NRIC National Reactor Innovation Center

Advanced Nuclear Energy Demonstrations

January 18, 2022

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nric.inl.gov

Idaho National Laboratory's origin is the National Reactor Testing Station (NRTS)

International Intellectual Leadership

Building a Laboratory

National Reactor Testing Station

1949

Argonne NATIONAL LABORATORY

1974

INEL Idaho National Engineering Laboratory

Energy Mission – Reactor Science, Safety and Sustainability Solutions

1997

INEEL Idaho National Engineering and Environmental Laboratory

Environmental Management Mission

2005

INL

INEEL & ANL-W combined to create the new Idaho National Laboratory

- **Nuclear Energy**
- **National and Homeland Security**
- **Energy and Environment**

2020

- **Advancing Nuclear Energy**
- **Securing & Modernizing Critical Infrastructure**
- **Enabling Clean Energy Systems**

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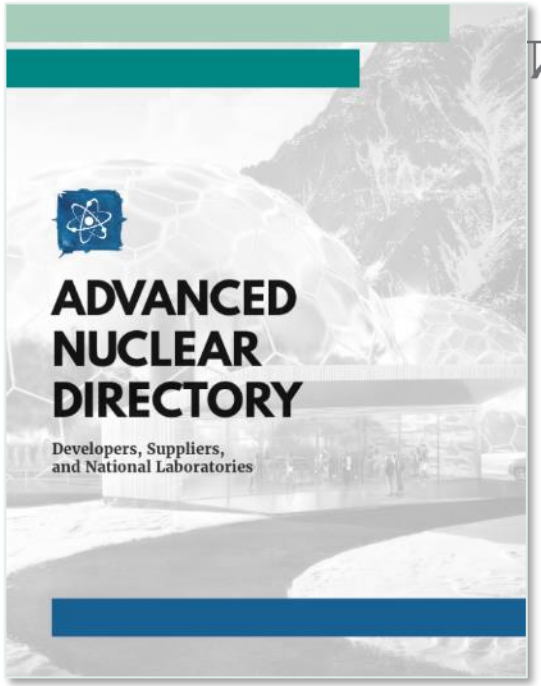
Strong interest in advanced nuclear energy has motivated private sector interest and the need for a new NRTS

- Facilities and capabilities to develop, test, and demonstrate promising advanced reactor concepts to enable commercialization and deployment, domestically and beyond.



GAIN
Gateway for Accelerated Innovation in Nuclear

framatome

OKLO

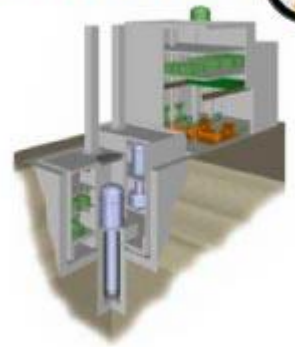
HolosGen™

U BATTERY
Local Modular Energy

STARCORE NUCLEAR

TerraPower

TOSHIBA
Micro Nuclear



Westinghouse

HOLTEC INTERNATIONAL

Kairos Power

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HITACHI

Advanced Reactors: One size does not fit all

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Advanced Fission

- Categorized in terms of capacity
  - Microreactors: <10 MWe
  - Small reactors: 10 MWe – <300MWe (SMRs use modular construction)
  - Medium reactors: 300MWe - 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

Image courtesy of GAIN and Third Way, inspired by the *Nuclear Energy Reimagined* concept led by INL. Learn more about these and other energy park concepts at thirdway.org/blog/nuclear-reimagined

