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

May 13, 2015

The Power Reactor Licensees
on the Enclosed List

SUBJECT: SCREENING AND PRIORITIZATION RESULTS FOR THE WESTERN UNITED STATES SITES REGARDING INFORMATION PURSUANT TO TITLE 10 OF THE *CODE OF FEDERAL REGULATIONS* 50.54(f) REGARDING SEISMIC HAZARD RE-EVALUATIONS FOR RECOMMENDATION 2.1 OF THE NEAR-TERM TASK FORCE REVIEW OF INSIGHTS FROM THE FUKUSHIMA DAI-ICHI ACCIDENT

The purpose of this letter is to inform Western United States (WUS) licensees of the results of U.S. Nuclear Regulatory Commission's (NRC's) seismic hazard screening and prioritization for plants to conduct seismic risk evaluations. The NRC staff has reviewed licensee interim evaluations which provide a safety basis supporting continued plant operations. This letter also discusses staff review plans including targets for acceptance of the seismic hazard by the end of 2015 and completion of the staff assessment in 12 to 18 months.

BACKGROUND

On March 12, 2012, the NRC issued a request for information pursuant to Title 10 of the *Code of Federal Regulations,* Part 50 (10 CFR), Section 50.54(f) (hereafter referred to as the 50.54(f) letter) (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12053A340). The purpose of that request was to gather information concerning, in part, the seismic hazards at operating reactor sites and to enable the NRC staff to determine whether licenses should be modified, suspended, or revoked. The "Required Response" section of Enclosure 1 indicated that licensees and construction permit holders should provide a Seismic Hazard Evaluation and Screening report within 3 years from the date of the letter for WUS plants (i.e., Columbia Generating Station (Columbia), Diablo Canyon Power Plant (Diablo Canyon), and Palo Verde Nuclear Generating Station (Palo Verde)). Further, the 50.54(f) letter stated that NRC would provide the results of the screening and prioritization indicating deadlines for individual plants to complete seismic risk evaluations to assess the total plant response to the re-evaluated seismic hazard. Additionally, by letter[1] dated February 20, 2014, the NRC provided supplemental information on the content of the seismic re-evaluated hazard submittals including guidance on reportability and operability. The purpose of this letter is to inform WUS licensees of the NRC's screening and prioritization and to allow licensees to appropriately plan the completion of further seismic risk evaluations described in Enclosure 1 of the 50.54(f) letter.

To respond to the 50.54(f) letter, all addressees committed to follow the Electric Power Research Institute (EPRI) Report, "Seismic Evaluation Guidance: Screening, Prioritization and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force

[1] The February 20, 2014, supplemental information letter is available in ADAMS under Accession No. ML14030A046.

Recommendation 2.1: Seismic,"[2] as supplemented, by the EPRI Report, "Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima Near-Term Task Force (NTTF) Recommendation 2.1: Seismic"[3] (this approach is known as the Expedited Approach). The NRC held multiple public meetings and teleconferences with industry and the public leading to the development of the guidance documents to review the re-evaluated seismic hazards.

The WUS licensees submitted seismic hazard and screening reports (SHSRs) by letters dated on or before March 12, 2015 (references are provided in Enclosure 3 of this letter). The SHSRs included interim evaluations that the staff has reviewed as part of this letter. The NRC staff conducted the screening and prioritization review of the submittals by assessing each licensee's screening evaluation and hazard analyses utilizing the endorsed SPID guidance.

INTERIM EVALUATIONS[4]

The 50.54(f) letter requested that licensees provide "interim evaluations and actions taken or planned to address the higher seismic hazard relative to the design-basis, as appropriate, prior to completion of the risk evaluation." For those plants where the re-evaluated seismic hazard exceeds the seismic design-basis, licensees stated they will provide interim evaluations to demonstrate that the plant can cope with the higher re-evaluated seismic hazard while the longer-term seismic risk evaluations are ongoing.

In support of the requested interim evaluations for licensees, WUS plants provided information related to seismic margin evaluations or insights from Individual Plant Examination of External Events (IPEEE) evaluations including estimated seismic risk. Additionally, the submittals discussed completing plant seismic walkdowns as part of NTTF Recommendation 2.3 in order to verify that the current plant configuration is consistent with the licensing basis. The NRC staff review of WUS reports found that licensees have demonstrated seismic margins supportive of continued plant operation while additional risk evaluations are conducted.

