April 8, 2020 Docket No. 52-048

U.S. Nuclear Regulatory Commission
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SUBJECT: NuScale Power, LLC Submittal of Presentation Materials Entitled "NRC Public Meeting: Revisions to NuScale's EPZ Sizing Methodology Topical Report," PM-0420-69598, Revision 0

NuScale Power, LLC (NuScale) has requested a meeting with the NRC technical staff on April 15, 2020, to discuss revisions made to the Emergency Planning Zone (EPZ) topical report. NuScale had previously requested that the NRC suspend review of Revision 1 of the EPZ topical report in order to consider staff and public feedback from prior meetings and to review Commission votes on key EPZ-related activities.

The purpose of this submittal is to provide presentation materials to the NRC for use during this meeting. The enclosure to this letter is the nonproprietary presentation entitled "NRC Public Meeting: Revisions to NuScale's EPZ Sizing Methodology Topical Report," PM-0420-69598, Revision 0.

This letter makes no regulatory commitments and no revisions to any existing regulatory commitments.

If you have any questions, please contact Deb Luchsinger at 541-452-7334 or at DLuchsinger@nuscalepower.com.

Sincerely,

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Director, Regulatory Affairs
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Enclosure: "NRC Public Meeting: Revisions to NuScale's EPZ Sizing Methodology Topical Report," PM-0420-69598, Revision 0

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"NRC Public Meeting: Revisions to NuScale's EPZ Sizing Methodology Topical Report," PM-0420-69598, Revision 0

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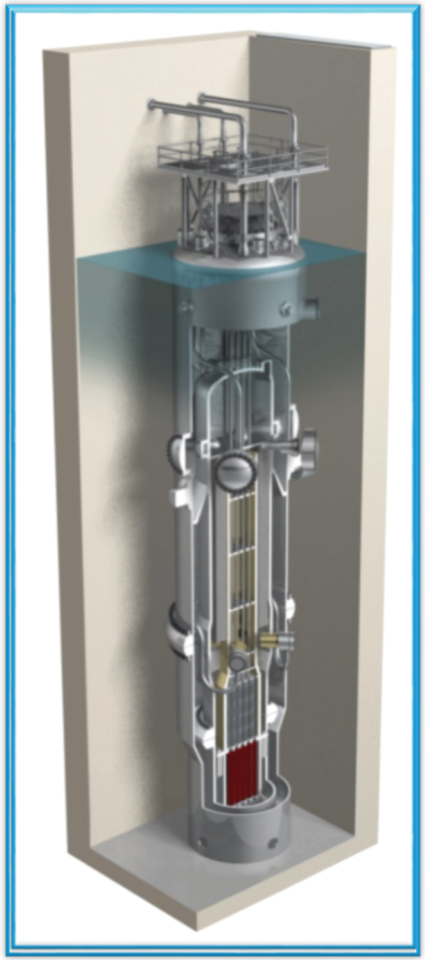
NRC Public Meeting



Revisions to NuScale's EPZ Sizing Methodology Topical Report

Scott Weber
EPZ Technical Lead

April 15, 2020

PM-0420-69598
Revision: 0

Template #: 0000-21727-F01 R6

Outline

- Background
- Goals of Revision 2 of EPZ topical report
- Significant modifications in Revision 2
- Other modifications made for consistency
- Open discussion

Background and Goals

Background

- Rev. 0 EPZ topical report submitted Dec. 2015 and accepted for review in March 2016
- Rev. 1 topical report submitted March 2018 (ML18071A354)
- Since submittal of Rev. 1, three public meetings (Oct. 18, 2018, March 5, 2019, and Aug. 6, 2019 [meeting summary ML19233A165]) and one round of RAIs (RAI No. 9666, submitted by staff March 22, 2019)
  - Primary areas of discussion: PRA technical adequacy, defense-in-depth, seismic event screening, severe accident phenomena, and dose criteria for most probable accidents
  - Based on the Aug. 6 meeting summary, the topics of PRA technical adequacy and severe accident phenomena have been substantially resolved

Background

- NuScale requested in late 2019 that NRC suspend review of Revision 1 of the EPZ topical report in order to:
  - Consider staff and public feedback from prior public meetings
  - Review Commission decisions on key EPZ-related activities:
    - Ongoing NRC EP rulemaking, which signals a policy recognition of the need for alternative risk informed bases to determine the EPZ size for new nuclear technologies including SMRs
    - Approved TVA Clinch River Early Site Permit (ESP) that contains a methodology to determine plume-exposure EPZ sizing
  - Interface with industry, including NEI, TVA, and other advanced nuclear reactor designers, to ensure alignment behind proposed methods
  - Further review the existing EPZ basis in NUREG-0396, including replicating results based on WASH-1400, and other existing regulatory framework
- Since the Aug. 2019 NRC public meeting, NuScale has spent over 1500 staff and management hours developing revisions to the EPZ methodology

