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United States Nuclear Regulatory Commission
Protecting People and the Environment

Near-term Task Force Recommendation 2.1 Seismic Hazard Evaluation

Pacific Gas & Electric Company
Public Meeting

April 28, 2015

References and Logistics

- Public Meeting Agenda – ML15105A528
- NRC Presentation Slides – ML15117A226
- Licensee Presentation Slides – ML15117A069
- Licensee Hazard Report – ML15070A607 and ML15070A608
- Meeting Feedback Form (request from njd2@nrc.gov)
- Webcast Archive at http://video.nrc.gov
- Meeting Summary to be issued within 30-day

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Meeting Purposes

- Gather additional information based on early identification of areas where additional technical information will support the staff's review
- Gain a better understanding of how the licensee conducted their evaluation

Outline

- Background of NRC Near-term Task Force Recommendation 2.1 (NTTF R2.1)
- Current NRC approach to seismic hazard characterization
- Hazard characterization for NTTF R2.1
- Potential outcomes
- Focus questions for NRC review
- Timeline

NTTF Report and Recommendations

Recommendation 2

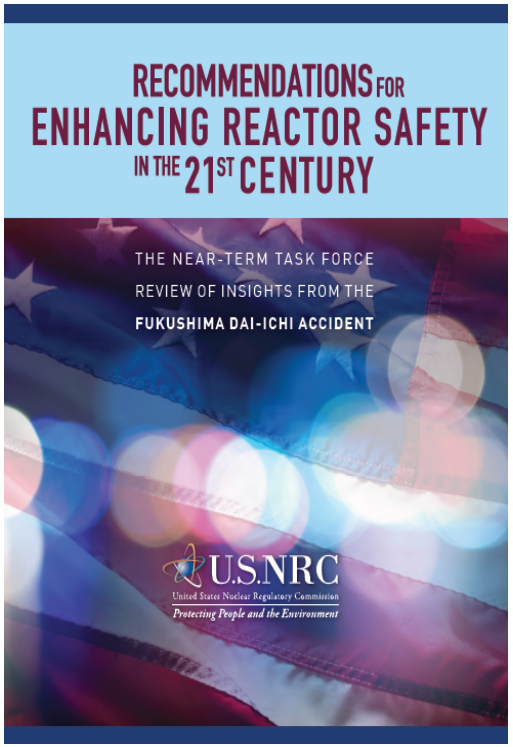
The Task Force recommends that the NRC require licensees to reevaluate and upgrade as necessary the design-basis seismic and flooding protection of SSCs for each operating reactor.

The Task Force recommends that the Commission direct the following actions to ensure adequate protection from natural phenomena, consistent with the current state of knowledge and analytical methods. These should be undertaken to prevent fuel damage and to ensure containment and spent fuel pool integrity:

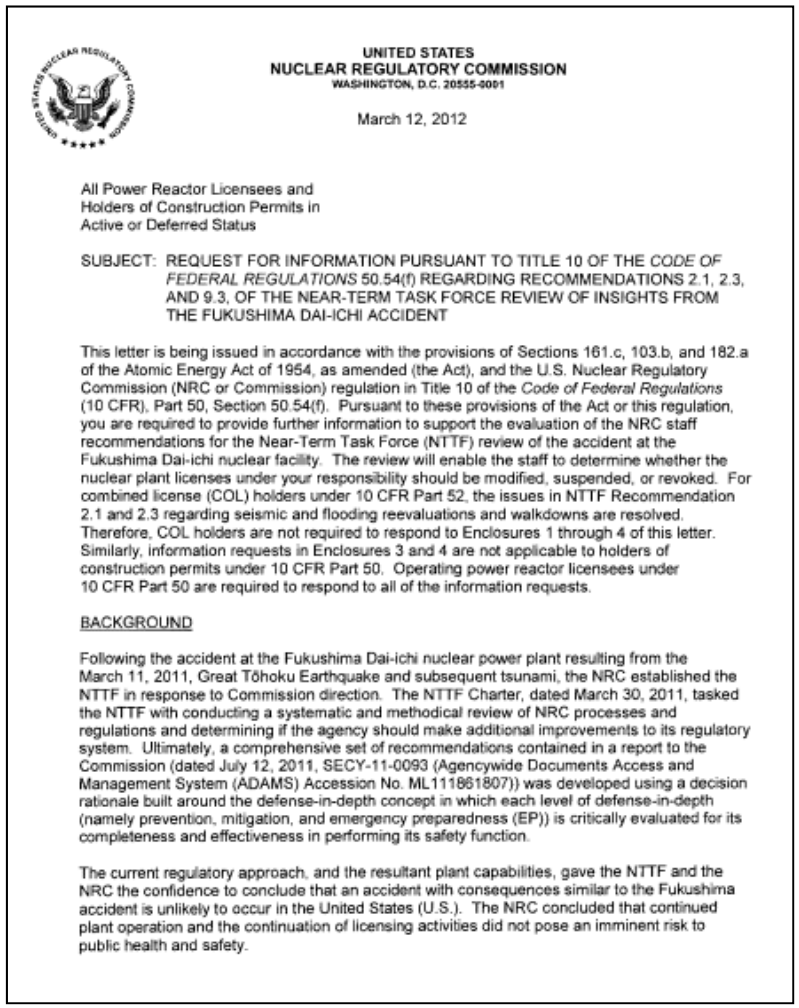
2.1 Order licensees to reevaluate the seismic and flooding hazards at their sites against current NRC requirements and guidance, and if necessary, update the design basis and SSCs important to safety to protect against the updated hazards.

2.2 Initiate rulemaking to require licensees to confirm seismic hazards and flooding hazards every 10 years and address any new and significant information. If necessary, update the design basis for SSCs important to safety to protect against the updated hazards.

2.3 Order licensees to perform seismic and flood protection walkdowns to identify and address plant-specific vulnerabilities and verify the adequacy of monitoring and maintenance for protection features such as watertight barriers and seals in the interim period until longer term actions are completed to update the design basis for external events.



NRC 50.54(f) activities to address NTTF Seismic Recommendations



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

March 12, 2012

All Power Reactor Licensees and
Holders of Construction Permits in
Active or Deferred Status

SUBJECT: REQUEST FOR INFORMATION PURSUANT TO TITLE 10 OF THE *CODE OF FEDERAL REGULATIONS* 50.54(f) REGARDING RECOMMENDATIONS 2.1, 2.3, AND 9.3, OF THE NEAR-TERM TASK FORCE REVIEW OF INSIGHTS FROM THE FUKUSHIMA DAI-ICHI ACCIDENT

This letter is being issued in accordance with the provisions of Sections 161.c, 103.b, and 182.a of the Atomic Energy Act of 1954, as amended (the Act), and the U.S. Nuclear Regulatory Commission (NRC or Commission) regulation in Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 50.54(f). Pursuant to these provisions of the Act or this regulation, you are required to provide further information to support the evaluation of the NRC staff recommendations for the Near-Term Task Force (NTTF) review of the accident at the Fukushima Dai-ichi nuclear facility. The review will enable the staff to determine whether the nuclear plant licenses under your responsibility should be modified, suspended, or revoked. For combined license (COL) holders under 10 CFR Part 52, the issues in NTTF Recommendation 2.1 and 2.3 regarding seismic and flooding reevaluations and walkdowns are resolved. Therefore, COL holders are not required to respond to Enclosures 1 through 4 of this letter. Similarly, information requests in Enclosures 3 and 4 are not applicable to holders of construction permits under 10 CFR Part 50. Operating power reactor licensees under 10 CFR Part 50 are required to respond to all of the information requests.

