

BEFORE THE
PUBLIC UTILITIES COMMISSION
OF THE STATE OF CALIFORNIA

Application of Pacific Gas and Electric)	
Company for Compliance Review of Utility)	
Owned Generation Operations, Electric Energy)	
Resource Recovery Account Entries, Contract)	Application 15-02-023
Administration, Economic Dispatch of Electric)	(Filed February 27, 2015)
Resources, Utility Retained Generation Fuel)	
Procurement, and Other Activities for the Period)	
January 1 through December 31, 2014.)	
(U 39 E))	
_____)	

**ALLIANCE FOR NUCLEAR RESPONSIBILITY'S
OPENING BRIEF**

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I. INTRODUCTION.

Pursuant to Rule 13.11 of the Rules of Practice and Procedure of the California Public Utilities Commission (“Commission” or “CPUC”) and the briefing schedule established by the Scoping Memo and Ruling of Assigned Commissioner Michel Peter Florio,¹ the Alliance for Nuclear Responsibility (“A4NR”) files its Opening Brief in the 2014 Energy Resource Recovery Account Compliance (“ERRA Compliance”) application filed by the Pacific Gas and Electric Company (“PG&E”). A4NR timely filed its Protest objecting to recovery of certain balances recorded in the Diablo Canyon Seismic Studies Balancing Account (“DCSSBA”) for 2014 costs which fail to comply with D.12-09-008 and D.10-08-003 and, consequently, were not reasonably incurred.² Additionally, D.14-08-032 directed PG&E to transfer funding for its Long Term Seismic Program (“LTSP”), including the Senior Seismic Hazard Analysis Committee (“SSHAC”) process, to the DCSSBA effective January 1, 2014, subject to reasonableness review in ERRA Compliance proceedings.³ A4NR’s Protest objected to recovery of certain LTSP amounts as well.

PG&E stipulated to the admission into evidence of A4NR’s testimony,⁴ which incorporated the Protest by reference,⁵ in its entirety.⁶ PG&E elected not to cross-examine

¹ Scoping Memo and Ruling, June 26, 2015, p. 4.

² A4NR Protest, April 3, 2015.

³ D.14-08-032, OP 29 a. The Commission stated, “*We find this disposition to be a reasonable approach to improving oversight of the LTSP costs,*” (*Id.*, p. 411) and, “*We find this disposition to be a reasonable approach to assure the proper integration of Assembly Bill (AB) 1632 seismic studies with the LTSP and the SSHAC process.*” (*Id.*, p. 412)

⁴ A4NR-1, Prepared Testimony of John Geesman; A4NR-2, Prepared Testimony of Sam Blakeslee; and A4NR-3, Supplemental Testimony of A4NR.

⁵ A4NR-1, p. 2.

⁶ PG&E also stipulated to the admission into evidence of certain of its responses to A4NR data requests: A4NR-4, A4NR-5, A4NR-6, A4NR-7, A4NR-8, and A4NR-9. The Office of Ratepayer Advocates (“ORA”) stipulated to the admission into evidence of A4NR-10, ORA’s response to an A4NR data request.

either of A4NR's witnesses and agreed with A4NR that the DCSSBA issues did not require evidentiary hearings and are best resolved through briefs. Based on PG&E's Amended Prepared Testimony concerning the contested 2014 costs recorded in the DCSSBA,⁷ its Reply to A4NR's Protest,⁸ its Rebuttal Testimony,⁹ and its Surrebuttal Testimony,¹⁰ PG&E has failed to meet its burden of proof that its conduct of the AB 1632 seismic studies in 2014 was consistent with D.12-09-008 and D.10-08-003 or that its management of the LTSP in 2014 was reasonable in light of its avoidance of meaningful IPRP review of the integration of the AB 1632 seismic studies into the SSHAC Report. Although PG&E's failure to meet this burden is sufficient alone to prevent recouping these DCSSBA costs from ratepayers, A4NR has additionally established by a preponderance of the evidence that PG&E's conduct was unreasonable and non-compliant.

II. PG&E's CONTINUED EVASION OF IPRP REVIEW.

Escalating the non-compliant conduct which A4NR protested in the still-pending 2013 ERRR Compliance proceeding,¹¹ PG&E in 2014 willfully circumvented review of its seismic work by the Commission's Independent Peer Review Panel ("IPRP"). Despite repeated attempts in 2014 by the IPRP¹² to perform its Commission-designated role, PG&E rebuffed these inquiries and intensified the stonewalling strategy it had deployed after the IPRP's unsparing mid-2013 criticisms of PG&E's ground motion assumptions.¹³ One day after the evidentiary hearing in the

⁷ PG&E-1, chapter 6.

⁸ PG&E Reply to Protests, April 14, 2014.

⁹ PG&E-2, chapter 6.

¹⁰ PG&E-3.

¹¹ See A4NR Opening Brief and Reply Brief in A.14-02-008.

¹² A4NR-1, pp. 6 – 7, 9.

¹³ The ground motion critique in IPRP Report No. 6 is summarized in A4NR's Protest at pp. 6 – 7 as follows:

- To prioritize the main targets of the AB 1632 onshore and offshore geophysical studies, the IPRP earlier asked PG&E for sensitivity analyses of the probabilistic hazards. PG&E's 2011 response ranked uncertainty in the slip rate

2013 ERRA Compliance proceeding, PG&E provided IPRP Chair Chris Wills and CPUC staff Eric Greene with five days' advance notice (but no draft) that *"the report will be submitted to the NRC on Wednesday, September 10, at which time the report will become public."*¹⁴ PG&E named this document the Central Coastal California Seismic Imaging Project ("CCCSIP Report").

As justification of its actions, PG&E cites D.10-08-003's provision of 30 days for the IPRP to submit written comments on PG&E's *"study plans prior to the implementation of the seismic studies"* and another 30 days for the IPRP to submit written comments on PG&E's *"findings and/or results associated with the seismic studies upon finalizing those findings and/or results."*¹⁵ It cites similar language in D.12-09-008 and concludes that *"(t)here were no other prescribed requirements by the Commission on how PG&E was to interact with the IPRP... PG&E has fully complied with the Commission decisions."*¹⁶ This is a blinkered reading of D.10-08-003 and D.12-09-008, and insufficient litmus for assessing the reasonableness of PG&E's conduct regarding the IPRP:

of the Hosgri Fault as clearly the most significant, with a *"calculated ground motion hazard that varies by a factor of nearly 2."* [footnote omitted]

- Changing PG&E's base case ground motion characterization of VS30 of 1200 m/s to a generic site with a VS30 of 760 m/s (*"more consistent with other soft rock sites in California"* [footnote omitted] *"increases the hazard by more than a factor of 3"* [footnote omitted] and changing PG&E's assumed site condition to a generic site with a VS30 of 1000 m/s *"increases hazard by a factor of 2."* [footnote omitted]

- *"Compared to traditional approaches, the PG&E method resulted in lower ground motion hazard estimates, particularly in the spectral period range important to [Diablo Canyon] ... " In contrast, "(a) lower VS30 brings the estimated ground motion hazards beyond the original design level when used in typical, state-of-the-practice seismic hazard analysis..."* [footnote omitted]

- The IPRP questioned whether PG&E's approach adequately captured shear wave velocities at different depths beneath the plant: *"With only three profiles, it is unlikely that one of them represents the lowest velocity material underlying the plant. Some of the variability seen in the 1978 data may reflect poor quality of the VS measurements made 35 years ago. Interpretations of that data, however, appear to include unconservative assumptions of velocity in boreholes where no velocity was recorded..."* [footnote omitted]

¹⁴ A4NR-1, p. 17.

¹⁵ PG&E-2, p. 6-3.

¹⁶ *Id.*, p. 6-4.

