



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

January 11, 2016

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

SUBJECT: AUDIT REPORT REGARDING PACIFIC GAS AND ELECTRIC COMPANY'S
SEISMIC SITE RESPONSE RELATED TO THE NEAR-TERM TASK FORCE
RECOMMENDATION 2.1 - SEISMIC FOR: DIABLO CANYON POWER PLANT,
UNIT NOS. 1 AND 2 (CAC NOS. MF5275 AND MF5276)

Dear Mr. Halpin:

On March 12, 2012¹, the U.S. Nuclear Regulatory Commission (NRC) issued a request for information pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Section 50.54(f). The purpose of that request was to gather information concerning, in part, the seismic hazard at operating reactor sites to enable the NRC to determine whether licenses should be modified, suspended, or revoked. The "Required Response" section of Enclosure 1 of the request indicated that licensees should provide a seismic hazard evaluation and screening report. By letters² dated March 11, 2015, August 12, 2015, September 16, 2015, December 2, 2015, and December 21, 2015, Pacific Gas and Electric Company (PG&E, the licensee) submitted for NRC review its Seismic Hazard and Screening Report, Pursuant to 10 CFR 50.54(f), Request for Information Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident for Diablo Canyon Power Plant, Unit Nos. 1 and 2 (Diablo Canyon).

By letter dated September 4, 2015³, the NRC issued a regulatory audit plan, which identified the technical areas for review related to the Diablo Canyon's site response analysis and all associated and relevant supporting documentation used in the development of these models. The purpose of this audit was to enable the NRC staff to come to a better understanding of the licensee's site response analysis performed for the Diablo Canyon site. The information gained from this audit will support the staff's review and subsequent development of its staff assessment.

¹ The letter can be found under Agencywide Documents Access and Management System (ADAMS) Accession No. ML12053A340.

² The letters can be found under ADAMS Accession Nos. ML15071A046, ML15071A046, ML15259A600, ML15349A874, and ML15362A569, respectively.

³ The letter can be found under ADAMS Accession No. ML15244B099.

E. Halpin

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By letter dated December 21, 2015, the licensee provided a response to technical requests made during the staff's regulatory audit, which was held on September 11, 2015, and follow-up audit completed on December 3, 2015. Additional information related to the audit are enclosed with this letter.

If you have any questions, please contact me at (301) 415-1115 or by e-mail at Nicholas.DiFrancesco@nrc.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Nicholas DiFrancesco", with a stylized flourish at the end.

Nicholas DiFrancesco, Senior Project Manager
Hazards Management Branch
Japan Lessons-Learned Division
Office of Nuclear Reactor Regulation

Enclosures:

1. Audit Report for September 11, 2015
2. Audit Report for December 3, 2015

Docket Nos. 50-275 and 50-323

cc w/encl: Distribution via Listserv



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

REPORT OF REGULATORY AUDIT REGARDING
PACIFIC GAS AND ELECTRIC COMPANY'S
SEISMIC SITE RESPONSE RELATED TO THE NEAR-TERM TASK FORCE
RECOMMENDATION 2.1 - SEISMIC FOR
DIABLO CANYON POWER PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-275 AND 50-323
SEPTEMBER 11, 2015

BACKGROUND

On March 12, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12053A340), the U.S. Nuclear Regulatory Commission (NRC) issued a request for information pursuant to Title 10 of the *Code of Federal Regulations*, Part 50 (10 CFR), Section 50.54(f). The purpose of that request was to gather information concerning, in part, the seismic hazard at operating reactor sites to enable the NRC to determine whether licenses should be modified, suspended, or revoked. The "Required Response" section of Enclosure 1 of the request indicated that licensees should provide a seismic hazard evaluation and screening report. By letters dated March 11, 2015, August 12, 2015, September 16, 2015, December 2, 2015, and December 21, 2015 (ADAMS Accession Nos. ML15071A046, ML15071A046, ML15259A600, ML15349A874, and ML15362A569, respectively), Pacific Gas and Electric Company (PG&E, the licensee) submitted for NRC review its Seismic Hazard and Screening Report (SHSR), Pursuant to 10 CFR 50.54(f), Request for Information Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident for Diablo Canyon Power Plant, Unit Nos. 1 and 2 (DCPP, Diablo Canyon).

By letter dated September 4, 2015 (ADAMS Accession No. ML15244B099), the NRC issued a regulatory audit plan, which identified the technical areas for review during the audit related to Diablo Canyon's site response analysis and all associated and relevant supporting documentation used in the development of these models including, but not limited to, methodology, process information, calculations, computer models, etc.

