

April 21, 2016

Mr. Thomas Bergman
Vice President, Regulatory Affairs
NuScale Power, LLC
1100 Circle Boulevard, Suite 200
Corvallis, OR 97330

SUBJECT: RESPONSE TO GAP ANALYSIS SUMMARY REPORT FOR REACTOR SYSTEMS
ISSUES

Dear Mr. Bergman:

In a July 31, 2014, letter, NuScale Power, LLC (NuScale) submitted to the U.S. Nuclear Regulatory Commission (NRC) staff the "Gap Analysis Summary Report," Revision 1 (Report). The stated purpose of the Report was to facilitate discussion on specific regulations listed in Table 3-1 of the Report that warrant further consideration with regard to their applicability or relevancy to NuScale power plant design and to solicit feedback on the utility of the document. The Report provided the results of a regulatory gap analysis performed by NuScale as part of pre-application activities. This analysis identified potential regulatory issues (gaps) by comparing current NRC requirements and guidance to the characteristics of the NuScale power plant design. Current NRC requirements are set forth in Title 10 of the *Code of Federal Regulations*, Parts 1 through 199, and current NRC guidance is set forth in NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition" (SRP) and documents referenced in the SRP. The Report highlights the unique features of the NuScale reactor design that may present novel applications of existing NRC staff requirements and guidance. NuScale stated in the Report that the intent of highlighting these issues was to determine the appropriate regulatory process to be used to address the "regulatory gaps" identified in the Report.

As you are aware, the NRC staff and NuScale representatives have had a number of engagements to further the NRC staff's understanding of the NuScale design. The NRC staff acknowledges that it is important that the key regulatory process issues be addressed before NuScale submits a design certification application to facilitate the development of a complete application.

The NRC staff understands that in some cases NuScale believes that regulations are not applicable or may not be technically relevant to NuScale based on the design as described in the Report. The NRC staff notes that the relevance of a particular regulation is informed, in part, by the functions addressed by that regulation. To be clear, the concept of "technical relevance" applies *only* to the requirements of 10 CFR 50.34(f), since 10 CFR 52.47(a)(8) requires an applicant for design certification to include in its application information to demonstrate compliance with the "technically relevant" portions of 50.34(f), with certain exceptions. If a 50.34(f) requirement is technically relevant, NuScale must either comply or justify an exemption from the requirement in accordance with 50.12. In addition, other NRC regulations by their terms

may or may not apply to the NuScale design. For example, a regulation that applies only to boiling water reactors would not apply to the NuScale design, which is a pressurized water reactor. In general, a regulation that requires, for example, a certain function or design attribute will apply to NuScale design. The mere fact that the NuScale design employs a novel means to perform a required function or include a required design attribute does not necessarily trigger a need for an exemption, nor is the novel means for compliance a reason why the regulation would not apply.

Should NuScale take the position that a regulation is not applicable or not technically relevant to its design, it is incumbent upon NuScale to provide a technical basis to explain why the requirements in the regulation do not apply to the design. To the extent NuScale shows that the requirement is not necessary for the NuScale design to meet the underlying purpose of the regulation, that showing would appear to address the “special circumstances” required to justify an exemption from the regulation under 10 CFR § 50.12. This important documentation must be provided as part of the design certification (DC) application in chapter one so that the NRC can determine whether or not the regulation is applicable or technically relevant.

There are three enclosures to this letter. Enclosure 1, responds to the Report’s Table 3-1, Gap 7, “Reactor Coolant System Venting,” Enclosure 2, responds to Report Table 3-1, Gap 12, “Reactor Coolant Makeup,” and Enclosure 3, responds to Report Table 3-1, Gap 19, “ECCS Evaluation Models.”

Report Table 3-1, Gap 11, “Combined Reactivity Control Systems Capability,” will be addressed in a subsequent letter.

These responses are based on information in the Report and from various NuScale meetings, presentations, and submitted information. However, as you are aware, there is no licensing action before the NRC staff in these areas and, therefore, the NRC staff cannot perform its detailed technical review on all technical and regulatory issues at this time to determine if the design will be acceptable in its present form.

T. Bergman

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Should you have any questions, please contact Mr. Gregory Cranston, Senior Project Manager for the NuScale design certification at (301) 415-0546 or via email at gregory.cranston@nrc.gov.