BACKGROUND

Following the accident at the Fukushima Dai-ichi nuclear power plant resulting from the March 11, 2011, Great Tōhoku Earthquake and subsequent tsunami, the NRC established the NTTF in response to Commission direction. The NTTF Charter, dated March 30, 2011, tasked the NTTF with conducting a systematic and methodical review of NRC processes and regulations and determining if the agency should make additional improvements to its regulatory system. Ultimately, a comprehensive set of recommendations contained in a report to the Commission (dated July 12, 2011, SECY-11-0093 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML111861807)) was developed using a decision rationale built around the defense-in-depth concept in which each level of defense-in-depth (namely prevention, mitigation, and emergency preparedness (EP)) is critically evaluated for its completeness and effectiveness in performing its safety function.

The current regulatory approach, and the resultant plant capabilities, gave the NTTF and the NRC the confidence to conclude that an accident with consequences similar to the Fukushima accident is unlikely to occur in the United States (U.S.). The NRC concluded that continued plant operation and the continuation of licensing activities did not pose an imminent risk to public health and safety.

50.54(f) Request for Information Letter issued March 12, 2012

- Enclosure 1 (or R2.1): Seismic hazard and risk reevaluation
- Enclosure 3 (or R2.3): Seismic Walkdowns
- Other enclosures addressed flooding and emergency response

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Tiered-approach to Seismic Activities

NTTF 2.3 – Seismic Walkdowns – COMPLETED reviews June 2014
Licensees identify and address degraded, nonconforming, or unanalyzed conditions relative to a plant's current licensing and design bases.

NTTF 2.1 – Hazard Reevaluations: SUBMITTED CEUS:3/2014; WUS:3/2015
Licensees reevaluate hazard based on present day guidance/methods used to define the design basis for new reactors.

NTTF 2.1 – Interim Evaluation: COMPLETED CEUS: 4/2014; WUS: 4/2015
If the design basis does not bound reevaluated hazard: Licensees evaluated the need for interim evaluations using new seismic sources and ground motion with old hazard while the longer-term risk evaluation is performed.

NTTF 2.1 – Interim Expedited Approach (ESEP) CEUS: 12/31/2014; WUS: 1/16
If the design basis does not bound reevaluated hazard: Licensees perform interim evaluation to demonstrate key pieces of equipment for core cooling at a higher hazard using installed FLEX equipment up to 2 x SSE. Evaluate need for modifications while longer-term risk evaluation is performed.

NTTF 2.1 – Seismic Risk Evaluations: June 2017 – 2020
If the design basis does not bound reevaluated hazard: Licensees determine perform a seismic risk evaluation.

Regulatory Actions
NRC staff determines whether additional regulatory actions are necessary to provide additional protection against the updated hazards.

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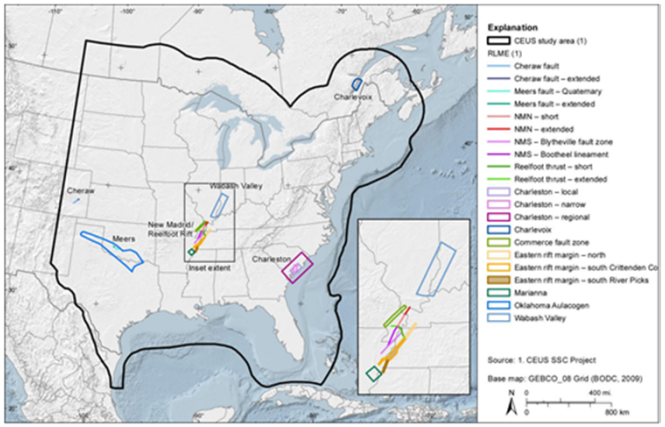
Probabilistic Approach