Goals of Revision 2

- Align with most recent NRC emergency preparedness (EP) regulatory precedents and guidance
  - NRC ongoing EP rulemaking (ML19351C731)
  - TVA's approved ESP methodology (ML19351D663)
  - EPZ exemptions at decommissioned nuclear reactor sites and associated ongoing rulemaking
    - The exemptions use similar technical basis, most recent example is Pilgrim nuclear power plant (ML18347A717)
- Ensure consistency within the NuScale methodology
- Clarify distinction between EPZ methodology and NuScale's DCA
- Develop methodology supported by nuclear industry, including NEI, TVA, and other advanced nuclear reactor designers

Significant Modifications in Revision 2

Defense-in-Depth Update

- Revision 1 Methodology
  - **Quantitative** methodology for sequence-based assessment of defense-in-depth (DID) (Section 3.5)
- Revision 2 Methodology
  - New topical report Section 3.9 – **Qualitative**, plant-level DID evaluation, independent from accident screening process
  - Identify key SMR characteristics (unique design features and SSCs) that enhance protection of public health and safety by preventing and mitigating the consequences of postulated accidents
  - Remove quantitative methodology, and associated screening criteria at 1E-3 x Total CDF

Defense-in-Depth Update

- Emphasizes need for balance between accident prevention and ability to mitigate postulated consequences
- Consistent with RG 1.174 and INSAG-10
- Consistent with ongoing NRC EP rulemaking
  - The draft rule's discussion of DID states that "the rationale upon which EP for current reactor designs is based… is consistent with the Commission's defense-in-depth safety philosophy." (ML19351C731)
- Consistent with NRC's decision-making process for approving licensing amendments for operating fleet

External Event Screening Update

- Revision 1 Methodology (for seismic sequences)
  - Based on the results of a seismic margins assessment, screen seismic sequences at an acceptance criteria of 1.67 x SSE (0.84g for the NuScale design)
- Revision 2 Methodology
  - Require a seismic PRA, similar to other external events
  - Apply the same sequence CDF screening threshold (1E-7/module year, Slide 13) to external events as applied to internal events
  - Apply an additional initiator screening threshold for all external events - screening external initiators at a 1E-5/year exceedance frequency, unless alternate endorsed criteria exist
    - For example, only seismic core damage sequences resultant from a peak ground acceleration (pga) which occurs at frequency of 1E-5/year or greater would be retained for screened based on CDF at 1E-7/module year.

External Event Screening Update

- EPZ exemptions have been granted for decommissioning plants based on a maximum credible earthquake
  - The underlying technical and regulatory basis is appropriate for all external events, not just seismic
- Technical basis for approving these exemptions is found in NUREG-1738 and NUREG-2161
  - NUREG-2161 cited an earthquake at frequency of 1.7E-5/y as “stronger than the maximum earthquake reasonably expected to occur for the reference plant.” Less likely earthquakes were not considered in the analysis
  - NUREG-2161 demonstrates that a more severe, and lower likelihood, earthquake would produce greater consequences
  - NUREG-1738 states that pre-planning for large (>0.5g) earthquakes “would have marginal benefit due to extensive collateral damage offsite”
- All-hazards off-site plans will exist and will function to respond to an extreme external event
  - See Commission transcript and voting record for Clinch River ESP

CDF Screening Update

- Revision 1 Methodology
  - PRA sequence-level single module screening at 1E-08 per module year
    - Sequences < 1E-08 per year but > Total CDF x 1E-3 have sequence-level defense-in-depth evaluation
    - Sequences < Total CDF x 1E-03 screen out
- Revision 2 Methodology
  - PRA sequence-level single module screening at 1E-07 per module year
    - No conditional screening threshold; not required for qualitative DID evaluation
    - Sequences < 1E-07 per module year screen out

CDF Screening Update

- The draft EP rulemaking requires use of a “spectrum of credible accidents for the facility” as the basis for EPZ size
- TVA’s ESP methodology uses screening thresholds of 1E-6/rx-yr for less severe accidents, and 1E-7/rx-yr for more severe accidents
  - Screening all sequences in the NuScale methodology at 1E-7/module year is consistent with the TVA threshold approved to determine EPZ sizing
- 1E-7/module year is also consistent with NRC guidance and previous analysis, such as NUREG-1860 and NUREG-1935 (SOARCA)
- 1E-7/module year meets the NRC’s quantitative health objectives to be less that 0.1 percent of non-nuclear fatality risks
  - Prompt and cancer fatality rates for the general public are greater than 1E-4/year, and therefore greater than 1E-7 multiplied by 0.1 percent