The interim evaluation provided in March 2015 is a first step in assessing the plant's capacity to withstand the re-evaluated hazard. In the near-term, by January 2016, licensees will complete an "Expedited Approach" to evaluate and identify reinforcements, if necessary, for certain equipment to ensure a safe shutdown pathway can withstand seismic ground motion that exceeds the safe shutdown earthquake (SSE). For Diablo Canyon and Palo Verde sites, the licensees stated that the Expedited Approach would not provide additional safety benefit for their plants because existing anaylses already demonstrate the ability to withstand the higher seismic ground motion. The NRC staff is continuing to assess the information provided by the licensees to determine if it meets the intent of the Expedited Approach review and will respond under a separate letter.

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[2] The SPID guidance document is found in ADAMS under Accession No. ML12333A170. The staff endorsement letter for the SPID guidance is found in ADAMS under Accession No. ML12319A074.

[3] The Expedited Approach guidance document is found in ADAMS under Accession No. ML13102A142.

[4] Enclosure 1 of this letter provides a Glossary of Seismic Evaluations, explaining each of the evaluations that are part of the overall seismic reevaluation.

SCREENING PROCESS

As described in the 50.54(f) letter and the SPID guidance, the seismic hazard re-evaluations were to be conducted using current analysis methods and guidance. The licensees' responses to the 50.54(f) letter provided seismic hazard re-evaluation results, which were the focus of the NRC staff's initial screening and prioritization review.

Although the SSE is commonly referred to as a single number, this number represents a distribution of ground motions that occur over a range of spectral frequencies. This results in a curve of ground acceleration over frequency. The ability of the equipment and structures in the plant to withstand the effects of ground motions is frequency specific. For the purposes of the licensees' analyses and NRC staff's review, the SPID guidance identifies three frequency ranges that are of particular interest: 1–10 Hertz (Hz), a low frequency range of <2.5 Hz, and a high frequency range of >10 Hz. The different ranges have been identified due to the different types of structures and equipment that may be impacted by ground motions in that range. For example, large components generally are not affected significantly by high frequencies (i.e., >10 Hz). The frequency range 1–10 Hz is the focus for this portion of the risk evaluation, as this range has the greatest potential effect on the performance of equipment and structures important to safety. For other frequency ranges, discussed below, limited-scope evaluations will be conducted, when appropriate.

In accordance with the SPID and Expedited Approach guidance, the re-evaluated seismic hazard determines if additional seismic risk evaluations are warranted for a plant (i.e., the plant screens in for further evaluation). Specifically, the re-evaluated ground motion response spectra (GMRS) in the 1–10 Hz frequency range is compared to the existing SSE:

- If the re-evaluated GMRS, in the 1–10 Hz range, is less than the plant's existing SSE, then the plant screens out of conducting further seismic risk evaluations.

- If the GMRS, in the 1–10 Hz range, is greater than the existing SSE, then the plant will complete the Expedited Approach (including the Interim Evaluation). Most plants that meet this criterion also screen in to conduct a seismic risk evaluation and have committed to conduct high frequency and spent fuel pool evaluations.

In addition, if the GMRS meets the low hazard threshold, which is described in the SPID, and only exceeds the SSE below 2.5 Hz, the licensee will perform a limited evaluation of equipment potentially susceptible to low frequency motions. Similarly, if the GMRS exceeds the SSE only above 10 Hz, then the licensee will perform an evaluation of the equipment or structures susceptible to that specific range of ground motion.

Enclosure 2 provides the staff's determination of priority for plants that screen-in to conduct a seismic risk evaluation, and identification of plants to complete limited-scope evaluations (i.e., spent fuel pool, high frequency, or low frequency).

CONDITIONAL SCREENING

As discussed in public meetings[5], the staff anticipated the possibility of not being able to complete the determination for conducting a seismic risk evaluation for some plants in the 30 to 60 day review period under certain circumstances. For example, if a licensee provided a unique submittal or deviated from the SPID guidance, additional time for the review might be needed. In general, WUS submittals contain extensive site specific information including site specific source models and ground-motion models which could affect the final screening decisions.

Accordingly, during the NRC screening and prioritization process, the staff identified that for Palo Verde additional time and interactions will be required to better understand the seismic hazard for the plant. As such, the staff determined that Palo Verde "conditionally screens-in" for the purposes of prioritizing and conducting additional evaluations. After interactions have occurred, the staff will make a final screening and prioritization determination and provide a letter to the licensee. If the plant remains screened-in, the final screening letter will affirm the plant priority for further evaluations and establish schedule for an Expedited Approach, if necessary. If the plant screens out, the final screening letter also will determine if Palo Verde needs to complete limited-scope evaluations (i.e., spent fuel pool, high frequency, or low frequency).