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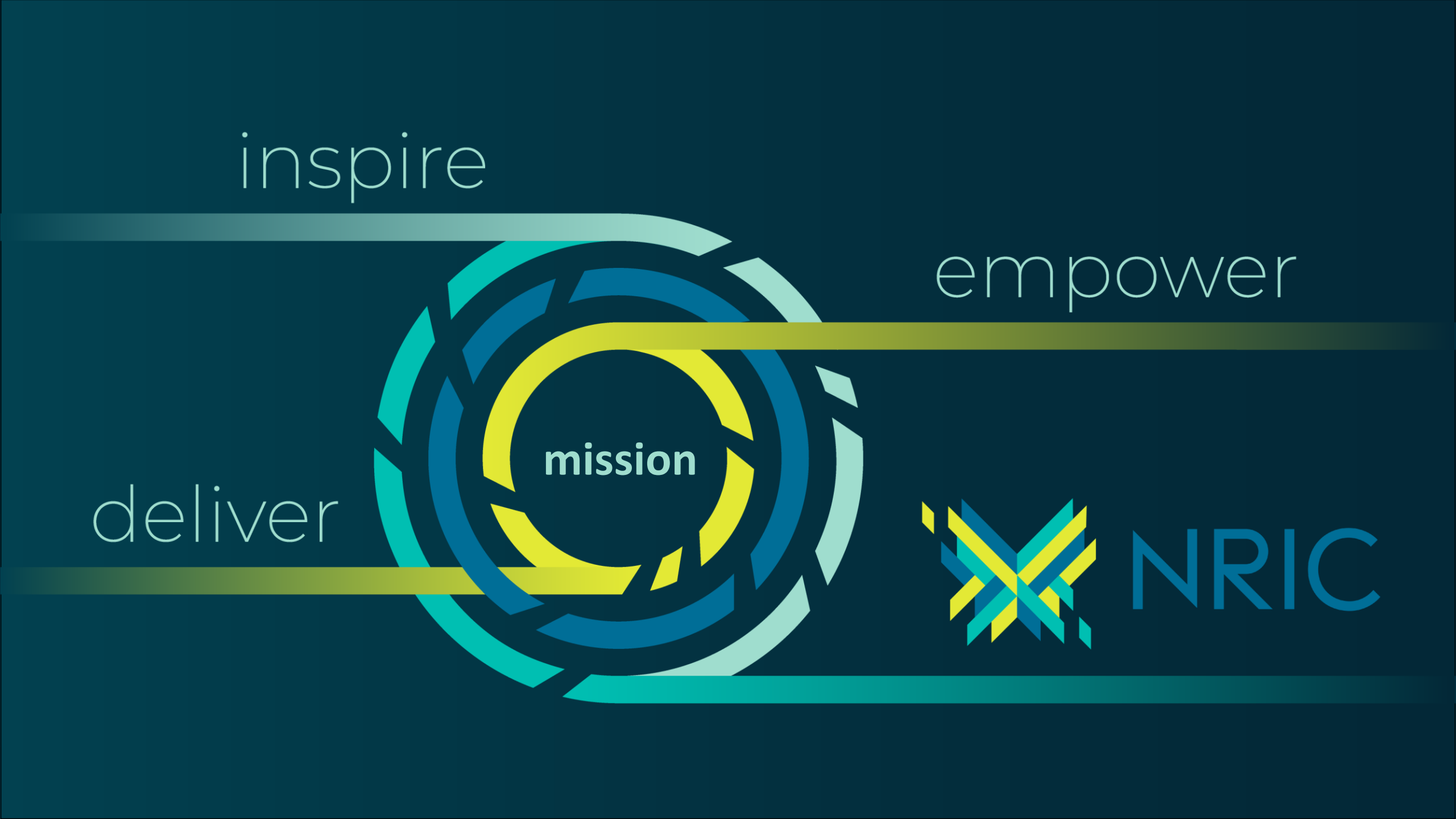
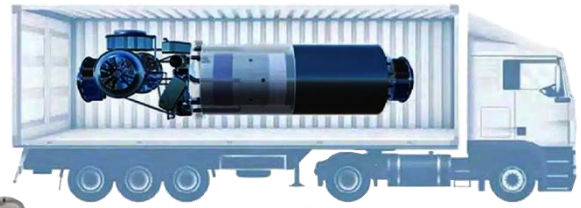
NRIC Vision

