NRIC National Reactor Innovation Center

INL Idaho National Laboratory

National Reactor Innovation Center Overview

June 7, 2022

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nric.inl.gov

NRIC is a new DOE program, launched in FY'2020

NRIC
National Reactor Innovation Center

NRIC Enables Nuclear Reactor Demonstrations

- Authorized by the Nuclear Energy Innovation Capabilities Act (NEICA)
- Partner with industry to bridge the gap between research and commercial deployment
- Leverage national lab expertise and infrastructure

NRIC INL

NRIC Vision

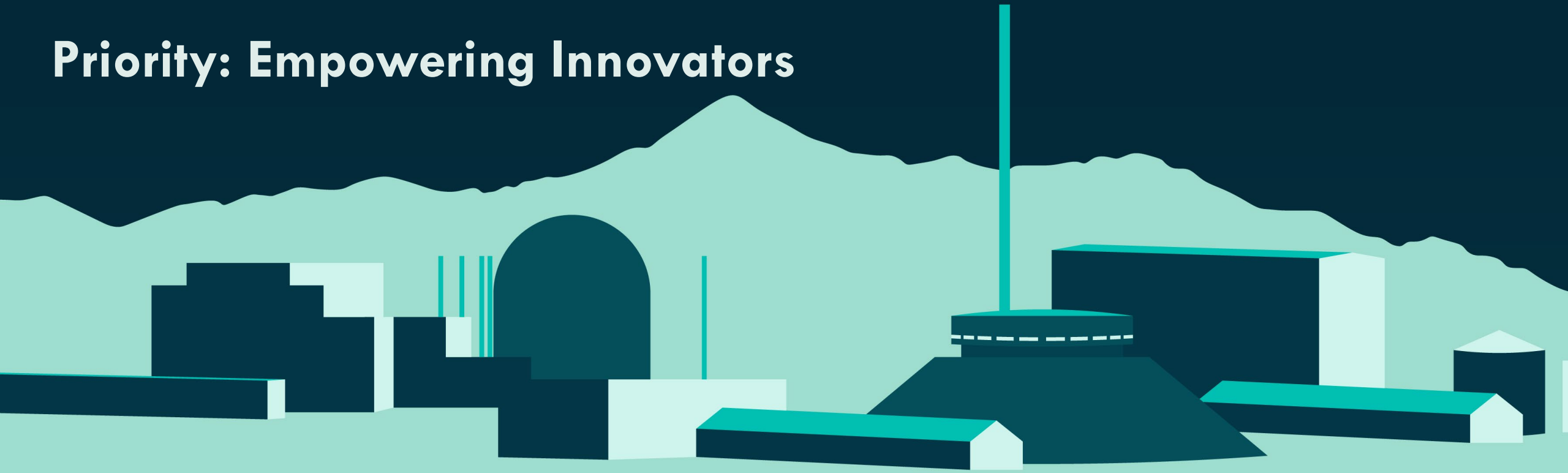
Commercial Advanced Nuclear by 2030

Collaborative Approach

NRIC is partnering regionally and nationally to support demonstrations

NRIC INL

Priority: Empowering Innovators



- Demonstration Test Beds
- Experimental Facilities
- Virtual Test Bed
- Regulatory Risk Reduction

- Planning Tools
  - NRIC Resource Team
  - NEPA guidance
  - Demonstration Resource Network (https://nricmapping.inl.gov/)
  - Siting Tool for Advanced Nuclear Development
- Addressing Costs and Markets
- Proactive Impact Management
- Engagement & Communication