- Previous studies such as 2011 Shoreline Fault Report and 2014 Coastal Commission Report were deterministic
  - Few selected scenario earthquakes
  - Limited treatment of uncertainty
- NTTF Recommendation 2.1 calls for seismic hazard reevaluations at each nuclear power plant using current NRC regulations
- Current NRC regulations and guidance specify a probabilistic approach for developing design ground motions
- Probabilistic ground motion hazards are characterized by a Ground Motion Response Spectrum or GMRS

Development of Seismic Hazard for R2.1 Reevaluations

- Licensees perform probabilistic seismic hazard analyses following NRC guidance (Regulatory Guide 1.208)
- CEUS licensees (96 units/59 sites)
  - Previously approved SSHAC Level 3 Models
  - Plant-specific site analyses
- WUS licensees (6 units/3 sites)
  - **Regional** source and ground motion models developed by each Licensee using SSHAC Level 3 Studies
  - Plant-specific site analyses



Screening Approach for R2.1 Reevaluations

- Screening approach specified in Industry Screening, Prioritization, and Implementation Details (SPID) Guidance
- SPID provides detailed guidance for
  - Development of GMRS
  - Seismic Risk Evaluations & Limited Scope Evaluations (high frequency, SFP)
- Plants with GMRS > SSE “Screen In” for
  - Interim Evaluations (and actions, as needed)
  - Expedited Interim Evaluations (and actions, as needed)
  - Seismic Risk Evaluations

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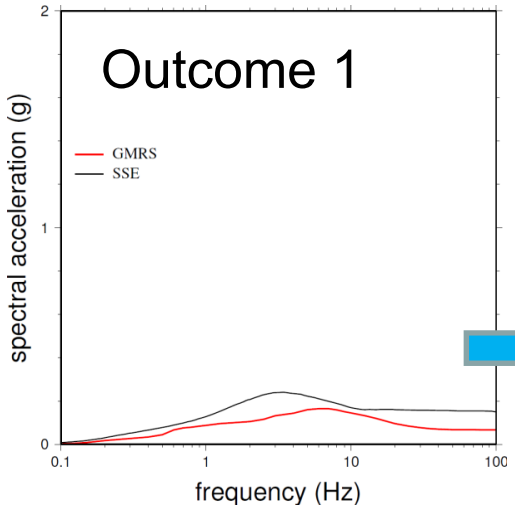
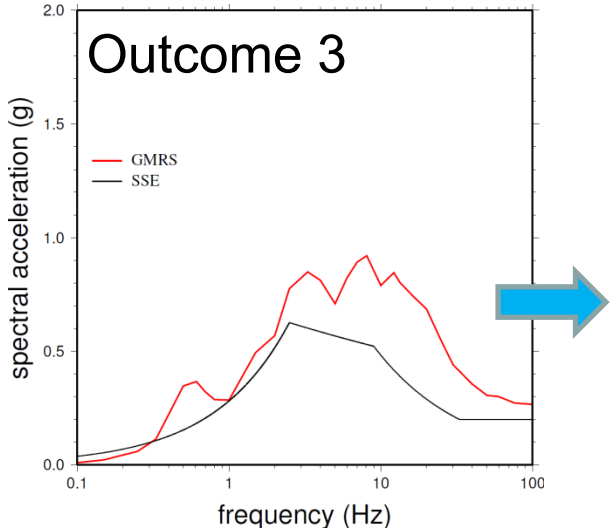
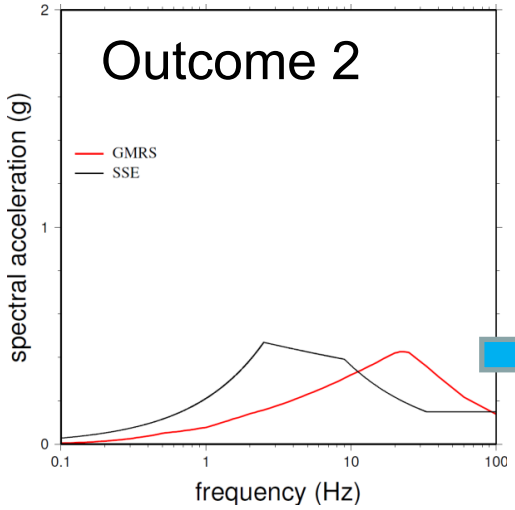
Potential Outcomes for R2.1 Reevaluations



