NRC Emergency Preparedness for Small Modular Reactors and Other New Technologies

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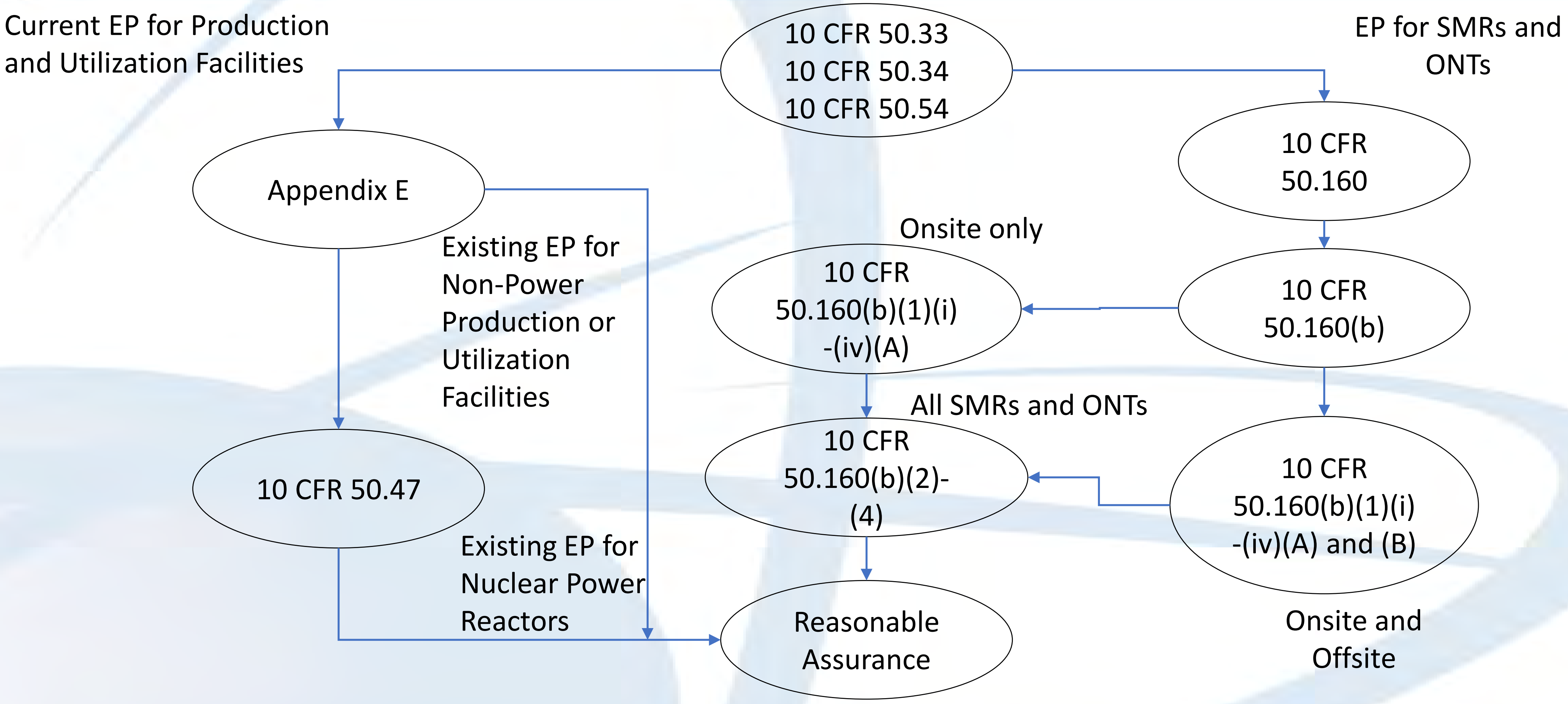
Emergency Preparedness Frameworks



Still a graded approach to EP

Still risk-informed however the process balances the regulatory burden commensurate to the facility risk

Existing NRC regulations that use a similar graded approach to EP

- *Power reactors*
- *low-power testing and decommissioning*
- *Research and test reactors*
- *Fuel Fabrication Facilities*
- *Independent Spent Fuel Storage Installations*
- *Monitored Retrievable Storage*

