



The Secretary of Energy

Washington, DC 20585

December 14, 2021

The Honorable Joyce L. Connery
Chair
Defense Nuclear Facilities Safety Board
625 Indiana Avenue NW, Suite 700
Washington, DC 20004

Dear Chair Connery:

This letter is in response to the Defense Nuclear Facilities Safety Board's (DNFSB or Board) June 10, 2021, letter, and technical report DNFSB/TECH-47, *Seismic Hazard Assessments*. In its letter, the Board identified a number of safety issues pertaining to the implementation of the required unreviewed safety question (USQ) process, the approval of seismic hazard assessments and subsequent analyses, the analyses of any potential impact of an increased seismic hazard on safety controls, and the lack of sufficient guidance and standardization in the Department of Energy (DOE or Department) directives regarding conducting seismic hazard assessments.

DOE has assessed the Board's report and shares the Board's views on the importance of having clear guidance, as well as rigorous implementation of requirements pertaining to seismic hazard assessments. The Department's response to the questions set forth in the Board's June 10, 2021, letter is contained in the enclosed report. In accordance with your request, the Department will coordinate a briefing to the DNFSB to discuss this response.

DOE appreciates the Board's advice and assistance in bringing attention to the seismic hazard assessment process with the goal of ensuring that credited seismic controls perform their safety functions during seismic events. If you have any questions, please contact Mr. Matthew Moury, Associate Under Secretary for the Office of Environment, Health, Safety and Security, at 202-586-1285.

Sincerely,

A handwritten signature in black ink, appearing to read "J. Granholm", written over a white background.

Jennifer M. Granholm

Enclosure

Enclosure – Response to DNFSB/TECH-47, Seismic Hazard Assessments

Background

DNFSB/TECH-47, *Seismic Hazard Assessments*, documents the complex-wide review by the Defense Nuclear Facilities Safety Board (DNFSB or Board) technical staff of the process for implementing the Department of Energy’s (DOE) requirement in DOE Order (O) 420.1C, *Facility Safety*, to review natural phenomena hazard (NPH) assessments for high hazard facilities at least every ten years and whenever significant changes in NPH data, criteria, and assessment methods warrant updating the assessments. The DNFSB staff performed this review over several months from December 2019 to May 2020, and the review focused specifically on the seismic hazard assessment process. The final report was transmitted to DOE on June 10, 2021. This section provides background and history of DOE’s requirements for NPH assessments.

DOE recognizes that evaluation of existing DOE nuclear facilities for significant changes in NPH is essential because there has been a significant evolution in the understanding of NPHs and how to design facilities to withstand those hazards. The purpose of the ten-year NPH assessment review is to ensure the NPH assessment maintains a viable technical basis, and to screen information that could significantly change the results of existing assessments. This information can take the form of new data sets, new modeling techniques, new assessment methods, or a combination of these. Most often, the ten-year assessment review involves additional data, or new interpretations of data, that were not available during the previous assessment.

DOE first published interim facility design criteria and NPH evaluation guidelines in University of California Radiation Laboratory (UCRL)-15910, *Design and Evaluation Guidelines for DOE Facilities Subjected to Natural Phenomena Hazards*, issued in October 1989, cited by DOE O 6430.1A, *General Design Criteria*. This was superseded by DOE O 5480.28, *Natural Phenomena Hazards Mitigation*, issued in January 1993, which introduced the NPH assessment review requirement: “A review of the state-of-the-art of natural phenomena hazard assessment methodology and of site-specific information shall be conducted at least every 10 years.” Subsequent NPH mitigation requirements, included in all versions of DOE O 420.1, *Facility Safety*, (successor of DOE O 5480.28) from October 1995 through present, have contained similar wording that NPH assessments must be reviewed at least every ten years.

The requirement to perform the ten-year NPH assessment is in DOE O 420.1C, Chg 3, Attachment 2, Chapter IV, Section 3.d, *Review and Upgrade Requirements for Existing DOE Nuclear Facilities (Hazard Category 1, 2, and 3)* which reads:

1. Existing facility or site NPH assessments must be reviewed at least once every ten years and whenever significant changes in NPH data, criteria, and assessment methods warrant updating the assessments. Section 9.2 of DOE-STD-1020-2016 contains criteria and guidance for performing these reviews. The review results, along with any recommended update actions, must be submitted to the DOE Head of Field Element for approval. If no update is necessary, this result must be documented following the review.

