the DCP” to be part of the March 2015 report. *Id.*

<sup>49</sup> A change to the FSAR of this magnitude would require an amendment to PG&E’s license under the criteria of 10 C.F.R. § 50.59 because such a change would both “result[] in more than a minimal increase in the likelihood of occurrence of a malfunction of a SSC important to safety” and “result[] in a departure from a method of evaluation described in the FSAR used in establishing the design basis or in the safety analysis.” 10 C.F.R. § 50.59 (c)(1)(iv) and (c)(1)(viii), respectively.

<sup>50</sup> PG&E Seismic Study, Ch. 13 at 20.

<sup>51</sup> To the extent PG&E might argue that FSAR Revision 21 now includes the Shoreline Fault Zone as a lesser included case under the Hosgri evaluation, PG&E’s Seismic Report shows this assertion to be baseless, as described in this Contention 1.

that a rupture on one fault could trigger a rupture on the other. The two faults together are 145 km in length, far longer than the 110 km the Hosgri fault was previously thought to be. In 1977 the San Simeon fault was not known to connect to the Hosgri fault; PG&E's Seismic Report now describes the two faults as structurally connected. During the original DDE analysis, PG&E presumed there was no connection between the San Simeon and Hosgri faults and that joint rupture was not possible.<sup>52</sup> PG&E's Seismic Report now says these faults are so interconnected that they are assumed to rupture together. We now know a great deal more about the potential for seismic activity in the area of Diablo Canyon, particularly that the known faults are longer than they first appeared to be and connected in ways that increase the greatest potential energy that could be released along the faults.

Second, in light of the different ground motion equations used in the Hosgri analysis and in the PG&E Seismic Report, PG&E's claim that the 1977 Hosgri earthquake scenario and LTSP "bound" the potential seismic energy released from the Shoreline, San Simeon, Los Osos, and San Luis Bay faults makes no sense. The Hosgri analysis is specific to that fault and, even if it could be applied to other faults, the only meaningful way to do so would be to use the same ground motion prediction equations used to analyze the Hosgri earthquake, not an entirely new set of assumptions, as PG&E has done in its 2014 Seismic Report. PG&E states that the analysis of ground motion potentials in the PG&E Seismic Report are based on a constantly evolving, entirely new set of ground motion prediction equations from those used in either the 1977 Hosgri analysis or the 1991 LTSP. The result of the first calculation, done with a particular set of assumptions and data, cannot rationally be compared to, let alone be asserted to somehow "bound," the result of a second calculation performed with an entirely different set of assumptions and augmented data.

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<sup>52</sup> *Pacific Gas & Elec. Co.*, (Diablo Canyon Nuclear Power Plant (Units 1 and 2)), 10 NRC 453, 472-473 (1979).

**b. A Genuine Dispute Exists With The Applicant On A Material Issue Of Law Or Fact**

This Contention raises a genuine dispute with the applicant regarding whether a license renewal should be granted in this proceeding. Unless or until the applicant cures the deficiencies caused by its failure to properly analyze new seismic information presented in the PG&E Seismic Report, the dispute will remain alive.

**c. This Contention Is Within The Scope Of A License Renewal Proceeding.**

In general, the Commission's regulations require a license renewal application to demonstrate that certain SSCs will continue to function properly during the extended period of operation requested by the licensee. The SSCs within the scope of a license renewal proceeding are defined by 10 C.F.R. § 54.4 and include:

(1) Safety-related systems, structures, and components which are those relied upon to remain functional during and following design-basis events (as defined in 10 CFR 50.49 (b)(1)) to ensure the following functions--

(i) The integrity of the reactor coolant pressure boundary;

(ii) The capability to shut down the reactor and maintain it in a safe shutdown condition; or

(iii) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in § 50.34(a)(1), § 50.67(b)(2), or § 100.11 of this chapter, as applicable.

(2) All nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of any of the functions identified in paragraphs (a)(1)(i), (ii), or (iii) of this section.

(3) All systems, structures, and components relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48), environmental qualification (10 CFR 50.49), pressurized thermal shock (10 CFR 50.61),

anticipated transients without scram (10 CFR 50.62), and station blackout (10 CFR 50.63).<sup>53</sup>

This Contention is within the scope of the Diablo Canyon license renewal proceeding because it seeks to ensure that Diablo Canyon's safety-related SSCs, non-safety related SSCs that support a safety function, and SSCs relied upon in the safety analysis, in their aged state, can continue to perform their intended functions such that the plant can safely remain shut down following an earthquake of the magnitude now known to be possible.

NRC's rules limiting the scope of license extension proceedings are designed to assure an efficient process, avoiding consideration of issues that are dealt with through the continued maintenance required of the licensee throughout the life of the plant.<sup>54</sup> But the Commission's rules implicitly assume, by focusing on the plant's SSCs rather than the seismic environment, that the seismic environment remains as it was when the plant was first licensed. That is no doubt true in most instances, but in the case of Diablo Canyon, the seismic environment has now been shown to be far more challenging than was assumed in the 1970s. An accurate assessment of the capabilities of the aged SSCs must therefore take into account the new seismic information. Given the seismic history and current knowledge of Diablo Canyon recited herein, that excluding consideration of seismic considerations would conflict with the purpose of the license renewal process, which is to insure that the plant can continue to safely operate during the additional 20-year period requested by the licensee.