- PG&E’s reading would effectively confine the reasonableness assessment to whether it had provided 30 days for IPRP comments prior to implementation of the studies, since any deadline for comments after PG&E submitted a “final”¹⁷ report would be purposeless. The illogic of post-submittal IPRP review was underlined by PG&E Chief Nuclear Officer Ed Halpin five months before the report’s release: *“In other words is the report final once submitted? What is the purpose of the 30 day review by the IPRP?”*¹⁸ PG&E continues to insist that it had no obligation to share a pre-submittal draft of the report with the IPRP.¹⁹
- Neither D.10-08-003 nor D.12-09-008 expressly contemplated a report being submitted to the Nuclear Regulatory Commission (“NRC”), so “finalizing” the “findings and/or results” of the seismic studies would logically take place before a “final” report was submitted to the NRC – as would the 30-day period allowed for IPRP written comments. As the Commission observed in D.10-08-003, *“Our order in this application will require PG&E to submit its ... **completed study findings to the IPRP for review prior to implementation.**”*²⁰ (emphasis added)
- The authorization in D.10-08-003 and D.12-09-008 for the IPRP to retain consultants and experts envisioned a larger scope of potential work than merely assisting the IPRP to submit comments on PG&E’s “study plans prior to the implementation of the seismic studies” or purposeless comments post-completion. As specified in D.12-09-008,

¹⁷ *Id.*, p. 6-2.

¹⁸ A4NR-1, p. 10. Halpin lieutenant Jeff Summy responded: *“Our sense is they will not be happy not getting an advanced review before we issue but we really have no choice at this point. I suspect if they come back with substantive comments that we agree with we could see a way to revise but not if they are just providing comments that express their general disagreement with our approach or things to that affect [sic].”* *Id.*, pp. 11 – 10.

¹⁹ PG&E-2, p. 6-5.

²⁰ D.10-08-003, p. 10.

*“Outside help is needed to ensure that the enhanced seismic studies are scoped out properly at the front end **and reviewed properly during the course of the studies** pursuant to the recommendations in AB 1632.”²¹ (emphasis added)*

- Because the study plans would evolve with passing time (e.g., change orders to contractors), the Commission expected continuous interaction between PG&E and the IPRP – as D.12-09-008 clarified: *“We expect PG&E to continue to meet with the IPRP to present and review changes to the seismic study plans, to provide process updates to the IPRP regarding implementation of the studies, and to receive IPRP comments.”²²*

A measure of the degree to which PG&E’s sustained circumvention of IPRP review knowingly and materially differed from the interaction envisioned by the Commission can be seen in PG&E’s own financial records. Despite PG&E’s estimate of a \$950,000 budget *“to support activities of the IPRP,”²³* which was approved by the Commission in D.12-09-008, by June 30, 2014 PG&E was internally reporting that some \$720,100 remained unspent.²⁴

PG&E’s refusal to share drafts²⁵ or allow any pre-submittal review of the CCCSIP Report greatly impaired the IPRP’s ability to assess the use of the AB 1632 seismic studies in PG&E’s SSHAC Report. Despite the Commission’s stated objective in D.14-08-032 of *“improving oversight of the LTSP costs”²⁶* and its desire *“to assure the proper integration of Assembly Bill*

²¹ D.12-09-008, p. 23.

²² *Id.*, p. 16. Geosciences Director Klimczak agreed under cross-examination in the 2013 ERRRA Compliance proceeding this language was a *“substantive”* requirement incorporated within D.10-08-003 and D.12-09-008 (A.14-02-008 Transcript, Klimczak-PG&E, p. 147, lines 21–23, 26), mooted the contrary claim by PG&E witness Ferre in this proceeding at PG&E-3, p. 3.

²³ *Id.*, p. 14.

²⁴ A4NR-1, p. 13.

²⁵ After learning of the plan to withhold drafts from the IPRP in March, 2014, Valerie Winn, PG&E’s Chief, State Agency Relations, emailed an internal warning that a contrary commitment had been made to the IPRP more than a year previously. A4NR-1, pp. 7 – 8.

²⁶ D.14-08-032, p. 411.

*(AB) 1632 seismic studies with the LTSP and the SSHAC process,*²⁷ PG&E knowingly chose not to relax its IPRP information embargo. On July 7, 2014, six weeks after learning that the IPRP had requested six months and four public meetings to perform its post-submittal review of the CCCSIP Report,²⁸ PG&E Geosciences Manager Kent Ferre calculated a more abbreviated schedule: any IPRP input to the SSHAC team would have to come by October 1. *“This establishes a last date for the AB1632 final report transmittal to the IPRP at mid to late August, depending on the amount of time allowed for their review and comment.”*²⁹

With the scheduled release of the CCCSIP Report continuing to slip, and the envisioned IPRP post-release review time reduced to 30 days, Halpin lieutenant Jeff Summy emailed a reminder to Mr. Klimczak and Mr. Ferre on August 21, 2014: *“We need to be clear on the potential impact to IPRP’s ability to provide input to SSHAC if we delay past August 28.”*³⁰ An indicator of the low priority placed on IPRP input was PG&E’s belated communication with its SSHAC consultants. Dr. Stephen Thompson, team leader for PG&E’s seismic source characterization SSHAC consultants, on September 2, 2014 asked to meet with Geosciences Manager Kent Ferre that same day *“to talk briefly about implications of the **new IPRP scope.**”*³¹ (emphasis added) That evening, Dr. Thompson emailed his team:

We understand that the IPRP – a review board working on behalf of the California PUC

²⁷ *Id.*, p. 412.

²⁸ As Geosciences Director Richard Klimczak emailed Halpin lieutenant Jeff Summy on May 29, 2014, *“We did not agree with this, but asked them to revisit this topic after they get the report for review. We will need to discuss and agree upon our position on IPRP review time and public meetings.”* A4NR-1, pp. 11 – 12. Mr. Summy’s response: *“As we have discussed in the past the IPRP will be what it will be and we will have to deal with it as it occurs. It would be nice if it was clearly defined and played by some fixed set of rules but it doesn’t.”* *Id.*, p. 12.

²⁹ *Id.*, pp. 12 – 13. PG&E tends to use the terms “CCCSIP” and “AB 1632 report” interchangeably.

³⁰ *Id.*, p. 14.

³¹ *Id.*, p. 17. Inside PG&E, Mr. Klimczak had alerted others in mid-April, 2014 to the IPRP’s planned meeting with NRC Commissioner William Magwood to *“review the SSHAC information ...”* A4NR-1, p. 11, Appendix B, Ex. 18.

*to review the AB1632 program – **has new scope to explore** how the results of the AB1632 program are being used in the SSHAC for the SSC model. As such, **we are just beginning to figure out how we can accommodate this change.**³² (emphases added)*

As it turned out, the CCCSIP Report was submitted to the NRC on September 10, 2014; Ms. Winn attempted to “*at least minimize any blow back from the delayed issuance;*”³³ and the IPRP published three reports commenting on discrete chapters of the CCCSIP Report on November 21, 2014, December 17, 2014, and March 6, 2015. The “*closure letter*” from the Participatory Peer Review Panel (“PPRP”) for PG&E’s seismic source characterization SSHAC indicates that the “*Final PPRP Briefing, Part 1*” took place July 24-25, 2014 and that the “*Final PPRP Briefing, Part 2*” took place October 31, 2014.³⁴ The opportunity for the IPRP review of the AB 1632 seismic studies to have any meaningful impact on the SSHAC process was null because IPRP Reports Nos. 7, 8, and 9 came too late. The effect, if not the intent, of PG&E’s information-control tactics was to run out the clock.

PG&E-2 acknowledged the impact of D.14-08-032 on the IPRP’s SSHAC role: “*As part of that [transfer of LTSP funding to the DCSSBA] the IPRP was assigned a role to assure the proper integration of AB 1632 studies with the LTSP and the SSHAC process.*”³⁵ PG&E-2’s description of what unfolded was more than a little disingenuous:

The CCCSIP Report results have been reflected in the SSC model that was included in the SSHAC Level 3 studies ... The IPRP played a role in this. After completion of the CCCSIP Report, the IPRP met with the SSHAC Technical Integrator Team on three separate

³² *Id.*, pp. 17 – 18. Dr. Thompson proposed a schedule that, with the release date for the CCCSIP Report yet to be identified (“*this is coming soon*”), nevertheless reduced the IPRP “*initial review*” to “*approx. 3 weeks*” with a meeting in “*the Oct. 1-3 window.*”

³³ *Id.*, p. 15.

³⁴ PG&E Letter DCL-15-035, Appendix C, page 4 of 18.

³⁵ PG&E-2, p. 6-4.