Sincerely,

/RA/

Frank Akstulewicz, Director
Division of New Reactor Licensing
Office of New Reactors

Project No.: PROJ0769

Enclosures:

1. NRC Response to NuScale's position on Gap 7, "Reactor Coolant System Venting."
2. NRC Response to NuScale's position on Gap 12, "Reactor Coolant Makeup."
3. NRC Response to NuScale's position on Gap 19, "ECCS Evaluation Models."

cc: DC NuScale Power LLC Listserv

T. Bergman

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**NRC Staff Response to NuScale's Position on Gap 7:
"Reactor Coolant System Venting"**

Summary of NuScale Position: In its "Gap Analysis Summary Report," Revision 1, Table 3-1, Gap 7, NuScale Power, LLC (NuScale) indicated that it will request concurrence from the NRC staff that it may seek an exemption from Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.46a, "Acceptance criteria for reactor coolant system venting systems," because the collection of non-condensable gases will not inhibit post-accident core cooling. NuScale states that for design certification applicants, 10 CFR 52.47(a)(4) requires an analysis and evaluation of emergency core cooling system (ECCS) cooling performance and the need for high-point vents following postulated loss-of-coolant accidents in accordance with the requirements of 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," and 10 CFR 50.46a, "Acceptance criteria for reactor coolant system venting systems." Also, according to NuScale, 10 CFR 50.34(f)(2)(vi), "Contents of applications; technical information," states that the design should provide the capability of high point venting of non-condensable gases from the reactor coolant system. NuScale believes that this regulation is not "technically relevant" to the NuScale design in accordance with 10 CFR 52.47(a)(8), which requires compliance with the technically relevant portions of the Three Mile Island requirements.

NRC Staff Response:

The NRC Staff would review a request for exemption from 10 CFR 50.46a. The NRC staff notes that NuScale currently is not crediting the reactor vent valves, which are part of the ECCS, for reactor coolant system venting to satisfy the requirement of 50.46a.

However, the NRC staff's current view is that 10 CFR 50.34(f)(2)(vi) is technically relevant to the NuScale design as non-condensable gases may accumulate in containment which could challenge adequate core cooling upon actuation of the ECCS. As such, NuScale's position should be documented and technically justified in an exemption request.

The NRC staff will remain receptive to additional information provided by NuScale. The NRC staff has concluded that the exemption process is the necessary licensing process to be used during the design certification review.

Having said the above, the NRC staff does not now have before it a formal application that describes in detail the current NuScale design or a complete justification for the approach described above. Therefore, the NRC staff has not been able to engage with NuScale in a manner that would permit the detailed review necessary to finally resolve this issue.

The NRC staff has also concluded that this regulatory question is within the purview of the staff to determine and, therefore, does not rise to the level of a policy issue that warrants Commission involvement at this time.

NRC Staff Response to NuScale's Position on Gap 12: "Reactor Coolant Makeup"

Summary of NuScale Position: In its "Gap Analysis Summary Report," Revision 1, Table 3-1, Gap 12, NuScale Power, LLC (NuScale) indicated that it will request concurrence from the NRC staff that a "departure" from Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix A, General Design Criterion (GDC) 33, "Reactor coolant makeup," is warranted for NuScale. GDC 33 requires that a system to supply reactor coolant makeup for protection against small breaks in the reactor coolant pressure boundary shall be provided. However, NuScale states that the plant incorporates specific design provisions assuring adequate reactor coolant inventory to ensure that leaks do not result in core uncover or loss of, core cooling. Thus, NuScale believes that a reactor coolant makeup system as contemplated by GDC 33 is not appropriate for the NuScale design and that "a NuScale specific principal design criterion for the assurance of adequate reactor coolant inventory is warranted as an alternative to GDC 33."

NuScale believes that "[t]he intent of this criterion would be to require that the reactor coolant pressure boundary and associated systems and components be designed to limit loss of reactor coolant so that an inventory adequate to perform the safety functions of the core decay heat removal systems (including the DHR system and the ECCS) is maintained under normal operation (including anticipated operational occurrences [AOO]) and postulated accident conditions." NuScale states that this proposed new criterion "would represent a NuScale-specific principal design criterion to ensure that the NuScale design provides sufficient retention of coolant inventory in the event of a leak to maintain a decay heat removal path." NuScale further states that "a similar alternative design criterion to GDC 33 has been determined by the NRC to be acceptable in other applications, albeit to substantially different reactor technologies,"

NRC Staff Response:

GDC 33 states that

a system to supply reactor coolant makeup for protection against small breaks in the reactor coolant pressure boundary shall be provided. The system safety function shall be to assure that specified acceptable fuel design limits [SAFDLs] are not exceeded as a result of reactor coolant loss due to leakage from the reactor coolant pressure boundary and rupture of small piping or other small components which are part of the boundary. The system shall be designed to assure that for onsite electric power system operation (assuming offsite power is not available) and for offsite electric power system operation (assuming onsite power is not available) the system safety function can be accomplished using the piping, pumps, and valves used to maintain coolant inventory during normal reactor operation.

