



***Key Staff Observations on the  
NuScale Emergency Planning Zone  
Sizing Methodology Topical Report  
(Non-Proprietary)***

***JCNRM SCORA***

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# Overview

NuScale EPZ Sizing Methodology TR Revision 2 (ML20217L422) uses PRA accident sequences and Design Basis Source Term to size the EPZ for ALWRs and NLWRs as applicable.

Using the TR, the EPZ is intended to encompass areas around the plant where:

- (a) The consequences of Design Basis Accidents could exceed the EPA PAGs- range 1-5 rem.
- (b) The consequences of less severe core damage accidents (assumes containment is intact) could exceed the EPA PAGs- range 1-5 rem.

TR considered a risk-informed application.



# Emergency Planning (EP) Regulatory Basis

- EP Requirements in 10 CFR 50.47 and 10 CFR Part 50 Appendix E.
- EPZ for power reactors (> 250 MWt) generally 10 miles in radius.
- May be determined on a case-by-case basis for reactors with power < 250 MWt. If reactor > 250 MWt, an exemption may be required.
- Basis for 10 mile plume exposure from NUREG-0396 (ML051390356).

*NOTE: Comment period for draft EP rule for SMR/ONT (Small Modular Reactors/Other New Technologies) closed on September 25, 2020.*



# CDF Screening Threshold

**Staff conducted initial review of the screening threshold in the TR.**

- TR screens core damage sequences on frequency then evaluates remaining sequences for consequences.
- Staff needs to ensure TR consistent with the QHOs:
  - individual within 1 mile of plant; early fatality risk  $< 5 \times 10^{-7}$ /year
  - risk of cancer to the population in the area near a nuclear power plant  $< 2 \times 10^{-6}$ /year
- If core damage sequence consequences unknown, sequences w/frequencies below the QHOs should be retained to ensure QHOs are met (aggregate of all core damage sequences for all hazards.)

**Slide 4**

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**VM1**

Valentin, Milton, 2/3/2021

# External Event Initiating Event Frequency Screening Threshold

**External events (includes internal fires) should have equivalent sequence screening treatment to internal events.**

- RG 1.174 (ML17317A256) states that all plant operating modes and hazard groups be addressed when those risk contributions affect the decision.
- TR should not screen out potentially risk significant external events.
- ASME/ANS RA-Sb–2013 has PRA guidance for LWR external events.
- ASME/ANS RA-S-1.4-2020, NLWR PRA Standard, has guidance for external events.



# Need for Peer Review and Evaluation of Uncertainties against numerical screening thresholds

- PRA at time of application should be peer reviewed in accordance with NEI 17-07, Rev. 2 (for ALWRs) or NEI 20-09 (for NLWRs).
- PRA at time of application should be developed using RG 1.200 or staff guidance for Non LWR PRA Standard.
- TR should stipulate, consistent with NUREG-1855, Revision 1\*, how PRA uncertainties will be compensated regarding lack of:

Operating procedures

Operating experience (especially for new design features)

Inability to perform walkdowns

\*NUREG-1855, Revision 1: Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decisionmaking, Final Report (ML17062A466).

## **Additional Information**

- Public meeting with NuScale on EPZ TR held on 1/12/21
- Public meeting summary available week of 2/11/21 (ML21029A251)



# 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

**NUREG** – NRC Technical Report Designation

**PAGs** - Protective Action Guidelines

**PRA** – Probabilistic Risk Assessment

**QHOs** – Quantitative Health Objectives

**RG** – Regulatory Guide

**SMRs** – Small Modular Reactors

**TR** – Topical Report