*occasions in September and October 2014, to discuss integration of the CCCSIP Report results into the SSHAC Level 3 studies' SSC model.*³⁶

As indicated in A4NR-1, which PG&E-2 was supposed to rebut, Dr. Thompson's account of these interactions described them as being with the California Geological Survey, not the IPRP, and Dr. Thompson concluded: *"This activity is not central to the SSHAC work and schedule, but communicating with the CGS has been helpful to understand their initial thoughts and logic ..."*³⁷

However, as A4NR-1 elaborated in detail³⁸ and PG&E-2 left conspicuously unmentioned, the one CCCSIP topic – explaining the uplift of the Irish Hills – on which PG&E claimed the IPRP had impacted the SSHAC was egregiously misrepresented. In response to IPRP concerns that PG&E's preferred tectonic model seemed no more plausible than two competing models, PG&E resolved to weight each of the three models equally. As Geosciences Manager Kent Ferre explained to Halpin lieutenant Jearl Strickland, *"There is no preferred model based on available data."*³⁹ This point was reinforced 16 minutes later by PG&E's CCCSIP Technical Manager, Dr. Stuart Nishenko, in an email to Chief Nuclear Officer Ed Halpin.⁴⁰ According to the media talking points assembled by PG&E after release of the SSHAC Report in March, 2015:

... An example of how IPRP feedback was incorporated had to do with the Irish Hills. The [AB 1632] seismic studies identified a single preferred fault model for the Irish Hills. The IPRP, after receiving additional insight from the SSHAC team, supported that multiple

³⁶ *Id.*, p. 6-7.

³⁷ A4NR-1, pp. 23 – 24. PG&E's Prepared Testimony attributed a similarly neutered role to the IPRP: *"Since the release of the AB 1632 report in September 2014, the IPRP has met with the SSC TI Team to see first-hand how AB 1632 results were incorporated into the SSC model for slip rates on the Hosgri and Shoreline faults; dips of the Los Osos and San Luis Bay faults. The two-way feedback between the TI Team and the IPRP has been valuable to understand how the AB 1632 geophysical and geological data and interpretations of those data have been considered, evaluated, and integrated into the SSHAC models."* PG&E-1, p. 6-13.

³⁸ A4NR-1, pp. 34 – 37, 39 – 40.

³⁹ *Id.*, p. 37.

⁴⁰ *Id.*

*models be utilized. The SSHAC accepted the IPRP's input and utilized three separate, **equally weighted** models to characterize faults in the Irish Hills...*⁴¹ (emphasis added)

As A4NR-1 documented, this claim was false. Rather than equal weighting, the SSHAC Report made clear that two of the models were weighted at 40%, and one at 20%.⁴² Which of the three models was under-weighted? Notwithstanding what the SSHAC Report described as “noticeable differences in hazard” at the 5 Hz spectral frequency, the tectonic model with the largest ground motion ratios received the lowest weighting.⁴³

PG&E has failed to meet its burden of proof that its 2014 conduct of the AB 1632 seismic studies was reasonable, or that its 2014 management of the SSHAC project was reasonable in properly integrating the results of the AB 1632 seismic studies into the SSHAC Report.

III. THWARTED REVIEW FOSTERED MAJOR DEFICIENCIES IN CCCSIP REPORT.

A4NR's testimony identified material features of (and material omissions from) PG&E's CCCSIP Report that should have received thoughtful consideration from the IPRP rather than be determined by unilateral decisions from PG&E. Among the most significant:

A. PG&E BUFFERED EARTHQUAKES ABOVE M6.5.

Dr. Sam Blakeslee, a former Exxon research geophysicist and the legislative author of AB

⁴¹ *Id.*, p. 39.

⁴² *Id.*, p. 40.

⁴³ *Id.*

1632 (2006),⁴⁴ testified that PG&E's CCCSIP Report "*evidenced a marked increase in the size, faulting styles, connectivity and proximity*" to Diablo Canyon of "*newly discovered and re-interpreted earthquake faults.*"⁴⁵ Conversely, Dr. Blakeslee observed that PG&E's ground motion projections used "*new methods*" which "*significantly lowered the levels of predicted shaking at the plant relative to prior analysis.*"⁴⁶ He further noted that "*PG&E's models assume that shaking does not increase much with increasing proximity ... [and] that, above a certain level, increased earthquake magnitudes produce relatively small increases in shaking.*"⁴⁷

In rebuttal testimony, PG&E Chief Seismologist Dr. Norman Abrahamson stated,

*I agree with the short-distance, large-magnitude scaling described by Dr. Blakeslee. This is known as "magnitude saturation" in ground motion studies. It is accepted within the scientific community, and both empirical observations and numerical simulations validate, that there is not a large increase in high-frequency ground shaking levels for sites located close to shallow crustal earthquakes for magnitudes above about magnitude 6.5 (M6.5).*⁴⁸

Dr. Abrahamson tried to dodge Dr. Blakeslee's concern about a paucity of recorded data for large earthquakes in the extreme near field by claiming support for PG&E's magnitude saturation assumption in "*over 100 recordings from 20 earthquake M6.5 and greater at distances of less than 10 km*"⁴⁹ and citing to a recent journal article which actually found its best fit at distances ≤ 20 km. This attempted deflection simply ignored Dr. Blakeslee's clearly

⁴⁴ Dr. Blakeslee retired as Minority Leader of the California Senate at the end of 2012, and is the Director of the Institute for Advanced Technology & Public Policy at Cal Poly, San Luis Obispo.

⁴⁵ A4NR-2, p. 4.

⁴⁶ *Id.*

⁴⁷ *Id.*, p. 2.

⁴⁸ PG&E-2, p. 7-4. A4NR believes Dr. Abrahamson's rebuttal testimony is the first public acknowledgment by PG&E of diminished concern for earthquakes above M6.5 at Diablo Canyon.

⁴⁹ *Id.*

stated apprehension: *“The fundamental problem is that only a tiny amount of the data ... perhaps less than 1%, include recordings of large earthquakes (>M7), in the extreme near field (<2 km).”*⁵⁰ As the Commission should be aware, PG&E has previously acknowledged the Shoreline Fault is 0.6 km from the Diablo Canyon power block and 0.3 km from the intake structures,⁵¹ while PG&E’s CCCSIP Report places the San Luis Bay Fault 1.9 km away from the power block.⁵²

As Dr. Blakeslee testified:

*... in the very range where the data is least available, and where Diablo is most vulnerable, the functional form of the models results in shaking predictions that minimize the effect of increasing proximity and earthquake magnitude. The importance of this assumption, which is built into the model predictions, is difficult to overstate. Are these good assumptions? It is impossible to know given the paucity of strong motion data in the ranges and magnitudes relevant to Diablo.*⁵³

As pointed out in A4NR’s Supplemental Testimony, PG&E’s approach to magnitude saturation effectively immunizes the plant from earthquakes above M6.5 while avoiding concerns about long-period motions (and the tail distributions of short-period motions) expressed during the SSHAC process by Dr. Thomas Heaton, Director of the Earthquake Engineering Research Laboratory at the California Institute of Technology.⁵⁴ PG&E’s Surrebuttal

⁵⁰ A4NR-2, p. 11.

⁵¹ PG&E Shoreline Fault Zone Report, p. ES-4.

⁵² PG&E CCCSIP Report, Chapter 13, page 9 of 21, Table 2-2. The same table identifies the Hosgri Fault and the Los Osos Fault as 4.7 km and 8.1 km, respectively, from the power block.

⁵³ A4NR-2, p. 13. A4NR’s Supplemental Testimony added, *“The magnitude saturation assumption depends upon data extrapolation using far-field earthquakes, because there simply is not much recorded data from large earthquakes in the near-field (although there are some very large accelerations which have been observed in the extreme near-field). The catalog of near-field data that measures the magnitude saturation observationally is small, with a large standard deviation, while using a numerical simulations approach to estimate the effect misses the influence of starting phases, stopping phases, heterogeneous stress drops, and asperities.”* A4NR-3, p. 3. None of these concerns was addressed in PG&E’s Surrebuttal Testimony.

⁵⁴ A4NR-3, pp. 3 – 5.

Testimony elected not to address any of the issues raised by Dr. Heaton – including his point that, rather than saturate, peak ground displacement increases with magnitude – and instead relegated them to “*follow-up research.*”⁵⁵

There is no evidence that PG&E consulted the IPRP about its approach to magnitude saturation in assessing seismic hazard in the CCCSIP Report.

