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Advanced Reactor Stakeholder Public Meeting

April 15, 2021

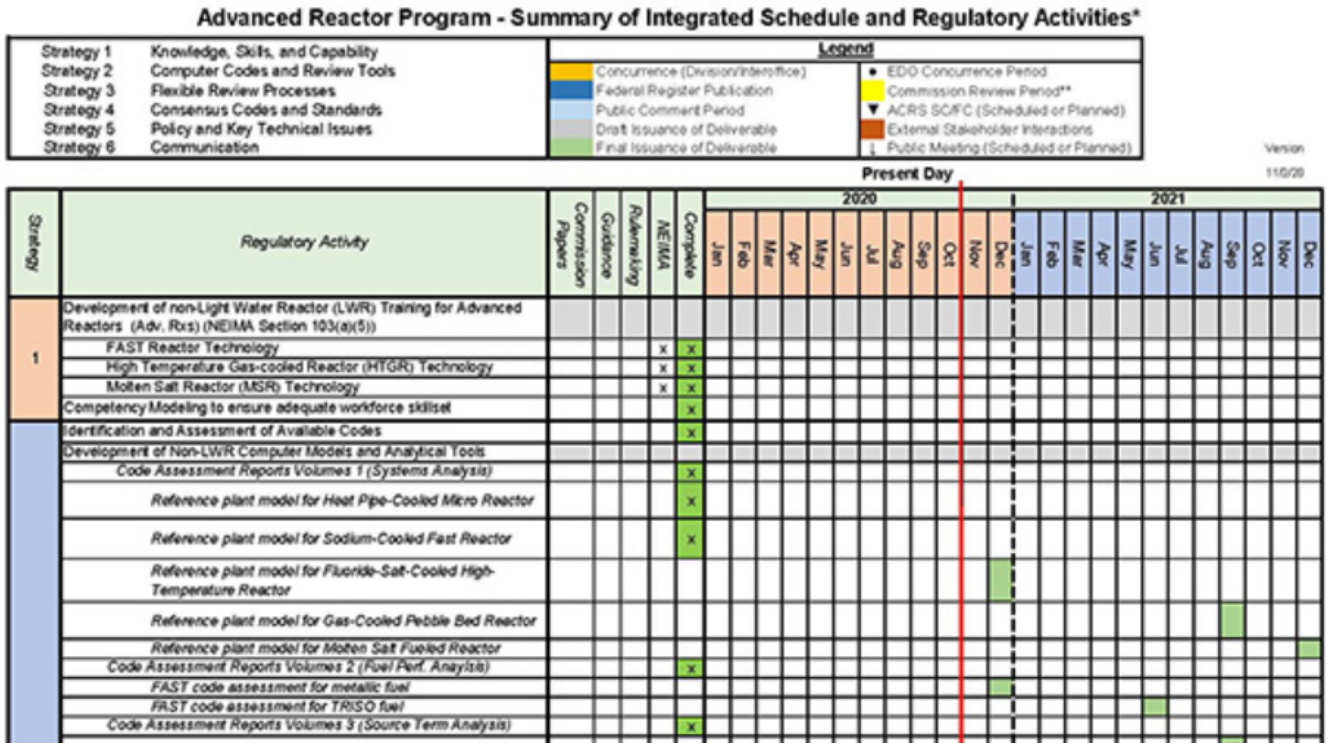
Microsoft Teams Meeting
Bridgeline: 301-576-2978
Conference ID: 107 764 254#

Time	Agenda	Speaker
10:00 – 10:10 am	Opening Remarks	NRC
10:10 – 10:20 am	NRC Advanced Reactor Public Website & Integrated Schedule Walkthrough	NRC
10:20 – 10:45 am	Annual Fees for Advanced Reactors	A. Rossi, OCFO
10:45 – 11:15 am	Status of Environmental Topics (SECY-21-0001, ANR GEIS, Categorical Exclusions)	NRR/NMSS
11:15 – 11:45 am	Site Reuse Deployment Guidance for Advanced Reactors FOA	SODI, Orano, Southern Company, EPRI
11:45 am – 1:00 pm	BREAK	All
1:00 – 3:00 pm	Risk-Informed Seismic Design and Seismic Isolation	RES, Southern Company
3:00 – 3:15 pm	Concluding Remarks and Future Meeting Planning	NRC/All

Advanced Reactor Integrated Schedule of Activities

Advanced Reactor - Summary of Integrated Schedule and Regulatory Activities

Summary of Integrated Schedule and Regulatory Activities (updated 11/02/2020)



https://www.nrc.gov/reactors/new-reactors/advanced.html

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Non-LWR Annual Fees

Anthony Rossi, Team Leader
License Fee Policy Team, OCFO

Annual Fee Alternatives for Non-LWRs including Micro-reactors

- Three alternatives currently under consideration at NRC staff level.
- More alternatives may be developed and/or the three alternatives modified/expanded.
- Based upon anticipated schedule for new facilities, the staff is considering proposing the policy for FY 2023.
- Any fee rule policy changes go through a notice and comment rulemaking.
- The policy and specific fees for non-LWRs, including micro-reactors, would be subject to change based upon implementation experience.
- Planning continued engagement with stakeholders.

NEI Input on NRC Annual Fee Assessment for Non-LWRs - Dated Nov. 23, 2020

- The NRC staff agrees with the following goals from the NEI input:
  - Make the SMR variable fee structure technology-inclusive.
  - Establish equitable fees for micro-reactors that … avoid disproportionate impacts relative to larger power reactors and bundled SMR units.