If, notwithstanding these points, the ASLB determines that NRC regulations preclude Petitioner from asserting in a license renewal proceeding that PG&E cannot establish that Diablo

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<sup>53</sup> 10 C.F.R. § 54.4(a).

<sup>54</sup> Nuclear Power Plant License Renewal; Revisions, 60 Fed. Reg. 22,461, 22,462-63 (May 8, 1995).

Canyon is able to withstand an earthquake that could occur at the site, Petitioner seeks a waiver of application of those regulations.<sup>55</sup>

## CONTENTION 2

### **PG&E HAS FAILED TO ESTABLISH IN ITS LICENSE RENEWAL APPLICATION THAT THE EFFECTS OF AGING ON DIABLO CANYON'S RELAY SWITCHES AND SNUBBERS WILL BE ADEQUATELY MANAGED FOR THE PERIOD OF EXTENDED OPERATION, IN VIOLATION OF 10 C.F.R. § 54.21(c).**

#### **a. Statutory And Regulatory Background**

##### *i. The Scope Of A License Renewal Proceeding*

Generally, the Commission's review of a license renewal application focuses on ensuring that certain SSCs will continue to function properly during the extended period of operation requested by the licensee. It bears repeating that the SSCs within the scope of a license renewal proceeding, as defined by 10 C.F.R. § 54.4, include:

(1) Safety-related systems, structures, and components which are those relied upon to remain functional during and following design-basis events (as defined in 10 CFR 50.49 (b)(1)) to ensure the following functions--

(i) The integrity of the reactor coolant pressure boundary;

(ii) The capability to shut down the reactor and maintain it in a safe shutdown condition; or

(iii) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in § 50.34(a)(1), § 50.67(b)(2), or § 100.11 of this chapter, as applicable.

(2) *All nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of any of*

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<sup>55</sup> See Friends of the Earth's Petition for Waiver of 10 C.F.R. §§ 54.4, 54.21, and 54.29(a) As Applied to Application for Renewal of Licenses for Diablo Canyon Units 1 and 2 ("Waiver Petition"), submitted together with this Petition.

*the functions identified in paragraphs (a)(1)(i), (ii), or (iii) of this section.*

(3) All systems, structures, and components relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48), environmental qualification (10 CFR 50.49), pressurized thermal shock (10 CFR 50.61), anticipated transients without scram (10 CFR 50.62), and station blackout (10 CFR 50.63).<sup>56</sup>

*ii. Contents Of A License Renewal Application*

Pursuant to 10 C.F.R. § 54.21, an application for a license renewal must include, among other requirements, an “evaluation of time-limited aging analyses.” Subsection (c)(1) of that regulation parses the components of this requirement:

A list of time-limited aging analyses, as defined in [10 C.F.R.] § 54.3, must be provided. The applicant shall demonstrate that—

- (i) The analyses remain valid for the period of extended operation;
- (ii) The analyses have been projected to the end of the period of extended operation; or
- (iii) The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.<sup>57</sup>

“Time-limited aging analysis” is defined by 10 C.F.R. § 54.3:

Time-limited aging analyses, for the purposes of this part, are those licensee calculations and analyses that:

- (1) Involve systems, structures, and components within the scope of license renewal, as delineated in [10 C.F.R.] § 54.4(a);
- (2) Consider the effects of aging;
- (3) Involve time-limited assumptions defined by the current operating term, for example, 40 years;

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<sup>56</sup> 10 C.F.R. § 54.4(a) (emphasis added).

<sup>57</sup> 10 C.F.R. § 54.21(c).

(4) Were determined to be relevant by the licensee in making a safety determination;

(5) Involve conclusions or provide the basis for conclusions related to the capability of the system, structure, and component to perform its intended functions, as delineated in § 54.4(b); and

(6) Are contained or incorporated by reference in the CLB.<sup>58</sup>

#### **b. Diablo Canyon's Relay Switches**

An electric relay is a mechanical device that performs a function similar to that of a large switch or circuit breaker. Relays are designed to allow and/or prevent the flow of electricity using springs, electromagnets, and mechanical couplings that pivot, according to the relay's intended function. Relays support other SSCs by ensuring the proper flow of electricity, allowing safety-related SSCs such as cooling water pumps to continue to function properly.<sup>59</sup>

As relays age, the mechanical components within them deteriorate, increasing the likelihood of the occurrence of "relay chatter," a rapid opening and closing of relays that can occur during an earthquake.<sup>60</sup> In the event the buildings at Diablo Canyon were to shake excessively, the mechanical components within relays would bounce from an open to closed position, failing to remain correctly open or closed. Relay chatter can prevent the proper functioning of critical safety-related SSCs, including by preventing electricity from reaching critical pumps that cool and circulate cooling water.<sup>61</sup> Relay chatter may also prevent the flow of electrical signals necessary to monitor and safely operate the reactor from reaching the reactor's control room.<sup>62</sup>

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<sup>58</sup> 10 C.F.R. § 54.3.