B. PG&E’S SITE-SPECIFIC DATA WAS SPARSER THAN THOUGHT.

IPRP Report No. 6’s unanswered criticisms of PG&E’s ground motion approach cast a shadow over PG&E’s CCCSIP Report, and Dr. Blakeslee testified that the undue brevity and poorly organized opacity of Chapters 11 and 13 made “*it difficult to isolate, quantify and test how different methodological approaches, underlying assumptions, parametric values and ad-hoc adjustments combine to influence the final shaking predictions.*”⁵⁶ While PG&E’s data dependence on only two local earthquakes (San Simeon, 35 km away, and Parkfield, 85 km away) drew criticism in 2012 from the NRC, even before the IPRP’s Report No. 6 in 2013,⁵⁷ a 2014 PG&E “*Calculation Document*” -- never discussed or shared with the IPRP -- indicated that a more accurate count would be “*1 + an amplification.*” As described in A4NR-1:

Of the two free-field recording sites at Diablo Canyon, ESTA27 (with two profiles, A1200 and B1200) and ESTA28 (with one profile, A100), **only ESTA27 was installed at the time of the San Simeon earthquake. Despite this longer history and the presence of two profiles rather than one, PG&E selected ESTA28 as the reference free-field station for analytic purposes** because “*(t)he deeper part of the velocity profile at Station ESTA28 is more consistent with deeper parts of the velocity profile for the power block and turbine building than station ESTA27.*” Consequently, an “*amplification factor*” is applied to data from ESTA27, with the expected difference between ESTA27 and ESTA28 computed

⁵⁵ PG&E-3, p. 6.

⁵⁶ A4NR-2, p. 8.

⁵⁷ A4NR Protest, p. 9.

using the NGA-W2 GMPEs for a magnitude 6 strike-slip earthquake at a distance of 30 km – “*This distance and magnitude is selected to capture the linear site amplification and be in the center of the data range where the GMPEs are most accurate.*” Although the velocity profile for ESTA28 is similar at depth to that used in NRC RIL 12-01, Dr. Abrahamson acknowledges that “*it has deeper soil ... which will tend to affect the low frequency amplification*” and so “*(a)n additional factor is developed to account for this difference in soil depth.*” Finally, in “*smoothing*” the Diablo Canyon site term derived from the two earthquakes, Dr. Abrahamson notes the contrast between similar within-event residuals at high frequencies and “*a wider range*” at low frequencies, “*indicating that path effect differences are being seen in addition to site term.*” He concludes, “*This is consistent with the observation that the low frequency ground motion from the San Simeon earthquake is controlled by late arriving surface waves*” **without repeating that San Simeon was not recorded at ESTA28.**⁵⁸ (emphases added, footnotes omitted)

Notwithstanding the adjustments PG&E deemed necessary to the San Simeon data, Dr. Blakeslee noted these two earthquakes were recorded “*from azimuths that don’t reflect some of the most critical potential sources of nearby earthquake threats, which lie to the west rather than the north or east.*”⁵⁹ In his judgment,

*This is not just a sampling problem that can be fixed through the application of a simple estimate of uncertainty derived from the variability in the data. First, there just isn’t enough data to build a robust statistical estimate of uncertainty for this circumstance. And, second, the near-field physics of fault ruptures include a number of earthquake phenomena that cannot be modeled by using far-field datasets. In the extreme near-field starting and stopping phases, stress drop heterogeneity, directivity, and other effects can be quite significant. Those effects are not well represented in models that are constructed using the larger dataset of earthquakes that fall outside the 0-2 KM and M7-8 recordings.*⁶⁰

⁵⁸ A4NR-1, pp. 25 – 26.

⁵⁹ A4NR-2, p. 14. Nor was PG&E’s long-delayed Ocean Bottom Seismometer (“OBS”) project, originally authorized by the Commission in 2010, available to plug this data gap to the west of the plant. After extended delay, deployment occurred in late 2013 but the OBS system quickly stopped functioning due to underwater cable damage. Temporary replacement units were not deployed until November, 2014. A4NR-1, p. 27.

⁶⁰ A4NR-2, p. 12.

Nor did Dr. Blakeslee consider PG&E's proffered solution of tomographic imaging a plausible solution to constraining sub-surface velocities at Diablo Canyon, especially in the face of the two wells that best measure velocities near the plant foundation yielding significantly different velocity values. Dr. Blakeslee noted that tomographic inversions are highly dependent on ray coverage, *"and are notoriously difficult to tie to known well data in the absence of detailed and extensive calibration efforts."*⁶¹ He testified that tomographic velocity analysis is commonly relied upon to make statistical estimates of the location of **relative** velocity variations, not precise measurements of specific velocities, adding that *"(i)t would be a serious mistake to believe that uncalibrated tomographic velocities are an acceptable substitute for the precise and accurate velocities needed to accurate [sic] compute amplification factors and site effects."*⁶²

Dr. Blakeslee's testimony posed the same question one would expect from a properly-informed IPRP, tasked with oversight of the most expensive seismic re-evaluation of a nuclear power plant site in U.S. history: *"Given the relative ease and low cost, it's not clear why more wells aren't simply drilled so that the velocity question, which is so important to the final shaking predictions, can be resolved once and for all through direct measurements."*⁶³

There is no evidence that PG&E consulted the IPRP about augmenting its site-specific data for the CCCSIP Report.

⁶¹ *Id.*, pp. 13 – 14.

⁶² *Id.*, p. 14.

⁶³ *Id.*

C. PG&E OMITTED ITS DETERMINISTIC JOINT RUPTURE ANALYSES

Geosciences Director Richard Klimczak authored a document entitled “*Results from a 12/6/13 CNO Seismic Update meeting*”⁶⁴ which extensively described certain deterministic joint rupture analyses intended to go into PG&E’s CCCSIP Report. These included linking the Hosgri to faults running up to the Mendocino Triple Junction offshore Northern California, and then separately linking the Hosgri to the Los Osos, to the San Luis Bay, and to the Shoreline faults. Mr. Klimczak emphasized these four deterministic cases would not be based on earthquake recurrence rates, and that an additional “*hybrid approach*” would be run with a 10^{-6} annual recurrence rate used for each of the four joint rupture cases.⁶⁵ Mr. Klimczak explained the “*hybrid approach*”:

Justification of the use of 10-6 would be it is a reasonable cutoff for deterministic analysis, less than 1 in a million chance of exceeding the selected magnitude of an earthquake on each fault. PRA group⁶⁶ (Nathan) has provided justification for the use of 10-6 as follows:

A recent reference that defines design basis accident scope can be found in INL/EXT-10-19521 “Next Generation Plant Licensing Basis Event Selection White Paper”. This paper describes the frequency based categories for licensing basis events (LBEs). These categories are anticipated operational occurrences (AOOs), infrequent design basis events (DBEs) and beyond design basis events (BDBEs).

- *AOOs - greater than 10-2 per plant-year*
- *DBEs - < 10-2 and > 10-4 per plant-year*
- *BBDEs - < 10-4*

For seismic events, definition of a lower limit on BDBE’s can be aligned with the concept of the ‘maximum credible earthquake’ or MCE (NUREG-0800 Rev. 2⁶⁷). The MCE

⁶⁴ A4NR-1, pp. 42 – 44. A4NR believes that CNO is an acronym for Chief Nuclear Officer.

⁶⁵ *Id.*, p. 42.

⁶⁶ A4NR believes this is a reference to PG&E’s internal Probabilistic Risk Assessment group at Diablo Canyon.

⁶⁷ NUREG-0800 Rev 2 is the 2007 update of the NRC’s Standard Review Plan (“SRP”) for its staff in performing safety reviews of new construction permit or operating license applications, including requests for amendments.

represents the level of ground motion for which a nuclear power plant must be designed to safely shut down and is defined as the 'largest earthquake that can be reasonably expected to occur on a geologic structure in the current tectonic region'. An accepted quantitative measure of the credibility or reasonableness of severe accident consequences has been established as a frequency of core damage of less than 10⁻⁶ per year (Regulatory Guide 1.174). This criterion can be conservatively applied to the frequency of earthquake occurrence for the purposes of identifying the characteristics of the MCE. Also supporting the determination of a 10⁻⁶ per year frequency of occurrence criterion for the MCE is PRA scoping guidance from Regulatory Guide 1.200 which states that an external event can be screened from a plant probabilistic risk assessment (PRA) if a conservative analysis shows that the event's contribution to CDF is less than 10⁻⁶ per year. Therefore, a seismic hazard frequency of 10⁻⁶ per year conservatively meets the RG 1.200 external event screening criterion.