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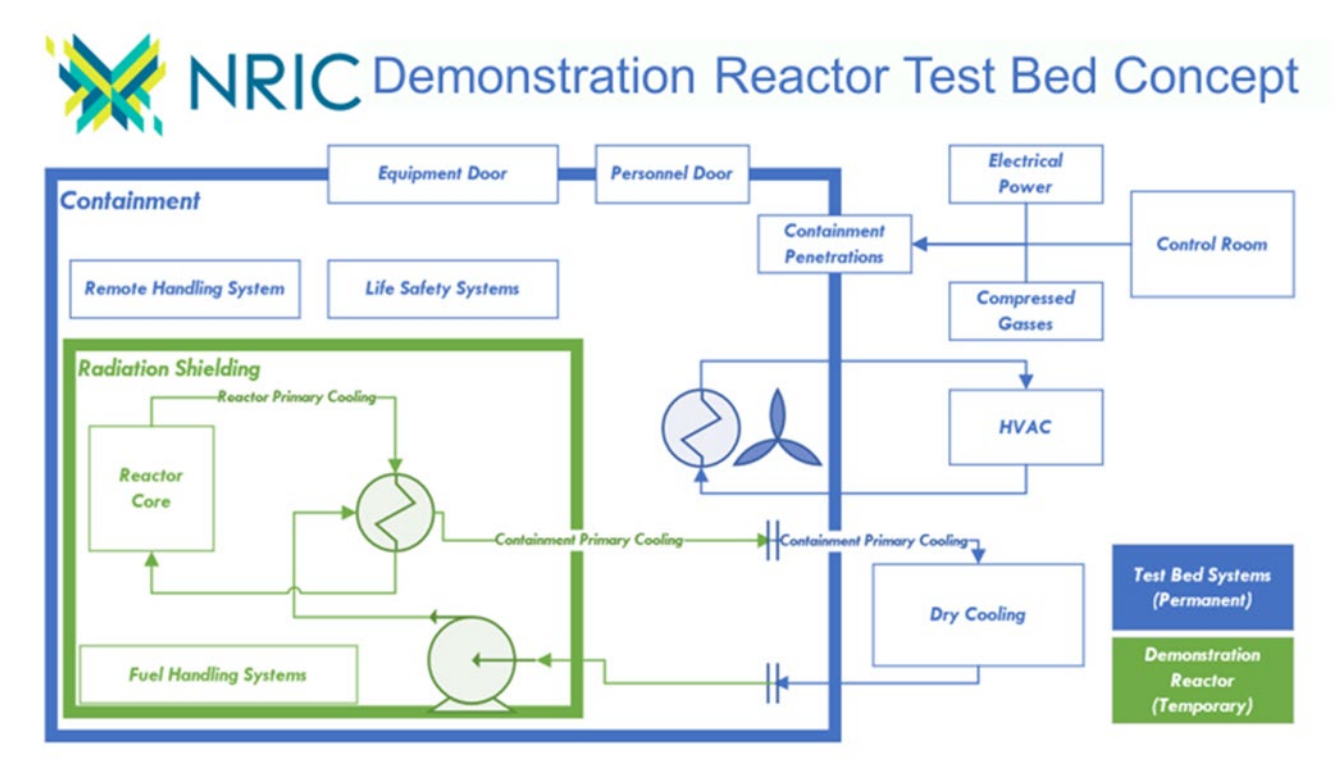
Enabling Industry Demonstrations is Critical to Resurgence of U.S. Nuclear Energy Leadership



- Leverage unique existing facilities including:
  - Experimental Breeder Reactor II (EBR-II)
  - Zero Power Physics Reactor (ZPPR)
- Implement new way of doing business:
  - Balance public/private sector interests
  - Lean startup principles
  - Systems Engineering
  - Digital Engineering

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Not the typical national lab research project

