U.S. DEPARTMENT OF ENERGY | Office of NUCLEAR ENERGY

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DOE Microreactor Program

Microreactor Regulatory Development

GAIN-EPRI-NEI Virtual Microreactor Workshop

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Regulatory Development Program Introduction

<u>Regulatory Development Mission:</u> Address and resolve key regulatory framework and licensing technical issues that directly impact the "critical path" to advanced reactor (including microreactor) demonstration and deployment

To achieve this mission, Regulatory Development activities focus on establishing each of the four key parts of the regulatory framework:

- Addressing unresolved and high impact Nuclear Regulatory Commission policy issues
- Developing adaptations of LWR-based regulations & regulatory guidance
- Performing R&D necessary to establish licensing technical requirements
- Establishing clear expectations for license application content and review criteria

Continuing to Improve Regulatory Certainty

- Varying degrees of technical challenges are being addressed by multiple industry, DOE, and NRC programs
  - Increasing Congressional support – NEIMA & NEILA
  - Establishing licensing technical requirements
- Creating a smooth path to deployment will take time
  - First movers will face some “potholes of uncertainty”…how severe will they be??

Connections to other R&D programs, NRC, Industry

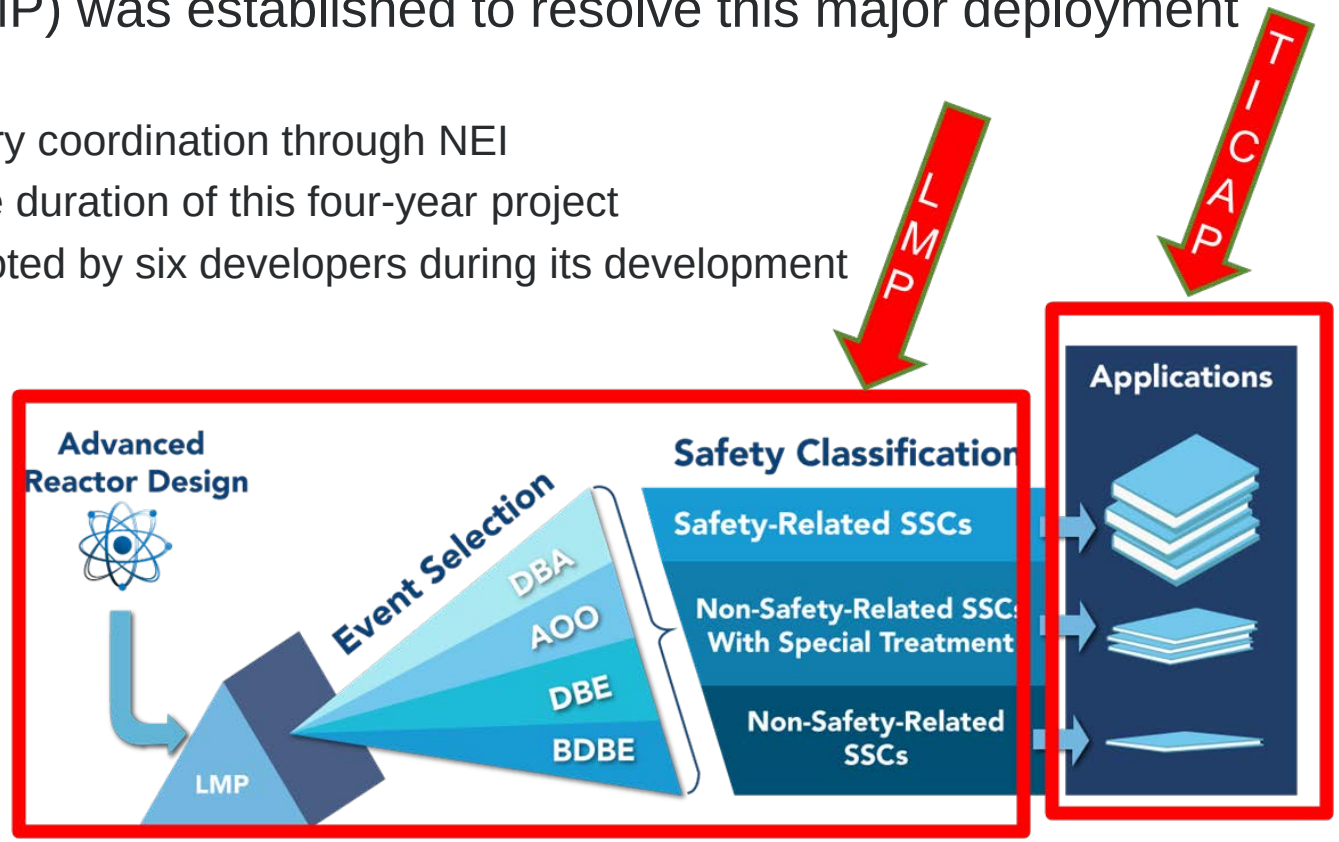
- **NRC Interactions**
  - Program NTDs interface with NRC technical area managers
  - NRC Near-Term Implementation Action Plan for Advanced Non-LWRs
- **Coordination with industry groups**
  - EPRI
  - Fast Reactor Technology Working Group
  - Gas Cooled Reactor Technology Working Group
  - Molten Salt Reactor Technology Working Group
- **Insights & engagement by future owner/operators & utilities**
- **Insights from DOE Authorization Projects (VTR, TCR)**
- **Insights from GAIN Initiative, NRIC, and associated interactions**
- **Engagement with Non-Government Organizations (NGOs)**
  - NEI Microreactor Working Group participation
  - NEI Advanced Reactor Working Group participation
  - NEI Advanced Reactor Regulatory Task Force participation
  - US Nuclear Industry Council