<sup>59</sup> Affidavit of Arnold Gundersen, Attachment 2, at ¶ 8 ("Gundersen Affidavit").

<sup>60</sup> *Id.* at 26.

<sup>61</sup> *Id.* at 26.

<sup>62</sup> *Id.* at 26.

Industry experience indicates that as relays age, the components within relays deteriorate in a number of ways.<sup>63</sup> Continual exposure to heat causes mechanical deterioration by hardening the lubrication applied to the relays' armatures.<sup>64</sup> Like any spring, the spring constant of components within relays degrades over time.<sup>65</sup> The rate of spring constant degradation is a function of age, use cycles and temperature.<sup>66</sup>

**c. Diablo Canyon's Snubbers**

Snubbers are specialized devices designed to absorb energy generated during an earthquake to prevent breakage of other SSCs such as pipes.<sup>67</sup> In Diablo Canyon and other plants prone to seismic hazard, pipes are connected to the plant's concrete structures by pipe hangers, which are designed to handle the dead weight of the pipes, and by snubbers. Snubbers are similar to a car's shock absorbers, and are designed and constructed to allow the pipe to move slowly during an earthquake but not break.<sup>68</sup> Snubbers are uniquely designed according to the seismic risk they are intended to mitigate. Accordingly, the appropriate design of a certain snubber depends on accurate seismic data inputs.

**d. Analysis**

- i. PG&E's Time-Limited Aging Analyses For Diablo Canyon's Relay Switches And Snubbers Do Not Take Into Account New And Material Data In The Seismic Report, In Violation Of 10 C.F.R. § 54.21(c)(1)(i)-(iii).*

PG&E has failed to show that its Time-Limited Aging Analyses ("TLAAs") for relay switches and snubbers is adequate. The TLAAs for relays and snubbers, to the extent PG&E has in fact conducted such TLAAs, are no longer valid in light of PG&E's conclusions in the

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<sup>63</sup> *Id.* at 33.

<sup>64</sup> *Id.* at 34.

<sup>65</sup> *Id.* at 34.

<sup>66</sup> *Id.* at 34.

<sup>67</sup> *Id.* at 36-37.

<sup>68</sup> *Id.* at 37.



Seismic Report that its previous analyses of the Hosgri, Shoreline, and other faults greatly underestimated the earthquake capability of those faults. The TLAAAs for relay switches and snubbers have not taken into account this new information and, accordingly, PG&E has failed to evaluate these TLAAAs in violation of 10 C.F.R. § 54.21(c)(1)(i)-(iii).

The license renewal rule requires an applicant to include in its application a list of TLAAAs for certain SSCs,<sup>69</sup> and demonstrate the adequacy of those TLAAAs.<sup>70</sup> An applicant may satisfy this second requirement by making one of three showings: (1) that the “analyses remain valid for the period of extended operation”;<sup>71</sup> (2) that the “analyses have been projected to the end of the period of extended operation”;<sup>72</sup> or (3) that the “effects of aging on the intended function(s) will be adequately managed for the period of extended operation.”<sup>73</sup> PG&E has made none of these showings.

It is not apparent from Diablo Canyon’s License Renewal Application whether PG&E has included evaluations of its TLAAAs for relays and snubbers as required by 10 C.F.R. § 54.21(c). But even if such analysis is included in the License Renewal Application, the evaluations are inadequate and out of date due to PG&E’s failure to take into account the new and material seismic data from the Seismic Report.

1. The Seismic Report Shows That Previous Seismic Analyses Greatly Underestimate The Capability Of Faults Surrounding Diablo Canyon.

The PG&E Seismic Report revised upward the capability of three major faults near Diablo Canyon—the Shoreline, Hosgri, and San Luis Bay faults. Among other findings, the Report concludes that:

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<sup>69</sup> 10 C.F.R. § 54.21(c).

<sup>70</sup> 10 C.F.R. § 54.21(c)(1)(i)-(iii).

<sup>71</sup> 10 C.F.R. § 54.21(c)(1)(i).

<sup>72</sup> 10 C.F.R. § 54.21(c)(1)(ii).

<sup>73</sup> 10 C.F.R. § 54.21(c)(1)(iii).

- The Hosgri and Shoreline faults are now assumed to intersect such that a linked rupture involving the full Hosgri Fault and the full Shoreline fault is possible. This conclusion is contrary to PG&E’s previous assessment in its 2011 Shoreline Report that such a linked rupture was not possible. The recent Seismic Report demonstrates that the linked Hosgri-Shoreline fault structure is capable of producing a magnitude 7.3 earthquake occurring within 600 meters of the plant.<sup>74</sup>
- The Shoreline fault is nearly double the previously assumed length. It is now found to be 45 km long rather than the previously presumed 23 km.<sup>75</sup> This revised estimation increases the potential magnitude of the earthquake from 6.5 to 6.7, resulting in a doubling of the energy output of the earthquake.<sup>76</sup>
- The “step-over” between the Hosgri fault and the San Simeon fault “is small enough that the two faults are presumed to rupture together rather than separately. Under previous PG&E analysis, a rupture on one fault was presumed not to be able to cause a rupture on another fault. This new finding revised the potential magnitude of a Hosgri earthquake from 7.1 to 7.3.<sup>77</sup>

This newly released data demonstrates that previous seismic assessments are thoroughly inaccurate and incomplete.