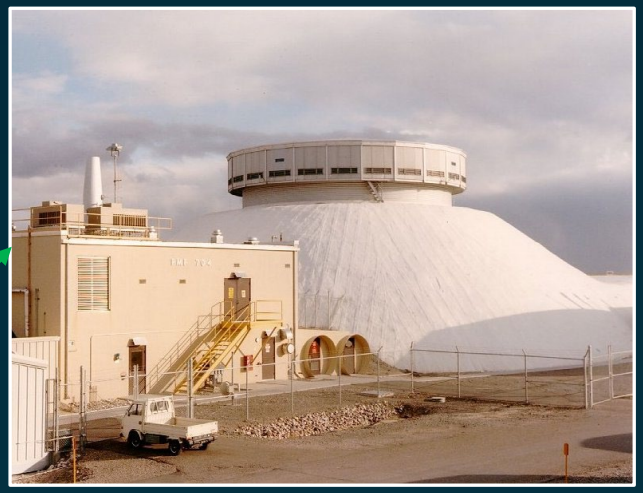
NRIC Testbed Status

DOME

- Is currently in Final design phase
- First user expected 2024

Materials & Fuels Complex at INL

Safeguards Category 1 Testbed



- Has completed conceptual design phase
- DOE Analysis of Alternatives is in process
- First user expected Jan 2026*

*Pending Analysis of Alternatives

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NRIC-DOME Test Bed

(Demonstration of Microreactor Experiments)

Strategy:

- Repurpose EBR II which operated from 1964 – 1994
- Establish a minimum viable test bed that is just flexible enough to test 4-5 known small modular reactors such as high temperature gas reactors

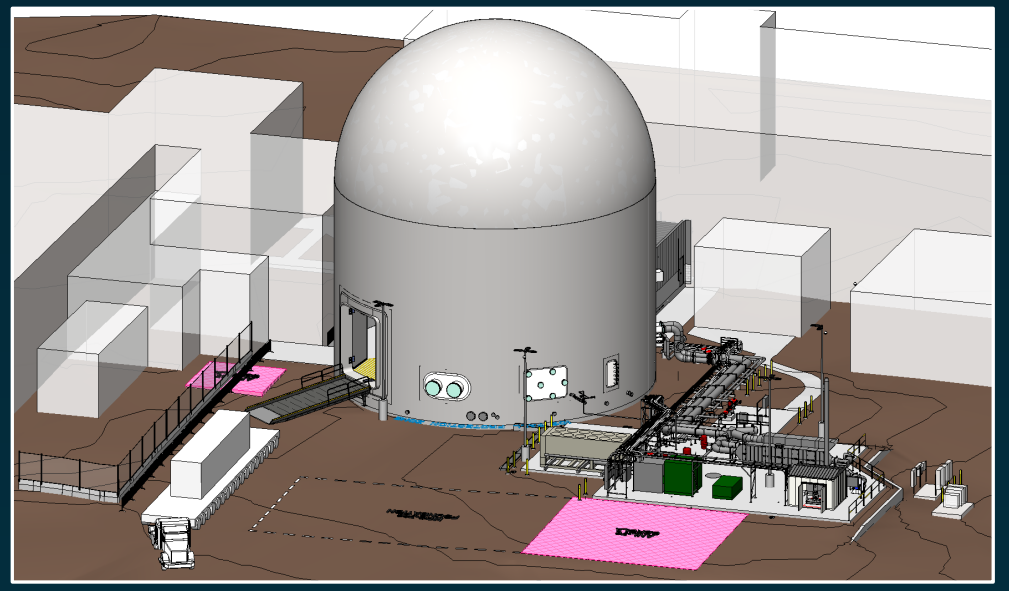
Capabilities:

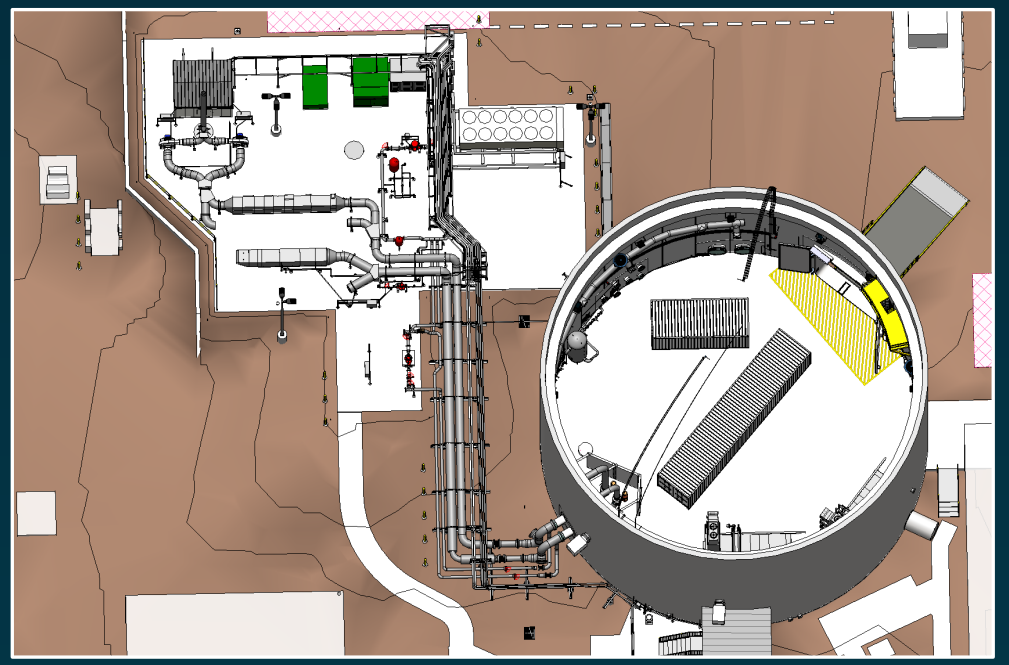
- Small Modular Reactors (SMR) up to 20MW thermal power
- High-Assay Low-Enriched Uranium (HALEU) fuels < 20% enrichment
- Safety-Significant confinement for reactors to go critical for first time

***Total estimated cost of Construction for* DOME minimum viable test bed:**

- $33M Range: $27M - $49M

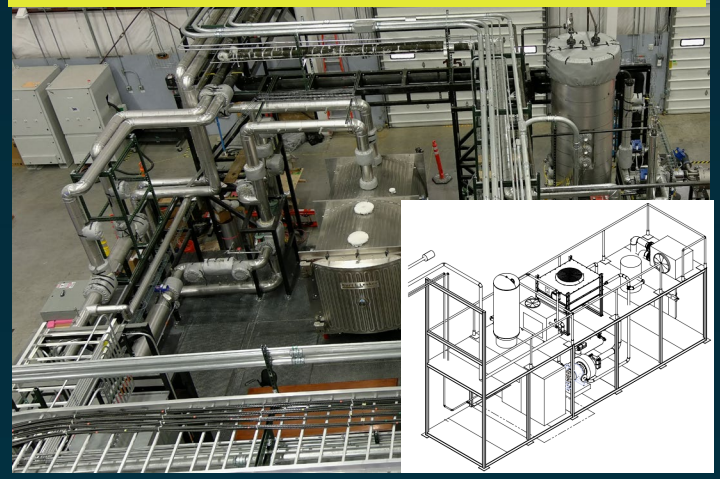
Interested Companies: 5

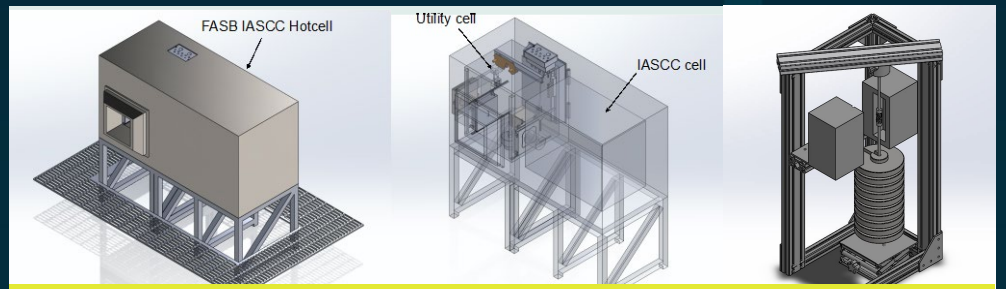




NRIC Experimental Test Beds

Helium Component Test Facility [*2022*]