FY21 Objectives and Priorities

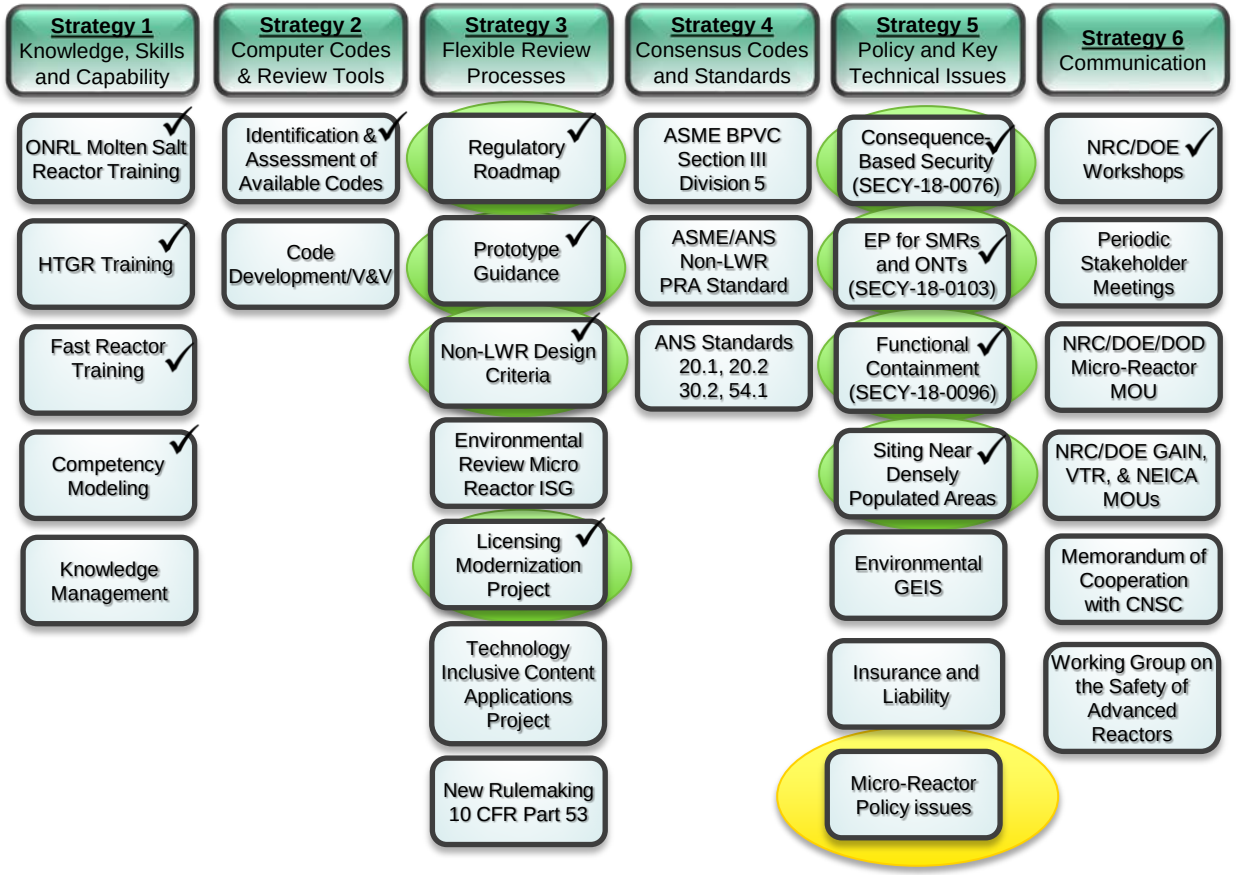
- Working closely with industry stakeholders and NRC, apply DOE's national laboratory resources to address/resolve key areas of regulatory uncertainty
- Priority is on what can be "resolved" in next 1-3 years to facilitate 2026-2028 deployments – address showstoppers vs. enhancements
- DOE strategic goals (in conjunction with industry) target deployments in the 2025-2028 timeframe
- FY21 scope is generally stakeholder and technology-inclusive, but will need to be closely coordinated with the NRC license application plans/schedules associated with pending microreactor plans