2. PG&E’s Failure To Conduct Updated TLAA’s For Relays And Snubbers Following The Issuance Of The Seismic Report Violates 10 C.F.R. § 54.21(c)(1)(i)-(iii)

Despite the discovery of new data indicating that previous assessments forming the basis of the seismic qualification of Diablo Canyon’s SSCs are inaccurate and underestimate the

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<sup>74</sup> PG&E Seismic Report, Ch. 13, at 17-18.

<sup>75</sup> PG&E Seismic Report, Technical Summary at 6-7.

<sup>76</sup> *Id.* at 10.

<sup>77</sup> *Id.* at 10.

capability of faults near the plant, PG&E has not conducted any reevaluation of the TLAAs to take into account the updated seismic data. PG&E's current TLAAs for relays and snubbers, to the extent the licensee has conducted such TLAAs, are thus based on obsolete seismic data. Thus, PG&E's conclusions that the plant's relays and snubbers, in their aged state, are able to continue to function properly following a potential earthquake, are no longer valid.

Moreover, permitting the license renewal proceeding to go forward without considering whether the plant's relays and snubbers, in their aged state, can withstand an earthquake which is demonstrably capable of occurring would be at odds with the stated purpose of the license renewal rule. The rule "is intended to ensure that important systems, structures, and components will continue to perform their intended function in the period of extended operation."<sup>78</sup>

Accordingly, "[a]pplicants must 'demonstrate how their programs will be effective in managing the effects of aging during the proposed period of extended operation,' at a 'detailed . . . component and structure level,' rather than at a more generalized 'system level.'"<sup>79</sup> Limiting the scope of the proceeding to exclude consideration of whether the plant's relays and snubbers can withstand an earthquake would not serve the purposes of the license renewal rule. Indeed, excluding this contention based on the fact that this argument might be viewed as having a seismic dimension would counteract the rule's stated purpose of ensuring continued plant safety *on a detailed component and structure level*, rather than at a generalized "system level."<sup>80</sup>

*ii. This Contention Is Within The Scope Of A License Renewal Proceeding.*

Generally, the scope of issues within license renewal proceedings focuses on aging-management issues and time-limited aging analyses that are required by § 54.21(c) for certain

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<sup>78</sup> Nuclear Power Plant License Renewal; Revisions, 60 Fed. Reg. 22,461, 22,463 (May 8, 1995).

<sup>79</sup> *Carolina Power & Light Co.* (Shearon Harris Nuclear Power Plant, Unit 1), ASLBP 07-855-02-LR-BD01, 65 NRC 41, 60 (2007) (quoting *Fla. Power & Light Co.* (Turkey Point Nuclear Generating Plant, Units 3 and 4), CLI-01-17, 54 NRC 3, 8 (2001)).

<sup>80</sup> See *Fla. Power & Light*, 54 NRC at 8.

SSCs.<sup>81</sup> Section 54.4 sets forth which SSCs that are within the scope of a license renewal proceeding, and includes: “(1) Safety-related systems, structures, and components which are those relied upon to remain functional during and following design-basis events . . . to ensure [certain] functions”; and “(2) All nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of any of [three] functions.”<sup>82</sup> Those three functions are to ensure:

- (i) The integrity of the reactor coolant pressure boundary;
- (ii) The capability to shut down the reactor and maintain it in a safe shutdown condition; or
- (iii) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in § 50.34(a)(1) [construction permit site evaluations], § 50.67(b)(2) [amendments to accident source term analyses], or § 100.11 [siting plants based on low population zones] of this chapter, as applicable.<sup>83</sup>

Thus, § 54.4 sweeps within the scope of a license renewal rule “all nonsafety-related” SSCs whose failure *could prevent* satisfactory accomplishment of safety-related SSCs’ important safety functions. Under this standard, in order to determine that a certain SSC is within the scope of the proceeding, and therefore subject to either (1) the aging management program or (2) the requirement to evaluate TLAAs, it is not necessarily to show that a failure of the SSC *would* prevent a safety-related SSC from satisfying its safety-related function; it is necessary only to show that a failure of the SSC in question *might* inhibit a safety-related SSC from discharging its

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<sup>81</sup> See *id.*; 10 C.F.R. § 54.21.

<sup>82</sup> 10 C.F.R. § 54.4(a).

<sup>83</sup> 10 C.F.R. § 54.4(a).

safety-related function.<sup>84</sup> If such a showing is made, the SSC in question is within the scope of a license renewal proceeding.<sup>85</sup> Relays and snubbers easily meet this standard.

