



Briefing on Small Modular Reactors

November 5, 2014

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Executive Director for Operations

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Agenda

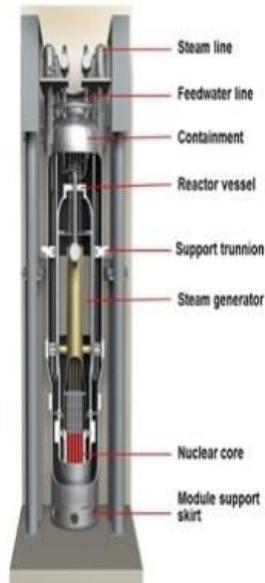
- **SMR Licensing**
- **Guidance**
- **Policy**

Stewart Magruder
Chief, SMR Licensing Branch

Pre-Application Interactions Facilitate More Effective Reviews

- **Meeting frequently with SMR designers on technical topics**
- **Identified licensing, policy, and technical issues**
- **Developing Design Specific Review Standards (DSRSs)**

Engaged in Productive Discussions with SMR Designers

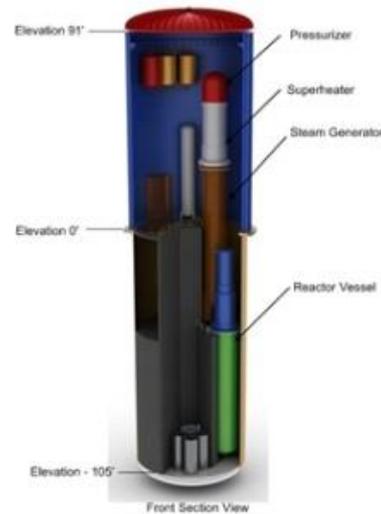


NuScale

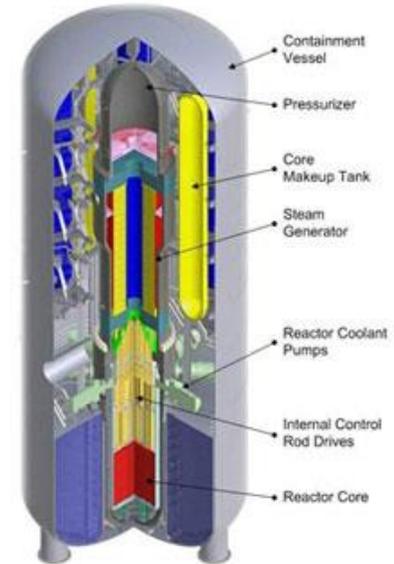


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mPower



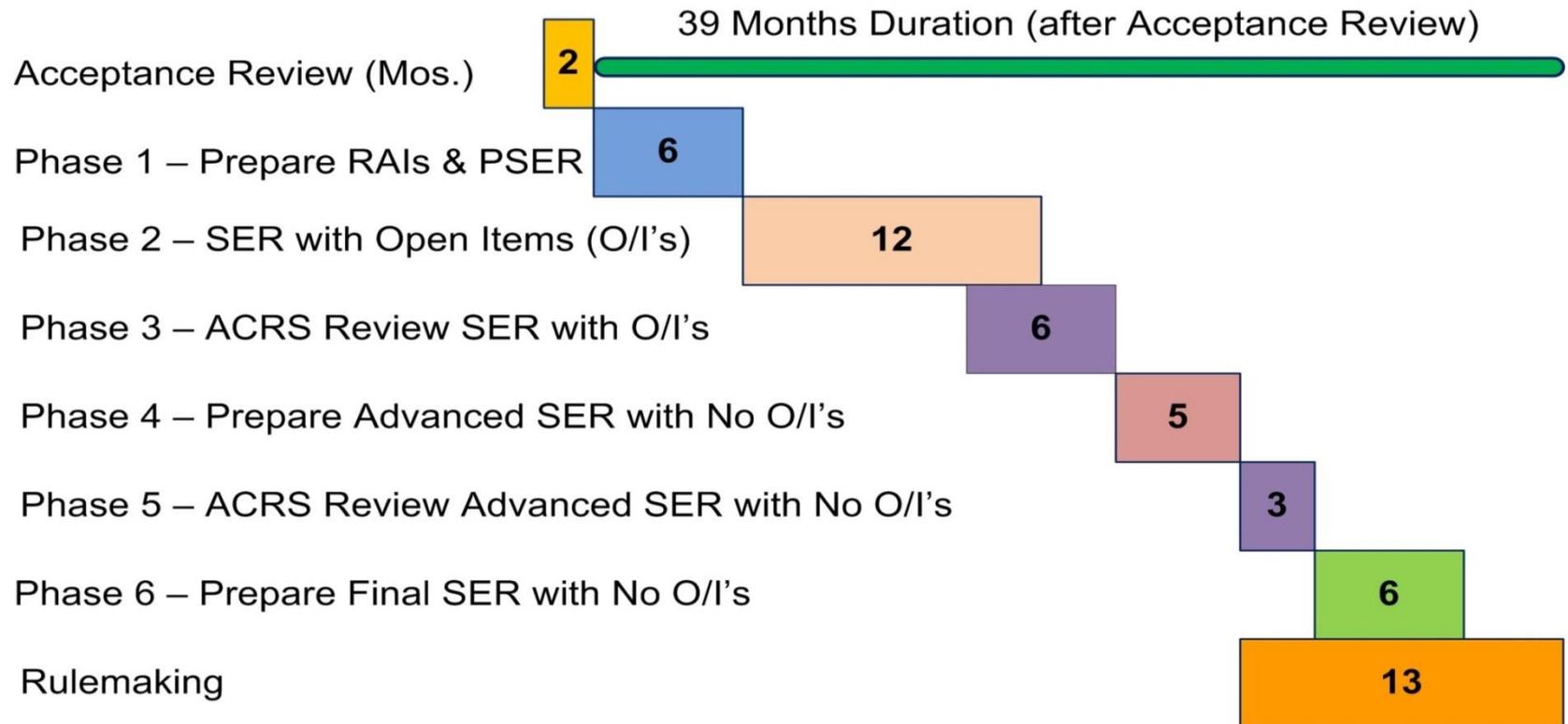
Holtec SMR-160



Westinghouse SMR

Baseline Review, Optimal Scenario

Baseline SMR Design Certification Review Schedule



Optimal Scenario Requires Satisfying Key Assumptions

- 1. Requests for additional information answered in a timely manner**
- 2. DSRS complete before docketing**
- 3. Positions developed on all critical issues**

Additional Key Assumptions

- 4. Safety Evaluation Report with Open Items complete before phase 3**
- 5. Use of Design Acceptance Criteria is minimized**

Actively Observing TVA Early Site Permit Preparations

- **Informative site visits**
- **Effective public meetings**



Diane Jackson at the Clinch River Site

NRC Leading Collaboration with International Partners

- **Established forum for SMR regulators**
- **Goal is to identify and address key regulatory challenges**



Forum Objectives

- **Share regulatory experience among forum members**
- **Document and disseminate the results of discussions**
- **Interact with key stakeholders**

Forum Will Address Important Issues