Commission Policy Issue Resolution Example: Licensing Modernization Program

- The previously unresolved Commission policy regarding accident identification for advanced non-LWRs was the largest source of regulatory uncertainty for reactor developers since the late 1980's
- The Licensing Modernization Program (LMP) was established to resolve this major deployment restraint
  - LMP was utility-led (Southern) with close industry coordination through NEI
  - DOE provided direct cost-shared support for the duration of this four-year project
  - The industry-proposed policy resolution was piloted by six developers during its development
  - NRC engagement was provided "off-fee"
- NRC formally resolved this issue via Reg. Guide 1.233 in June 2020
- Program now progresses to the "Technology-Inclusive Content of Applications Project" (TICAP)
- Applicable to Microreactors



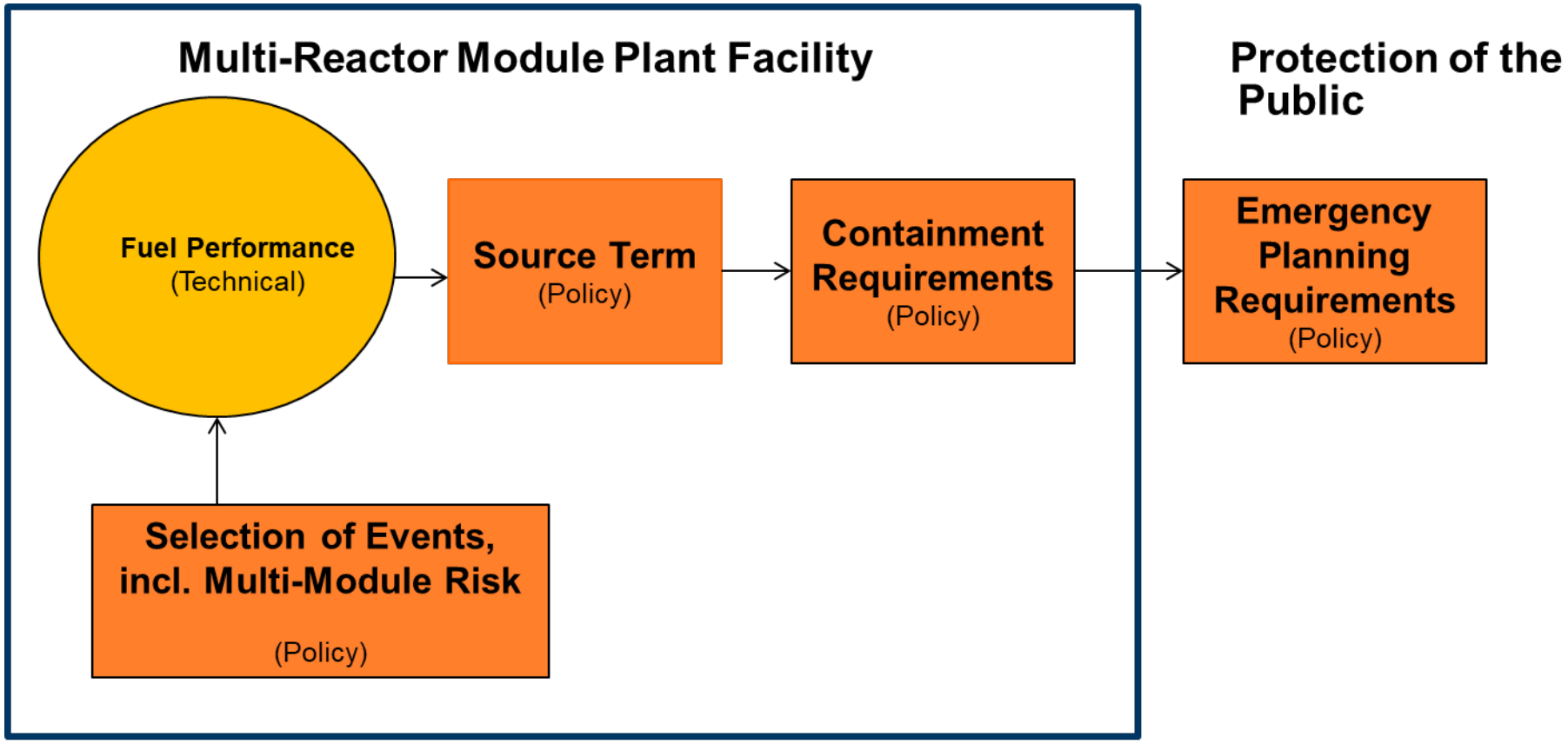
NRC's Near-Term Implementation Action Plan – ART Program Engagement & Results



From Advanced Reactors to Microreactors…

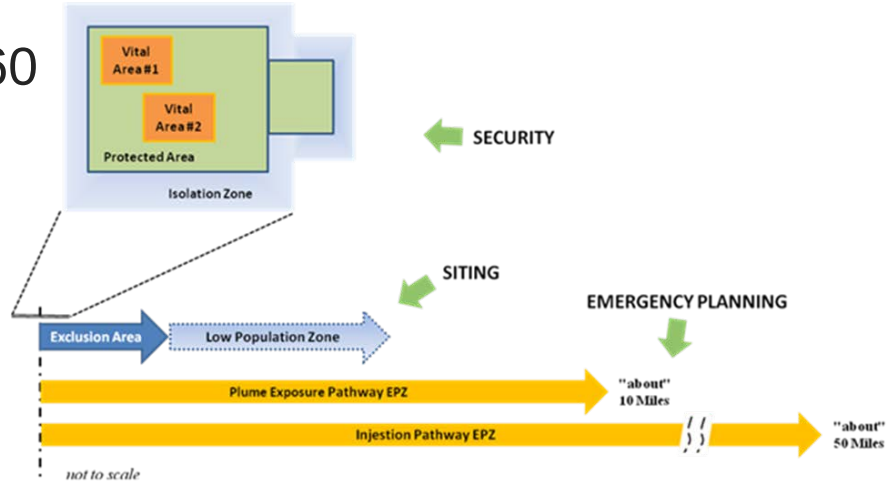
- As high-level regulatory development work is completed, we now move to topics more specific to Microreactors…

