Advanced Nuclear Energy Demonstrations

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Idaho National Laboratory’s origin is the National Reactor Testing Station (NRTS)
Strong interest in advanced nuclear energy has motivated private sector interest and the need for a new NRTS

- Facilities and capabilities to develop, test, and demonstrate promising advanced reactor concepts to enable commercialization and deployment, domestically and beyond.
Advanced Reactors: One size does not fit all
Advanced Fission

- Categorized in terms of capacity
  - Microreactors: <10 MWe
  - Small reactors: 10 MWe – <300 MWe (SMRs use modular construction)
  - Medium reactors: 300 MWe - 700 MWe
  - Large reactors: > 700 MWe
- Variety of coolants (gas, sodium, salt, lead, water, etc.)
- Clean, high availability
- Diverse markets
- Improved safety, waste, security, and target economics
- 60+ private sector projects

Small Town: 1 Megawatt (MW)
Mid-size City: 1 Gigawatt (GW)
The US: 1,000 Gigawatts
NRIC Vision

Two by 2025

Commercial Advanced Nuclear by 2030
inspire
deliver
mission
empower
NRIC
Accelerating Advanced Reactor Demonstration and Deployment
NRIC is a National Program and Central Integrator for Partners and Collaborators
Priority: Empowering Innovators

• Demonstration Test Beds
• Experimental Facilities
• Regulatory Risk Reduction

• Planning Tools
  • NRIC Resource Team
  • NEPA guidance
  • Demonstration Resource Network (https://nricmapping.inl.gov/)
  • Siting Tool for Advanced Nuclear Development
NRIC-DOME Test Bed
(Demonstration of Microreactor Experiments)

**Strategy:**
- Repurpose EBR II which operated from 1964 – 1994
- Establish a demonstration platform that is flexible enough to test 4-5 known small modular reactors such as high temperature gas reactors

**Capabilities:**
- Small Modular Reactors (SMR) up to 20MW thermal power
- High-Assay Low-Enriched Uranium (HALEU) fuels < 20% enrichment
- Safety-Significant confinement for reactors to go critical for first time
NRIC Timeline for Microreactor in 2024 (example)

2021
Design DOME

2022
Complete DOME design; award construction contract

2023
DOME Refurbishment

2024
DOME Readiness
Final Preparations and Reactor integration; Startup

2025
Reactor Operations
Priority: Addressing Cost and Markets

• Advanced Construction Technologies
• Digital Engineering
• Construction Readiness
• Integrated Energy Systems
• Considerations for Deployment
Advanced Construction Technology

- Project Team - General Electric Hitachi
  - EPRI, Black & Veatch, Purdue, UNCC, Nuclear Advanced Manufacturing Research Centre, Caunton Engineering w/Modular Walling Systems Ltd and Tennessee Valley Authority

- Demonstrate 3 technologies: 1) Vertical Shaft, 2) Steel Bricks™ 3) Advanced Sensors and Digital Twin

- Contract executed; kickoff in January 2022
- Involve Regulators and NRC early
- Phase 1: 12 months
- Phase 2: 2-3 years
Priority: Proactive Impact Management

• Environmental impact assessment
  • Cultural and biological surveys
  • Plant parameter envelope
  • Water use
• Packaging, storage, transport, and disposition
Priority: Engagement

- Tools
- Web/Social
- Flyover, Mapping, Videos
- Best practices development
- University of Michigan, Fastest Path to Zero

Communities

The planning and construction of advanced nuclear power plants requires collaboration between Communities, Innovators, and the U.S. National Laboratory System. NRIC provides a platform for these groups to work with each other to communicate common visions and accomplishing shared goals. Communities that host nuclear power technology are its most trusted stewards. Constructing new plants requires identifying
Goals for FY22
Maintain progress to support demonstrations by the end of 2025 and sustained innovation

- Prepare vital infrastructure
- Demonstrate cost-cutting technology
- Build and develop the NRIC team
- Provide planning tools and resources
- Anticipate and address regulatory needs
- Strengthen and expand partnerships and engagement
Thank you!

Questions?