



***Accident Dose Analysis - NuScale's
Emergency Planning Zone Sizing
Methodology Topical Report (TR)***

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July 14, 2021

EP Regulatory Basis

- Requirements in 10 CFR 50.47, 10 CFR Part 50 Appendix E, and 10 CFR Part 20.
- 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.

Figures-of-Merit

The NRC staff is reviewing the TR figures-of-merit dose-based criteria and methodologies for developing source terms and performing radiological consequence analyses.

There is one important distinction between the TR and NRC Regulations which will require a Condition of Applicability of it's use for U.S. applications...

The EPA PAG Manual criterion is in terms of Total Effective Dose (TED) while the various NRC dose-related criteria are in terms of Total Effective Dose Equivalent (TEDE).

- EPA TED utilizes International Commission on Radiological Protection (ICRP) 60 vintage dosimetry methodology. (NRC has not adopted for these purposes)
- **NRC TEDE utilizes ICRP 26/30 vintage dosimetry methodology which is codified under Parts 50 (10 CFR 50.2, "*Definitions.*") and 20 (10 CFR 20.1003, "*Definitions.*").**

Figures-of-Merit (Cont'd)

The TR recommends the use of the “most recent” MACCS dose conversion factor (DCF) files but does not make a distinction for selecting different DCF files for different purposes. Therefore, it is up to the applicant to make sure to use the correct DCF files to meet a specific country's regulatory requirements.

MACCS has many DCF libraries based on various ICRP recommendations. Many countries utilize different DCF files for different purposes.

Message: Staff will include a Condition of Applicability to bring awareness to utilize appropriate DCF files to meet specific regulatory requirements. The Condition will point to which MACCS DCF files to use and how to use them.

Path forward

- NRC/RES Work Product (In progress)
 - Problem: MACCS is not typically used for licensing. Many of the DCF files are multiple decades old with little documentation verifying pedigree and accuracy of certain DCF files.
 - Purpose: verify MACCS DCF files being applicable to compute TEDE for the purposes of EPZ sizing analyses to be consistent with regulations.
 - Product: RES staff will document findings in a brief memo with recommendations to be made publicly available and subsequently referenced in the staff Safety Evaluation Report.