Additionally, the Klimczak document said that the four joint rupture cases would also be run at a 10⁻⁷ annual recurrence rate, but that these analyses would not be included in the Report.⁶⁸

None of these assessments were included in PG&E's CCCSIP Report. PG&E's Surrebuttal Testimony pointed out that no comment upon them appears in IPRP Reports Nos. 7, 8, or 9 issued after publication of the CCCSIP Report,⁶⁹ a museum-quality non sequitur since PG&E has not suggested that the deterministic joint rupture analyses described by Mr. Klimczak were ever made known to the IPRP. There is no dispute that the four deterministic analyses, as well as the four "hybrid approach" cases utilizing a 10⁻⁶ annual recurrence rate, that Geosciences Director Klimczak's document said would be included in PG&E's CCCSIP Report were

As described by its authors, "The principal purpose of the SRP is to assure the quality and uniformity of staff safety reviews. It is also the intent of this plan to make information about regulatory matters widely available and to improve communication between the NRC, interested members of the public, and the nuclear power industry, thereby increasing understanding of the NRC's review process." *Id.*, p. 1.

⁶⁸ *Id.*, p. 43.

⁶⁹ PG&E-3, p. 4. PG&E witness Kent Ferre rephrased his assertion to a slightly different, but equally clever, non sequitur on the next page: "As I noted above, the IPRP did not comment **on the inclusion** of deterministic plots in any of the three IPRP reports on PG&E's final AB 1632 report." (emphasis added) *Id.*, p. 5.

completed. PG&E provided them (along with the four 10^{-7} scenarios that were never intended to be included in the Report) to A4NR as data responses.⁷⁰ While PG&E assigned a M8 to each of the four deterministic joint ruptures “based on established magnitude scaling methods (e.g., Hanks and Bakun),”⁷¹ and noted that in the probabilistic SSHAC model “the magnitude was conservatively increased to M8.5,”⁷² the only joint rupture case that made it into PG&E’s CCCSIP Report was much different.

Extending the Hosgri Fault linkage only to the San Simeon, rather than “up to Mendocino Triple Junction (offshore Northern California)” as specified by Mr. Klimczak,⁷³ and using “the Leonard (2010) magnitude-area scaling relation for strike-slip faults,”⁷⁴ PG&E’s CCCSIP Report included a deterministic “sensitivity” joint rupture of the Hosgri and Shoreline Faults of M7.3. With a predictability enabled by the ground motion data void described above and criticized in IPRP Reports Nos. 6 and 9, PG&E’s CCCSIP Report reached an unsurprising conclusion: “The ground motion from this linked rupture case remains bounded by the 1977 Hosgri spectrum.”⁷⁵ But as IPRP Report No. 9 emphasized, PG&E’s sanguine conclusions about single ruptures of the surrounding faults are driven by its choice of ground motion methodologies:

*Figure 5a shows that the deterministic spectra calculated based on the ergodic assumption **exceed the 1977 HE and the 1991 LTSP spectra for all but one scenarios** in the period range important to DCCPP, which re-illustrates observations made in the IPRP Report No. 6 and depicted in Figure 7c of that report... For the DCCPP site, the use of*

⁷⁰ A4NR-3, Ex. 1.

⁷¹ A4NR-3, Ex. 2.

⁷² *Id.*

⁷³ A4NR-2, p. 42.

⁷⁴ PG&E CCCSIP Report, Chapter 13, page 18 of 21.

⁷⁵ *Id.*

*single station sigma with site-specific term **appears to be the key factor that brings the deterministic spectra below** the original design spectra.*⁷⁶ (emphases added)

The IPRP calculated similar exceedance of both the 1977 Hosgri and 1991 LTSP spectra when the ergodic methodology was applied to PG&E's deterministic M7.3 joint Hosgri-Shoreline rupture "*sensitivity*".⁷⁷ Based on IPRP Reports Nos. 6 and 9, A4NR strongly suspects that a similar IPRP evaluation of PG&E's four deterministic M8 joint rupture scenarios, or the four joint ruptures using the 10^{-6} "*hybrid approach*," would produce even larger exceedances of the 1977 Hosgri and 1991 LTSP spectra. There is no evidence that the IPRP has ever been made aware of any of these analyses, or that PG&E consulted the IPRP before excluding them from the CCCSIP Report.⁷⁸

D. PG&E IGNORED THE STATE'S INTEREST IN NON-SAFETY SSCs.

As emphasized in Dr. Blakeslee's testimony, PG&E's CCCSIP Report "*reviewed only shaking within the power block and turbine building and ignored other components of the facility related to reliability.*"⁷⁹ (emphasis in original) The U.S. Supreme Court's landmark, unanimous decision in *Pacific Gas and Elec. Co. v. State Energy Resources Conservation & Development Com'n* (1983) 461 US 190 established that, while Congress intended that the federal government regulate the radiological safety aspects involved in the construction and operation of a nuclear power plant, "*the States retain their traditional responsibility in the field*

⁷⁶ IPRP Report No. 9, p. 12.

⁷⁷ *Id.*, pp. 12, 14 Figure 6.

⁷⁸ PG&E's omission of these joint rupture analyses renders the assertion by Chief Seismologist Dr. Norman Abrahamson ("*For the ground motion estimates shown in Chapter 13 of the CCCSIP Report, the most severe set of source parameters was used for each of the four controlling faults near DCP.*" PG&E-2, p. 7-7) misleading,

⁷⁹ A4NR-2, p. 6.

of regulating electrical utilities for determining questions of need, reliability, cost and other related state concerns.”⁸⁰ Dr. Blakeslee quoted from the discussion of reliability concerns in the AB 1632 Report issued in 2008 by the California Energy Commission (“CEC”): “The **non-safety** related systems, structures and components (SSCs) of the plant are most vulnerable to damage from earthquakes. Damage to non-safety related SSCs is **the greatest source of seismic-related plant reliability risk.**”⁸¹ (emphases in Blakeslee testimony) And his testimony highlighted the resultant recommendation in the CEC’s AB 1632 Report: “Evaluate the seismic vulnerability and reliability implications for the nuclear plants’ **non-safety** related SSCs from changes to seismic design standards that have occurred since the plants were designed and built.”⁸² (footnote omitted, emphasis in Blakeslee testimony)

PG&E’s Rebuttal Testimony cited a 2010 report by Enercon as responsive to concerns about non-safety structures, systems, and components,⁸³ but it chose to simply ignore Dr. Blakeslee’s criticism of reliance on the outdated Enercon report:

*... that report fails in two key ways: First, the Enercon Service analysis was performed many years **before** the newly discovered and reinterpreted seismic hazards were identified [in] 2014. The study therefore failed to use the relevant seismic threat information that was appropriate to examine the reliability of non-safety SSC’s at Diablo. Second, the 2010 analysis was based on an Electric Power Research Institute database, which included instances of maximum recordings of earthquake shaking of between 0.2 and 0.8g at a variety of electrical generation facilities. Most of these recorded accelerations in this database are lower than the maximum accelerations PG&E predicts in its 2014 CCCSIP for earthquakes on the Hosgri, Shoreline, San Simeon, and Los Osos faults for locations with rock velocities of 760 m/s. Some of Diablo’s important non-*

⁸⁰ 461 US 190, 205.

⁸¹ A4NR-2, p. 6.

⁸² *Id.*, p. 7.

⁸³ PG&E-2, p. 7-2.