Major provisions of 10 CFR 50.160 EP regulations

This framework provides small modular reactors (SMR) and other new technologies (ONT):

- regulatory framework proportional to the risk profile of facility

  required EP functions set commensurate to radiological risk

- technology inclusive, performance based

  performance demonstration in drills and exercises

- scalable EPZ according to planning needs
- hazard analysis for contiguous facilities
- ingestion planning capabilities

A Scalable EPZ Supports Planning Needs

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The EPZ is a planning tool

The EPZ determination considers form and function:

- The area within which public dose is projected to exceed 10 mSv TEDE over 96 hours considering:
  - *accident likelihood*
  - *source term*
  - *meteorology*
- The area within which predetermined, prompt protective measures are warranted
  - *timing of the accident sequence*

Emergency response functions provide capabilities

Event classification and mitigation

Protective actions

Communications

Command and control

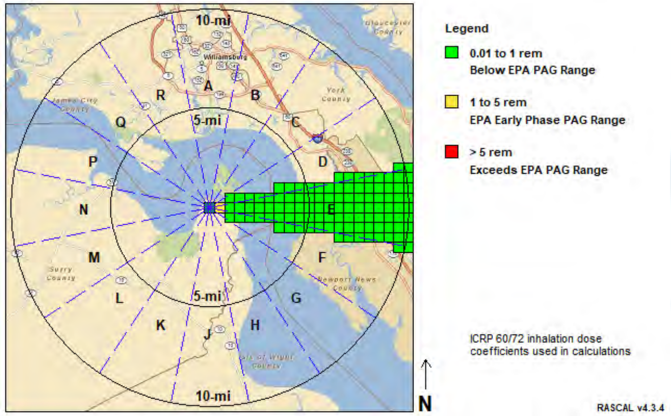
Staffing and operations

Radiological assessment

Re-entry

Critiques and corrective actions

Emergency Classification Level			
Unusual Event	Alert	SAE	GE
Initiating Condition	Initiating Condition	Initiating Condition	Initiating Condition
Emergency Action Level (1)	Emergency Action Level (1)	Emergency Action Level (1) • Operating Mode Applicability • Notes • Basis	Emergency Action Level (1) • Operating Mode Applicability • Notes • Basis



Planning activities ensure readiness

- Prepare and issue public information during emergencies
- Implement the emergency plan in conjunction with the licensee’s safeguards contingency plan
- Voice and data communications with the NRC
- Identify emergency facilities where effective direction and control can be exercised in an emergency
- Site familiarization training for offsite support
- Maintain the emergency plan

Additional Planning activities for EPZ > Site Boundary

Additional planning activities for an EPZ beyond the site boundary:

- Protective actions within the EPZ
- Contacts and arrangements
- Evacuation time estimate within the EPZ
- Primary and backup offsite response facilities
- Making and communicating dose projections
- Periodic emergency planning information for public
- General re-entry plans after an emergency
- Drill and exercise programs with offsite response

1MW nuclear in a box site layout

What can 1MW in a box do?