Other Modifications in Revision 2

Surrogate Less Severe Accidents

- Revision 1 Methodology
  - If all less severe accidents screen out based on CDF, requirement to include most probable less severe accident
- Revision 2 Methodology
  - Requirement for surrogate less severe accident removed, because design basis source term used for Ch. 15 off-site dose analysis is always required to be analyzed (Section 3.3)
    - This source term represents a conservative less-severe core damage sequence
    - Therefore, the required inclusion of an additional less-severe sequence is a redundant unnecessary step
    - Revision also serves as an incentive for a future applicant of this methodology to demonstrate that all accidents are low frequency

Aggregate of Screened Out Sequences

- Revision 1 Methodology
  - Summed the CDF of all screened out accidents, and if the sum exceeded 1E-8, require additional sequences to go into DID screening
- Revision 2 Methodology
  - No check on screened out accident sequences in aggregate
    - Previous method is inconsistent with revised DID evaluation
    - Aligned with the approved methodology in TVA's ESP, which does not require an additional check on screened-out sequences

Other Changes

- Multi-module methodology frequency screening changed from 1E-3 x Total CDF to 1E-7/module year for multi-module sequences
  - Aligned with single module screening
- Clarifies distinction between the methodology and the DCA and DC PRA. For example:
  - Updated definitions of the PRA used in the application of the methodology
  - Revised sections on spent fuel pool and security which were previously based on DCA results; these are now presented as examples to be confirmed. No change to content.
- Additional comparisons to NUREG-0396
- Update to background to reflect ongoing NRC EP rulemaking and approved TVA ESPA
- Removal of information in appendices which is no longer consistent with revised methodology.

Open Discussion

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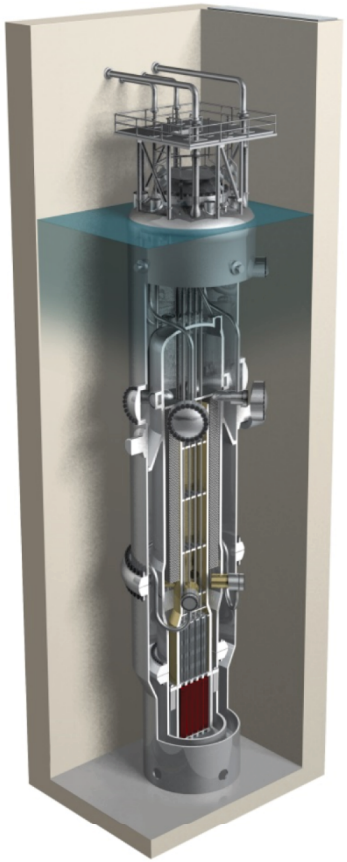

