



RULEMAKING ISSUE

(Affirmation)

July 1, 2022

SECY-22-0062

FOR: The Commissioners

FROM: Daniel H. Dorman
Executive Director for Operations

SUBJECT: FINAL RULE: NUSCALE SMALL MODULAR REACTOR DESIGN
CERTIFICATION (RIN 3150-AJ98; NRC-2017-0029)

PURPOSE:

The purpose of this paper is to obtain Commission approval to publish in the *Federal Register* (FR) the enclosed draft final rule (Enclosure 1) that will amend Title 10 of the *Code of Federal Regulations* (10 CFR) Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants," to certify the NuScale standard design. This paper addresses no new commitments.

SUMMARY:

NuScale Power, LLC (NuScale Power) submitted an application for certification of its NuScale standard design (hereafter referred to as NuScale) on December 31, 2016. In August 2020, the U.S. Nuclear Regulatory Commission (NRC) staff completed its review and issued the final safety evaluation report for the standard design application. A proposed rule to certify NuScale was published in the *Federal Register* on July 1, 2021 (86 FR 34999), for public comment. The NRC received nine comment submissions on the proposed rule and the environmental assessment. After considering public comments on the proposed rule, and based on its safety review of the design, the staff concludes that the NuScale design certification rule (DCR) meets all applicable requirements in 10 CFR 52.54, "Issuance of standard design certification," and meets the requirements of 10 CFR 50.150, "Aircraft impact assessment." Therefore, the staff seeks Commission approval to publish a final rule to certify the NuScale design.

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BACKGROUND:

Subpart B, “Standard Design Certifications,” of 10 CFR Part 52 presents the process for obtaining standard design certifications. In a letter dated December 31, 2016, NuScale Power filed its application for certification of the NuScale design (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17013A229). The NRC published a notice of receipt of the application in the *Federal Register* on February 22, 2017 (82 FR 11372).

On March 30, 2017, the NRC formally accepted the application as a docketed application for design certification (82 FR 15717) and assigned it Docket No. 52-048. The preapplication information submitted before the NRC formally accepted the application can be found in ADAMS under Docket No. PROJ0769.

NuScale is based on a small light water reactor developed at Oregon State University in the early 2000s. It consists of one or more NuScale power modules (hereafter referred to as power module(s)). A power module is a natural circulation light water reactor composed of a reactor core, a pressurizer, and two helical coil steam generators located in a common reactor vessel that is housed in a compact cylindrical steel containment. The reactor building is designed to hold up to 12 power modules. Each power module has a rated thermal output of 160 megawatt thermal and electrical output of 50 megawatt electric (MWe), yielding a total capacity of 600 MWe for 12 power modules. NuScale contains all its power modules partially submerged in one safety-related pool, which is also the ultimate heat sink for the reactor. The pool portion of the reactor building is located below grade. NuScale is the first small modular reactor design reviewed by the NRC. The design utilizes several first-of-a-kind approaches to accomplish key safety functions, such as reduced control room staffing, no class 1E safety-related power (no emergency diesel generators), and no pumps required for post-accident safety injection.

DISCUSSION:

Public Comments

On July 1, 2021, the NRC published the proposed rule, “NuScale Small Modular Reactor Design Certification,” for a 60-day public comment period (86 FR 34999). The NRC subsequently extended the comment period by 45 days (86 FR 47251; August 24, 2021), providing a total comment period of 105 days.¹ The comment period ended on October 14, 2021. One submission was received after the close of the public comment period. As stated in the proposed rule, comments received after the comment close date are considered by staff when it is practical to do so; the staff determined it was practical to consider the late-filed comment submission.