NEI Input on NRC Annual Fee Assessment for Non-LWRs - Dated Nov. 23, 2020

- Additional considerations relating to the NEI input:
  - The NRC staff is currently considering whether to define micro-reactors for fee purposes as power reactors with a thermal power rating of less than or equal to 20 MWt instead of the NEI proposed 100 MWt.
  - NEIMA requires the NRC to recover, to the maximum extent practicable, approximately 100 percent of its appropriated budget (less the budget authority for excluded activities) through fees for services (10 CFR Part 170) and annual fees (10 CFR Part 171). The NRC must base fees on its annual appropriated budget.
  - NEIMA also requires the schedule of annual fees, to the maximum extent practicable, to be reasonably related to the cost of providing regulatory services. Consistent with NEIMA, the NRC staff is focusing on the cost of providing regulatory services and an equitable allocation of resources, and not licensee annual plant generating costs or gross revenues.

Annual Fee Alternatives for Non-LWRs including Micro-reactors

- The Small Modular Reactor (SMR) variable annual fee structure is currently limited to light water reactors.
- The staff is considering alternatives that would modify the SMR definition to be technology-inclusive.
- The staff is also considering alternatives that would establish an annual fee specific to micro reactors.

Defining Micro-reactors for Fee Purposes

- There is not a consistent established definition for micro-reactors used by various government agencies and industry. However, DOE and INL note on their websites that micro-reactors would generally be able to produce 1-20 MWt.

- NEIMA requires the schedule of annual fees, to the maximum extent practicable, to be reasonably related to the cost of providing regulatory services.

- Without operational experience, the NRC staff currently anticipates that the cost of providing regulatory services for micro reactors may be comparable to the NRC cost for regulating non-power production and utilization facilities (NPUF) of comparable size.

- The largest operating non-power reactor (in the proposed NPUF Fee Class) is the 20 MWt NIST reactor.

- The staff is considering alternatives where power reactors with a rated power level ≤ 20 MWt would be assessed the same annual fee as the proposed NPUF Fee Class.

Annual Fee Alternatives for Non-LWRs including Micro-reactors

- **Alternative 1:**
  - Change the SMR definition to include non-LWRs
  - Micro reactors would pay the minimum SMR fee if the bundled units have a total licensed thermal power rating ≤ 250 MWt
  - The bundled unit concept would apply

- **Alternative 2:**
  - Change the SMR definition to include non-LWRs
  - Include a separate minimum fee in the SMR variable fee structure for power reactors ≤ 20 MWt
  - The bundled unit concept would apply

- **Alternative 3:**
  - Change the SMR definition to include non-LWRs and to exclude power reactors ≤ 20 MWt
  - Add definition of micro-reactors ≤ 20 MWt for the purpose of annual fees
  - Include a set fee for power reactors ≤ 20 MWt
  - The bundled unit concept would not apply to power reactors ≤ 20 MWt

Annual Fee Alternative 1

Micro-reactors would pay the minimum SMR fee and the bundled unit concept would apply.

Bundled Unit Thermal Power Rating	Minimum Fee *	Variable Fee *	Maximum Fee *
First Bundled Unit - cumulative MWt			
0 MWt ≤ 250 MWt	$162.4K (a)	N/A	N/A
>250 MWt ≤ 2,000 MWt	$162.4K (a)	TBD (b)	N/A
>2,000 MWt ≤ 4,500 MWt	N/A	N/A	$4809K (d)
Additional Bundled Units – cumulative MWt (above the first bundled unit of 4,500 MWt)			
0 MWt ≤ 2,000 MWt	N/A	TBD (c)	N/A
>2,000 MWt ≤ 4,500 MWt	N/A	N/A	$4809K (d)

* FY 2021 Proposed Annual Fees used as an Illustration.

a) *Minimum Fee*: Equals the average of the annual fees for Spent Fuel Storage/Reactor Decommissioning (SFS/RD) and Non-Power Production or Utilization Facilities (NPUFs)
b) *Variable Fee*: Equals [(Maximum Fee-Minimum Fee) / 1750] x the difference between 250 MWt for the first bundled unit and the actual cumulative MWt rating upto 2000 MWt
c) *Variable Fee*: Equals [(Maximum Fee-Minimum Fee) / 2000] x the difference between 4500 MWt for the first bundled unit and the total actual cumulative MWt rating upto 2000 MWt
d) *Maximum Fee*: Equals the annual fee paid by the Operating Power Reactor Fee Class

Annual Fee Alternative 2

Power reactors ≤ 20 MWt would pay a lower annual fee and the bundled unit concept would apply.

Bundled Unit Thermal Power Rating	Minimum Fee *	Variable Fee *	Maximum Fee *
First Bundled Unit - cumulative MWt			
0 MWt ≤ 20 MWt	$ 78.7K (e)	N/A	N/A
>20 MWt ≤ 250 MWt	$162.4K (a)	N/A	N/A
>250 MWt ≤ 2,000 MWt	$162.4K (a)	TBD (b)	N/A
>2,000 MWt ≤ 4,500 MWt	N/A	N/A	$4809K (d)
Additional Bundled Units – cumulative MWt (above the first bundled unit of 4,500 MWt)			
0 MWt ≤ 2,000 MWt	N/A	TBD (c)	N/A
>2,000 MWt ≤ 4,500 MWt	N/A	N/A	$4809K (d)

* FY 2021 Proposed Annual Fees used as an Illustration

a) *Minimum Fee*: Equals the average of the annual fees for Spent Fuel Storage/Reactor Decommissioning (SFS/RD) and Non-Power Production or Utilization Facilities (NPUFs)
b) *Variable Fee*: Equals [(Maximum Fee-Minimum Fee) / 1750] x the difference between 250 MWt for the first bundled unit and the actual cumulative MWt rating upto 2000 MWt
c) *Variable Fee*: Equals [(Maximum Fee-Minimum Fee) / 2000] x the difference between 4500 MWt for the first bundled unit and the total actual cumulative MWt rating upto 2000 MWt
d) *Maximum Fee*: Equals the annual fee paid by the Operating Power Reactor Fee Class
e) *Power Reactor ≤ 20 MWt Fee*: Equals annual fee paid by NPUF Fee Class

Annual Fee Alternative 3

- Define micro-reactors, for the purpose of annual fees, as power reactors with thermal power ratings of less than or equal to 20 MWt

- Modify the SMR variable fee structure to be technology inclusive and to begin with **> 20 MWt ≤ 250 MWt**

- Under this alternative, the bundled unit concept applied to small modular reactors would not be applied to micro-reactors
  - The Staff does not currently anticipate multiple micro-reactors to be co-located on one site
  - If the number of micro-reactors per site is large, the Staff is considering whether this alternative would be more fair and equitable.