AUDIT ACTIVITIES

The NRC audit team consisted of:

- Nicholas DiFrancesco, Japan Lessons-Learned Division, Office of Nuclear Reactor Regulation
- Clifford Munson, Division of Site Safety and Environmental Analysis, Office of New Reactors
- Jon Ake, Division of Engineering, Office of Nuclear Regulatory Research
- Vladimir Graizer, Division of Site Safety and Environmental Analysis, Office of New Reactors
- Thomas Weaver, Division of Engineering, Office of Nuclear Regulatory Research
- Scott Stovall, Division of Engineering, Office of Nuclear Regulatory Research
- John Stamatakos, Director of Technical Programs, Center for Nuclear Waste Regulatory Analyses (CNWRA) consultant to the NRC
- Miriam Juckett, CNWRA consultant to the NRC

The licensee supporting staff consisted of:

- Jearl Strickland (PG&E Technical Services Director)
- Nozar Jahangir (PG&E Technical Services, Manager)
- Steve Thompson (Lettis Consultants International, Inc)
- Kent Ferre (PG&E Technical Services)
- Norm Abrahamson (PG&E Technical Services)

The audit team reviewed the following types of information:

The NRC staff audited the licensee's site response analysis for Diablo Canyon. Recently, the licensee updated its seismic velocity profiles based on more recent geophysical data acquisition and analysis. The NRC staff requested that the licensee incorporate this new data into its site response analyses for Diablo Canyon by (1) updating the site term based on the empirical approach and (2) developing site amplification factors by incorporating the recently updated seismic velocity data into an analytical approach. As a follow-up, the NRC issued a request for additional information (RAI) by letter dated October 1, 2015 (ADAMS Accession No. ML15267A774).

Audit outcomes and proposed disposition of issues

1. Discussed the approach for developing final control point seismic hazard curves and Ground Motion Response Spectrum (GMRS) to include:
 - a. Basis for control point location
 - b. Incorporation of deeper site seismic velocity data
 - c. Basis for combining site specific profiles with $V_{S30}=760$ host profile
 - d. Capturing uncertainty in development of site amplification factors
 - e. Combining analytical and empirical approaches to develop final control point hazard curves

2. Identified additional information and requested for Audit eRoom
 - a. Confirm version of flat file from PEER
 - b. Review of March 2015 calculations to assess the low frequency site terms
 - c. The NRC staff clarified the August 26 and 27 audit Hosgri data slip rate request
 - d. Review of 3D seismic velocity data from the recently updated Fugro report
3. Discussed the potential of updating the March 2015 seismic hazard and screening report to include:
 - a. An assessment of changes to the empirical site term due to recently updated seismic velocity data
 - b. Development of site amplification factors for Diablo Canyon using an analytical site response approach
 - c. Licensee re-confirmation of site screening comparison
4. The NRC staff noted that the target of January 2016 to complete its assessment of the suitability of the final control point hazard curves and GMRS may be a challenge depending on when the request for additional information is received and staff time necessary to complete the technical review.

AUDIT SUMMARY

The audit team performed an independent review of the documents referenced above.

The team's observations and specific topics, included above, were discussed with the licensee to further understand the licensee's site response analysis for Diablo Canyon, as documented in the SHSR and in the August 2015 RAI response.

Discussions with the licensee led to an increased level of clarity regarding the licensee's site response analysis performed for the Diablo Canyon site.

By discussing in depth with the licensee the specific topics and the documentation specified above, the team was able to meet the objectives of the audit and has a better understanding of the licensee's site response analysis and has sufficient information to address the issues identified in the audit plan.

CONCLUSION

The NRC staff was able to obtain or identify needed information to continue its review which will support the subsequent issuance of a staff assessment.



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REPORT OF REGULATORY AUDIT REGARDING
PACIFIC GAS AND ELECTRIC COMPANY'S
SEISMIC SITE RESPONSE RELATED TO THE NEAR-TERM TASK FORCE
RECOMMENDATION 2.1 - SEISMIC FOR
DIABLO CANYON POWER PLANT, UNIT NOS. 1 AND 2
DOCKET NOS. 50-275 AND 50-323
DECEMBER 3, 2015

BACKGROUND

On March 12, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12053A340), the U.S. Nuclear Regulatory Commission (NRC) issued a request for information pursuant to Title 10 of the *Code of Federal Regulations*, Part 50 (10 CFR), Section 50.54(f). The purpose of that request was to gather information concerning, in part, the seismic hazard at operating reactor sites to enable the NRC to determine whether licenses should be modified, suspended, or revoked. The "Required Response" section of Enclosure 1 of the request indicated that licensees should provide a seismic hazard evaluation and screening report. By letters dated March 11, 2015, August 12, 2015, September 16, 2015, December 2, 2015, and December 21, 2015 (ADAMS Accession Nos. ML15071A046, ML15071A046, ML15259A600, ML15349A874, and ML15362A569, respectively), Pacific Gas and Electric Company (PG&E, the licensee) submitted for NRC review its Seismic Hazard and Screening Report (SHSR), Pursuant to 10 CFR 50.54(f), Request for Information Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident for Diablo Canyon Power Plant, Unit Nos. 1 and 2 (DCPP, Diablo Canyon).