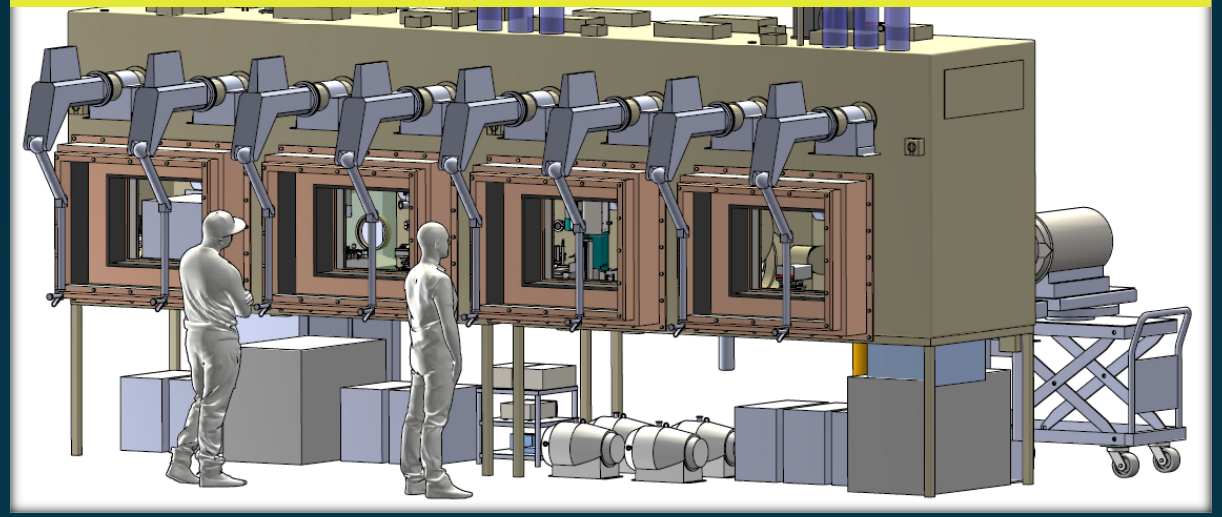


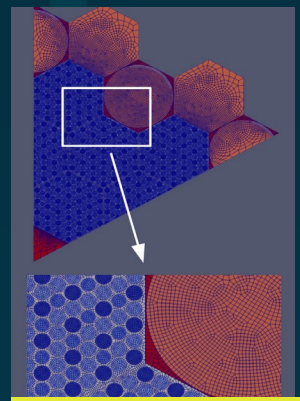


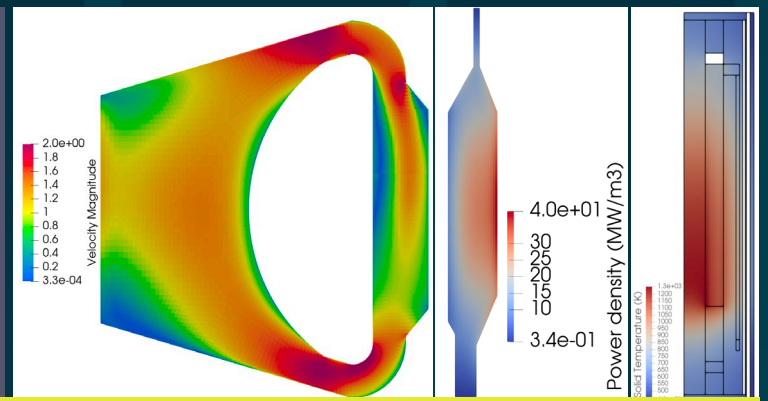
In-HotCell Thermal Creep Frame [*2022*]

Mechanisms Engineering Test Lab (METL) [Operating]

Molten Salt Thermophysical Examination Capabilities (MSTEC) [*2024*]