#### 1. Relays Are Within The Scope Of A License Renewal Proceeding

Relays ensure the proper flow of power to crucial safety-related SSCs.<sup>86</sup> Relays' proper functioning is therefore necessary to ensure the plant's ability to safely shut down and remain shutdown following an earthquake. Safety-related SSCs such as pumps that ensure the continued flow of cooling water throughout the reactor depend on relays to continue functioning following an earthquake.<sup>87</sup> Failure of certain relays, therefore, could prevent the satisfactory accomplishment of other SSCs' safety-related functions.<sup>88</sup> Relays are thus within the scope of a license renewal proceeding.

#### 2. Snubbers Are Within The Scope Of A License Renewal Proceeding

Snubbers provide an energy-absorbing buffer between Diablo Canyon's concrete structures and components such as safety-related piping.<sup>89</sup> Safety-related piping containing large amounts of radiation are prone to failure in the event of an earthquake.<sup>90</sup> Snubbers help prevent these pipes from breaking by allowing the pipe to move slowly during an earthquake yet not break.<sup>91</sup> Failure of these snubbers to perform properly in the event of an earthquake could cause safety-related piping to break, preventing the safety-related SSC from performing its safety-related function and potentially impeding the ability of the plant to safely shut down.<sup>92</sup> Snubbers are therefore within the scope of a license renewal proceeding.

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<sup>84</sup> See 10 C.F.R. § 54.21(a), (c).

<sup>85</sup> 10 C.F.R. § 54.4(a).

<sup>86</sup> Gundersen Affidavit at 24-25.

<sup>87</sup> *Id.* at 25-26.

<sup>88</sup> See 10 C.F.R. § 54.4(a)(2).

<sup>89</sup> Gundersen Affidavit at 37.

<sup>90</sup> *Id.* at 37.

<sup>91</sup> *Id.* at 37.

<sup>92</sup> See 10 C.F.R. § 54.4(a)(2).

- iii. Even If This Contention Is Outside The Scope Of A License Renewal Proceeding As Defined By Commission Regulations, The Commission Should Consider This Critical Issue Of Safety In This Proceeding.*

To the extent NRC regulations preclude Petitioner from asserting in a license renewal proceeding that PG&E has not established through Time-Limited Aging Analyses that Diablo Canyon’s relay switches and snubbers are unable to withstand an earthquake that, given the surrounding seismic landscape, may occur at the site, Petitioner seeks a waiver of those regulations.<sup>93</sup>

### CONTENTION 3

**PG&E HAS FAILED TO ESTABLISH IN ITS AGING MANAGEMENT PLAN THAT THE EFFECTS OF AGING ON DIABLO CANYON WILL BE ADEQUATELY MANAGED FOR THE PERIOD OF EXTENDED OPERATION, IN VIOLATION OF 10 C.F.R. § 54.21(a)(3).**

#### **a. Statutory And Regulatory Background**

Applicants for a license renewal must include in their application an integrated plant assessment, under which it must identify those SSCs that are subject to an aging management review.<sup>94</sup> Paragraph (a)(1)(i) includes a partial list of SSCs that are subject to an aging management review, and a partial list of SSCs excluded from such review. Generally, only passive, long-lived SSCs are subject to an aging management review. This category includes only SSCs that (1) perform passive functions—with no moving parts or changes in configuration or properties—and (2) are not subject to replacement based on a qualified life or specified time period.<sup>95</sup> Section 54.21 also provides that for “each structure and component” subject to an aging management review, the applicant must “demonstrate that the effects of aging will be

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<sup>93</sup> See Friends of the Earth’s Waiver Petition, attached to this Petition.

<sup>94</sup> 10 C.F.R. § 54.21(a)(1).

<sup>95</sup> *Entergy Nuclear Generation Co. (Pilgrim Nuclear Power Station)*, CLI-10-14, 71 NRC 449, 454 (2010).

adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation.”<sup>96</sup>

**b. Analysis**

As part of the license renewal application’s aging management review program, licensees are required to demonstrate that the effects of aging for passive, long-lived SSCs will be adequately managed so that the intended functions will be maintained consistent with the current licensing basis for the period of extended operation.<sup>97</sup> Implicit in this requirement is that the demonstration of adequate management of aging must rest on accurate, complete data, particularly with regard to the stresses that the SSCs must be able to withstand. The aging management review in PG&E’s license renewal application, however, rests on seismic data that has been shown to be obsolete and inaccurate. PG&E’s Seismic Report demonstrates that Diablo Canyon is located within a mere 0.6 km of a fault capable of producing a magnitude 7.3 earthquake. Diablo was not initially built to withstand such a massive earthquake so close to the plant, and its SSCs will have sustained four decades of wear and tear by the time the license renewal would become effective. PG&E’s conclusions that SSCs subject to an aging management review can continue to perform their intended functions for the period of extended operation, therefore, is without basis unless demonstrated with respect to the newly understood seismic circumstances of the plant. Thus, PG&E has failed to ensure that the effects of aging will be adequately managed for an additional 20 years, in violation of 10 C.F.R. § 54.21(a)(3).