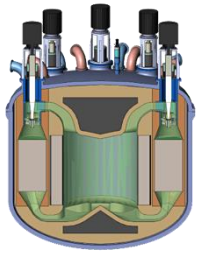
Commercial Advanced Nuclear by 2030


inspire
empower
mission
deliver
NRIC

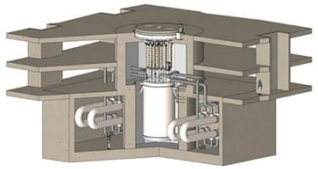
Accelerating Advanced Reactor Demonstration and Deployment



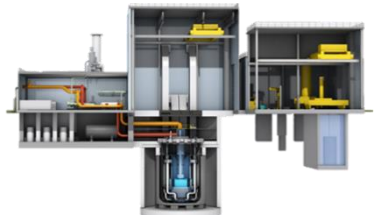
MARVEL



TerraPower
Southern Company



Kairos Power



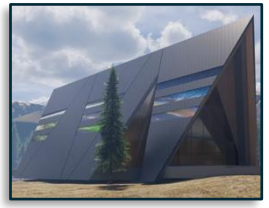
TerraPower
GE HITACHI

2030

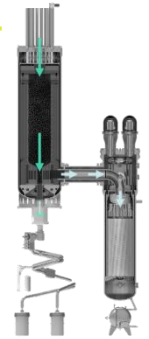
LLAMPS

NUSCALE
Power for all humankind

energy



OKLO



NRIC National Reactor Innovation Center

NRIC is a National Program and Central Integrator for Partners and Collaborators

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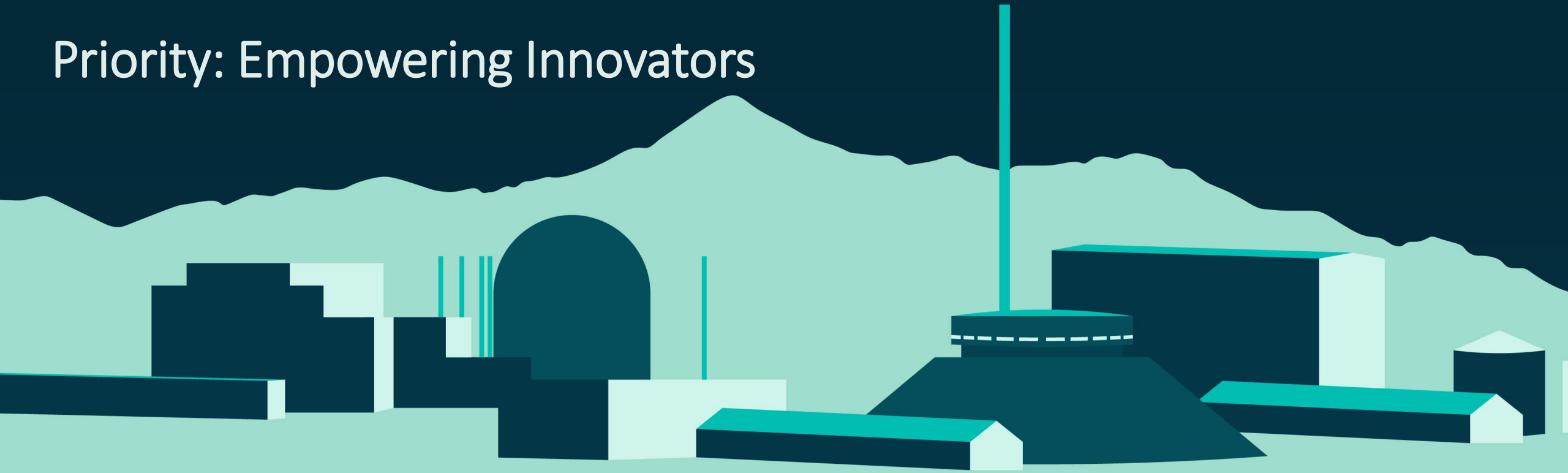
Stage 1
Research
Stage 2
Development
Stage 3
Demonstration
GAIN
&
NRIC
Concept
Commercial
Product