PLANT PRIORITIZATION

The NRC grouped the "screened-in" plants into three groups[6], which (i) reflects the relative priority for conducting a seismic risk evaluation that compares each plant's current capabilities to the re-evaluated seismic hazard, and (ii) accounts for the appropriate allocation of limited staff and available expertise for reviewing and conducting seismic risk evaluations. During the prioritization review, the staff considered each licensee's re-evaluated hazard submittals, plant specific seismic and risk insights. The WUS plants are included in the same groups as CEUS plants for completion of seismic risk evaluations.

To prioritize the plants for completing seismic risk evaluations, staff examined certain key parameters such as (1) the maximum ratio of the new re-evaluated hazard (GMRS) to the SSE in the 1-10 Hz range; (2) the maximum ground motion in the 1-10 Hz range; and (3) insights from previous seismic risk evaluations. As such, Group 1 plants are generally those that have the highest re-evaluated hazard relative to the original plant seismic design-basis (GMRS to SSE), as well as ground motions in the 1-10 Hz range that are generally higher in absolute magnitude. Based on these criteria, Columbia and Diablo Canyon are prioritized as Group 1 plants. Group 1 plants, including Columbia and Diablo Canyon are expected to conduct a seismic risk evaluation and submit it by June 30, 2017. Although, WUS have a shorter timeframe to develop a seismic risk evaluation relative to CEUS plants, WUS sites have the benefit of updating existing seismic probabilistic risk assessments (SPRAs) to meet current guidance.

Group 3 plants have GMRS to SSE ratios that are greater than 1, but the amount of exceedance in the 1-10 Hz range is relatively small, and the maximum ground motion in the

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[5] Discussion as part of public meetings dated December 4, 2014, February 11, 2015, and March 30, 2015 (ADAMS Accession Nos. ML14342A901, ML15104A065 and ML15111A031, respectively).

[6] Central and Eastern licensees seismic hazard screening and priority reviews were completed in 2014.

1-10 Hz range is also not high. As described above, Palo Verde has conditionally screened in; based on current information Palo Verde has been assigned to prioritization Group 3. Given the limited level of exceedance of the Group 3 plants including Palo Verde, staff is evaluating the need for licensees to conduct a seismic risk evaluation in order for the staff to complete its regulatory decision making. After further review, the staff will decide which Group 3 plants need to complete a seismic risk evaluation to inform NRC regulatory decision making. Risk evaluations for Group 3 plants are due by December 31, 2020.

NEXT STEPS

Based on the staff's screening review, the licensee for Columbia should finalize and submit an Expedited Approach report no later than January 31, 2016. The NRC staff is continuing to review the licensee-provided information for Diablo Canyon and Palo Verde related to the Expedited Approach. In accordance with the endorsed guidance, the staff acknowledges that the January 2016 Expedited Approach submittal will focus on plant equipment (i.e. safe shutdown pathway[7]) evaluations and modifications, as necessary, prior to submitting the plant seismic risk evaluations.

The content of limited-scope evaluations or confirmations and their associated schedule milestones remain under development with NRC staff and stakeholders. The NRC staff has conducted a number of public meetings on the implementation details of these evaluations, including the development of alternatives approaches for conducting these evaluations. The staff expects that implementing guidance should be established by summer 2015 and fall 2015 for high frequency and spent fuel pool evaluations, respectively. It is expected that WUS licensees can complete these evaluations in parallel with completion of SPRAs for Group 1 plants by June 2017.

This letter transmits the NRC staff's results of the seismic hazard submittals for the purposes of screening and prioritizing the plants. It does not convey the staff's final determination regarding the adequacy of any plant's calculated hazard. As such, the NRC staff will continue its review of the submitted seismic hazard re-evaluations, and may request additional plant-specific information through the summer of 2015. The staff has placed a high priority on this review for the early identification of issues that might adversely affect each licensee's seismic risk evaluations. Interactions with licensees will occur as soon as practical, including NRC staff plans to acknowledge whether seismic hazard curves are suitable for use in SPRA development by the end of 2015. The NRC staff plans to issue a staff assessment on the re-evaluated seismic hazard once each review is completed in approximately 12 to 18 months.

[7] Section 3 of the Expedited Approach guidance (ADAMS Accession No. ML13102A142), provides a process to identify a single seismically robust success path using a subset of installed plant equipment, FLEX equipment and connection points.

If you have any questions regarding this letter, please contact Nicholas DiFrancesco at 301-415-1115 or via email at Nicholas.Difrancesco@nrc.gov.

