U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Emergency Preparedness and Non-LWRs

RAMP Non-LWR HP Technical Meeting
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NRC is preparing to license Non-LWR Designs

NRC Vison and Strategy: Safely Achieving Effective and Efficient Non-Light Water Reactor Mission Readiness

"…policy issues include emergency preparedness requirements for high-safety, low-consequence designs…"

Commission Policy Statement on Regulation of Advanced Reactors

"the Commission expects, as a minimum, at least the same degree of protection of the environment and public health and safety and the common defense and security that is required for current generation light-water reactors (LWRs)…

In addition, the Commission expects that the safety features of these advanced reactor designs will be complemented by the operational program for Emergency Planning (EP)."

NRC Vision and Strategy: Safely Achieving Effective and Efficient Non-Light Water Reactor Mission Readiness (ML16356A670; December 2016)
Policy Statement on the Regulation of Advanced Reactors (73 FR 60612; October 14, 2008)

Emergency Preparedness Provides Reasonable Assurance

- EP required as a final layer of defense-in-depth
- Compliance with NRC regulations provides reasonable assurance that adequate protective measures can and will be taken in the event of a radiological emergency
  - —Reasonable Assurance finding is made before a nuclear facility is licensed
  - —Inspected over the lifetime of that facility
- EP provides for dose savings for a spectrum of accidents that could produce doses in excess of the U.S. Environmental Protection Agency (US EPA) protective action guides (PAG)

A Graded Approach is Risk-Informed

- A risk-informed process in which the safety requirements and criteria are set commensurate to the risk of the facility
- Existing NRC regulations employ a graded approach
  - Power Reactors (low power testing and decommissioning)
  - Research and Test Reactors
  - Fuel Fabrication Facilities
  - Independent Spent Fuel Storage Installations
  - Monitored Retrievable Storage
- Same level of protection afforded to public health and safety.

Draft Final Rule on EP for SMR/ONT

- Final Rule for small modular reactors and other new technologies (SMR/ONT):
  - Performance-based
  - Technology-inclusive (including non-LWRs)
  - Consequence-oriented and risk-informed
- Scalable emergency planning zone (EPZ) for prompt action
- Assessment of contiguous hazards
- Requirement to describe ingestion response **capabilities**
- Requirements for onsite and offsite response **capabilities**

Draft Regulatory Guidance

RG 1.242, “Performance-Based Emergency Preparedness for Small Modular Reactors, **Non-Light Water Reactors**, and Non-Power Production or Utilization Facilities”

Time-tested, Risk-informed Planning Basis

Scoping the planning efforts

A spectrum of accidents should be considered to scope the planning efforts for:

- *The **distance** to which planning for predetermined protective actions is warranted*
- *The **time** dependent characteristics of a potential release*
- *The type of radioactive **materials***

NUREG-0396 "Planning Basis for the Development of State and Local Government Radiological Emergency Response Plans in Support of Light Water Nuclear Power Plants," December 1978 (ML051390356)

Please remember…

EP ≠ EPZ

Draft Final Rule on EP for SMR/ONT

Scalable plume exposure pathway EPZ

The EPZ is based on an analysis of a spectrum of accidents describing an area within which:

- Public dose is projected to exceed 10 mSv (1 rem) TEDE over 96 hours from the release of radioactive materials from the facility considering accident ***likelihood*** and ***source term***, ***timing*** of the accident sequence, and meteorology; and
- Predetermined, prompt protective measures are necessary

NUREG-0396 EPZ based on Large LWRs

EPZ size considerations:

1. Projected doses from traditional design basis accidents would not exceed Federal PAG levels outside the EPZ.
2. Projected doses from most core melt sequences would not exceed Federal PAG levels outside the EPZ.
3. For the worst core melt sequences, immediate life-threatening doses would generally not occur outside the EPZ.

