

Hazard Assessments to Risk-Inform Emergency Preparedness

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NRC is Prepared to Support Safety Reviews of Advanced Reactors

Commission Policy Statement on 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)...

the Commission expects that advanced reactors will provide **enhanced** margins of safety and/or use **simplified, inherent, passive, or other innovative means** to accomplish their safety and security functions.” (emphasis added)¹

Emergency Preparedness Provides Reasonable Assurance

- 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.

NRC Applies a Graded Approach to Emergency Preparedness Rulemaking

- Final Rule for small modular reactors and other new technologies (SMR/ONT):
 - Performance-based
 - Technology-inclusive
 - 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**

Time-tested Planning Basis (NUREG-0396)

Hazard Assessment

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***

Hazard Assessment Supports Scalable EPZs

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

Safety of Design Certified Through NRC Rulemaking Process

- Milestone achieved in NuScale design certification
 - Design review includes transient and accident analyses
 - Design review examines PRA and severe accident evaluation
 - NRC Final rule will certify safety of NuScale design
- NuScale Topical Report to determine EPZ size:
 - Internal/external hazards, multi-module events
 - Dose criteria
 - Accident likelihood and timing
 - NRC evaluating methods to account for uncertainty and screening criteria

Design Certification for the NuScale Small Modular Reactor Design Certification.

<https://www.regulations.gov/docket/NRC-2017-0029>

Emergency Preparedness is more than the EPZ

“The EPZ guidance does not change the requirements for emergency planning, it only sets bounds on the planning problem. The Task Force does not recommend that massive emergency preparedness programs be established around all nuclear power stations.”

“An added element of confidence can be gained, however, if States and local governments assure that their plans for responding to radiological emergencies are coordinated with their plans for...other disaster situations...”

Harmonization is achieved with all-hazards planning by taking a modern capabilities-based approach.

Hazard Assessment to Scope the Planning

- Performance-based capabilities for response based on analysis of design and site-specific considerations.
- The NRC will require licensees to demonstrate performance and the capability to take appropriate action.
- When the EPZ extends beyond the site boundary, FEMA and the NRC will ensure offsite radiological emergency preparedness is adequate
- State and local governments maintain emergency plans to respond to all-hazards, and the NRC has high confidence in the ability of offsite agencies to implement appropriate response actions when necessary.

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

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