The aging management review concept is based on the continued validity of certain analysis initially done to ensure the plant may continue to safely operate. For example, as part of an aging management review, the licensee must show that, in light of the specific operating

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<sup>96</sup> 10 C.F.R. § 54.21(a)(3).

<sup>97</sup> *Id.*

conditions at the plant, a particular SSC in its aged state is strong enough to continue functioning properly.

As to Diablo Canyon, PG&E's aging management review is based on a number of assumptions that, in these particular circumstances, are not valid. As described above, the PG&E Seismic Report demonstrated that previous seismic studies by both PG&E and NRC grossly underestimated the capability of faults near the plant. PG&E's License Renewal Application was submitted in 2009, well before the issuance of the report. A determination made before the issuance of the Seismic Report that an SSC will remain strong enough throughout the plant's extended period of operation to withstand an earthquake in accordance with the plant's CLB, is no longer valid.

In light of the new seismic data, PG&E is required to update its aging management review program. Unless and until the aging management review is based on up-to-date and accurate seismic data, PG&E's conclusions that the effects of aging will be managed for an additional 20 years is unfounded and false. In order to comply with the terms of 10 C.F.R. § 54.21(a)(3), therefore, PG&E must update its aging management review with data from the Seismic Report.

#### **IV. TIMELINESS**

##### **a. The Board's Revised Scheduling Order and Regulatory Background**

In its Revised Scheduling Order dated November 19, 2012, the ASLB ordered that persons not currently a party to the Diablo Canyon license renewal proceeding may file new hearing requests and petitions to intervene "provided they satisfy the 'good cause' criteria of 10 C.F.R. § 2.309(c)(1)(i)-(iii), the contention admissibility criteria of 10 C.F.R. § 2.309(f)(1)(i)-



(iv), and the standing criteria of 10 C.F.R. § 2.309(d).”<sup>98</sup> The order also provided that “[b]ecause such filings are subject to additional requirements, the determination as to whether such requests or petitions are filed in a ‘timely manner’ as required by 10 C.F.R. § 2.309(c)(1)(iii) shall be subject to a reasonableness standard and is not subject to the thirty (30) day deadline” applicable to motions by parties already admitted to the proceeding seeking leave to add additional or amend existing contentions.<sup>99</sup> Section 2.309(c)(1) provides:

(1) Determination by presiding officer. Hearing requests, intervention petitions, and motions for leave to file new or amended contentions filed after the deadline in paragraph (b) of this section will not be entertained absent a determination by the presiding officer that a participant has demonstrated good cause by showing that:

(i) The information upon which the filing is based was not previously available;

(ii) The information upon which the filing is based is materially different from information previously available; and

(iii) The filing has been submitted in a timely fashion based on the availability of the subsequent information.

**b. This Petition Is Timely Under The Terms Of The Board’s Revised Scheduling Order And 10 C.F.R. § 2.309(c)(1)(i)-(iii).**

*i. The Information Upon Which The Filing Is Based Was Not Previously Available.*

The Contentions raised in this Petition are based upon new information contained in PG&E’s Seismic Report. This report, which was released to the public for the first time on September 10, 2014, adds significant new and material information to the body of scientific knowledge regarding the seismicity of the area surrounding Diablo Canyon.

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<sup>98</sup> Revised Scheduling Order, Nov. 19, 2012, Docket Nos. 50-275-LR and 50-323-LR, ASLBP No. 10-890-01-LR-BD01, at 9, para. II.G.

<sup>99</sup> *Id.*

*ii. The Information Upon Which The Filing Is Based Is Materially Different From Information Previously Available.*

The Seismic Report revises upward previous estimations of the seismic potential of a number of faults near the plant, including the Hosgri, San Simeon, Shoreline, San Luis Bay, and Los Osos faults. Among other significant findings, the Seismic Report found that:

- The Shoreline fault is nearly double the previously assumed length. It is now found to be 45 km long rather than the previously presumed 23 km.<sup>100</sup> This revised estimation increases the potential magnitude of the earthquake from 6.5 to 6.7.<sup>101</sup>
- The “step-over” between the Hosgri fault and the San Simeon fault “is small enough that the two faults are assumed to rupture together rather than separately. Under previous PG&E analysis, a rupture on one fault was presumed not to be able to cause a rupture on another fault. This new finding revised the potential magnitude of a Hosgri earthquake from 7.1 to 7.3.<sup>102</sup>
- The Hosgri and Shoreline faults are assumed to intersect such that a linked rupture involving the full Hosgri fault and the full Shoreline fault is now assumed to be possible. This discovery made clear, for the first time, that the Hosgri/Shoreline fault system was capable of producing a magnitude 7.3 earthquake occurring within 600 meters of the plant.<sup>103</sup> This conclusion abrogates PG&E’s previous assessment that such a linked rupture was not possible.

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<sup>100</sup> PG&E Seismic Report, Technical Summary, at 6-7.

<sup>101</sup> *Id.* at 10.