- **Emergency Planning Zone size**
- **Defense in depth**
- **Grading approaches to reviews**

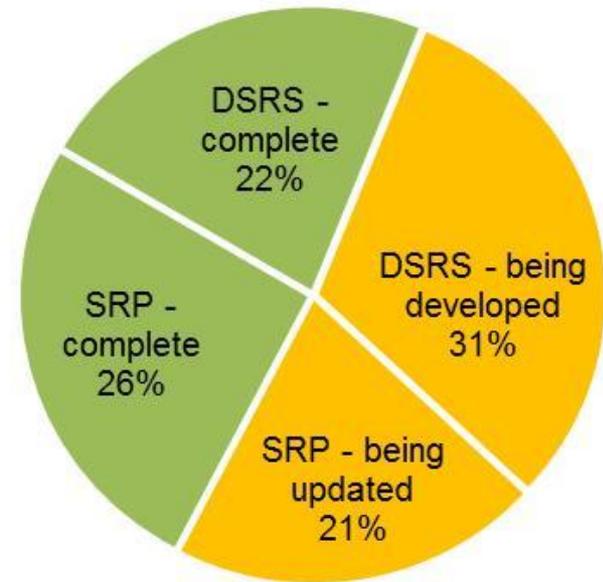
Joseph Colaccino
Chief, New Reactor Rulemaking
and Guidance Branch

Completed Guidance to Support SMR Related Application Reviews

- **mPower Draft DSRS**
- **Introduction to Standard Review Plan (SRP) for SMR reviews**
- **Pre-application readiness assessment guidance**
- **Interim Staff Guidance for light water reactor reviews**

Optimizing Pre-Application Engagement – NuScale DSRS

- **Composition:**
 - **137 DSRS sections**
 - **119 SRP sections**
- **All DSRS and SRP sections complete by end of 2015**



Moving Aggressively to Complete Additional Guidance

- **NuScale DSRS**
- **Staff acceptance review Office
Instruction**

Application Guidance Updated and Expanded

- **Combined license application
Regulatory Guide (RG 1.206)**
 - **Utilizing industry developed standard format
and content**
 - **Providing new guidance for applicants that
use DSRS**
 - **Enhancing guidance on the Final Safety
Analysis Report**

Continued Updates Tied to Submittal Dates

- **Finalize prior to receipt of SMR related application:**
 - **DSRS**
 - **SRP sections referenced by DSRS**
 - **Draft of RG 1.206 for use and comment**

Anna Bradford
Chief, Advanced Reactor and Policy
Branch

Significant Work Has Been Accomplished

SECY-10-0034: Potential Policy, Licensing, and Key Technical Issues for Small Modular Nuclear Reactor Designs

SECY-11-0024: Use of Risk Insights to Enhance the Safety Focus of Small Modular Reactor Reviews

SECY-11-0079: License Structure for Multi-Module Facilities related to Small Modular Nuclear Power Reactors

SECY-11-0098: Operator Staffing for Small or Multi-Module Nuclear Power Plant Facilities

SECY-11-0112: Staff Assessment of Selected Small Modular Reactor Issues Identified in SECY-10-0034