Thermal Power Rating for Each Unit	Fee for Each Unit *
0 MWt ≤ 20 MWt	$ 78.7K (a)

* FY 2021 Proposed Annual Fees Used as an Illustration

(a) Power reactor ≤ 20 MWt Fee: Equals the annual fee paid by the NPUF Fee Class.

Discussion Topics

- Power level for micro-reactors
- Number of micro-reactors at a single site
- Potential radiological consequences for micro-reactors
- Bundling concept
- Other considerations?

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Status Update on the Proposed Rulemaking to Update and Streamline 10 CFR Part 51

Kenneth Erwin
Branch Chief
Environmental Center of Expertise

Key Messages

- Staff delivered SECY-21-0001, "Rulemaking Plan — Transforming the NRC's Environmental Review Process" to the Commission on December 31, 2020 (https://www.nrc.gov/docs/ML2021/ML20212L389.html).

- The current 10 CFR Part 51 rule is essentially the same rule that the NRC issued in 1984, in response to the CEQ's original NEPA-implementing regulations that were issued in 1978.

- There have been a few, narrowly focused changes to Part 51 since 1984, however, the NRC has not made major changes to Part 51 that concern the process by which the NRC implements its NEPA reviews.

- Staff believes that an update would be beneficial.

Key Messages

- The staff can apply best practices and lessons learned from many past environmental reviews to improve these regulations and future NEPA analyses.

- Substantial public meeting feedback from dozens of public and stakeholder meetings over the past several years, including the monthly Advanced Reactor stakeholder public meetings, supports the assertion in the previous bullet.

- Staff awareness and participation in government wide efforts such as: FAST-41, NEIMA, and the Council for Environmental Quality's July 2020 final rule amending its NEPA implementing regulations, which may be further amended by CEQ due the change of administration, are external drivers to the proposed RM.

- Informed by Advanced Reactor GEIS effort and Part 53 Rulemaking for Advanced Reactors.

Example Of Potential Amendments to Part 51

- Increased discretion for the staff to develop Environmental Assessments, rather than the more resource intensive Environmental Impact Statement currently required for most reactor licensing actions.
- Reduce cost, increase transparency and accountability, and reduce redundancy by combining text from multiple sections of the rule that are repetitive (e.g., there are two sets of definitions in Part 51: 10 CFR 51.4 and 51.14).
- Clarification of text that can be interpreted in contradictory ways.
- Revise Tables S-3 and S-4 in Part 51, which were developed for large light water reactors and may not be applicable for new designs, especially those that use different types of fuels than in the past.

Anticipated Part 51 Rulemaking Schedule

- Receipt of an SRM from the Commission authorizing staff to perform a rulemaking to update and streamline 10 CFR Part 51, with the rulemaking activity added to the agency's list of funded rules.
- Deliver regulatory basis: 12 months after the Commission issues its Staff Requirements Memorandum.
- Deliver proposed rule to the Commission: 12 months after the completion of the regulatory basis comment period.
- Deliver final rule to the Commission: 12 months after the proposed rule comment period closes.

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Status on Rulemaking to Amend Categorical Exclusions

Nancy Martinez

Environmental Center of Expertise

Background

- Categorical exclusions (CATEXs) are a category of actions that do not individually or cumulatively have a significant effect on the human environment.
- CATEXs are listed in 10 CFR 51.22.
- In SECY-20-0065, staff recommended rulemaking to establish new and amend existing CATEXs.

Status of CATEX ANPR

- SRM-SECY-20-0065 directed the staff to initiate rulemaking to amend CATEXs in 10 CFR 51.22.
- The NRC will issue an Advance Notice of Proposed Rulemaking (ANPR) seeking public comment to inform the development of the proposed rule.

Scope of CATEX ANPR

- The ANPR will identify potential modifications the NRC is considering:
  - Amending existing CATEXs
  - Adding new categories
- The ANPR will be published in the *Federal Register* to obtain stakeholder input.
  - Public meeting
  - 75-day comment period

Estimated Rulemaking Schedule

- ANPR Publication: 2021
- Deliver proposed rule to the Commission: 12 months after the ANPR comment period closes.
- Deliver final rule to the Commission: 12 months after the proposed rule comment period closes.

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Status Update on the Advanced Reactor Generic Environmental Impact Statement and Rulemaking

Jack Cushing and Laura Willingham
Environmental Project Managers
Environmental Center of Expertise
U.S. Nuclear Regulatory Commission

Key Messages

- The ANR GEIS uses a technology neutral approach. Any advanced reactor can use the ANR GEIS (LWRs, Non-LWRs, SMRs, fusion reactors) provided the reactor and site meet the plant and site envelope values and assumptions used in the GEIS and there is no significant new information.

- The ANR GEIS evaluates: construction, operation, decommissioning, fuel cycle, transportation of fuel, continued storage, postulated accidents, SAMA, rad health, greenhouse gas emissions, land use, ecology, water use, air quality, socioeconomics, noise, and visual impacts.

- Approximately 80% of the environmental issues are generic ("category 1"); 20% are site specific ("category 2").

- Most environmental issues are decoupled from reactor power level.

Status of ANR GEIS

- In September 2020, the Commission directed the staff to conduct rulemaking to codify the results of the ANR GEIS (SRM-SECY-20-0020, ADAMS Accession No. ML20265A112).
- Scoping Summary Report issued on September 25, 2020 (ADAMS Accession No. ML20260H180).
- Staff is finalizing writing sections of the draft ANR GEIS.
- Staff will next develop proposed rule language, regulatory analysis and related rulemaking documents and propose revisions to guidance documents.