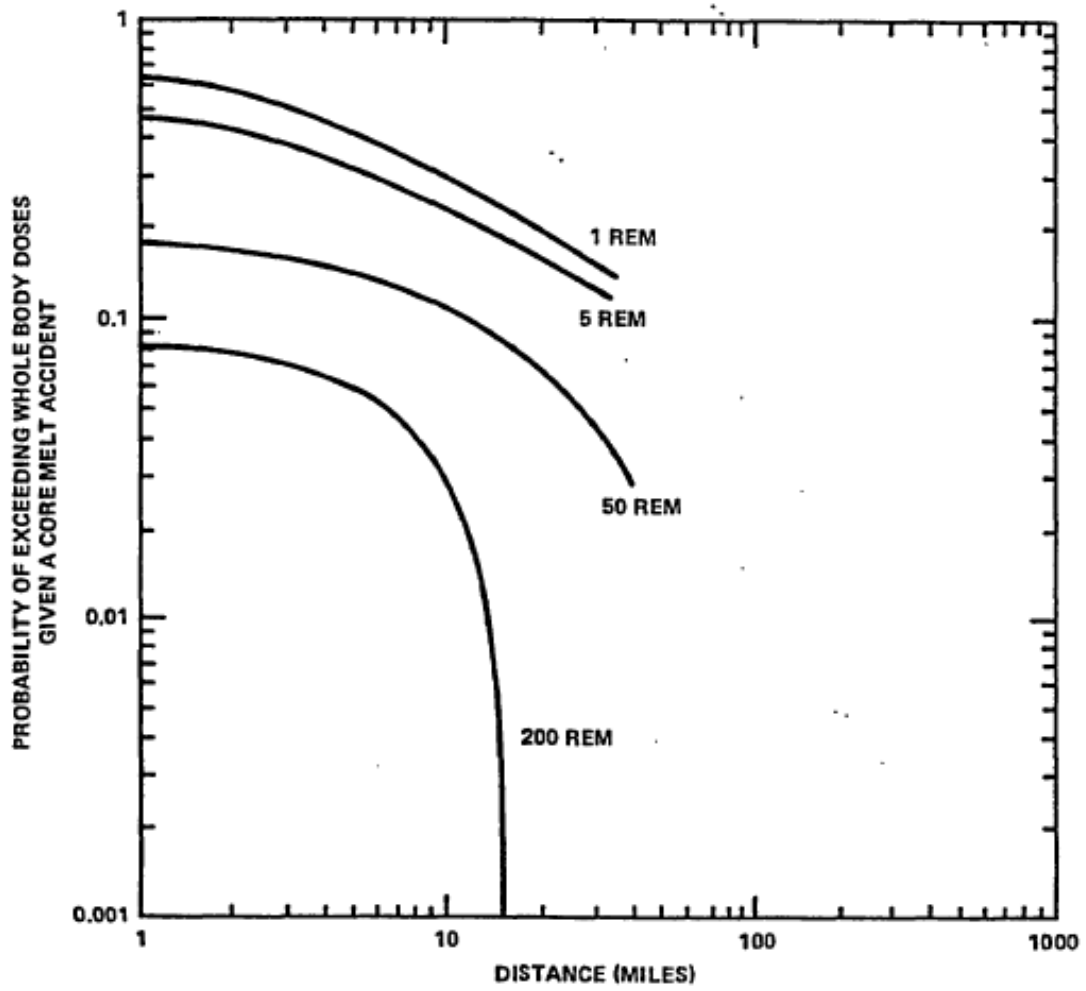

Figure I-11. Conditional Probability of Exceeding Whole Body Dose Versus Distance. Probabilities are Conditional on a Core Melt Accident (5×10^{-5}).

Technology-Neutral Guidance in DG 1.242

EPZ size considerations:

1. Projected doses from traditional design basis accidents would not exceed Federal PAG levels outside the EPZ.
2. Projected doses from most ~~**core melt**~~ sequences that result in a release would not exceed Federal PAG levels outside the EPZ.
3. For the worst ~~**core melt**~~ sequences that result in a significant release, immediate life-threatening doses would generally not occur outside the EPZ.

Draft Regulatory Guidance

- Applies to Non-LWR facilities that choose to adopt the performance-based EP framework
- Appendix A, "General Methodology for Establishing Plume Exposure Pathway Emergency Planning Zone Size"
  - Provides a general methodology acceptable to the NRC for the analysis for establishing plume exposure pathway EPZ size
  - Section A-3.1, "Event Selection," references RG 1.233 for Non-LWRs
- Appendix B, "Development of Information on Source Terms"

RG 1.233, "Guidance for a Technology-Inclusive, Risk-Informed, and Performance-Based Methodology to Inform the Licensing Basis and Content of Applications for Licenses, Certifications, and Approvals for Non-Light-Water Reactors"

Performance-Based Framework

1. Maintenance of Performance
2. Performance Objectives
3. **Event Classification and Mitigation**
4. **Protective Actions**
5. Communications
6. Command and Control
7. Staffing and Operations
8. **Radiological Assessment**
9. Reentry
10. Critique and Corrective Actions

Reactor technology is advancing,
EP is evolving,
but the NRC's mission to protect the health and safety of the public remains unchanged

Contact Information

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