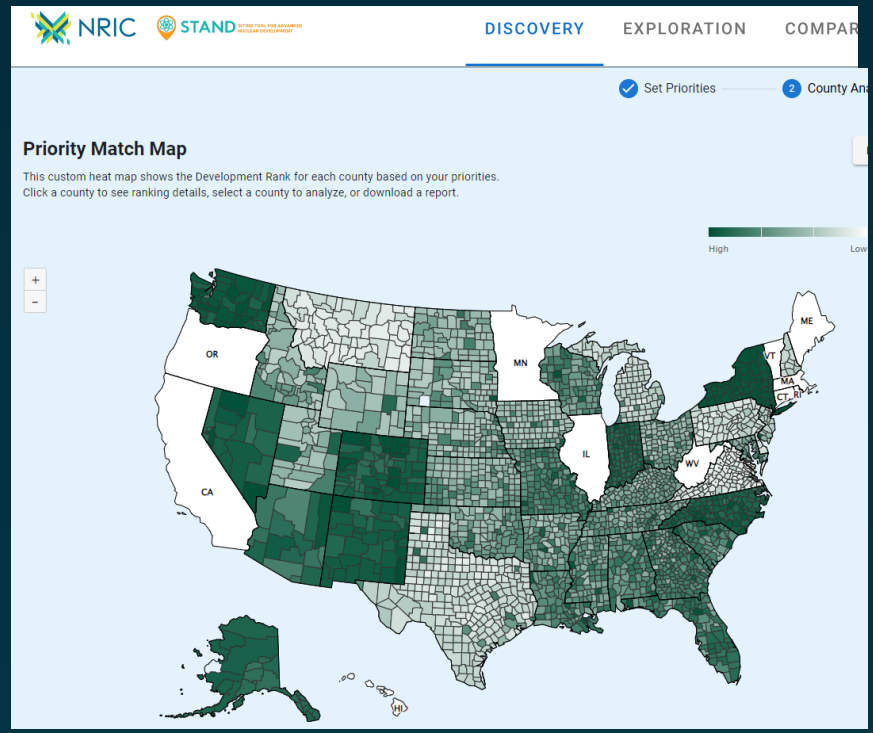
Virtual Test Bed [Launched 2020]

Siting Tool for Advanced Nuclear Development - STAND

Provides a systematic way based on user siting preferences and priorities to:

- **Discover areas that may be a good fit**
- **Explore areas to identify specific sites**
- **Compare sites to identify an optimal option**

Launched at January 26th Tech Talk
https://nric.inl.gov/nric-tech-talks-stand-tool/



NRIC | INL | FASTEST PATH TO ZERO UNIVERSITY OF MICHIGAN | OAK RIDGE National Laboratory | Argonne NATIONAL LABORATORY

Addressing Cost and Markets

- Advanced Construction Technologies – Project kicked off Jan 2022
- Digital Engineering & Knowledge Sharing/Lessons Learned
- Construction Readiness – With TVA, EPRI, NEI
- Integrated Energy Systems – design of IES demonstration platform
- Work with Communities on Deployment Opportunities (coal retirements; Alaska; maritime)

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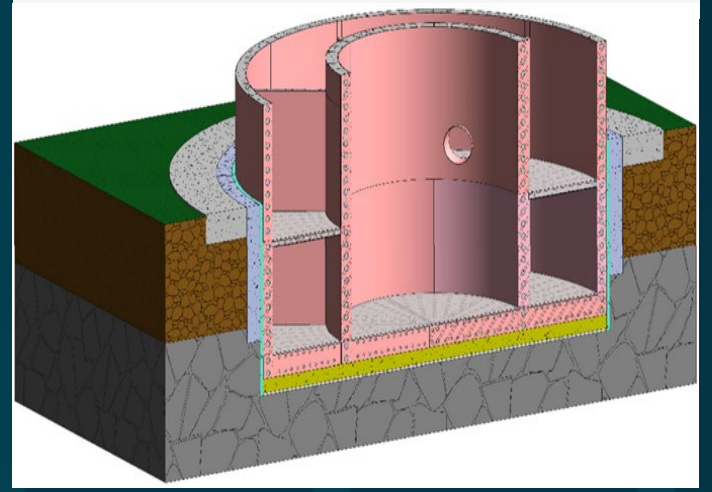
Advanced Construction Technology

