



TVA's Clinch River SMR Project

Emergency Preparedness Approach

December 17, 2014

Protecting public health and safety is TVA's primary consideration in evaluating appropriate EPZ sizing

- A criteria-based, scalable EPZ approach is more appropriate for SMRs
 - It is more objective (dose-limit-based EPZ boundary)
 - Better aligns Emergency Preparedness (EP) resource allocation with safety significance
- Avoids unintended health risks associated with unnecessary large public evacuations



Regulatory Basis and Background Regarding Smaller EPZs for SMRs

- SMRs are expected to have significantly reduced risks of radiological release and offsite consequences:
 - Smaller accident source terms
 - Slower fission product release rates
- SECY-11-0152 (Oct. 28, 2011):
 - NRC to develop a technology-neutral, dose-based, consequence-oriented EP framework for SMR sites
 - NRC concluded an approach using a dose/distance rationale based on EPA PAGs would be appropriate for advanced reactors
- NRC staff said they will not propose new EP policy or revise EP guidance absent a specific proposal from an applicant or industry group (May 30, 2013)

In the Clinch River ESP Application, TVA will provide NRC with a specific proposal by an applicant that enables furtherance of policy and guidance

TVA Approach Tiers From NEI Framework

- NEI Framework:
 - Generic to accommodate multiple designs and sites
 - Establishes dose criteria limits at EPZ boundary to allow scalable sizing
 - Addresses the 16 Planning Standards generically
- TVA approach (two-step; ESPA and COLA):
 - Clinch River Site specific, considering the four current U.S. SMR designs
 - Implements NEI Framework's dose criteria limits
 - In ESPA, proposing two specific EPZ size options: 2-miles and site boundary
 - Reasonable sizes based on preliminary data from SMR vendors
 - Benefits all future EPZ applications (evaluation addresses site boundary and scalable options)
 - Addresses the 16 Planning Standards in each EPZ size option
 - In COLA, confirm the selected SMR vendor's source terms result in a dose below the dose criteria limits at the selected EPZ boundary



TVA's Emergency Planning Approach

Step 1 - ESPA



Step 2 - COLA

“Complete and Integrated” Emergency Plan

i. Commit to dose criteria limit at EPZ boundary

- Design Basis Accidents: < 1 REM Total Effective Dose Equivalent (TEDE)
- Severe Accidents (Beyond Design Basis Accidents):
 - Very low probability that severe accidents cause fission product release
 - High confidence there is > 10 hours duration from accident initiation until release exceeding 1 REM at EPZ
 - < 200 REM acute dose from severe accidents

ii. EPZ size determination in ESPA

- Evaluated preliminary source term information provided by SMR vendors
- Used site atmospheric dispersion characteristics
- Compared with dose criteria limits at distance
- Concluded that criteria may be met at site boundary; 2-miles expected to be bounding

iii. Emergency Plan development in ESPA

- Generate two emergency plans (E-Plans)
 - 2-mile EPZ: Complete and Integrated E-Plan
 - Site Boundary: Onsite E-Plan and offsite “all hazards” plan
- Evaluate all 16 Planning Standards for each case
- Request exemptions as appropriate
- Make commitments to address open items

Confirmation that selected SMR meets dose criteria limit established in ESPA

i. Calculate source term and dose at distance

- Based on a specific SMR design selected
- Using NEI EPZ White Paper methodology
 - Accident scenarios
 - Source term mitigation
 - Severe accidents and multiple units considered
 - Use of PRA to provide risk insights
- Using site atmospheric dispersion characteristics

ii. Final EPZ size selected in COLA based upon:

- If calculated dose is < Dose Criteria at site boundary, then site boundary EPZ established. Implement an onsite emergency plan and an IPZ and coordinate with offsite emergency response organizations on an All Hazards Plan.
- If dose criteria limit reached between site boundary and 2-miles, then a 2-mile EPZ and an IPZ will be established and coordination on an all hazards plan.
- If calculated dose is > dose criteria limit at 2-miles, a new E-Plan submittal is required in COLA for NRC review.

iii. The applicable ESPA E-Plan will be incorporated by reference into the COLA if dose criteria are met



EPZ Dose Criteria Limit Basis

Criteria	Applicability	Description	Reference
<1 REM TEDE	Design Basis Events and More Probable, Less Severe accidents	Inclusive of thyroid dose. 30-day cumulative dose	Protective Action Guidelines (PAGs) (EPA 400-R-92-001) and NEI White Paper
< 200 REM Acute Dose	Severe Accidents	Calculated based on Design Specific implementation of NEI White Paper Methodology	NEI White Paper
Very low probability of an event leading to offsite fission product release. If release occurs, high confidence it will take > 10 hours from accident initiation until dose exceeding PAG limit (1 REM TEDE) at the EPZ boundary	Severe Accidents	Ten hours has been found to be a reasonable time to implement pre-planned mitigation measures and, if necessary, to implement off-site protective actions using an “all hazards” plan approach.	Kewaunee Power Station, Safety Evaluation Report dated October 27, 2014 (page 3)



Preliminary Emergency Planning Approach

- TVA will coordinate with offsite organizations and support development of an offsite Multi-Jurisdictional Emergency Response Plan (MJERP), also known as an “all hazards plan,” regardless of EPZ size
- Exemptions enable a graded application of emergency planning regulations commensurate with reduced risks of SMRs

For Site Boundary EPZ:

- Ensure all applicable guidance from the Planning Standards are incorporated into the onsite E-Plan
- Offsite All Hazards Plan

For 2-mile EPZ:

- TVA expects the majority of the Planning Standards will be largely unchanged from the existing TVA E-Plan for its operating nuclear fleet
- 2-mile offsite and onsite E-Plan

TVA ESPA EPZ Open Items and Closure Timing

Topic to be addressed:	ESPA	DCA	COLA
EALs	Commitment to establish EALs in COLA	Considers accident sequences, hostile action scenarios, etc.	Define triggers for Emergency Classification Levels
On-Shift Staffing	Commitment to develop on-shift staffing in COLA	Develop plant staffing basis	Define On-Shift Staffing with commitment to perform required on-shift staffing analyses
Augmented ERO	Commitment to define augmentation time in COLA	Define accidents and accident progression	Define ERO complement and augmentation time
IPZ	Commitment to address IPZ in COLA (IPZ size varies with EPZ size)	Design details inform IPZ	IPZ size defined

- SMRs offer an opportunity to enhance safety and security in nuclear energy
- Industry is proposing a technology-neutral, dose-based, consequence-oriented approach to emergency planning
- TVA's Two-Step approach provides an opportunity for industry and NRC to advance EPZ policy commensurate with development of design and licensing information
- TVA requests NRC feedback by Spring of 2015 on:
 - Acceptability of NEI/TVA dose criteria to define the EPZ boundary
 - Acceptability of an ESP Application containing two EPZ size options



Acronyms

CEMP = Comprehensive Emergency Management Plan

COLA = Combined construction and Operating License Application

DCA = Design Certification Application

EAL = Emergency Action Levels

EP = Emergency Preparedness

E-Plan = Emergency Plan

EPZ = Emergency Planning Zone

ERO = Emergency Response Organization

ESP = Early Site Permit

ESPA = Early Site Permit Application

IPZ = Ingestion Pathway Zone

NEI = Nuclear Energy Institute

NRC = Nuclear Regulatory Commission

PAG = Protective Action Guidelines

REM = Radiation Equivalent Man (a measure of radiological dose)

SMR = Small Modular Reactor

TEDE = Total Effective Dose Equivalent

TVA = Tennessee Valley Authority



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