The NRC received nine comment submissions containing 33 individual comments on the proposed rule and the environmental assessment from members of the nuclear power industry, non-government organizations, and private citizens. Of those comments, six were in favor of

¹ During the public comment period, the NRC received a request for access to non-public information under proposed rule preamble Section XVI, “Procedures for Access to Proprietary and Safeguards Information for Preparation of Comments on the NuScale Design Certification Proposed Rule.” The Executive Director for Operations ultimately approved the request with respect to one document on appeal (ADAMS Accession No. ML21258A220). However, the requestor did not complete the process to obtain access and did not submit comments on the proposed rule or environmental assessment.

the DCR, one was opposed, and the other comment submittals posed questions but stated no preference for the outcome of the rule. Six of the nine comment submissions contained questions on technical aspects of the design, corrections to the preamble, and a request for interpretation of requirements.

Enclosure 3, "NRC Response to Public Comments," summarizes the comments and the agency's responses (ADAMS Accession No. ML22004A007). The NRC staff considered these comments in developing the draft final rule.

Changes to the Proposed Rule

The NRC staff is recommending changes to the rule text due to seven comments:

- In response to a comment that the definition of generic design control document (DCD) could be confusing because the DCD is not contained in a single document, the staff recommends revising the definition to refer to "documents" instead of "document." The staff does not intend this variance to indicate a substantive difference from other design certification rules, but merely clarifies that the NuScale DCD is comprised of multiple documents.
- In response to a comment, the staff recommends that an exemption from Type A testing, as required by Appendix J to 10 CFR Part 50, for licenses referencing the NuScale DCR be included in a new Section IV.C of the final rule and an explanation added to the preamble. Final Safety Evaluation Report, Section 6.2.6.4, "Technical Evaluation for Exemption Request No. 7," issued July 2020 (ADAMS Accession No. ML20205L406), documents the NRC staff's review of the exemption from Type A testing described in Appendix J to 10 CFR Part 50 for licensees referencing the NuScale design.
- In response to a comment, the staff recommends changes to the rule to reorganize and clarify the special rules for licensees referencing the NuScale DCR regarding operator staffing and an exemption from Type A testing described in Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." Specifically, the staff created a new paragraph C in Section IV, "Additional Requirements and Restrictions," of the final rule to list design-specific regulations for licensees referencing the NuScale DCR. The alternative requirements for operator staffing were moved out of Section V of the final rule, "Applicable Regulations," and into this new paragraph. The staff also added explanatory text in the preamble to the final rule.
- In response to a comment regarding a proposed rule provision on raising a contention on compliance with Tier 2 departure provisions during an ongoing adjudicatory proceeding and consistency with previous design certifications, the staff recommends changing "stands on" to "bears on" in a sentence in Section VIII.B.5.g of the rule to read as follows: "Further, the petition must demonstrate that the change bears on an asserted noncompliance with an ITAAC acceptance criterion in the case of a § 52.103 preoperational hearing, or that the departure bears directly on the amendment request in the case of a hearing on a license amendment."
- In response to a comment about the relationship between 10 CFR Part 20, "Standards for Protection against Radiation," and unresolved issues for steam generator tube

integrity, the staff recommends revisions to the preamble and final rule to clarify that a license application referencing Appendix G, “NuScale Small Modular Reactor Design Certification,” to 10 CFR Part 52 will need to meet the standard in 10 CFR 52.47(a)(2)(iv), rather than demonstrating that the 10 CFR Part 20 limits will not be exceeded. These revisions are in Section III.C.3 of the preamble and Section IV.A.2.i of the final rule. The regulation in 10 CFR 52.47(a)(2)(iv) is directly applicable to this issue and requires applicants to show in the safety analysis that the dose will not exceed certain criteria for this accident.

- In response to a comment that General Design Criterion (GDC) 10, “Reactor Design,” in Appendix A, “General Design Criteria for Nuclear Power Plants,” of 10 CFR Part 50 is not relevant to the steam generator integrity issue because GDC 10 concerns reactor design, which is not implicated by the unresolved steam generator integrity issue, the staff recommends deleting the reference to GDC 10 from Section VI.B.1.d of the rule.
- In response to a comment that the term “multi-unit” in the context of a multi-module reactor design is ambiguous, the staff recommends adding a definition to the rule for “nuclear power unit,” as applied to the NuScale certified design, and adding a discussion of the issue to the preamble to the final rule, in new section III.D. Adding this definition to the final rule will avoid confusion and establish these terms for use in any future proceedings referencing the design certification.