*safety SSCs are located in areas of lower-velocity rock than those assumed for the foundations of the powerblock and turbine building.*⁸⁴ (emphasis in original)

Dr. Blakeslee also criticized a remark in Geosciences Director Klimczak's "Results from a 12/6/13 CNO Seismic Update meeting" document: "It was decided to only evaluate the 'critical' SSCs in any frequency of exceedance ranges to show they can perform their safety function..."⁸⁵

As Dr. Blakeslee observed, "Thus, nine months before the release of the CCCSIP, PG&E had pre-determined not to evaluate the non-safety SSC areas of concern to state energy regulators, although the AB 1632 recommendations specifically call for this."⁸⁶ His conclusion:

It is imperative that free-field accelerations be calculated for all relevant locations within the Diablo plant footprint, including those where non-safety SSCs are located. The predicted accelerations, some of which will occur at locations of low-velocity fill such as the switchyards, can then be available to properly examine whether or not non-safety SSCs could withstand the shaking anticipated from these new seismic hazards using the EPRI database. If the EPRI database is statistically inadequate to test how non-safety SSC's would perform given the large Diablo accelerations, then forward modeling or other approaches could be employed to address the issue. Finally, if these updated calculations are not performed, the state's confidence regarding the reliability of the plant will rest solely upon outdated analysis of data that failed to include the seismic threats identified by the AB1632 research. It is difficult to understand why the study of the non-safety SSCs was commissioned by the utility before the seismic threat was properly understood and quantified, and why their December 2013 AB 1632 plan excludes them from analysis.⁸⁷ (emphasis in original)

There is no evidence that PG&E consulted the IPRP before excluding consideration of seismic impacts on non-safety SSCs from the CCCSIP Report.

⁸⁴ A4NR-2, p. 7.

⁸⁵ *Id.*

⁸⁶ *Id.*, p. 8.

⁸⁷ *Id.*

E. CCCSIP NEVER ASSESSED SAN-SIMEON-BENEATH-THE-PLANT.

As clearly stated in D.12-09-008,

*PG&E designed the proposed seismic studies to use the advanced technologies recommended by the CEC to explore fault zones near Diablo Canyon. **These studies were also designed to address the CEC recommendation that PG&E assess the implications of a San Simeon type earthquake beneath Diablo Canyon.***⁸⁸ (emphasis added, footnotes omitted)

A4NR-1 documented the effort by Geosciences Director Richard Klimczak to wordsmith a way around the unmistakable directive from the CEC's AB 1632 Report to analyze a blind thrust San Simeon-type earthquake occurring directly beneath the Diablo Canyon nuclear power plant.⁸⁹ Mr. Klimczak's insertion into the CCCSIP Report described PG&E's previously performed probabilistic study of "a San Simeon-type earthquake beneath the Irish Hills,"⁹⁰ an assessment that the CEC's AB 1632 Report in 2008 had expressly deemed insufficient:

*PG&E has considered a San Simeon-type earthquake scenario within probabilistic seismic hazard assessments for Diablo Canyon. However, **further studies that consider such an earthquake from a deterministic basis (i.e., using a probability of 1) are recommended to evaluate the full implications of this earthquake, particularly for non-safety related plant components and reliability.***⁹¹ (emphasis added)

There is no evidence that PG&E consulted the IPRP before excluding deterministic consideration of a San Simeon-type earthquake directly beneath the plant from the CCCSIP Report.

⁸⁸ D.12-09-008, p. 17.

⁸⁹ A4NR-1, pp. 40 – 41.

⁹⁰ *Id.*, p. 41.

⁹¹ *Id.*

F. PG&E COULD SEE IT HAD A DEEPLY FLAWED WORK PRODUCT.

A4NR-1 documented the July 15, 2014 candid assessments of the CCCSIP chapters communicated to PG&E by its primary seismic source characterization consultants, Dr. Stephen Thomson and Dr. William Lettis. As Dr. Thompson informed Dr. Lettis:

Things are going horribly.

*AB 1632 continues to be a major major distraction for me ... I am being asked to review all AB 1632 reports late this week and next ... From what I have read ... or have learned from others ... **these reports are in bad shape and will be a blight on PG&E if they go out as is.***

***I brought up the subject of requesting a delay with Kent;**⁹² **it was immediately rejected.** My impression is that you have to take the lead in that type of discussion, and perhaps get Norm⁹³ on board first.⁹⁴ (emphases added)*

Nine minutes later, Dr. Lettis emailed PG&E Chief Seismologist Dr. Norman Abrahamson:

Hi Norm

I need to have an urgent discussion with you early next week. Please see email from Steve below.

*... Steve (in particular) and Hans have been tied up almost full time with the AB 1632 study, **which is in very sad state (this is another issue that I would like to discuss with you, in terms of PG&E Geosciences credibility).***

*At this point in time, I think **it would be wise for PG&E to talk with the NRC about a 3 to 6 month delay in submitting the 50.54f response.** We can offer the NRC many reasons, but the fundamental reason is the completion of ongoing new studies (AB 1632, USGS CRADA, etc.) that we would like to incorporate into the model.⁹⁵*

⁹² A4NR believes this reference is to PG&E Geosciences Manager Kent Ferre.

⁹³ A4NR believes this reference is to PG&E Chief Seismologist Dr. Norman Abrahamson.

⁹⁴ A4NR-1, pp. 3 – 4.

⁹⁵ *Id.*, p. 4.

As indicated in A4NR-1, and left undisputed by PG&E's Rebuttal Testimony: the 50.54(f) SSHAC submittal to the NRC took place as originally scheduled;⁹⁶ PG&E's documents show that all of the CCCSIP chapters except one (addressing the concerns raised on behalf of A4NR by Dr. Douglas Hamilton⁹⁷) were available for final review by July 17, 2014;⁹⁸ and the conclusions in the Executive Summary had not changed after July 2, 2014.⁹⁹ There is no evidence of any substantive changes to the CCCSIP Report or to its conclusions after the concerns expressed by Dr. Thompson and Dr. Lettis. A4NR believes that the material deficiencies which motivated their concerns remained unaltered in the final CCCSIP Report.

PG&E documents discussed in A4NR-1 show that notwithstanding the cautionary warnings from Dr. Thompson and Dr. Lettis, PG&E's internal review of the CCCSIP Report displayed a sweep-it-under-the-rug instinct which independent, outside observers like the IPRP might find unsettling. As Halpin lieutenant Jeff Summy described to Geosciences Director Richard Klimczak:

... he [Mr. Halpin] reviewed the Executive Summary that was presented in the recent webcast. I think John¹⁰⁰ really alerted him to it but it is important for all of us to understand. He specifically asked about the last set of ground motion curves in the

⁹⁶ The evening before PG&E's submittal of the 50.54(f) response, Jearl Strickland, Mr. Summy's replacement, assured Chief Nuclear Officer Ed Halpin that "Based on our earlier discussion, (t)he process used to manage the SSHAC process will be evaluated in detail and a lessons learned developed **with specific actions to improve the performance of the Geosciences department.**" (emphasis added) *Id.*, p. 4.

⁹⁷ D.12-09-008 required that PG&E "address the concerns" raised by A4NR witness Dr. Douglas Hamilton about the Diablo Cove Fault and the San Luis Range/Inferred Offshore Fault: "PG&E says we need not take any action other than approving this application in order to implement A4NR's recommendations. We agree with PG&E. PG&E has said it will address the concerns of Dr. Hamilton. We expect PG&E to do so." *Id.*, p. 8. This effort did not blossom until after A4NR filed its Protest in A.14-02-008, and took on greater intensity after A4NR served additional testimony from Dr. Hamilton in that proceeding. Eventually, PG&E incorporated Dr. Hamilton's San Luis Range/Inferred Offshore Fault hypothesis into one of the SSHAC submittal's three tectonic models to explain uplift of the Irish Hills. A4NR-1, pp. 29 – 34.

⁹⁸ This was two days after the Thompson/Lettis "blight on PG&E"/ "PG&E Geosciences credibility" emails.

⁹⁹ A4NR-1, pp. 4 – 5.

¹⁰⁰ A4NR believes this reference is to John Conway, Mr. Halpin's predecessor as Chief Nuclear Officer.