Power 1,000 homes


Run 2,000 servers

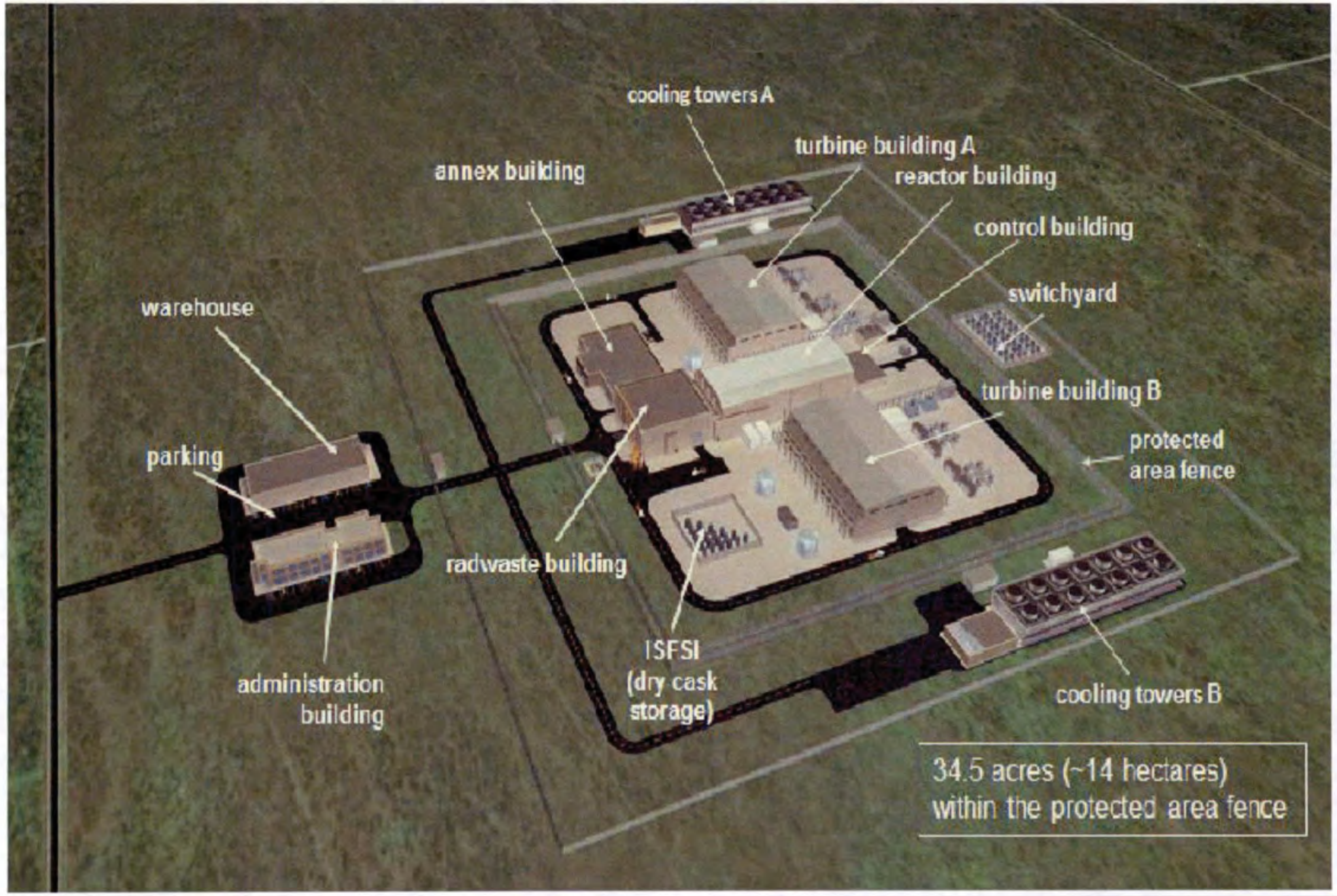

Charge 400 EVs in a day


Power a remote rig drilling 500 ft per day
day


Desalinate 1.8 million gallons of water


Replace 1,200 gallons of diesel per day

Potential SMR/ONT site layout



"The NuScale Design", PM-0616-49510-NP, Revision 0 - NuScale Nonproprietary (ADAMS #ML16161A7234)

Hazard Analysis - Adverse Impact of Contiguous Facilities

Address the impact on emergency plan implementation from:

- contiguous or nearby facilities and other credible hazards
- potential impacts of industrial plants, other reactors, transportation systems, or combination of factors
- site-specific, credible hazards from other facilities that may require additional EP considerations

Ingestion Pathway Planning - Emphasizes Capabilities

- Emphasizes capabilities and readiness to respond
- Identification of major exposure pathways for ingestion
- Identify resources available at all levels of government to sample, assess, and implement a quarantine or embargo of food and water to prevent ingestion

So… what's different?

- Performance objectives are not submitted
- Size of the EPZ is based on risk of individual facility
- Minimum staffing and augmentation times may be/likely will be facility design specific
- Likely much less uniformity
- Licensee is responsible for justification
- No set inspection schedule

Emergency Preparedness is and always will be

- *assurance protective actions can and will be taken*
- *to provide a dose savings*
- *risk-informed*
- *an independent layer of defense in depth*

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