No Further Analysis





Industry Testing Program for High Frequency Sensitive components

NRC Review of SSHAC Studies for WUS Sites

- Did SSHAC process follow NRC guidance?
- How effective was the peer review panel?
- Have all applicable data been considered?
- Were data uncertainties identified and considered?
- Was an appropriate range of applicable models considered?
- How were models selected and weighted in the analysis?
- How were models assembled into the PSHA?

NRC Review of Source Models for WUS Sites

- How were seismic sources identified?
  - Geologic mapping
  - Geophysical observations
  - Earthquake catalog
- How were seismic sources characterized?
  - Geometry (location, length, dip)
  - Range of magnitudes
  - Faulting style (normal, reverse, strike-slip)
  - Slip rate and recurrence models
  - Complex rupture scenarios

NRC Review of Ground Motion Models and Site Response for WUS Sites

- Do final ground motion models capture a reasonable range of alternative models?
- How were sources of uncertainty captured in model development?
- How were ground motion models adjusted for local site geology?
- Does site response analysis cover a reasonable range of alternative soil/rock properties?
- How was uncertainty in site response analysis incorporated into final probabilistic hazard curves?

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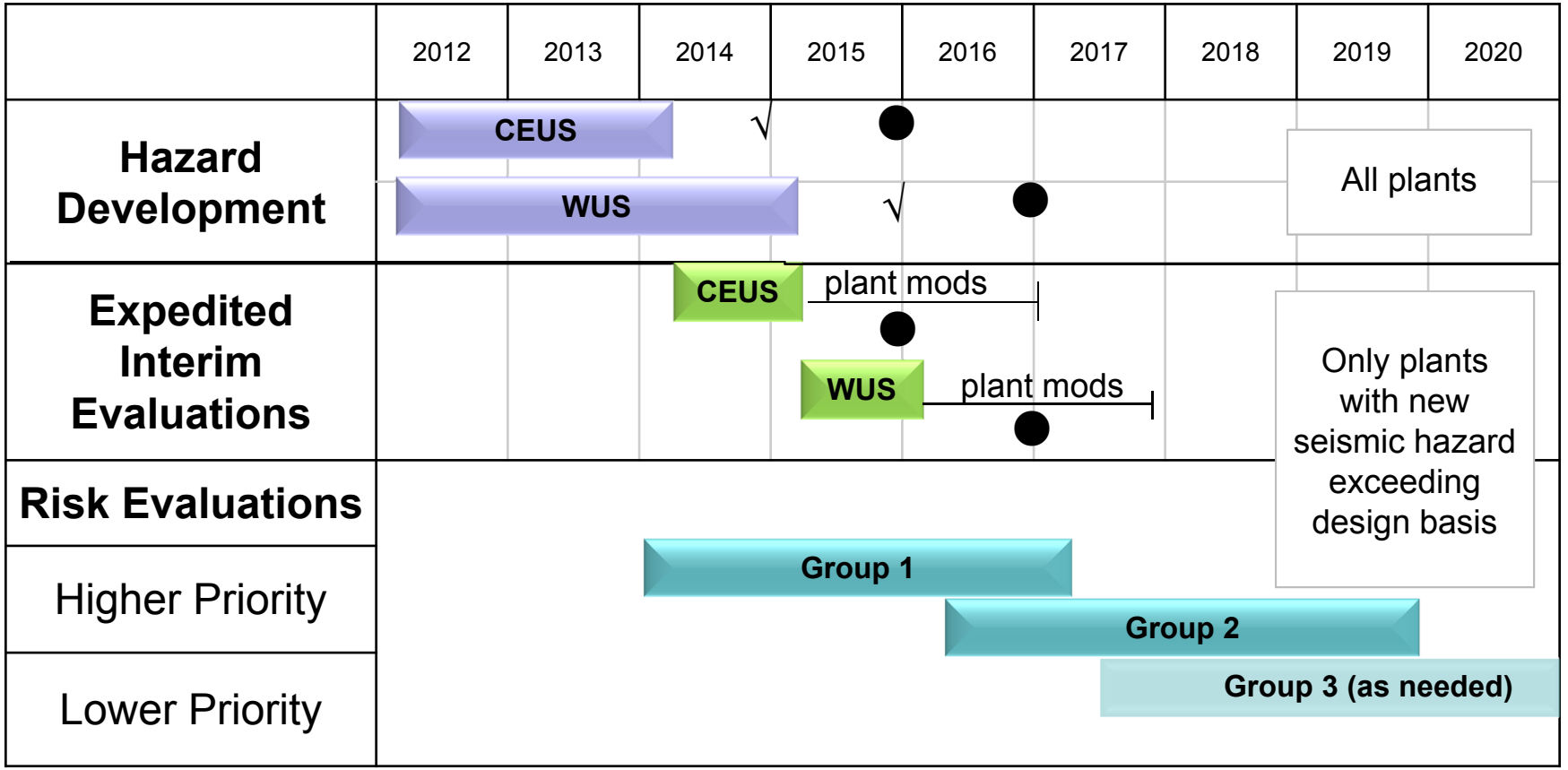
Schedule for Seismic Hazard and Risk Evaluations