Scoping Summary Report

- ANR GEIS will use a technology neutral, performance-based plant parameter envelope (PPE) and site parameter envelope (SPE) approach that is inclusive of as many advanced reactor technologies as possible.
- Power level will not be used in most resource areas.
  - Reactor of any size can use the ANR GEIS provided that it is bounded by the parameter values and assumptions.
  - Parameter values and assumptions may limit size of reactor depending on site location.
- Reactor applications can reference an individual environmental issue when it meets the parameter values and assumptions for that issue and would evaluate in a site-specific analysis those environmental issues whose parameter values and assumptions it does not meet
- Goal is to develop an effective GEIS to disposition generically as many issues as practicable.

Examples of Resources with Category 1 Environmental Issues

- Land use
- Visual
- Air quality
- Greenhouse gases
- Most water resources issues
- Most terrestrial resource issues
- Most aquatic resource issues
- Radiological and non-radiological issues
- Fuel cycle
- Decommissioning
- Socioeconomics

Examples of Category 2 Environmental Issues

- Endangered species
- Cultural and historic resources
- Environmental justice
- Chemical and thermal discharges to surface water
- Cumulative impacts
- Climate change
- Purpose and need statement
- Need for power or project
- Alternative sites
- Alternative energy sources

Rulemaking Schedule

- November 2021 – Proposed rule submitted to Commission
- May 2022 – Proposed rule publication for 60-day comment period (estimated)
- May 2023 – Final rule submitted to Commission (estimated)
- January 2024 – Final rule publication (estimated)

Questions?

FOA 1817 Generic Design Support Activities for Advanced Reactors:

Site Reuse Deployment Guidance Project

DOE Award No. DE-NE0008934

Presentation To NRC Stakeholders

April 15, 2021

SODI
SOUTHERN OHIO
DIVERSIFICATION INITIATIVE

Agenda

- Project Purpose
- Project Overview
- Portsmouth Gaseous Diffusion Site
- Period of Performance
- Project Team
- Public Outreach
- Key Deliverables
- Early Site Permit (ESP)
- Project Status
- Value Proposition
- Additional Information Contacts

Project Purpose

Evaluate and document the challenges and benefits of reuse of an existing nuclear facility undergoing decommissioning for siting and construction of an advanced reactor (AR):

- using the former Portsmouth Gaseous Diffusion Plant as a case study
- in the context of developing guidance for an Early Site Permit
- leveraging lessons-learned and products from the initial U.S. public-private efforts on new plant licensing
- providing lessons-learned for D&D technologies in reuse of existing DOE facilities

Project does not provide means to circumvent formal decision processes for determining use of Portsmouth Gaseous Diffusion Site (PGDS), but uses PGDS as example in newly revised advanced reactor permitting and licensing documentation

Project Overview

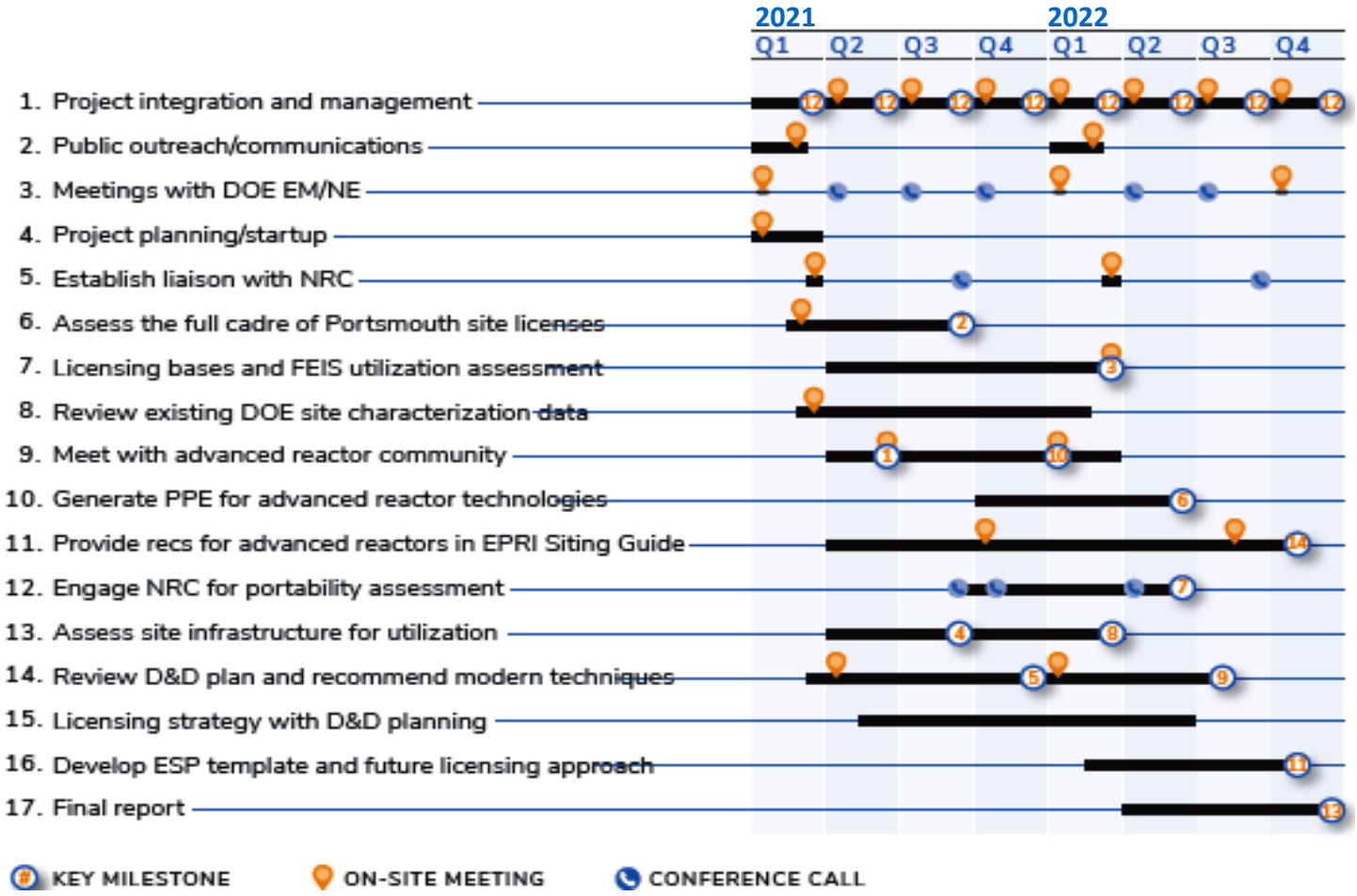
- Evaluate the potential for and value of leveraging legacy nuclear facilities for siting and construction of a new nuclear plant in terms of:
  - Existing characterization data and licenses/permits
  - Existing structures, infrastructure, and materials
  - Planned or ongoing decontamination and decommissioning (D&D) activities
- Develop an Early Site Permit (ESP) application template for guidance with advanced reactors
  - Not a complete ESP application
  - Engage with the NRC and industry to ensure applicable for advanced reactors
- Evaluate the reuse of the Portsmouth Site for future deployment of advanced reactors
  - Develop a Plant Parameter Envelope (PPE) for use at the DOE Portsmouth Site for advanced reactors (per NEI 10-01)
- Update EPRI Siting Guide with a focus on advanced reactors and site reuse
- Quantify potential savings to the U.S. Department of Energy's (DOE) Office of Environmental Management (EM) via reuse of the Portsmouth Site