SECY-11-0152: Development of an Emergency Planning and Preparedness Framework for Small Modular Reactors

SECY-11-0156: Feasibility of Including Risk Information in Categorizing Structures, Systems, and Components as Safety-Related or Non-Safety Related

SECY-11-0178: Insurance and Liability Regulatory Requirements for Small Modular Reactor Facilities

SECY-11-0181: Decommissioning Funding Assurance for Small Modular Nuclear Reactors

SECY-11-0184: Security Regulatory Framework for Certifying, Approving, and Licensing Small Modular Nuclear Reactors

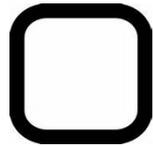
Commission Memo: Current Status of the Source Term and Emergency Preparedness Policy Issues for Small Modular Reactors (5/30/13)

Commission Memo: Update Regarding Recommendations for Use of Risk Insights for Small Modular Reactor Reviews (1/30/14)

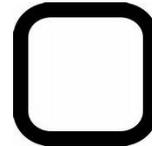
Commission Memo: Status of Mechanistic Source Term Policy Issue for Small Modular Reactors (06/20/14)

SECY-14-0095: Status of the Office of New Reactors Readiness to Review Small Modular Reactor Applications

Progress on Selected Policy Issues



**Mechanistic
Source Term**



**Emergency
Planning Zone**



**Control Room
Staffing**



Security

Mechanistic Source Term (MST) Approaches are Already Being Evaluated

- **SMR designers are interested in using MST approaches**
- **We anticipate more detailed information from industry**
- **May require a policy decision from the Commission**

Emergency Planning Zone (EPZ) Size Will Need Commission Input

- **Staff discussed a “scalable” EPZ approach in SECY-11-0152**
- **NEI submitted a white paper and public meetings have been held**
- **A new SECY paper is being developed**

Guidance Is In Place for Control Room Staffing

- **Applicants may propose different staffing levels than currently required in regulations**
- **NUREG-0711 was updated in November 2012**

Guidance Is In Place for Control Room Staffing (cont'd)

- **The need for a long term approach will be further evaluated**



NuScale Control Room Simulator

Security Can Be Handled Under NRC's Requirements

- **Industry is taking security into account in their designs**
- **SMR vendors may propose new approaches to security**

Security Can Be Handled Under NRC's Requirements (cont'd)

- **The staff has determined that current security requirements are adequate**



B&W Site Schematic

Strategically Planning for Non-Light Water Reactors

- **Issued comprehensive Report to Congress**
- **Implementing proactive joint, two-phase initiative with DOE**
- **Commented on proposed safety design criteria for sodium fast reactors**

Strategically Planning for Non-Light Water Reactors (cont'd)

- **Issued Next Generation Nuclear
Plant assessments**
- **Increasing international
engagement**

Summary

- **Staff has made significant progress and identified policy issues for future Commission consideration**
- **NRC is engaging in strategic international interactions**
- **Our preparations ensure the NRC continues to be ready to review SMR applications when they arrive**

Acronym List

- **ACRS – Advisory Committee on Reactor Safeguards**
- **DAC – Design Acceptance Criteria**
- **DOE – Department of Energy**
- **DSRS – Design Specific Review Standard**
- **EPZ – Emergency Planning Zone**

Acronym List (cont'd)

- **FSAR – Final Safety Analysis Report**
- **INPRO - International Project on Innovative Nuclear Reactors and Fuel Cycles**
- **ISG – Interim Staff Guidance**
- **LWR – Light Water Reactor**
- **MST – Mechanistic Source Term**

Acronym List (cont'd)

- **NEI – Nuclear Energy Institute**
- **NGNP – Next Generation Nuclear Plant**
- **NRO – Office of New Reactors**
- **O/I – Open Items**
- **OI – Office Instruction**
- **PSER – Preliminary Safety Evaluation Report**

Acronym List (cont'd)

- **RAI – Request for Additional Information**
- **RG – Regulatory Guide**
- **SER – Safety Evaluation Report**
- **SMR – Small Modular Reactor**
- **SRP – Standard Review Plan**
- **TVA – Tennessee Valley Authority**

Status of Technical and Policy Issues

| Issue | No Further Action | Path Forward |
|---|---|--------------|
| Prototype Reactors |  | |
| Licensing of Multi-Module Facilities |  | |
| Manufacturing License |  | |
| Defense-In-Depth |  | |
| Key Design Issues |  | |
| Control Room Staffing |  | |
| Operational Programs |  | |
| Installation During Construction |  | |
| Facilities Using Process Heat |  | |

Status of Technical and Policy Issues (cont'd)

| Issue | No Further Action | Path Forward |
|--------------------------------|---|---------------------------------------|
| Security and Safeguards |  | |
| Aircraft Impact |  | |
| Decommissioning Funding |  | |
| Multi-Module Risk | | Revising SRP Ch. 19 |
| Mechanistic Source Term | | Assessing Industry's Proposals |
| Emergency Preparedness | | Developing SECY Paper |
| Annual Fees | | Proceeding with Rulemaking |
| Insurance and Liability | | Future Rulemaking, If Needed |