Commission Policy and Technical Issue Relationships



Current Activities in Regulatory Development

- Emergency Planning
  - INL/EXT-20-58467, “Determining the Appropriate Emergency Planning Attributes for Micro-Reactor”
    - Provides recommendations for changes to the current Emergency Standards found in 10 CFR Part 50.47
    - Also discusses changing Emergency Planning Zone sizing to match technology-specific attributes
    - Complete, to be published August 2020
  - NRC Proposed Rulemaking for 10 CFR Part 50.160
    - Not expected until 2021 or later
    - INL report discusses current EP Standards found in 10 CFR Part 50.47 and 10 CFR Part 50 App. E
    - INL report not intended to replace the proposed rulemaking



FY21 Planned Activities Cont'd

- Regulatory Development organizations (INL, ORNL, LANL, ANL) will interact with the NRC to support regulations in:
  - Transportation of fueled microreactors
  - Unattended operation of microreactors (such as at remote sites)
  - ???
- Currently seeking industry input in identifying and confirming the critical R&D that's needed to support regulatory development and licensing of microreactors
  - Example: Regulatory Technology Development Plan (RTDP)

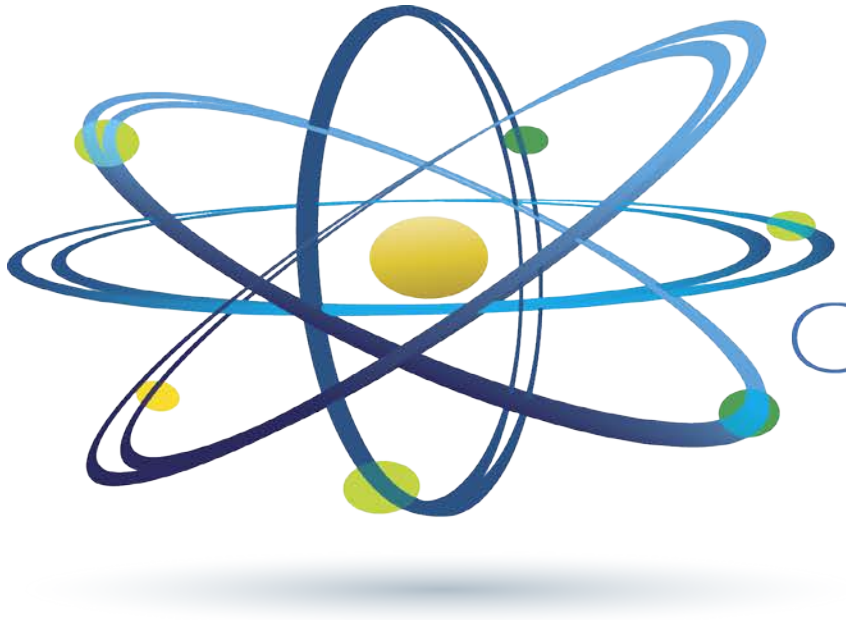
FY21 Planned Activities

- Regulatory Technology Development Plan (RTDP)
  - RTDP links major research activities to key regulatory requirements and licensing concerns for a program
  - RTDP completed HTGR and SFR for Advanced Reactor Technologies (ART) Program in 2015
  - Revised to include Molten Salt Reactor in 2017
  - Informs in prioritizing DOE-sponsored research with greatest regulatory need, technology safety case need, or with long lead-times or sequential dependencies
  - This revision will focus on microreactor related topics
  - Goal: Have initial draft done by April 2021 (final-9/30/21)

Future Regulatory Development Activities:

- DOE-NE is supporting an industry-led cost share to work with NRC in establishing license application content guidance that's risk-informed ("right-sized") and governed by LMP methodology.
- Continue development in the areas of:
  - Transportation of fueled microreactors
  - Remote/Unattended operations
  - Advanced manufacturing (currently an ART project but has strong ties to microreactors)
- Put emphasis on R&D done within the technology-based R&D rather than identified after
  - Reduces time and likely cost on creating a product that is licensable
- Depend on industry need!
  - Input from industry organizations, developers, and non-government organizations will allow the regulatory development group to perform research into areas of need for microreactor organizations
  - A focused and coordinated effort among all stakeholders is a key to timely microreactor deployment

Discussion and Questions



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