The decision on whether to update a NPH assessment(s) contains subjectivity; estimates of changes tend to be imprecise. An expected increase in hazard values should lead the reviewer toward recommending a new assessment. If hazard values appear to suggest a likely decrease from the earlier assessment, indicating the current assessment is conservative, a recommendation against spending the resources on a new assessment may be appropriate. Regardless of predicted changes to hazard values, large changes to major hazard inputs alone provide the justification for a new assessment to ensure the NPH assessment maintains a viable technical basis.

DOE plans to initiate revisions to DOE-STD-1020-2016, *Natural Phenomena Hazards Analysis and Design Criteria for DOE Facilities*, and companion DOE-HDBK-1220-2017, *Natural Phenomena Hazards Analysis and Design Handbook for DOE Facilities*, in 2022. DOE plans to use this opportunity to further clarify the ten-year NPH review requirements and expectations. Any required DOE Order 420.1C associated changes will also be worked in parallel.

In this report, DOE responds to the three questions raised by the Board's June 10, 2021, letter to DOE :

- What actions does DOE plan to take to ensure that the USQ process is implemented and timely compensatory measures are identified in cases where a site identifies an increased seismic hazard from a probabilistic seismic hazard analysis (PSHA) update that exceeds seismic safety control qualification assumptions in the safety basis?
- What specific natural phenomenon hazards assessment evaluations, recommended update actions, and recommended upgrade plans require DOE approval to comply with DOE Order 420.1C? What actions does DOE plan to take to ensure that site and field offices have established processes to ensure DOE Order 420.1C approvals are conducted?
- What actions does DOE plan to take to update DOE directives and documents to improve the existing guidance and standardization regarding seismic hazard assessments and the subsequent analyses (i.e., PSHA update and facility condition assessments) as it relates to the concerns discussed in the [technical] report?

Responses to Questions

Question 1: What actions does DOE plan to take to ensure that the USQ process is implemented, and timely compensatory measures are identified in cases where a site identifies an increased seismic hazard from a probabilistic seismic hazard analysis (PSHA) update that exceeds seismic safety control qualification assumptions in the safety basis?

Regarding NPH assessments and changes in hazards, the USQ process applies through criterion 4 listed in 10 CFR §830.203(c), a potential inadequacy in the documented safety analysis (DSA) because the analysis potentially may not be bounding or may be otherwise inadequate, commonly known as a PISA. A PISA may be declared when new NPH assessment results show an increase in hazard compared to the existing assessment referenced in the facility's DSA. At that time, a contractor would follow the steps outlined in 10 CFR §830.203(f), which includes performing a USQ determination. If the new hazard level exceeds that assumed or allowed by the DSA, the USQ determination would be positive, and compensatory measures might be appropriate.

DOE Headquarters program offices will request that site offices overseeing Hazard Category 1, 2 and 3 nuclear facilities verify that their contractors' USQ procedures adequately cover situations where new NPH assessments are performed.

Question 2: What specific natural phenomenon hazards assessment evaluations, recommended update actions, and recommended upgrade plans require DOE approval to comply with DOE Order 420.1C? What actions does DOE plan to take to ensure that site and field offices have established processes to ensure DOE Order 420.1C approvals are conducted?

Relevant DOE responsibilities for periodic NPH assessment reviews are assigned to the DOE Field Element manager and described in Section 5.d.(10) of DOE O 420.1C, Chg. 3, as follows: "Approve periodic NPH assessment evaluations, any recommended update actions, and any recommended upgrade plans, in accordance with Chapter IV of Attachment 2 of this Order."

The review results and recommended update actions based on the NPH assessments must be submitted to the Heads of Field Elements for review and approval. In the process of reviewing, updating, and mitigating NPH impacts to DOE facilities, DOE contractors are required to submit two different documents for DOE approval: (1) NPH assessment(s) review results and recommended NPH assessment(s) update actions, if any (as required by DOE O 420.1C, Attachment 2, Chapter IV, Section 3.d.(1)); and (2) a plan for upgrades to facility SSCs, if the updated NPH assessment(s) indicates deficiencies (as required by DOE O 420.1C, Attachment 2, Chapter IV, Section 3.d. (2)).

DOE is not required to approve the updated NPH assessment, if required, once it is complete. Contractors are responsible to perform NPH assessments. However, if a new NPH assessment reveals a higher hazard, and a facility condition assessment finds that the new NPH loads exceed a facility's design, then contractors are required to submit these facility upgrade plans to the Heads of Field Elements for approval.

As for DOE actions to ensure site office compliance with these requirements, DOE program offices expect their site offices to follow the DOE O 420.1C, Chg. 3 requirements. Site offices have the latitude to incorporate these requirements into their site processes, and verify their contractors' compliance, as they see fit. Headquarters program offices will continue to follow the requirements of DOE O 226.1B, *Implementation of Department of Energy Oversight Policy*, in overseeing site office compliance with these and other nuclear safety requirements. Program office headquarters staff will take appropriate action if the DOE O 420.1C, Chg. 3 requirements are not implemented and effective.