- 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
- Goal: demonstrate three construction technologies that will reduce the cost of new nuclear builds by more than 10 percent and speed the pace of advanced nuclear deployment.
  - Vertical shaft construction
  - Steel Bricks™
  - Advanced monitoring, coupled with digital twin technology



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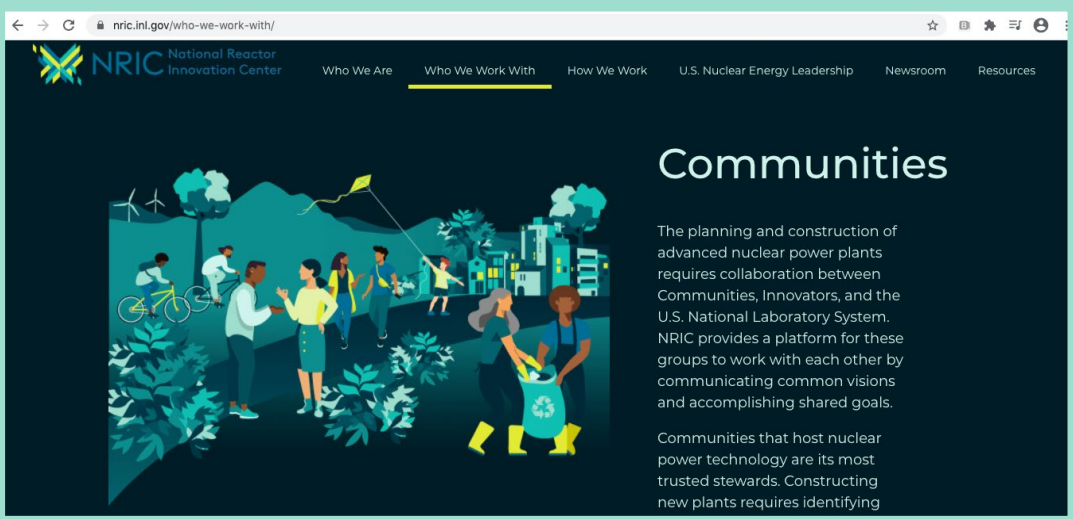
Steel Bricks is a trademark of Modular Walling Systems Holdings Limited

Proactive Impact Management

- Environmental impact assessment
  - Cultural and biological surveys
  - Plant parameter envelope
  - Water use
- Packaging, storage, and transport

Engagement

- Tools
  - Web/Social
  - Flyover, Mapping, Videos
- Best practices development
  - University of Michigan, FPTZ
- University grants for social science efforts



Companies NRIC works to support include:

- Terrapower
- X-energy
- Kairos
- BWXT
- Oklo
- Holtec
- ARC Clean Energy
- General Atomics
- Micronuclear
- Radiant
- GE-Hitachi
- CorePower
- Westinghouse
- USNC
- GERA