Portsmouth Gaseous Diffusion Site

- 3700 acre reservation near Piketon, OH
  - 1200 acre centrally developed area
  - 750 acre controlled access area
- Nuclear facility licensing includes:
  - Former NRC Certificate of Operation for the gaseous diffusion plant
  - Two NRC licenses for centrifuge facilities
- Existing site infrastructure includes:
  - Existing wells / water treatment / distribution systems
  - Existing sewage treatment facility
  - Existing fire station / emergency response
  - Dry air plant / nitrogen plant
  - Power to the site
  - Rail access / spur / on-site track
  - Administration/office buildings

Period of Performance

- Period of Performance is December 30, 2020 to December 29, 2022



Project Team

SODI
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EPRI | ELECTRIC POWER RESEARCH INSTITUTE

Southern Company

orano
Giving nuclear energy its full value
Orano Federal Services, LLC

INL
Idaho National Laboratory

orano
Giving nuclear energy its full value
Orano Decommissioning Services

Public Outreach

- Due to COVID-19 restrictions, virtual meetings will occur throughout most of 2021 instead of face-to-face meetings; will re-access as restrictions ease *but virtual outreach seems to increase participation*
- Meetings
  - Quarterly Project Reviews with DOE LE-5 Project Team
  - Quarterly EM/NE DOE stakeholder progress meetings
  - Quarterly NRC stakeholder progress meetings
  - Biannual meetings with Advanced Reactor Community stakeholders via NEI Advanced Reactor Forum
  - Portsmouth Gaseous Diffusion Site Open Visits by Advanced Reactor Stakeholders & Developers
  - Periodic drop-in meetings with NRC point of contact
- Other meetings as parties identify interest and/or need
  - Routine update meetings with Portsmouth Gaseous Diffusion Site management
  - SODI Board of Directors
  - Portsmouth Gaseous Diffusion Site Specific Advisory Board
  - Fluor-BWXT Portsmouth