*presentation where it shows us using the 86th percentile for a deterministic evaluation that links Hosgris [sic], San Simeon, and Shoreline and shows exceedance both at low frequency and high frequency. **He is asking why are we even including that. I said I thought it was because state of the art would require us to link these so the IPRP would expect this combination.** I also said the NRC would not worry about this (since they actually told us they will not expect us to link faults until we do the Seismic PRA) but he said (and he is likely right) that our opponents will challenge us on this. I responded that Nozar¹⁰¹ could demonstrate this is not really a safety challenge for the plant especially for how the NRC is treating eastern and Midwest plants. **However his challenge is why do we need to include it at all?**¹⁰²*

Two weeks prior to the CCCSIP public release, Geosciences Director Richard Klimczak commended media spokesperson Blair Jones for glibly reciting PG&E dogma (“*the core issue involving earthquake ground motions was resolved in the late 1970s with seismic retrofitting of the plant*”¹⁰³) in an Associated Press article about a recommendation by Diablo Canyon’s senior resident NRC inspector that the plant be at least temporarily shut down due to violations of the seismic design requirements of its license.

In the one-week run-up to public release of the CCCSIP Report, even with the significant abridgments described herein, Mr. Halpin required additional soothing. As he wrote to Geosciences Director Klimczak:

*>>>Rich-as I reread the executive summary section of the report and go to the last page that summarizes old vs new data/assumptions, it seems the majority of the data has worsened and not improved. The optics look bad. If I was to color code the summary sheet and show all data in red that’s worse in regard to assumptions it would not look good. I wonder how do I express that those areas that have worsened are low contributors to overall impact? How are they weighted in a deterministic calc and where is that weighting explained?
>>>*

¹⁰¹ A4NR believes this reference is to Nozar Jahangir, PG&E’s engineering manager of the Diablo Canyon seismic program update.

¹⁰² A4NR-1, p. 2.

¹⁰³ *Id.*, p. 5.

>>>Thanks
>>>
>>>Ed¹⁰⁴

Chief Seismologist Abrahamson sent his response to Mr. Halpin through Geosciences

Director Klimczak:

... the increase in the maximum magnitudes will probably be the focus for the public. A key issue to communicate is that for a site a [sic] close distances to the earthquakes, the high frequency ground motions do not increase much with increasing magnitude once the magnitude reaches M6.5...So the level of the ground motion is not sensitive to these changes in the magnitudes. The maximum magnitude remains an [sic] topic of ongoing scientific study, but the seismic hazard as [sic] DCPD is not sensitive to this uncertainty. This is good ...¹⁰⁵

IV. PG&E CANNOT USE SSHAC AS A SHIELD FROM CCCSIP DEFECTS.

A consistent theme of PG&E's Rebuttal Testimony is to explain away identified CCCSIP defects, especially on the hyper-significant subject of ground motion modeling, to a purported cure in the SSHAC process.¹⁰⁶ It would be highly inappropriate for the Commission to be taken in by this ruse. As discussed earlier, PG&E's information-control tactics prevented the IPRP from performing its review of the CCCSIP Report prior to the document being unilaterally declared "*final*." The time-compressed, post-release CCCSIP review which PG&E afforded the IPRP deprived the IPRP of the ability to assure the proper integration of the AB 1632 seismic studies into the SSHAC Report. PG&E even reneged on its commitment to the IPRP that the SSHAC Report would equally weight the three fault geometry models for the Irish Hills.

¹⁰⁴ *Id.*, pp. 5 – 6.

¹⁰⁵ *Id.*, p. 6.

¹⁰⁶ PG&E-2, pp. 6-6, 7-3, and 7-7.

The deterministic nature of the CCCSIP Report and the probabilistic nature of the SSHAC Report reflect the different objectives, and origins, of two distinct processes. As discussed in A4NR-3, PG&E has shown a proclivity to relegate the assessment of joint ruptures and other high consequence events to the murky abracadabra of its opaque calculation of probabilities where, in the company's memorable phrase, the *"probability is so small that it would mask in PRA space any probability of an issue occurring."*¹⁰⁷ As Dr. Blakeslee's testimony observed, PG&E *"has been largely non-responsive"* to most of the IPRP's concerns about *"the factors that affect shaking estimates, choosing instead to shift the analysis of these issues away from [the] CPUC-controlled IPRP to the NRC-controlled venue."*¹⁰⁸ The Commission should be wary of PG&E's ill-concealed regulatory arbitrage.

Nor should the Commission fail to recognize the distinct preference of the SSHAC process for *"participatory"* -- rather than *"independent"* -- *"peer review."* As described in PG&E-1, members of the Participatory Peer Review Panel (*"PPRP"*) are *"experts with SSHAC methodology and/or PSHA¹⁰⁹ experience"* that provide *"participatory peer review of the SSHAC methodology implementation process and technical judgments of the Technical Integration Team."*¹¹⁰ The PPRP is supposed to assure that the range of technically defensible interpretations is captured and documented through proper implementation of the SSHAC process. Members of the PPRP attend all of the formal workshops and are encouraged to participate in field reviews and selected working meetings of the Technical Integration Team.

¹⁰⁷ A4NR-3, p. 6.

¹⁰⁸ A4NR-2, p. 15.

¹⁰⁹ PSHA is an acronym for Probabilistic Seismic Hazard Analysis.

¹¹⁰ PG&E-1, p. 6-9.

In response to an A4NR data request about any prior professional relationships between PG&E and its PPRP members, PG&E responded that Dr. Kevin Coppersmith (chair of the Seismic Source Characterization PPRP) *“was involved in the original circa late 1980s Long Term Seismic Program”* and that several of the others had been members of the 2011 combined Seismic Source Characterization and Ground Motion Characterization PPRP before PG&E bifurcated its SSHAC process.¹¹¹ No mention was made of any relationship between any PPRP member and the AB 1632 seismic studies, but the *“AB 1632 Studies – Cost Plan”* provided by PG&E in response to an A4NR data request identified these cumulative payments to Seismic Source Characterization PPRP members thru February 2015: Dr. Neal Driscoll, \$60,500;¹¹² and Dr. Tom Rockwell, \$9,500.¹¹³

Neither Dr. Coppersmith’s prior LTSP role, nor Dr. Driscoll’s and Dr. Rockwell’s AB 1632 seismic studies compensation, disqualified them from serving as members of the PPRP. NUREG-2117, the NRC’s updated guidance document, makes an anodyne suggestion (*“It may be useful to require that [sic] TI Team members or evaluator experts to disclose any potential conflicts of interest to remove any doubt that they are acting as independent evaluators and not as representatives of their agencies or under the influence of any business relationships”*¹¹⁴), but is ambiguous about its applicability to the PPRP: *“the selection criteria for the PPRP should likewise be carefully considered and made explicit.”*¹¹⁵ The NRC guidance regarding PPRP members emphasizes more mundane practicalities of their interactions with TI Team members:

¹¹¹ A4NR-4.

¹¹² A4NR-6, p. 3, ln. 59 (*“Environment and Marine Solutions Driscoll”*) and ln. 73 (*“Envir & Marine Solutions”*); p. 4, ln. 59 (*“Environment and Marine Solutions Driscoll”*) and ln. 73 (*“Envir & Marine Solutions”*); p. 5, ln. 116 (*“Environmental and Marine”*); and p. 6, ln. 116 (*“Environmental and Marine”*).

¹¹³ A4NR-6, p. 3, ln. 74 (*“Rockwell”*); and p. 4, ln. 74 (*“Rockwell”*).

¹¹⁴ NUREG-2117, p. 66.

¹¹⁵ *Id.*

*A final point regarding the workshops concerns the independence and impartiality of the PPRP, and particularly the perception of this objectivity by observers. Given the relatively small and close-knit nature of the specialist technical communities in the earth sciences, it is very likely that members of the PPRP and the technical staff on the project will know each other and may even be working together on other endeavors. Therefore, there should be no unrealistic expectations about separation and distance, but all members of the panel should be vigilant about being drawn into participating in the actual technical assessments. Depending on the situation and environment in which the study is connected, project organizers may consider taking some measures to avoid excessive social and informal interaction between the members of the PPRP and other project participants. Options may include accommodating the PPRP members in a separate hotel to simply arranging a separate table for them to take meals during the workshop.*¹¹⁶

Based on documents provided by PG&E in response to A4NR data requests, Dr. Driscoll's interactions with the AB 1632 seismic studies appear to have been especially "*participatory*." Email correspondence between Geosciences Manager Kent Ferre and CCCSIP Technical Manager Dr. Stuart Nishenko confirmed that Dr. Driscoll invoiced both the CCCSIP and SSHAC projects.¹¹⁷ Dr. Driscoll featured prominently – the only individual quoted beside Chief Nuclear Officer Halpin --in the PG&E press release which accompanied submittal of the CCCSIP Report to the NRC:

*Vast resources have been devoted to examine onshore and offshore fault systems in the region of interest to better understand potential hazards ... In my opinion, outside of oil and gas exploration, the offshore areas by Diablo Canyon are one of the most studied continental regions in the world ... As a scientist and a member of the SSHAC process, I look forward to reviewing the data presented in these new reports ... The information gathered will be of benefit to researchers for decades to come.*¹¹⁸

¹¹⁶ *Id.*, p. 97.