<sup>102</sup> *Id.*

<sup>103</sup> PG&E Seismic Report, Ch. 13, at 17-18.

This information reveals that previous assessments of the Hosgri and Shoreline faults, two of the most significant faults near Diablo Canyon, are capable of creating much more powerful earthquakes than previously thought.

*iii. The Filing Has Been Submitted In A Timely Fashion Based On The Availability Of The Subsequent Information.*

The Revised Scheduling Order provides that because new hearing requests and petitions to intervene filed by persons not currently parties to the proceeding are subject to additional requirements on top of those applicable to requests by admitted parties to add additional or amend existing contentions, new petitions to intervene are not subject to the 30-day deadline applicable to requests to add additional or amend existing contentions.<sup>104</sup> Rather, the Board ordered, the determination of whether a new hearing request or petition is timely filed as required by this provision, 10 C.F.R. § 2.309(c)(1)(iii), is subject to a “reasonableness standard.”<sup>105</sup>

This Petition was filed on October 10, 2014, 30 days after the Final Seismic Report was released, and thus satisfies the requirement that the filing be submitted in a timely fashion after the availability of the subsequent information. Petitioner has satisfied not only the looser “reasonableness standard,” but also the more strict 30-day deadline applicable to requests to add additional new or amend existing contentions.<sup>106</sup>

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<sup>104</sup> Revised Scheduling Order at 9, para. II.G.

<sup>105</sup> *Id.*

<sup>106</sup> See *Shaw AREVA MOX Servs.* (Diablo Canyon Power Plant Independent Spent Fuel Storage Installation), ASLBP No. 07-856-02-MLA-BD01, 67 NRC 460, 493-94 (2008) In that decision, the ASLB, favoring a longer deadline, declined to impose a 30-day deadline for filing new contentions following a triggering event under 10 C.F.R. § 2.309(f)(2)(iii). Recognizing the unusual circumstances of the case—the applicant had sought an operating license before construction had begun, thus reversing the normal course of events—the ASLB held that petitioners should not be subject to “a rolling 30-day deadline for monitoring, reviewing, analyzing, and critiquing [newly released] documents.” *Id.* at 494. The ASLB found that a 60-day deadline was appropriate, noting that an additional 30 days to review documents would have a negligible effect on the license applicant, given the multiyear duration of the construction period. The facts in our case are remarkably similar—except that here, Petitioner has indeed met the more strict 30-day deadline applicable to already admitted parties who wish to file new or amended contentions. This is despite that the PG&E Seismic Report, the new information on which this Petition is based, is approximately 1,700 pages in length.

This Petition is therefore timely under 10 C.F.R. § 2.309(c)(1) and the terms of the Revised Scheduling Order.

## V. STANDING

FoE is a national non-profit environmental organization headquartered and incorporated in the District of Columbia with an office in Berkeley, California. FoE has a nationwide membership of over 33,000 (including over 6,000 members in California) and over 440,000 activists. Among its missions, FoE seeks to insure that the public has an opportunity to influence the outcome of government and corporate decisions that affect the lives of many people. Since its inception in 1969, FoE has sought to improve the environmental, health, and safety conditions at civil nuclear facilities licensed by the NRC and its predecessor agencies. To that end, FoE utilizes its institutional resources, including legislative advocacy, litigation, and public outreach and education, to minimize the risks that nuclear facilities pose to its members and to the general public.

### a. Legal Standards

Under section 189a of the Atomic Energy Act (AEA), the Commission must grant a hearing on a license renewal application upon “the request of any person whose interest may be affected by the proceeding, and shall admit any such person as a party to such proceeding.”<sup>107</sup>

To support the request, a petitioner must state “(1) the nature of the petitioner’s right under the governing statutes to be made a party; (2) the nature of the petitioner’s property, financial, or other interest in the proceeding; and (3) the possible effect of any decision or order on the petitioner’s interest.”<sup>108</sup> “The NRC generally uses judicial concepts of standing in

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<sup>107</sup> 42 U.S.C. § 2239(a)(1)(A). *See also Fla. Power & Light Co. (Turkey Point, Units 3 and 4)*, LBP-01-6, 53 NRC 138, 145 (2001), *aff’d*, 54 NRC 3 (finding that 42 U.S.C. § 2239 applies to license renewal proceedings).

<sup>108</sup> *Entergy Nuclear Vermont Yankee, LLC, and Entergy Nuclear Operations, Inc. (Vermont Yankee Nuclear Power Station)*, LBP-04-28, 60 NRC 548, 552 (2004) (citing 10 C.F.R. § 2.309(d)(1)).

interpreting [section 2.309(d)(1)].”<sup>109</sup> Thus, a petitioner may intervene if it can specify facts showing “that (1) it has suffered or will suffer a distinct and palpable harm constituting injury-in-fact within the zone of interests arguably protected by the governing statutes, (2) the injury is fairly traceable to the action being challenged, and (3) the injury will likely be redressed by a favorable determination.”<sup>110</sup> In determining whether a petitioner has met the requirements for establishing standing, the Commission “construe[s] the petition in favor of the petitioner.”<sup>111</sup>