NuScale states that GDC 33 is not appropriate as the NuScale design has specific design provisions which assures adequate reactor coolant inventory such that leaks or breaks would not lead to core uncover or a loss of cooling function. Thus, according to NuScale, a system to supply reactor coolant makeup as contemplated by GDC 33 is not appropriate for the NuScale design.

The makeup system addressed by GDC 33 is the system used during normal and anticipated operational occurrences to ensure SAFDLs are met for coolant losses less than the makeup capability (i.e., no net loss of inventory). Based on the information available to the NRC staff, core uncover and a loss of cooling function in the NuScale design would indicate potential breaks or leaks which would be in excess of the makeup system (i.e., a loss of inventory) and would be addressed by GDC 35, "Emergency Core Cooling." Consequently, NuScale has proposed providing a new principle design criteria which assures adequate inventory control as an alternative to satisfying GDC 33.

NuScale may in its design certification application propose a principle design criteria to address adequate inventory control. However, whether or not NuScale chooses to do so, its application must also either demonstrate that it has met the requirement of GDC 33 or request or justify an exemption from GDC 33. Since NuScale is proposing to provide a principle design criteria as an alternative to meeting GDC 33 an exemption from GDC 33 is needed. Any exemption request should include the proposed NuScale alternative to GDC 33, *i.e.*, the alternative principal design criterion.

Having said the above, the NRC staff does not now have before it a formal application that describes in detail the current NuScale design or a complete justification for the approach described above. Therefore, the NRC staff has not been able to engage with NuScale in a manner that would permit the detailed review necessary to finally resolve this issue.

The NRC staff has concluded that this regulatory question is within the purview of the NRC staff to determine and, therefore, does not rise to the level of a policy issue that warrants Commission involvement at this time.

NRC Staff Response to NuScale's Position on Gap 19: "ECCS Evaluation Models"

Summary of NuScale Position: In its "Gap Analysis Summary Report," Revision 1, Table 3-1, Gap 19, NuScale Power, LLC (NuScale) indicated, to the NRC staff, that it will not request an exemption from certain portions of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Appendix K, "ECCS Evaluation Models," and 10 CFR 50.46(a)(1)(i), "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors," which generally require that analysis and evaluation of emergency core cooling system (ECCS) cooling performance be performed. NuScale intends to use the conservative evaluation model pursuant to 10 CFR 50.46(a)(1)(ii) and 10 CFR Part 50, Appendix K. NuScale has stated that its design greatly reduces the consequences of design-basis loss-of-coolant accident (LOCA). Consequently, according to NuScale, many of the phenomena that are the subject of 10 CFR Part 50, Appendix K requirements are not encountered in the design-basis LOCA for the NuScale design. Thus, according to NuScale, only a subset of the phenomena that are addressed in 10 CFR Part 50, Appendix K will be encountered in design-basis LOCAs for the NuScale design.

NRC Staff Response:

Under 10 CFR 50.46(a)(1)(i), an applicant may use an evaluation model that satisfies the criteria of that section to evaluate the cooling performance of its proposed emergency core cooling system (ECCS) following a postulated accident. In the alternative, the applicant may use an evaluation model that conforms to Part 50, Appendix K, under 50.46(a)(1)(ii). Based on the NRC staff's current understanding of the design and NuScale's position, it appears that NuScale can develop an evaluation model under 50.46(a)(1)(i) without the need for exemptions, provided the NuScale evaluation model satisfies the criteria of that section. The NRC staff is also willing to entertain a NuScale request for approval of an evaluation model that conforms to 10 CFR Part 50, Appendix K, but exemptions from the portions of the Appendix K requirements that may not need to be met would be necessary.

The NRC staff will remain receptive to future submittals of additional information provided by NuScale.

Having said the above, the NRC staff does not now have before it a formal application that describes in detail the current NuScale design or a complete justification for the approach described above. Therefore, the NRC staff has not been able to engage with NuScale in a manner that would permit the detailed review necessary to finally resolve this issue.

The NRC staff has concluded that this regulatory question is within the purview of the NRC staff to determine and, therefore, does not raise to the level of a policy issue that warrants Commission involvement at this time.