Sincerely,

William M. Dean, Director
Office of Nuclear Reactor Regulation

Enclosures:
1. Glossary of Evaluations
2. Screening and Prioritization Results
3. List of Licensees' March 2015 Re-evaluated Seismic Hazard Submittals
4. List of Licensees

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Glossary of Evaluations

Associated with Near-Term Task Force Recommendation 2.1 Seismic Hazard Re-evaluations

Interim Evaluation or Actions – An immediate licensee and NRC review of the re-evaluated hazard to determine whether actions are needed to assure plant safety while further evaluations are ongoing. The staff has completed its review and concluded that, based on the licensees' interim evaluations and actions, Western United States (WUS) plants are safe for continued operations. Interim evaluations and actions are provided in Section 5.0, "Interim Actions," of the licensee submittals.

Expedited Approach – A near-term licensee evaluation to be completed by January 31, 2016, for WUS plants whose re-evaluated hazard exceeds the current design-basis for the safe shutdown earthquake (SSE) hazard level. The evaluation looks at the systems and components that can be used to safely shut down a plant under the conditions of a station blackout (i.e., no alternating current power is available) and loss of ultimate heat sink. The expedited approach will either confirm that a plant has sufficient margin to continue with a longer-term evaluation without any modifications, or confirm the need to enhance the seismic capacity to assure they can withstand seismic ground motion that exceeds the safe shutdown earthquake. The Expedited Approach guidance document is found in the Agencywide Documents Access and Management System under Accession No. ML13102A142.

Seismic Risk Evaluation – Longer-term seismic risk evaluation provides the most comprehensive information to make regulatory decisions, such as whether to amend a plant's design or licensing basis or make additional safety enhancements. These evaluations provide information to make risk-informed decisions. The staff will use this information in conjunction with the existing regulatory tools, such as backfit analyses, to decide on further regulatory actions. The longer-term seismic risk evaluations could be either a Seismic Margins Assessment or a Seismic Probabilistic Risk Assessment, depending on the magnitude of the exceedance.

Limited-Scope Evaluations – These include i) Spent Fuel Pool Evaluation, ii) High Frequency Evaluation, and iii) Low Frequency Evaluation. Respectively, these evaluations are focused on the following: i) spent fuel pool components and systems capable of draining water inventory to the level of the spent fuel, ii) a review of components susceptible to high frequency accelerations (e.g. electrical relays), and iii) a review of components susceptible to low frequency accelerations (e.g. water storage tanks).

Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident

Seismic Risk Evaluations Screening and Prioritization Results for

Western United States (WUS) Reactor Sites

Plant Name	Screening Result	Expedited Approach Evaluation	Seismic Risk Evaluation (Prioritization Group)	Limited-scope Evaluations		
				High Frequency Evaluation	Low Frequency Evaluation	Spent Fuel Pool Evaluation
Columbia Generating Station	In	x	1	x		x
Diablo Canyon Power Plant, Unit Nos. 1 and 2	In	x*	1	x		x
Palo Verde Nuclear Generating Station, Units 1, 2, and 3	Conditional in	x*	3	x		x

* NRC staff is evaluating whether information provided meets the intent of the Expedited Approach. The staff's conclusions will be provided in a separate letter.

Enclosure 2

March 2015 Re-evaluated Seismic Hazard and Screening Reports

for Western United States Reactor Sites

Licensee Facility	Date of letter (ADAMS Accession Nos.)
Columbia Generating Station	March 12, 2015 (ML15078A243)
Diablo Canyon Power Plant, Unit Nos. 1 and 2	March 11, 2015 (ML15071A046)
Palo Verde Nuclear Generating Station, Units 1, 2, and 3	March 10, 2015, (ML15076A073) and April 10, 2015 (ML15105A076)

LIST OF APPLICABLE POWER REACTOR LICENSEES

Columbia Generating Station
Energy Northwest
Docket No. 50-397
License No. NPF-21

Mr. Mark E. Reddemann
Chief Executive Officer
Energy Northwest
MD 1023
76 North Power Plant Loop
P.O. Box 968
Richland, WA 99352

Diablo Canyon Power Plant, Unit Nos. 1 and 2
Pacific Gas & Electric Company
Docket Nos. 50-275 and 50-323
License Nos. DPR-80 and DPR-82

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

Palo Verde Nuclear Generating Station, Units 1, 2, and 3
Arizona Public Service Company
Docket Nos. STN 50-528, STN 50-529, and STN 50-530
License Nos. NPF-41, NPF-51 and NPF-74

Mr. Randall K. Edington
Executive Vice President Nuclear/CNO
Arizona Public Service Company
P.O. Box 52034, MS 7602
Phoenix, AZ 85072-2034

If you have any questions regarding this letter, please contact Nicholas DiFrancesco at 301-415-1115 or via email at Nicholas.Difrancesco@nrc.gov.

Sincerely,

/RA by Jennifer Uhle for/

William M. Dean, Director
Office of Nuclear Reactor Regulation

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