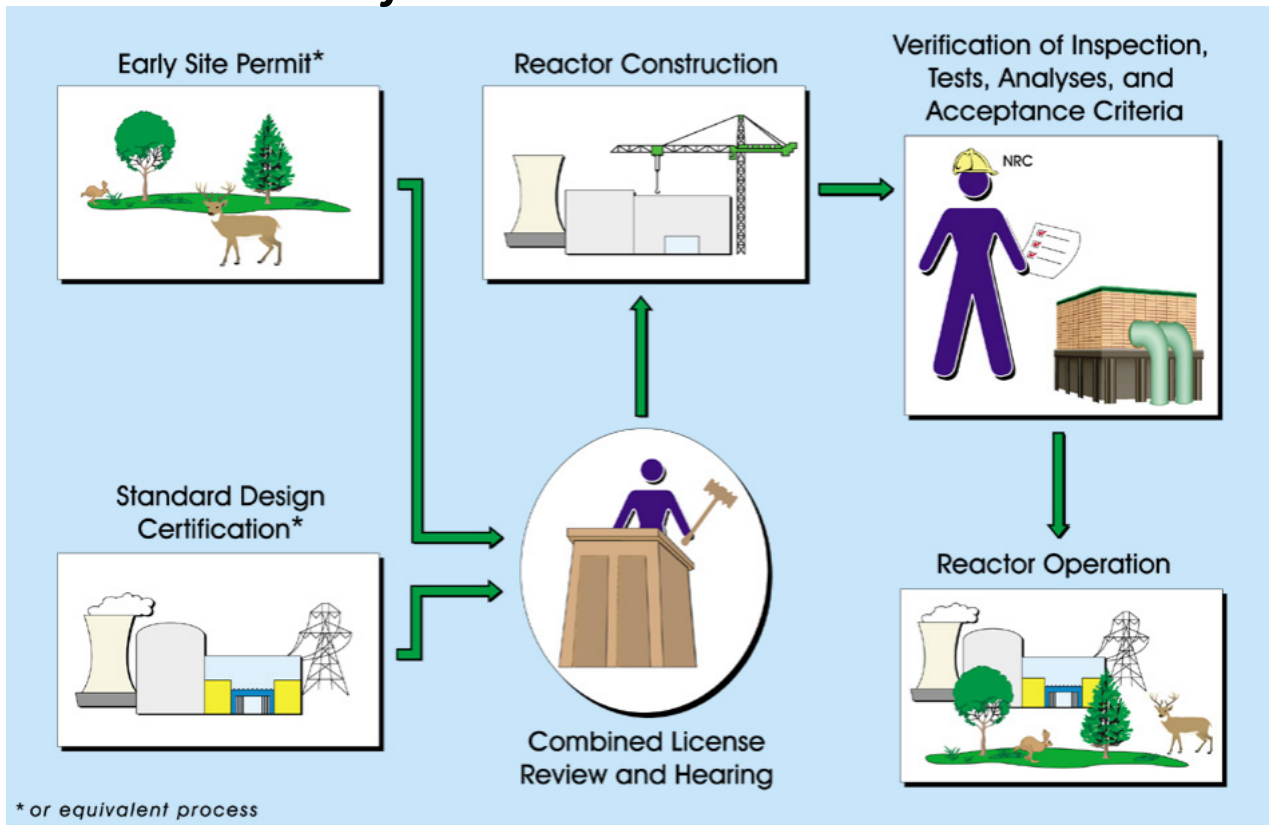
Key Deliverables

- Development of PPE based on review of NEI 10-01
- Infrastructure utilization assessment paper
- D&D for potential advanced reactor placement paper
- ESP application template for site reuse
- Revisions to the EPRI Siting Guide
- Final project report
- Above using Portsmouth Gaseous Diffusion Site as proxy example

Early Site Permit (ESP)

- Approval by the U.S. NRC of one or more sites for a nuclear power facility that is:
  - independent of an application for a construction permit or combined license
  - valid for 10 to 20 years from the date of issuance
  - renewable for an additional 10 to 20 years
- Six ESPs issued to date, including the TVA Clinch River Nuclear Site (2019) and the PSEG Site (2015)
- **Applicable to Part 50 or Part 52 licensing**

Role of the ESP in the Part 52 Process



Source: USNRC, 2006

Project Status

- Recipient Agreement acceptance completed
- Subrecipient agreement generation & acceptance completed
- Project Kickoff Meetings completed
- Project Startup activities completed
- Subcontract agreement generation completed & acceptance in process
- Collection of stakeholder contacts
- Team is planning 3rd and 4th quarter outreach/stakeholder meetings
  - Five outreach/stakeholder meetings already occurred or planned in April (virtual)
- PGDS information collection
- Meeting with PGDS SMEs for site background information
- Project Team Face-to-Face Work Sessions occurred early April (virtual)
- Start of deliverable pathways:
  - Assessment of PGDS site licenses, characterization data & Final Environmental Impact Statement (FEIS)
  - PGDS infrastructure reutilization assessment
  - Review of PGDS D&D plans , strategy and Record of Decision

Value Proposition

- For DOE-EM: Options for site infrastructure reuse could reduce cost and schedule for decommissioning of legacy DOE nuclear facilities
- For DOE-NE: All activities support efforts involved in identifying, characterizing, and licensing sites for near-term deployment of advanced reactor demonstrations and first-commercial units
- For NRC: Regulatory engagement supports NRC development and application of modern licensing framework for advanced reactors
- For Advanced Reactor Community: Review and updating of foundational work from DOE's NP 2010, industry's ALWR Program, NRC's Part 52 rollout, NGNP siting studies, etc.

Thank You !

For additional information contact

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Break

Meeting will resume at 1pm EST

Microsoft Teams Meeting
Bridgeline: 301-576-2978
Conference ID: 107 764 254#

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Non-Light Water Reactors Stakeholders Meeting Seismic Engineering Research Updates

Office of Nuclear Regulatory Research
April 15, 2021

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Topics

- Update on Activities for Risk-Informed Performance-Based Approach to Seismic Design
- Update on Adopting Seismic Isolation Technologies

Team Contributors

- SwRI

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Objectives

- Provide an alternative RIPB seismic design approach for advanced reactors
  - Technology inclusive
  - Leads to more balanced and uniform design with both safety and cost benefits while using a clearer approach to deciding “how safe is safe enough” for seismic design
  - Allows seismic design to be tailored to the role in achieving safety of each individual SSC
  - Design Flexibilities
- Work within LMP framework and consensus codes and standards

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Activity Update

- Phase 1: Completed
  - Developed an RIPB seismic design approach that integrates performance-based design with LMP RIPB framework
  - Held a 2-day public workshop September 2-3, 2020 ML20241A150, ML20241A151, ML20241A152
  - Updated Interim Phase 1 Report, “A proposed alternative risk-informed and performance-based regulatory framework for seismic safety for nuclear power plants.” SwRI report ML20106F035
  - Completed review of performance-based ASCE standards: ASCE 4-16 and draft ASCE 43-18 (now published as ASCE 43-19) documented in BNL Report “Evaluation of ASCE 4-16 and ASCE 43-18 (Draft) for use in the risk-informed performance-based seismic design of nuclear power plant structures, systems, and components.” ML21007A179

Activity Update (cont'd)

- Phase 2: On-going
  - Identify and propose changes to Part 53 requirements and regulatory guidance pertinent to seismic safety
    - A basic principle is that the seismic requirements must be technology inclusive and can be applied in a manner that accounts for the role in achieving safety of the seismic design for each SSC
    - Proposed seismic requirements will need to be applicable to a variety of different designs involving diverse fuel types, fuel configurations, power levels, and risk profiles. Therefore, the regulatory requirements will be worded such that they are generic and can be implemented for all advanced reactor designs
    - Rationale to support proposed changes will be explained.
    - Develop a new Regulatory Guide to provide one approach acceptable to the NRC for using the alternative seismic safety design approach