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

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NRIC-DOME Test Bed

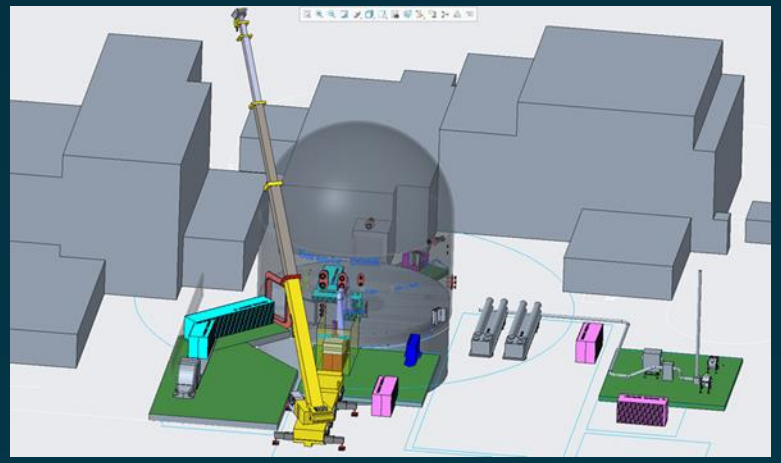
(Demonstration of Microreactor Experiments)

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



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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

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Priority: Addressing Cost and Markets

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

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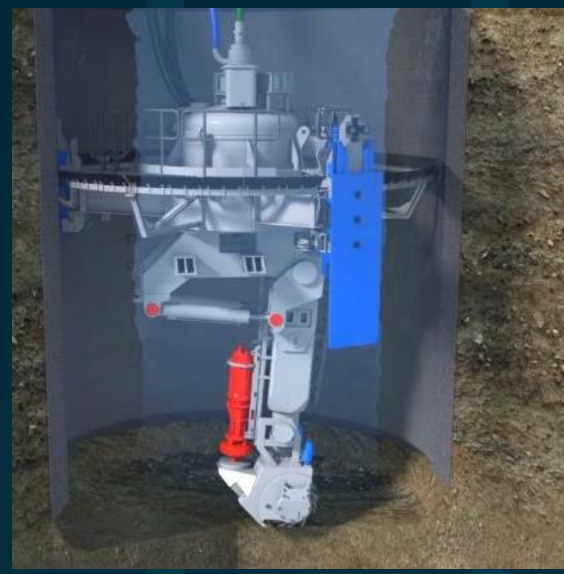
Advanced Construction Technology



- 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
- 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

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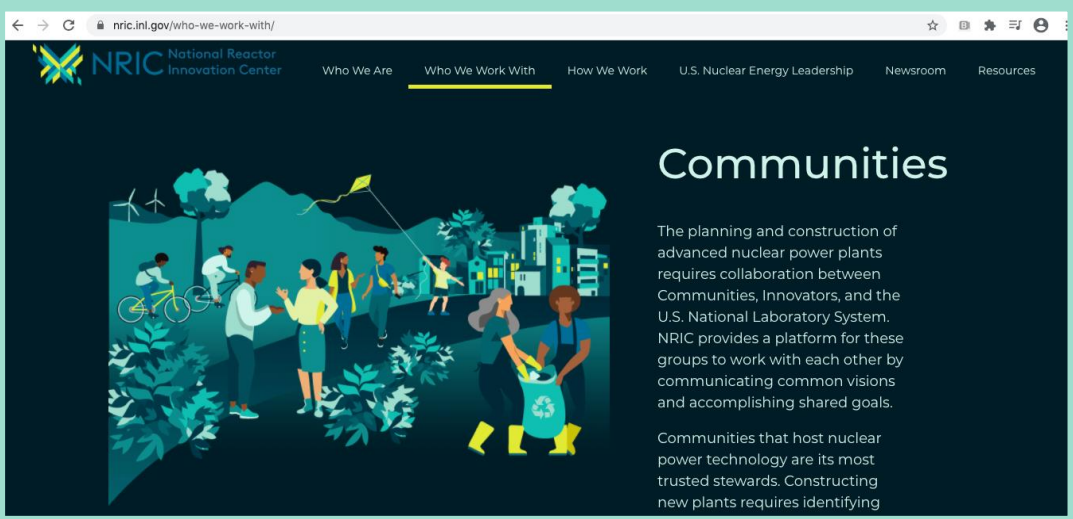
Priority:
Proactive Impact Management