Hazard Analyses

Expedited Interim Evaluations

Risk Evaluations

√ Staff acknowledgement to use GMRS for risk evaluation

● Staff Assessment or response

Forthcoming Seismic Screening Letter

- Issuance of letter for WUS sites in ~ 2 weeks
- Diablo Canyon has screened-in for further risk evaluations and is a review priority
- No immediate safety issues identified
- Information supports safety assurance allowing additional time to complete the seismic risk evaluation

List of Acronyms

- CEUS – Central and Eastern United States
- GMRS – Ground Motion Response Spectrum
- NRC – U.S. Nuclear Regulatory Commission
- NPP – Nuclear Power Plant
- NTTF – Near-Term Task Force
- SFP – Spent Fuel Pool
- SMA – Seismic Margins Analysis
- SPID - Screening, Prioritization, and Implementation Details SPID
- SPRA – Seismic Probabilistic Risk Assessment
- SSC – Structures, Systems and Components
- SSHAC – Senior Seismic Hazard Analysis Committee
- SSE – Safe Shutdown Earthquake
- SPID – Screening, Prioritization, and Implementation Details
- WUS – Western United States

Break for NRC Staff Alignment

- 15 – 20 minute planned break for NRC staff alignment to support meeting wrap-up
- Meeting to resume at 4:00pm (Eastern) or 1:00pm (Western)

Opportunity for Public Questions or Comments

- Additional Questions?

Please ask us at:

JLD_PublicResource@nrc.gov

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Backup Slides

Additional WUS Seismic Hazard Reports

Public SSHAC Reports

- Diablo Canyon

http://www.pge.com/en/safety/systemworks/dcpp/sshac/index.page

Guidance Documents

- Two main guidance documents proposed by industry and endorsed by the NRC
- Screening, Prioritization, and Implementation Details (SPID)
  - Submitted by EPRI on November 2012
  - Endorsed by NRC on February 15, 2013
  - EPRI-1025287 (ML12333A170)
- Seismic Evaluation Guidance: Augmented Approach (aka Expedited Approach)
  - Submitted by EPRI on April 9, 2013
  - Endorsed by NRC on May 7, 2013
  - EPRI-3002000704 (ML13102A142)

Seismic 2.1 Process Ensures Clarity, Consistency, and Risk-Informed Regulatory Decisions