Examples of Proposed Requirements with Technical Rationale

Design Basis Earthquake Ground Motion -1		
Current Requirement	Proposed Language	Reasons for Change
The Safe Shutdown Earthquake Ground Motion for the site is characterized by both horizontal and vertical free-field ground motion response spectra at the free ground surface.	The Design Basis Ground Motion(s) is (are) characterized by Design Response Spectra (DRS) for SSCs taking into consideration their safety functions and design performance	The concept of safe shutdown, as currently defined, is not universally applicable for all potential designs Under the RIPB/LMP Seismic Design Framework approach described in the Chokshi et al., (2020), multiple DRS(s) are possible in contrast to a single safe shutdown earthquake (SSE)

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Examples of Proposed Requirements with Technical Rationale (cont'd)

Design Basis Earthquake Ground Motion -2		
Current Requirement	Proposed Language	Reasons for Change
Structures, systems, and components required to withstand the effects of the SSE ground motion or surface deformation are those necessary to assure: (1) The integrity of the reactor coolant pressure boundary; (2) The capability to shut down the reactor and maintain; or (3) The capability to prevent or mitigate the consequences of accidents	*Structures, systems, and components required to withstand the effects of the DRS or surface deformation* are those required to meet the functional design criteria in accordance with § 53.410, 53.420, and 53.460.	The proposed language is more generic and technology inclusive. It is consistent with the safety functions described in the proposed Part 53.

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Examples of Proposed Requirements with Technical Rationale (cont'd)

Minimum Ground Motion Requirements		
Current Requirement	Proposed Language	Reasons for Change
The horizontal component of the Safe Shutdown Earthquake Ground Motion in the free-field at the foundation level of the structures must be an appropriate response spectrum with a peak ground acceleration of at least 0.1g.	The horizontal component of the DRS(s) in the free-field at the foundation level of the structures must be an appropriate response spectrum that is determined based on the risk-significance of SSCs and their safety functions.	With more than one DRS, the use of 0.1 g will be overly restrictive. ASCE 43 allows for consideration of the minimum requirements for each of the seismic design categories (SDCs).

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Outline of the Proposed Regulatory Guide to Implement RIPB Seismic Design Alternative

- A process-oriented guide with technical details, as necessary.
- Two main focus areas:
  1. A generic process acceptable to the NRC to determine different SDC categories and design limit states for SSCs considering their risk significance and other factors
  2. Process acceptable to the NRC to complete the final seismic design using this new guidance along with current guidance and available codes and standards.
- Two Appendices:
  1. An example to illustrate basic steps and concepts in the process to determine SDC categories and limit states using ASCE 43 standard
  2. Staff positions on ASCE 43, 4, and other standards, as necessary, to execute the design

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Schedules

- Part 53 inputs will follow established rulemaking schedule
- Draft Regulatory guide (RG) will be completed in 2023
- Publish RG in 2024

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Topics

- Update on Activities for Risk-Informed Performance-Based Approach to Seismic Design
- Update on Adopting Seismic Isolation Technologies

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Objectives

- Provide a pathway for applicants to use the seismic isolation (SI) technologies in support of its deployment for advanced reactors
- SI technologies may potentially achieve:
  - SI technology deployment could be a desirable option for some standard designs of advanced reactors
  - Could provide a better management strategy for seismic risk in certain situations
  - Potential savings on capital cost and construction time under certain conditions
  - Could lead to a shortened review process
- DOE sponsored Southern project “Topical Report: Guidelines for Implementing Seismic Base Isolation in Advanced Nuclear Reactors to Reduce Risk and Overnight Capital Cost”

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Approach

- Develop new regulatory guide (RG) focusing on important SI characteristics:
  - Materials
  - Design/analysis
  - Testing
  - Inspection and maintenance
  - Aging management
  - Risk assessment in LMP framework
- Work with stakeholders to achieve technical alignment and identify an efficient way forward

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Activity Update

- Research products:
  - NUREG/CR-7253 " Technical Considerations for Seismic Isolation of Nuclear Facilities," February 2019
  - NUREG/CR-7254 "Seismic Isolation of Nuclear Power Plants Using Sliding Bearings," May 2019
  - NUREG/CR-7255 "Seismic Isolation of Nuclear Power Plants Using Elastomeric Bearings," February 2019
- National consensus standards ASCE 4-16 and ASCE 43-19 provide design and analysis provisions for seismic isolation systems

Activity Update (cont'd)

- Using research products and leveraging ASCE 4-16 and ASCE 43-19 provisions to identify key attributes and to develop corresponding performance criteria
- Interact with stakeholders and incorporate insights from NRR review of Southern Topical Report (future activity)

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Southern Company

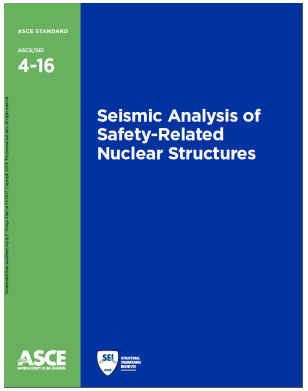
NRC Periodic Advanced Reactor Stakeholder Meeting

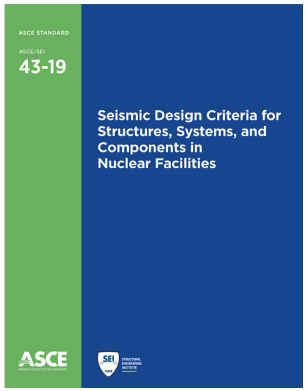
Guidelines for implementing seismic isolation in advanced nuclear reactors to reduce risk and overnight capital cost

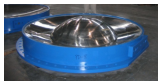
April 15, 2021

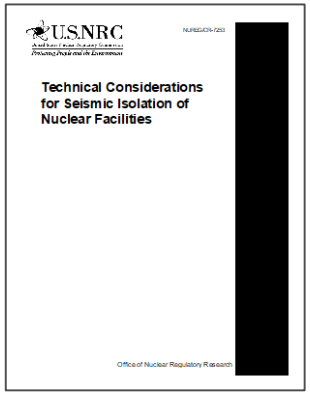
In a nutshell (1)