In addition, the staff determined that several comments did not necessitate changes to the final rule, but that the Commission should be aware of them because the comments raise issues of Commission policy. First, a commenter argued that the NRC should reverse the decision in the July 2, 2019, staff requirements memorandum to SECY-19-0036, “Application of the Single Failure Criterion to NuScale Power LLC’s Inadvertent Actuation Block Valves” (ADAMS Accession No. ML19183A408). The staff concluded that this comment did not warrant revisiting the staff requirements memorandum and provided clarifications of the decision in its response to this comment. Second, a commenter requested clarification on how Section VIII.C relates to the requirements of 10 CFR 50.109, “Backfitting;” the staff has provided an explanation of how the NRC applies these requirements in its response to this comment. Third, a commenter requested that the NRC extend 10 CFR 52.63, “Finality of standard design certifications,” provisions for finality to operational requirements covered by Section VIII.C. The staff determined that the comment did not warrant a change in the final rule and reiterated the Commission’s policy on Section VIII.C in its response to the comment. Finally, in response to a comment on severe accident mitigation design alternatives for the reactor building crane, the staff has made changes to the environmental assessment and the preamble to clarify that only one design element for the reactor building crane relating to design alternatives to reduce chances for human error would need to be resolved by future applicants.

In addition to changes from the proposed rule in response to comments, the staff is recommending a change for consistency with the terms and methods used in the NuScale environmental report, which refers to a “representative site” rather than “specified site parameters,” which the proposed rule referenced in section VI.B.7. To ensure that the environmental issues concerning severe accident mitigation design alternatives associated with the information in the NRC’s environmental assessment for NuScale are resolved within the meaning of VI.B.7 of the final rule, the staff recommends revising the final rule to afford issue resolution for these matters to “plants referencing this appendix whose site characteristics fall within the site parameters of the representative site specified in the NuScale environmental report.” Likewise, the staff recommends revising references in the environmental assessment to

“site parameters” and a “reference site” (the NRC staff’s preferred term for what NuScale calls a “representative site”) to incorporate this clarification. These revisions are a logical outgrowth of the proposed rule because they resolve inconsistencies between the wording of the proposed rule and the discussion in the supporting documents (the NuScale environmental report and the NRC’s environmental assessment).

Final Safety Evaluation Report

NuScale Power submitted the final revision of the NuScale DCD, Revision 5, in July 2020 (ADAMS Accession No. ML20225A071). In August 2020, the NRC staff issued a final safety evaluation report (ADAMS Accession No. ML20023A318) after the Advisory Committee on Reactor Safeguards (ACRS) performed its final independent review and issued its letter to the Commission in July 2020 on its findings and recommendations (ADAMS Accession No. ML20211M386). The final safety evaluation report is a collection of reports written by the NRC staff documenting the safety findings from its review of the standard design application, and it reflects all changes resulting from interactions with the ACRS as well as changes in the final version of the DCD. The final safety evaluation report reflects that NuScale Power has resolved all technical and safety issues (no open items) and all previously identified confirmatory items.² The final safety evaluation report also describes portions of the design that are not receiving finality in this rule. The report includes an index of all NRC staff requests for additional information, a chronology of all documents related to the NuScale design certification, and summaries of public meetings and audits.

Resolved Technical Issues

The NRC staff identified several technical issues that were resolved during the review:

- comprehensive vibration assessment program;
- containment safety analysis;
- emergency core cooling system inadvertent actuation block valve;
- conformance with General Design Criterion 27, “Combined Reactivity Control System Capability,” of Appendix A, “General Design Criteria for Nuclear Power Plants,” to 10 CFR Part 50, “Domestic Licensing of Production and Utilization Facilities”;
- absence of safety-related Class 1E alternating current or direct current electrical power;
- accident source term methodology; and
- boron redistribution during passive cooling modes.