¹¹⁷ A4NR-5.

¹¹⁸ "Advanced Seismic Research Confirms Earthquake Safety at Diablo Canyon," September 10, 2014, accessible at http://www.pge.com/en/safety/systemworks/dcpp/newsmedia/pressrelease/archive/advanced_seismic_research_confirms_earthquake_safety_at_diablo_canyon.page

Five months later, PG&E’s media spokesperson, Blair Jones, provided a reporter from Power Magazine with quotes from Dr. Driscoll, identifying him as a “*third party on the seismic studies*” without mentioning his compensation arrangement with PG&E.¹¹⁹ Mr. Jones encouraged the reporter to contact Dr. Driscoll.¹²⁰ Subsequently, when publication of the SSHAC Report triggered public criticism from Dr. Blakeslee and IPRP member Dr. Bruce Gibson,¹²¹ Dr. Driscoll was supposed to be enlisted in PG&E’s media strategy¹²² but could not respond in time. As he explained to Geosciences Manager Kent Ferre:

*Sorry I am in the field and missed your message. Also it appears I missed the deadline to respond. Unfortunate that these two gentlemen can cast so much doubt. In science, we call people like this “Mercenaries of Doubt” – they do not have to be right they just have to cast enough doubt to sway public opinion.*¹²³

In matters concerning Diablo Canyon, the Commission has wisely chosen to place a premium on “*independent*” review. The **Independent** Peer Review Panel, made up of representatives from selected state agencies and the County of San Luis Obispo, joins the Diablo Canyon **Independent** Safety Committee (“DCISC”), comprised of expert individuals appointed by the Commission after nomination the Governor, the Attorney General, and the California Energy Commission.¹²⁴ One measure of the emphasis the Commission has placed on independence is the strict conflict of interest standards in the DCISC Restated Charter adopted

¹¹⁹ A4NR-8, unnumbered p. 1.

¹²⁰ *Id.*

¹²¹ Dr. Gibson is a former geophysicist who presently serves on the San Luis Obispo County Board of Supervisors.

¹²² A4NR-9, unnumbered p. 1. As Jearl Strickland reported to Chief Nuclear Officer Halpin, “*I’ve been on the phone with Blair at length this evening. We will be meeting in the morning to lay out strategy to have third parties that have been involved in the seismic studies weigh in to the trib.*”

¹²³ A4NR-7, unnumbered p. 1.

¹²⁴ The DCISC was established by D.88-12-083. D.04-05-055 eliminated the participation of PG&E and the Dean of Engineering at the University of California at Berkeley from the nomination process for DCISC members.

in D.07-01-028, including a proscription on individuals serving who have received more than \$250 in income or gifts from PG&E or an affiliated company in the past year.¹²⁵

The Commission should not be taken in by PG&E's argument that the probabilistic assessments in the SSHAC process were an adequate corrective for the analytic shortcomings of the deterministic CCCSIP process. By refusing to allow pre-release IPRP review of the CCCSIP Report, and by thwarting IPRP oversight of the integration of the AB 1632 seismic studies into the SSHAC Report, PG&E has severely undermined the value of a large ratepayer investment in the seismic re-evaluation of Diablo Canyon.

V. CONCLUSION.

Of necessity, the Commission has been forced to recently confront continuing issues of corporate culture at PG&E. None but the most credulous would extend a presumption of objectivity to seismic studies which PG&E has brazenly shielded from proper review. Despite the IPRP cornerstone built into D.10-08-003 and D.12-09-008, PG&E reacted to the IPRP's mid-2013 criticism of its ground motion modeling by embargoing further substantive information from the IPRP until declaring the CCCSIP Report "*final*" in mid-September, 2014. As documented in A4NR-2, PG&E's CCCSIP Technical Director Dr. Stuart Nishenko as late as February, 2015 bitterly disputed whether ground motion issues were even within the purview of the IPRP.¹²⁶ PG&E knows that the CEC's AB 1632 Report in 2008 identified ground motion as the dominant factor in assessing seismic hazard at Diablo Canyon:

¹²⁵ The DCISC Restated Charter is attached to D.07-01-028.

¹²⁶ As Dr. Nishenko emailed one of PG&E's Regulatory Relations staff on February 8, 2015, "*Gibson and others (e.g., Blakeslee) were posturing that they want to spend more time delving into ground motion issues – this is beyond the original AB 1632 scope and outside the expertise of the IPRP (once again).*" A4NR-2, p. 25.

As ground motion models are refined to account for a greater understanding of the motion near an earthquake rupture, it will be important for PG&E to consider whether the models indicate larger than expected seismic hazards at Diablo Canyon and, if so, whether the plant was built with sufficient design margins to continue operating reliably after experiencing these larger ground motions.¹²⁷ (emphases added)

And D.12-09-008 was equally clear in construing the CEC's AB 1632 Report:

*Relevant to this application, the AB 1632 report recommended that ... PG&E should ... (a)ssess the implications of a San Simeon-type earthquake beneath Diablo Canyon. **This assessment should include expected ground motions and vulnerability assessments for safety-related and non-safety-related plant systems and components that might be sensitive to long-period motions in the near field of an earthquake rupture.***¹²⁸

PG&E has failed to meet its burden of proof that its 2014 conduct was reasonable. To the contrary, the evidence is overwhelming that PG&E's conduct of the AB 1632 seismic studies in 2014 contradicted D.12-09-008 and D.10-08-003,¹²⁹ and that PG&E's management of the LTSP in 2014 was unreasonable because it impeded meaningful IPRP review of the integration of the AB 1632 seismic studies into the SSHAC Report.

A4NR recommends that the Commission disallow recovery of the \$4.56 million recorded in the DCSSBA as costs incurred in 2014 for the AB 1632 seismic studies. PG&E's refusal to interact with the IPRP as required by D.12-09-008 and D.10-08-003, and its failure to submit to IPRP review prior to publishing its "final" report, prevent the Commission from finding these

¹²⁷ A4NR-2, p. 26, quoting the CEC's AB 1632 Report, November 2008, p. 6.

¹²⁸ D.12-09-008, p. 3.

¹²⁹ ORA- 1, pp. 6-2 – 6-4, addressed a significantly different question: whether the entries recorded in the DCSSBA were appropriate, correctly stated, and in compliance with applicable Commission decisions. As clarified in response to an A4NR data request, the ORA audit was confined to examining one particular cell in a PG&E excel spreadsheet to determine if there was adequate supporting documentation for the \$ 22,923.16 amount recorded. PG&E produced a billing invoice from the CPUC and a copy of a payment check from PG&E, both for the stated amount. ORA's conclusion: "The supporting documentation was determined to be adequate and there was no additional follow up ..." A4NR-10, unnumbered p. 2.

costs were reasonably incurred. A4NR also recommends disallowance of the \$0.90 million recorded in the DCSSBA as costs incurred in 2014 for Project Management of the LTSP. PG&E's failure to provide for timely IPRP review of the AB 1632 seismic studies, and obtain the IPRP's assurance that the AB 1632 seismic studies were properly incorporated into PG&E's SSHAC report as intended by D.12-09-008, prevents the Commission from finding these Project Management costs were reasonably incurred.

The Governor's recent signature of AB 361 (2015) codifying the role of the IPRP and extending its existence until 2025, an urgency bill which received a unanimous vote in every committee and on the floors of both legislative houses, reaffirms the priority of subjecting PG&E's seismic evaluations to rigorous scrutiny. The Commission should not allow PG&E to charge ratepayers for its evasion of IPRP review in 2014.

Respectfully submitted,

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