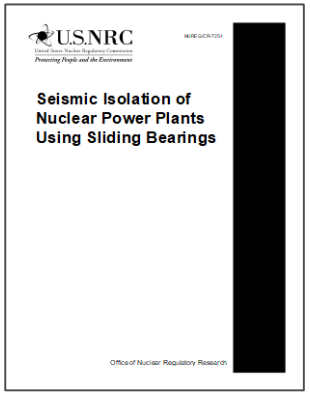
- Project participants
  - Southern Nuclear Development
  - Kairos Power
  - University at Buffalo
  - Idaho National Laboratory
  - Technical advisory board
- Inputs
  - Prior work products funded by USNRC and DOE
  - ASCE Standards
  - LMP thinking

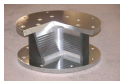


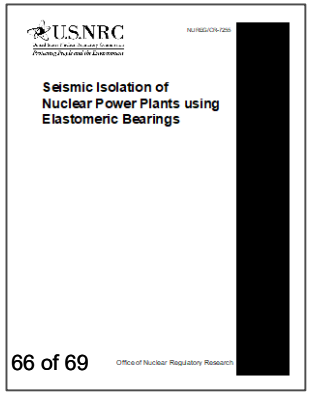


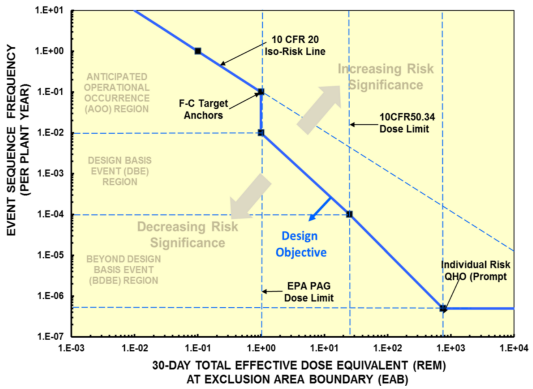






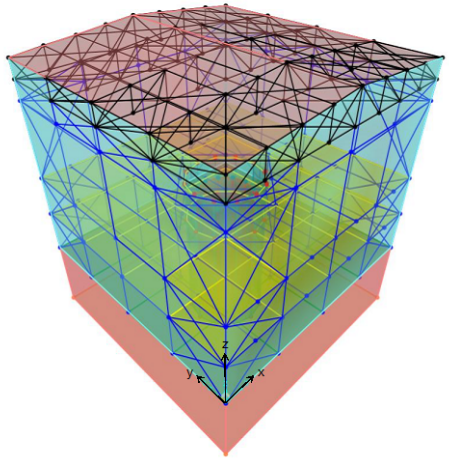


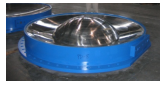


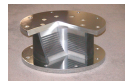


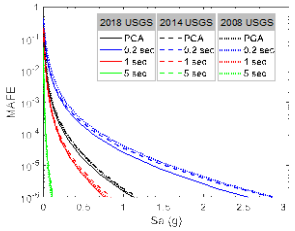
In a nutshell (2)

- Audience
  - Heat source developers
  - Commercial customers
  - Engineering consultants
  - Regulators in the US and abroad
- Key engagements
  - USNRC staff and consultants (SWRI team)
- Tasks
  - Generic advanced reactor
    - » Building and safety-related equipment
    - » Analysis and design
      - ASCE and ASME standards, LMP
    - » Fragility calculations, SPRA
  - Sample siting across range of seismic hazard
    - » Clinch River, Idaho National Laboratory, Hanford Site, Diablo Canyon
  - Specifications for supply and testing of isolators and dampers
  - Plans for CGD of isolators and dampers, maintenance, operation
  - Prepare a topical report for regulatory review









In a nutshell (3)

- Timeline

Task	Description	Month 1	2	3	4	5	6	7	8	9	10	11	12
1	Form TAB and engage with NRC												
2	Kick-off meeting, risk targets, schedule by month												
3	Generate design response spectra and ground motions												
4	Define advanced reactor building, Cat 1 equipment												
5	Design building superstructure, isolation systems, etc.												
6	Accident sequences for Cat 1 equipment, building framing, isolation system												
7	Develop plan for prototype and production testing												
8	Technology neutral specifications for seismic isolators												
9	Plan for CGD of isolator types, isolation system maintenance												
10	Prepare and submit a topical report												

- Planned outcomes
  - Standardized advanced reactors for deployment at scale
  - Guidelines to enable licensing seismic isolation for advanced reactors
    - » Analysis procedures for isolated reactor buildings
    - » Design of isolation systems and substructures
    - » Requirements for prototype and production testing
    - » Specifications for supply of isolators and dampers
    - » Plan for CGD of isolators and dampers
    - » Requirements for maintenance
  - Move seismic isolation to TRL 6 or 7
  - Support on-going Reg. Guide development on seismic isolation
  - Positive review of topical report by the USNRC

1	Basic principles observed	Research
2	Application formulated	
3	Analytical or experimental proof of concept	
4	Component validation in a laboratory environment	Development
5	Component validation in a relevant environment	
6	Prototype demonstration in a relevant environment	Demonstration
7	Full-scale demonstration in a relevant environment	Commissioning
8	Actual system completed and qualified through testing and demonstration	
9	Actual system operated over full range of expected conditions	Operation

Future Meeting Planning

2021 Upcoming Advanced Reactor Meetings (Tentative)
April 22, 2021 (Part 53 ACRS Subcommittee)
May 5, 2021 (Part 53 ACRS Full Committee)
May 6, 2021 (Part 53 Public Workshop)
May 11, May 19, May 26, 2021 (TICAP Workshops #1-3)
May 20, 2021 (Part 53 ACRS Subcommittee)
May 27, 2021 (Periodic Stakeholder Meeting)

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