In support of the September 11, 2015, audit review the NRC staff issued a request for additional information dated October 1, 2015 (Agencywide Document Access and Management System (ADAMS) Accession No. ML15267A774), as well as additional technical information by email dated November 13, 2015 (ADAMS Accession No. ML15323A200).

Subsequently, as a follow-up to the December 3, 2015, audit the NRC clarified the technical information by email dated December 7, 2015 (ADAMS Accession No. ML15349A003).

AUDIT ACTIVITIES

The NRC audit team consisted of:

- Nicholas DiFrancesco, Japan Lessons-Learned Division, Office of Nuclear Reactor Regulation
- Diane Jackson, Division of Site Safety & Environmental Analysis, Office of New Reactors
- Clifford Munson, Division of Site Safety & Environmental Analysis, Office of New Reactors
- Jon Ake, Division of Engineering, Office of Nuclear Regulatory Research
- Brittain Hill, Division of Site Safety & Environmental Analysis, Office of New Reactors
- Vladimir Graizer, Division of Site Safety & Environmental Analysis, Office of New Reactors
- Thomas Weaver, Division of Engineering, Office of Nuclear Regulatory Research
- Scott Stovall, Division of Engineering, Office of Nuclear Regulatory Research
- John Stamatakis, Director of Technical Programs, Center for Nuclear Waste Regulatory Analyses (CNWRA) consultant to the NRC
- Miriam Juckett, CNWRA consultant to the NRC

The licensee supporting staff consisted of:

- Jearl Strickland (PG&E Technical Services Director)
- Norm Abrahamson (PG&E Technical Services)

The audit team reviewed the following types of information:

The audit team discussed development of the methods associated with the empirical and analytical approach for Diablo Canyon's seismic site response and resolution of issues related to the NRC email dated November 13, 2015.

Discussion of empirical approach for site response

Through the audit, the NRC gathered additional information regarding whether the large 1 to 3 Hertz peak in the DCPD site term results are entirely due to a local site effect or if some of the peak is due to the path effect from the Parkfield earthquake. In particular, the NRC staff noted that the peak was present in the Parkfield earthquake DCPD site records but not in the DCPD site records from the San Simeon or Deer Canyon earthquakes. The licensee acknowledged uncertainty as to whether the peak can be entirely attributed to local site effects and that some of the peak may be due to path effects from the Parkfield earthquake. Due to this uncertainty, the licensee decided to develop control point hazard curves that combine the results of both the empirical and analytical site response analyses.

Discussion of analytical approach for site response

The NRC audited the analytical site response approach used by PG&E to develop site amplification factors. In particular, the NRC staff discussed the licensee's approach for

combining the generic host $V_{S30}=760$ m/sec seismic velocity profile with the site specific velocity profiles developed by the licensee through geophysical data acquisition and analysis. The licensee described how it incorporated both epistemic and aleatory uncertainty in the development of the site amplification factors and the subsequent determination of the control point seismic hazard curves for DCPD.

Audit outcomes and proposed disposition of issues

Subsequently, the NRC staff clarified additional technical requests and clarifications in its email dated December 7, 2015.

AUDIT SUMMARY

The audit team performed an independent review of the site response approach.

The team's observations and specific topics were discussed with the licensee to further understand the licensee's actions in evaluating the site response analysis for Diablo Canyon. Discussions with the licensee led to an increased level of clarity regarding the licensee's site response analysis performed for the Diablo Canyon site.

The team was able to meet the objectives of the audit and has a better understanding of the licensee's site response analysis and has sufficient information to address the issues identified in the audit plan.

CONCLUSION

The NRC staff was able to obtain needed information to continue its review, which will support the subsequent issuance of a staff assessment.

E. Halpin

- 2 -

By letter dated December 21, 2015, the licensee provided a response to technical requests made during the staff's regulatory audit, which was held on September 11, 2015, and follow-up audit completed on December 3, 2015. Additional information related to the audit are enclosed with this letter.

If you have any questions, please contact me at (301) 415-1115 or by e-mail at Nicholas.DiFrancesco@nrc.gov.

Sincerely,

/RA/

Nicholas DiFrancesco, Senior Project Manager
Hazards Management Branch
Japan Lessons-Learned Division
Office of Nuclear Reactor Regulation

Enclosures:

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2. Audit Report for December 3, 2015

Docket Nos. 50-275 and 50-323

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ADAMS Accession No.:ML15345A093

*** via e-mail**

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DATE	12/23/15	1/6/16	1/11/16

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