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

May 13, 2022

MEMORANDUM TO: Daniel H. Dorman
Executive Director for Operations

FROM: Andrea D. Veil, Director
Office of Nuclear Reactor Regulation

Andrea Veil Signed by Veil, Andrea on 05/13/22

SUBJECT: RESPONSE TO TASKINGS IN DECISION ON DIFFERING PROFESSIONAL OPINION APPEAL CONCERNING (DPO2020004)

The purpose of this memorandum is to respond to the taskings in your decision dated February 8, 2022,[1] on the Differing Professional Opinion (DPO) appeal concerning DPO-2020-004. The DPO raised concerns regarding the NuScale reactor building design evaluated in U.S. Nuclear Regulatory Commission (NRC) staff's NuScale Final Safety Evaluation Report (FSER) Chapter 3.8.4, "Seismic Category 1 Structures, and, in part, Section 3.8.5, "Foundations."[2]

Your decision concluded that the basis for accepting NuScale's stress averaging approach of the reactor building design was not sufficiently documented. You tasked the Office of Nuclear Reactor Regulation (NRR) to: 1) document its evaluation of the stress averaging approach used in the NuScale design certification application (DCA), including, if necessary, updating the FSER for the NuScale DCA and assessing whether there are any impacts to the NuScale standard design approval issued in September 2020[3] and 2) evaluate and update guidance, or create knowledge management tools, as appropriate, on how to evaluate applications that use stress averaging for structural building design.

You further directed NRR to consider, in its entirety, the additional input from the DPO submitter's February 14, 2022, letter that was submitted after your decision on the DPO

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[1] Memorandum from D. Dorman to J. Ma, "Differing Professional Opinion Appeal Concerning DPO-2020-004," dated February 8, 2022, Agencywide Documents Access and Management System (ADAMS) Accession No. ML22021B617.
[2] U.S. Nuclear Regulatory Commission, Final Safety Evaluation Report for the NuScale Standard Plant Design, Chapter 3, "Design of Structures, Systems, Components, and Equipment," dated August 28, 2022, ADAMS Accession No. ML20205L405.
[3] Letter from A. Bradford to Z. Rad, "Standard Design Approval for the NuScale Power Plant Based on the NuScale Standard Plant Design Certification Application," dated September 11, 2020, ADAMS Accession No. ML20247J564.

appeal.[4] The NRR staff has considered the information in addressing the taskings in your decision on the DPO appeal as summarized below and detailed in Enclosure 1 to this memorandum. Enclosure 2 provides responses to the submitter's significant comments in the submitter's February 14, 2022, letter.

In response to EDO Tasking #1, the NRR staff reviewed and assessed the existing material regarding the NRC staff's evaluation in NuScale FSER Chapter 3.8.4 and 3.8.5 in its totality (including requests for additional information, audit documentation, and the NuScale Final Safety Analysis Report, which was revised in response to NRR staff questions in this area) and has determined that NuScale's approach to demand averaging for seismic Category I structures is acceptable, as documented in the enclosure to this memorandum. The NRR staff notes that the tasking used the term "stress averaging" which is for metallic components, such as steel structures. Because the issue raised in the DPO is related to reinforced concrete, the NRR staff used the appropriate applicable terminology of "demand (force/moment) averaging" in its assessment. The assessment documents the NRR staff's technical basis for the acceptability of the demand averaging approach to address localized code exceedances in certain walls or slabs and focused on the reinforced concrete Category 1 structures in the NuScale standard plant design, namely the reactor building and the control building where demand averaging was used. Based on the material reviewed, the NRR staff continues to conclude that there is reasonable assurance of adequate protection. The staff continues to find that the demand averaging approach used by the applicant is a reasonable and acceptable method to approximate redistribution of forces/moments from linear elastic analysis to address element-based code check exceedances in localized areas to demonstrate that code acceptance criteria[5] for strength were met for such limited areas. Therefore, the design of the NuScale reinforced concrete structures remains acceptable as concluded by the NRR staff and documented in FSER Sections 3.8.4 and 3.8.5. Based on its assessment, the NRC staff concluded that there are no impacts to the NuScale standard design approval issued in September 2020 and that an update to the FSER for the NuScale DCA or the standard design approval is not necessary.

In response to EDO Tasking #2, the NRR staff reviewed the existing guidance in the NuScale Design-Specific Review Standard (DSRS) Section 3.8.4,[6] including Subsection III.7, and NUREG-0800 Standard Review Plan (SRP) Section 3.8.4,[7] including Subsection III.5, on the review procedures for meeting the structural acceptance criteria. As discussed in Enclosure 1, the NRR staff finds that the existing guidance is sufficient to review and evaluate an applicant's structural analysis. Since the structural analysis and design process involves making appropriate modeling idealizations, assumptions, approximations and professional judgements, there are many ways in which an issue can be addressed, and force/moment averaging is only one way of addressing code exceedances. Since high-level guidance for case-by-case evaluation of localized code acceptance limit exceedances exists in the current DSRS and SRP, the NRR staff finds that the existing review guidance is consistent with the policy direction in

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[4] E-mail from D. Dorman to A. Veil, "Action: NuScale DPO submitted response to DPO appeal decision," dated March 15, 2022, ADAMS Accession No. ML22082A178.
[5] American Concrete Institute Code, ACI-349-06, "Code Requirements for Nuclear Safety-Related Concrete Structures and Commentary."
[6] U.S. NRC, NuScale Design-Specific Review Standard Section 3.8.4, "Other Seismic Category I Structures," Revision 0, June 2016, ADAMS Accession No. ML15355A444.
[7] U.S. NRC, NUREG-0800, Standard Review Plan, Section 3.8.4, "Other Seismic Category 1 Structures," Revision 4, September 2013, ADAMS Accession No. ML13198A258.

NRR Office Instruction LIC-200,[8] and that the SRP specifies the high-level acceptance criteria for meeting the applicable regulation and describes acceptable methods the NRC staff may use in order to make a finding. Therefore, the NRR staff does not recommend any updates to the existing guidance for the evaluation of localized code exceedances for structural building design. The NRR staff plans to develop knowledge management tools to highlight the findings detailed in the enclosures to this memorandum and to document appropriate methods for demand averaging in structural analyses.

Based on the detailed responses in the enclosures, I find that the NRR staff has sufficiently assessed the evaluation of the demand (force/moment) averaging approach used in the NuScale DCA and justified its acceptability to conclude that there are no impacts to the NuScale standard design approval issued in September 2020 and that an update or supplement to the FSER for the NuScale DCA is not necessary. I also find that the existing review guidance is sufficient to review and evaluate an applicant's structural analysis/design and that my previous taskings to develop durable, knowledge management tools supplemented with the details enclosed will further complement the staff's ability to review such approaches.

Enclosures:
1) Staff Response to Taskings in the EDO's DPO Appeal Decision
2) Responses to Comments in the Submitter's February 14, 2022 Letter to EDO

[8] U.S. NRC, Nuclear Reactor Regulation Office Instruction, LIC-200, "Maintaining and Updating the Standard Review Plan," Revision 2, March 6, 2020, ADAMS Accession No. ML20042C827.

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