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

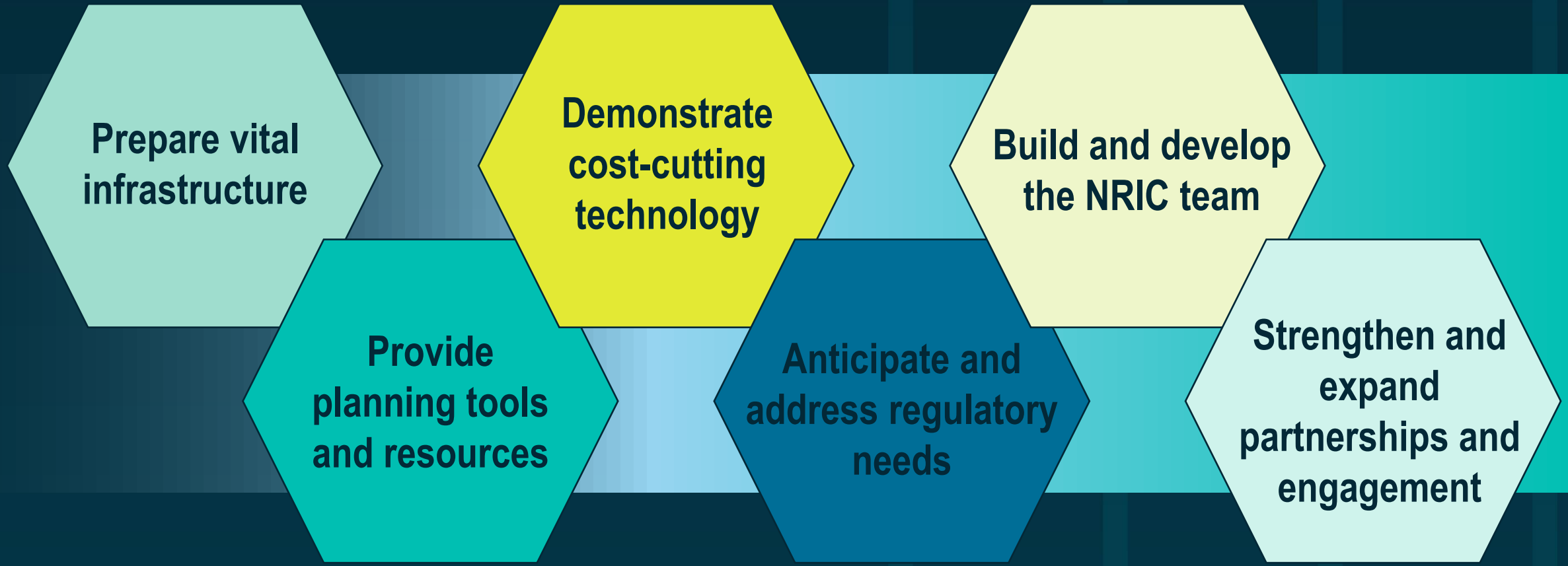
Priority: Engagement

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



Goals for FY22

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



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Thank you!

Questions?