NRC Staff Observations on NuScale's Proposed RAI Responses on the NuScale Emergency Planning Zone Sizing Methodology Topical Report (LTR) Revision 2

June 15, 2021

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EP Regulatory Basis

- Requirements in 10 CFR 50.47 and 10 CFR Part 50 Appendix E.
- EPZ for power reactors generally 10 miles in radius.
- May be determined on a case-by-case basis for reactors with power < 250 MWt.
- Basis for 10 mile plume exposure from NUREG 0396.
- Page I-9, NUREG 0396, “design basis accidents and less severe core-melt accidents should be considered for Protective Actions.”
- EPA-400/R-17/001, Protective Actions, Table 1-1: Sheltering-in-place or evacuation of the public: 1 to 5 rem dose over four days.
- More severe core damage events compared against 200 rem.

- NOTE: Comment period for draft EP rule for SMR and NLWR and non power production facilities recently closed.

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Background

Applicants (now only light water SMRs) can use the LTR to select the appropriate single module and multimodule accident sequences to include in the EPZ technical basis based on their PRA which is to include all internal and external initiators.

- "The most likely mechanism is a COL application; however, it is acknowledged that other regulatory processes exist. For simplicity, "COL applicant" and "COL application" are used throughout this LTR to refer to implementation of the methodology."
- NuScale should state what is necessary for PRA Acceptability in the LTR considering that an applicant may use a licensing approach other than Part 52.

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RAI 1.05-43

Issue/RAI: Justify that the screened-out sequences do not cause the QHOS to be exceeded**.**

Response: NuScale **expects** COL PRA to meet the LRF Commission Goal for new reactors of LRF <1E-6/yr which means that QHOs have been met.

Staff comment:

- COL/DC PRAs do not require a Seismic PRA for certification (reference SRM to SECY 93-087); therefore the QHOs for the COL/DC do not include aggregate risk.
- COL/DC PRAs are not acceptable for risk informed applications (reference DC/COL ISG-028) because they are not required to meet the PRA Standard in its entirety.

Potential resolution:

- The staff may write a condition of use that the COL PRA used to support this risk informed application, considering the aggregate risk including seismic risk shall show that the LRF meets the Commission Goals for new reactors, or
- The response may specify that the PRA used to support this application meets the QHOs considering aggregate risk from all hazards.

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RAI 1.05-44

Issue: External Events w/ initiator frequency <1E-5/yr screened. **Then**, core damage sequences w/ frequency <1E-7 screened**.**

RAI: Justify why external events screening different than internal events; (could screen risk significant sequences).

Response: NuScale is unaware of NRC guidance that requires risk informed applications to treat all hazards and modes equivalently. External event screening criterion of 1E-5 based on "credible" earthquake at de-commissioned plants. **No change to the LTR**.

Staff comment: A sufficient technical justification is not provided for lacking equivalent screening criterion.

- Screening external events with initiator frequencies <1E-5/yr could miss important core damage/large release sequences for this risk-informed application.
- RG 1.174: If the hazard or mode is important to the decision it must be evaluated.
- Screening criteria for de-commissioned plants are not applicable to operating plants.
- For some risk-informed applications, NRC staff has approved a bounding or conservative approach for screening external hazards

Potential Resolution:

The response may include screening criteria that is equivalent for internal and external events or specify a conservative or bounding quantitative approach to demonstrate that screening at the 1E-7/yr threshold does not impact the decision.

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RAI 1.05-45

Issue: The LTR and response did not appropriately address uncertainty against the screening thresholds.

RAI: Discuss how numerical uncertainties (e.g., parameter uncertainty, model uncertainty) are to be considered against the numerical thresholds.

Response: NuScale references DC/COL-ISG-028 which is not applicable for risk informed applications. **No change to the LTR**.

Staff comment: Not addressing uncertainty.

- The LTR was not updated to provide any guidance on how numerical uncertainties are to be considered against the screening thresholds such as:
  - Confirming the state-of-knowledge correlation does not change the screening of sequences
  - Assessing parameter and model uncertainties and performing sensitivity cases for the key model uncertainties.
  - Where the sensitivity cases challenge the screening thresholds, additional potential compensatory measures should be identified.
- This issue was discussed with NuScale in RAIs and a public meeting during the Revision 1 review. This issue not addressed in Revision 2 of the LTR.
- Risk-informed applications for operating reactors provide examples on how uncertainty has been addressed.

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RAI 1.05-46

Issue: DC/COL ISG-028, "Assessing the Technical Adequacy of the Advanced Light-Water Reactor Probabilistic Risk Assessment for the DC/COL Application," states that other applications, including risk-informed applications, "need to directly address the application-specific regulations and guidance, including the evaluation of the technical adequacy of the PRA needed for the specific application using the PRA Standard, as endorsed by RG 1.200."

RAI: Address in the LTR: (1) the need for the PRA with the application to be peer reviewed, (2) the need for the COL applicant to address hazards/modes not covered by the standards, and (3) the need for the PRA to be Capability Category (CC) II with exceptions identified and justified for (e.g. unique design features with lack of operating experience, and inability to perform walkdowns).

Response: RG 1.200 describes one approach for determining whether a based PRA is sufficient for risk informed decision making. NuScale seems to assert that the PRA can be found technically acceptable through the peer review process without RG 1.200. **No change to LTR.**

Staff comment: It's not clear that RG 1.200 will be followed by applicants.

Potential Resolution:

- The staff may write a condition of use that the applicant will need to identify and justify where CC II cannot be met.
- The staff may write a condition of use that if the PRA does not meet RG 1.200, then applicant may need to provide additional justification indicating that the PRA is comparable in depth, scope, and modeling to RG 1.200 which could require substantially increased staff review.

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RAI 1.05-48

Issue: The staff did not find information in the LTR about potential releases due to non-core damage events that would necessitate protective actions. The staff is requesting that the LTR include potential releases due to non-core damage events that would necessitate protective actions consistent with the Environmental Protection Agency (EPA) Protective Action Guidance (PAGs). For example, dropping the upper portions of the NuScale reactor pressure vessel and the containment vessel as they are moved to or from the dry dock area, onto the fuel in the lower RPV, which remains in the refueling flange tool may cause mechanical fuel damage and a gap release**.**

RAI: The staff did not find information in the LTR about potential releases due to non-core damage events that would necessitate protective actions.

Response: Beyond design basis events that are not core damage and outside the PRA would be evaluated as described in Section 3.5 of the LTR - demonstration, qualitatively or quantitatively, that the sequences of each risk are bounded by events screened-in by Sections 3.3 and 3.4. **No impact on LTR**

Staff comment pending discussion with NSIR

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Abbreviations

ALWRs – Advanced Light Water Reactors

COL – Combined License

DC – Design Certification

DG – Draft Guide

EP – Emergency Planning

EPZ – Emergency Planning Zone

LPSD – Low Power and Shutdown

MWt – Megawatt thermal

NLWRs – Non Light Water Reactors

PRA – Probabilistic Risk Assessment

QHOs – Quantitative Health Objectives

RG – Regulatory Guide

SMRs – Small Modular Reactors

TR – Topical Report