In addition, the NRC granted 17 exemptions from NRC regulations in 10 CFR Part 50. Section IV, “Technical Issues Associated with the NuScale Design,” in the preamble to the final rule (Enclosure 1) provides the staff analysis and resolution for each of these technical issues.

² Confirmatory items are items that point to the changes that the applicant and the NRC staff have agreed would be included in the next version of the DCD, but they do not contain or constitute substantive open issues.

Issues Not Resolved by the Design Certification

Insufficient information was available for the staff to resolve three issues within the meaning of 10 CFR 52.63(a)(5):

- the shielding wall design in certain areas of the plant;
- the potential for containment leakage from the combustible gas monitoring system; and
- the method of analysis to predict the thermal-hydraulic conditions of the steam generator secondary fluid system and resulting loads, stresses, and deformations from density wave oscillations from reverse flow, including the ability of the steam generator tubes to maintain structural and leakage integrity during density wave oscillations in the secondary fluid system.

Section III, "Regulatory and Policy Issues," in the preamble to the final rule (Enclosure 1) describes these issues in more detail. Because the staff requires additional information to make the ultimate safety finding on these three issues, these issues cannot be resolved within the meaning of 10 CFR 52.63(a)(5). However, the NRC staff has determined that this information can be provided by a future construction permit or combined license applicant who references this appendix without a demonstrable impact on safety or standardization because these issues are sufficiently isolated from other aspects of the design such that providing the additional information at a later time would not affect the design aspects that would be resolved by this design certification. Therefore, the final rule states in Section IV, "Additional Requirements and Restrictions," that the combined license applicant or construction permit applicant is responsible for providing the design information to address these unresolved issues, and Section VI, "Issue Resolution," states that these issues are not resolved within the meaning of 10 CFR 52.63(a)(5).

Differing Professional Opinion Related to Chapter 3 of NuScale

On September 17, 2020, a Differing Professional Opinion (DPO) was submitted that raised concerns related to the seismic margin evaluation of the NuScale reactor building and its structural response during the review level earthquake. An ad-hoc review panel was formed and tasked to review the DPO. The review panel subsequently issued its report to the Director of the Office of Nuclear Reactor Regulation (NRR) on April 19, 2021. On May 19, 2021, the Director of NRR issued a DPO decision to the DPO submitter. For the reasons described in the decision, the Director of NRR agreed with the review panel's finding that the NuScale reactor building design was complete and acceptable for the purposes of a design certification application. On June 14, 2021, the DPO submitter appealed the DPO decision to the Executive Director for Operations (EDO).

After consideration of the issues raised in the appeal, the EDO issued a decision on the DPO appeal on February 8, 2022. The EDO directed NRR to (1) document its evaluation of the stress averaging approach used in the NuScale design certification application, including, if necessary, updating the Final Safety Evaluation Report and assess whether there are any impacts to the standard design approval, and (2) evaluate and update guidance, or create knowledge management tools, on how to assess applications that use stress averaging for structural building design. On February 14, 2022, the DPO submitter responded to the EDO's DPO appeal decision. In this response, the submitter thanked the EDO for thoughtful consideration of the concerns raised and provided clarification regarding the applicability of the

Probabilistic Risk Assessment-based seismic margin analysis to the reactor building. After reviewing and considering the submitter's response to the DPO appeal decision, on March 15, 2022, the EDO directed the NRC staff to review and consider the totality of the information provided by the submitter when addressing the tasks mandated in the DPO appeal decision.