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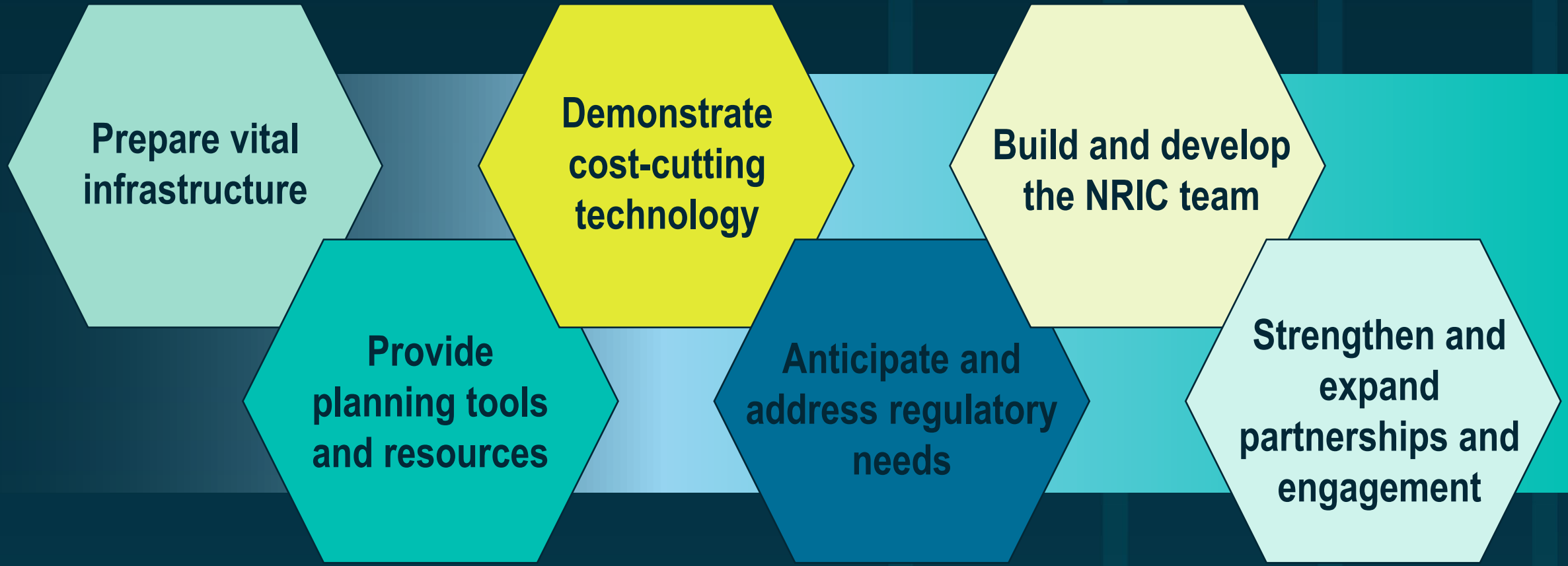
Goals for FY22

Maintain progress to support demonstrations by the end of 2025 and sustained innovation



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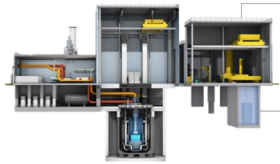
Questions?

Accelerating advanced reactor demonstration & deployment

DOME TEST BED
2024 | NRIC

MMR
2026 | USNC



NATRIUM© REACTOR
2028 | TERRAPOWER & GE

2030

2029

2028

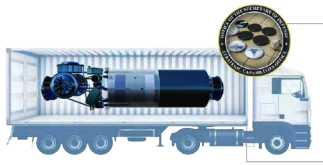
2027

2026

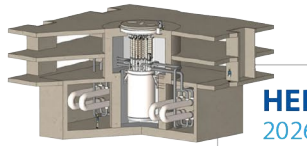
2025

2024

2023



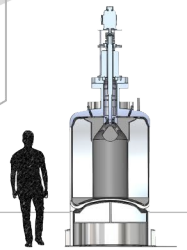
PROJECT PELE MICROREACTOR
2023-2024 | DOD



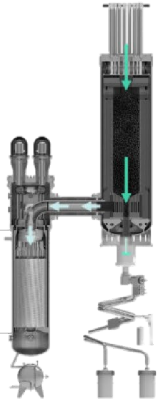
HERMES
2026 | KAIROS

AURORA
2025 | OKLO

MARVEL
2023-2024 | DOE

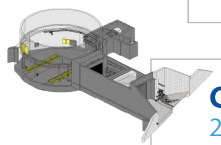


MCRE
2025 | SOUTHERN CO. & TERRAPOWER



Xe-100
2027 | X-ENERGY

VOYGR™
2029 | UAMPS & NuScale



CAT. 1 TEST BED FOR ADVANCED REACTOR DEMOS
2025 | NRIC