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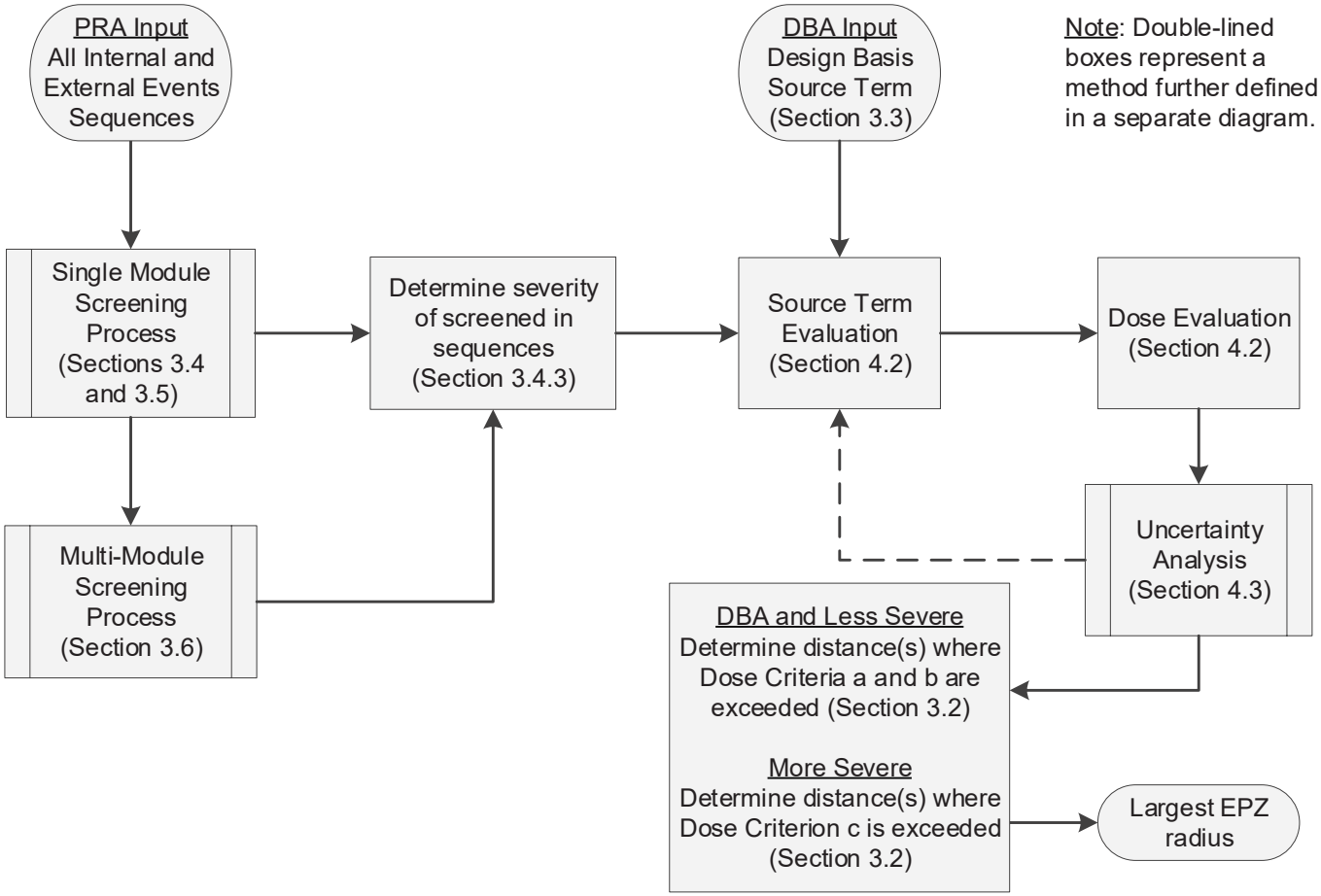
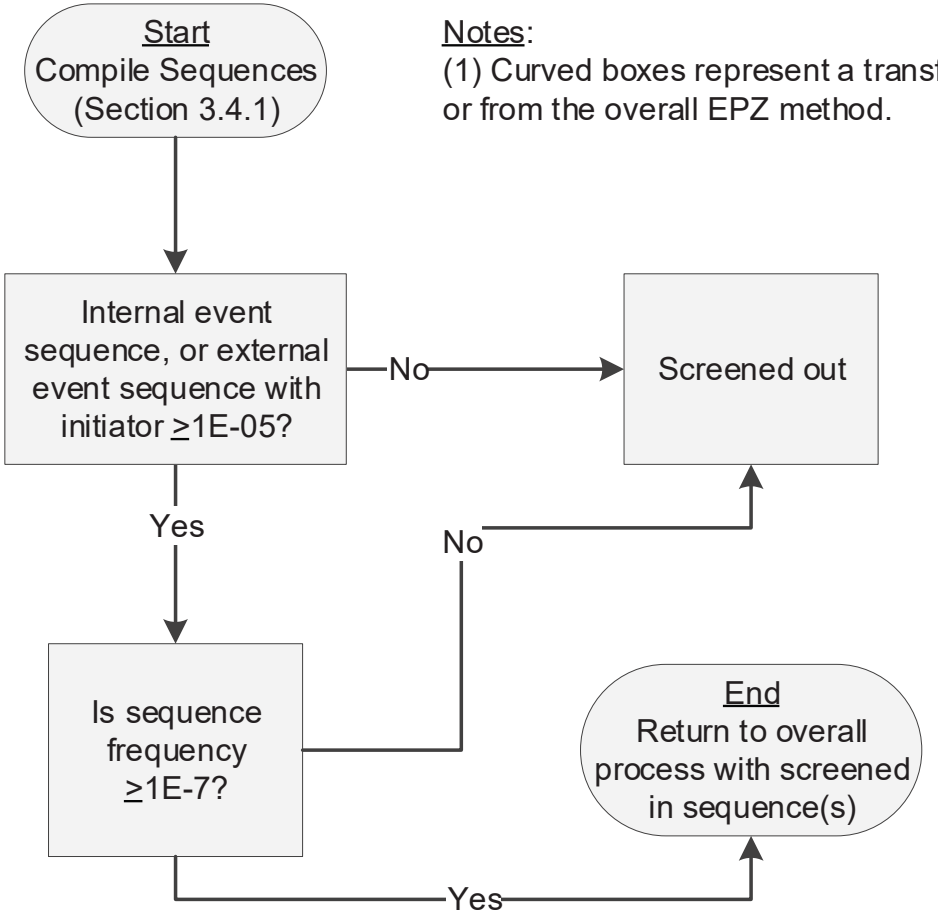
Back-up Slides

Overall EPZ Process Flowchart



Single Module Screening Flowchart



Multi-Module Screening Flowchart