Question 3: *What actions does DOE plan to take to update DOE directives and documents to improve the existing guidance and standardization regarding seismic hazard assessments and the subsequent analyses (i.e., PSHA and facility condition assessments) as it relates to the concerns discussed in the [technical] report?*

DNFSB/TECH-47 raises a concern that DOE requirements provide insufficient guidance on what constitutes "significant changes," according to Order 420.1C, Chg 3, paragraph 3.d(1) of Chapter IV, Attachment II: "Existing facility or site NPH assessments must be reviewed at least once every ten years and whenever significant changes in NPH data, criteria, and assessment methods warrant updating the assessments." DOE-STD-1020-2016, paragraph 9.2.1.2, provides the following guidance on what a "significant change" might be that would trigger a review prior to a ten-year period:

Consistent with DOE O 420.1C, Chg. 1, a preliminary estimate of whether changes to data, models, or methods are significant and warrant updating the assessments should be performed based on the following criteria:

- Are the changes to data, models, or methods likely to cause a change in the estimates of the major inputs to hazard calculations?
- Given potential changes to hazard inputs, by what magnitude might the calculated hazard results change, and how might the results affect current site design standards?

The Standard will be reviewed to determine whether additional clarification on what constitutes a significant change is needed.

DNFSB/TECH-47 also raises a concern with the lack of criteria for determining when a PSHA update is needed. Sections 9.2.1.3 through 9.2.1.5 of DOE-STD-1020-2016 provide additional qualitative criteria to guide a decision on whether an NPH assessment requires updating or replacement. The authors of the Standard struggled in developing these criteria, as some subjectivity always enters the decision on whether an NPH assessment remains technically viable or requires replacement. In crafting the guidance, the authors used the best available information at the time, referencing criteria in ANSI/ANS-2.29-2008 (R2016), *Probabilistic Seismic Hazard Analysis* and NUREG-2117, Rev. 1 *Practical Implementation Guidelines for SSHAC Level 3 and 4 Hazard Studies* for determining PSHA viability. After the applicable sections of DOE-STD-1020-2016 were written, a new process for guiding the update decision was developed. The

process was first tested at the Idaho National Laboratory and documented in INL/EXT-15-36510, *Proposed Risk-Informed Seismic Hazard Periodic Reevaluation Methodology for Complying with DOE Order 420.1C*. The process was further refined and is described in Section 4 of NUREG-2213, *Updated Implementation Guidelines for SSHAC Hazard Studies*. DOE will evaluate adding more detail on appropriate criteria as needed in the next revision to the standard.

This thorough review by the DNFSB staff has led DOE to further scrutinize DOE O 420.1C, Chg. 3 and DOE-STD-1020-2016. DOE staff have realized that the periodic review requirement as written in the Order applies to all existing Hazard Category 1, 2, and 3 nuclear facilities without qualification. However, Section 9.2.1 of the Standard states that the periodic review requirement applies only to facilities classified as NDC-3 or higher. During the future updates to the Order and Standard, DOE will resolve this discrepancy.

This review has also led DOE to conclude that additional schedule discipline is needed to ensure timely review and updates of NPH assessments. To wit, DOE will revise requirements related to the review and update of NPH assessments to identify key schedule milestones that will raise confidence that the reviews will be completed in a timely manner.

Conclusion

DOE appreciates the extensive DNFSB staff effort to research and produce DNFSB/TECH-47. DOE commits to carefully consider this report during the next revisions to DOE O 420.1C, Chg. 3, DOE-STD-1020-2016, and DOE-HDBK-1220-2017. Specifically:

- DOE Headquarters program offices will request that site offices overseeing Hazard Category 1, 2 or 3 nuclear facilities verify that their contractors' USQ procedures adequately cover situations where new NPH assessments are performed.
- DOE Headquarters program offices will continue to oversee site office compliance with DOE O 420.1C, Chg. 3 NPH ten-year review requirements, and take appropriate action if they are not implemented and effective.
- DOE will review DOE Order 420.1.1C, Chg. 3, DOE-STD-1020-2016, and DOE-HDBK-1220-2017 and consider revisions to provide clarity in the documents. As part of the review, DOE will resolve the discrepancy between DOE O 420.1C, Chg. 3, and DOE-STD-1020-2016 on the applicability of the periodic review requirement.

The DNFSB technical report has raised awareness and attention on the timely completion of essential NPH reviews and updates. DOE expects that in the future, Headquarters program offices will be more consistent in meeting these requirements.