In response to the EDO taskings, on May 13, 2022, the Director of NRR issued a memo to the EDO ("Response to DPO Tasking") discussing the staff's review of the items described in the tasking, documenting the staff's evaluation of the approach used in the NuScale design certification, and detailing the staff's assessment of existing related structural analysis guidance (ADAMS Accession No. ML22062A007). The Director of NRR concluded that the staff sufficiently assessed the evaluation of the demand (force/moment) averaging approach used in the NuScale design certification application; justified the acceptability to conclude that there are no impacts to the NuScale standard design approval issued in September 2020; determined that an update or supplement to the final safety evaluation report for the NuScale design certification application is not necessary; and found that the existing review guidance is sufficient to review and evaluate an applicant's structural analysis/design. Details on the EDO's decision on the DPO appeal and related correspondence, and the Response to DPO Tasking are found in the information package for DPO-2020-004 (ADAMS Accession No. ML22122A116).

Compliance with Requirements Governing Incorporation by Reference

The final rule would incorporate by reference NuScale standard design material into 10 CFR Part 52. Therefore, the NRC must comply with the Office of the Federal Register's regulations governing incorporation by reference. These regulations require an agency to include in a final rule a discussion of the ways that the materials the agency will incorporate by reference are reasonably available to interested parties or how the agency worked to make those materials reasonably available to interested parties. The final rule includes this information in Section XVIII, "Incorporation by Reference—Reasonable Availability to Interested Parties."

Backfitting and Issue Finality Considerations

The final rule for the NuScale design certification does not impose new or changed requirements on any NRC licensees or applicants and, therefore, does not constitute a backfit as defined in the backfit rule (10 CFR 50.109, "Backfitting") and is consistent with the applicable issue finality provisions in 10 CFR Part 52. For these reasons, neither a backfit analysis nor a discussion addressing the issue finality provisions in 10 CFR Part 52 was prepared for this rule.

RECOMMENDATIONS:

The NRC staff recommends that the Commission approve the enclosed draft final rule (Enclosure 1) for publication in the *Federal Register* and notes the following points:

1. Upon Commission approval, the NRC will publish the final rule in the *Federal Register*, effective 30 days after publication.
2. This final rule contains new information collection requirements that are subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.). The staff will submit the information collection for approval to the Office of Management and Budget after the Commission approves the final rule.

3. The staff prepared an environmental assessment that evaluated severe accident mitigation design alternatives for the final rule and resulted in a finding of no significant impact (Enclosure 2).
4. The staff prepared a public comment resolution document to capture the staff response to the comments received on the proposed rule (Enclosure 3).
5. The Office of Congressional Affairs will inform the appropriate congressional committees.
6. The staff will work with the Office of Public Affairs on an appropriate public communication when the NRC publishes the final rule in the *Federal Register*.
7. The staff will follow a communications plan containing frequently asked questions on the DCR process and the use of a DCR in combined license applications, as well as questions specific to the NuScale rulemaking.
8. The Office of Federal Register approved the NuScale design control document for incorporation by reference into 10 CFR Part 52.
9. The staff has determined that this is not a major rule under the Congressional Review Act of 1996 and has received verification from the Office of Management and Budget.

RESOURCES:

The NuScale Small Modular Reactor Design Certification rule activities are appropriately budgeted in the New Reactors Business Line. This is a final rule; therefore, minimal resources are needed to complete.

COORDINATION:

The Office of the General Counsel has no legal objection to the publication of the final rule related to the NuScale standard design. The Office of the Chief Financial Officer has reviewed this Commission paper for resource implications and has no objections. The NRC staff will provide an information copy of the final rule to the ACRS after publication.



Signed by Dorman, Dan
on 07/01/22

Daniel H. Dorman
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Enclosures:

1. Final Rule
2. Environmental Assessment
3. NRC Responses to Public Comments

SUBJECT: FINAL RULE: NUSCALE SMALL MODULAR REACTOR DESIGN
 CERTIFICATION (RIN 3150-AJ98; NRC-2017-0029) DATED: July 1, 2022

**ADAMS Accession Nos.: PKG: ML22020A003; SECY: ML22004A004; FRN: ML22004A005;
 EA: ML22004A006; Public Comments: ML22004A007**

SECY-012

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