**b. Friends Of The Earth Has Standing For Admission Of Its Contentions**

Member organizations such as FoE may intervene on behalf of their members if they can “demonstrate that the licensing action will affect at least one of [their] members, . . . identify that member by name and address, and . . . show that [they are] authorized by that member to request a hearing on his or her behalf.”<sup>112</sup> FoE has attached Declarations from five of its members<sup>113</sup> (“the Declarants”), each of which resides between approximately six and eleven miles from Diablo Canyon, and another Declaration from Erich Pica, President of Friends of the Earth.<sup>114</sup> The Declarants describe his or her personal health, safety, economic, aesthetic, and environmental interests in the proper operation of Diablo Canyon and the risk of harms that the plant’s operation, without proper seismic analysis, poses to those interests. Each of these interests is an independently sufficient injury-in-fact for standing purposes. Each of these members supports this Petition, and has authorized FoE to intervene in this proceeding and request relief on his or her behalf.

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<sup>109</sup> *Id.*

<sup>110</sup> *Id.* at 552-53.

<sup>111</sup> *Id.* at 553.

<sup>112</sup> *Id.*

<sup>113</sup> Declaration of Sandra L. Brazil, Attachment 3; Declaration of Thomas Danfield, Attachment 4; Declaration of Michael R. Jencks, Attachment 5; Declaration of Jeffrey Pienack, Attachment 6; Declaration of Susan Sunderland, Attachment 7.

<sup>114</sup> Declaration of Erich Pica, Attachment 8.

**c. Friends of the Earth Presumptively Has Standing To Intervene Based On The Members' Geographical Proximity to Diablo Canyon**

In addition to the traditional elements of standing, Petitioner has standing to intervene based on the “proximity presumption,” as set forth in Commission decisions. Under longstanding Commission precedent, if a petitioner resides within 50 miles of a nuclear plant, he or she, and his or her representing organization, presumptively has standing to intervene in certain proceedings, even if petitioner has failed to allege some specific injury-in-fact.<sup>115</sup> Each of the Declarants resides between approximately six and eleven miles from Diablo Canyon, well within the 50-mile threshold of the presumption. Therefore, FoE has standing based on the proximity of the Declarants’ residences to the plant.

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<sup>115</sup> *Fla. Power & Light Co.* (Turkey Point, Units 3 and 4), LBP-01-6, 53 NRC 138, 147-50 (2001), *aff'd*, 54 NRC 3 (compiling cases applying the geographical proximity presumption and applying the presumption in license renewal case where petitioner lived 15 miles from plant); *Duke Energy Corp.* (Oconee Nuclear Station, Units 1, 2, and 3), LBP-98-33, 48 NRC 381, 385 n.1 (1998), *aff'd*, CLI-99-11, 49 NRC 328 (same); *see also Northern States Power Co.* (Prairie Island Nuclear Generating Plant, Units 1 and 2), ALAB-107, 6 AEC 188, 190 (1973); *Gulf States Utilities Company* (River Bend Station, Units 1 and 2), ALAB-183, 7 AEC 222, 226 (1974); *Virginia Elec. & Power Co.* (North Anna Nuclear Power Station, Units 1 and 2), ALAB-522, 9 NRC 54, 56 (1979) (“close proximity has always been deemed to be enough, standing alone, to establish the requisite interest”); *Detroit Edison Co.* (Enrico Fermi Atomic Power Plant, Unit 2), LBP-79-1, 9 NRC 73, 78 (1979); *Cleveland Elec. Illuminating Co.* (Perry Nuclear Power Plant, Unit 1), CLI-93-21, 38 NRC 87, 95 (1993).

## VI. CONCLUSION

Based on the foregoing, Petitioners hereby pray the ASLB grant Friends of the Earth's petition to intervene and request for a hearing and admit the three contentions described above.

Respectfully submitted,

/s/ Richard Ayres  
/s/ Jessica Olson  
/s/ John Bernetich

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*Executed in accord with 10 C.F.R. §  
2.304(d).*

Date: October 10, 2014

**BEFORE THE UNITED STATES  
NUCLEAR REGULATORY COMMISSION**

**BEFORE THE ATOMIC SAFETY AND LICENSING BOARD**

In the Matter of	)	
	)	
PACIFIC GAS & ELECTRIC COMPANY	)	Docket No. 50-275-LR
	)	Docket No. 50-323-LR
(Diablo Canyon Nuclear Power Plant, Units 1 and 2)	)	
		October 10, 2014
(License Renewal Application)		

CERTIFICATE OF SERVICE

I hereby certify that, on this date, copies of the “Friends of the Earth’s Request for a Hearing and Petition to Intervene” and accompanying attachments in the above-captioned matter were filed through the Electronic Information Exchange (EIE) this 10th day of October, 2014, which to the best of my knowledge resulted in transmittal of the foregoing to those on the EIE Service List for the captioned proceeding.

*Signed (electronically) by Jessica Olson*  
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*Executed in accord with 10 C.F.R. § 2.304(d)*