INL/MIS-24-81995-Revision-0

# Microreactor Testing Planned for the National Reactor Innovation Centers DOME Facility - ANS Winter Meeting

November 2024

Brad Tomer

Changing the World's Energy Future

Idaho National Laboratory

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**Idaho National Laboratory**
**Idaho Falls, Idaho 83415**

**http://www.inl.gov**

**Prepared for the**
**U.S. Department of Energy**
**Under DOE Idaho Operations Office**
**Contract DE-AC07-05ID14517**

NRIC National Reactor Innovation Center

# Microreactor Testing Planned for the National Reactor Innovation Center's DOME Facility

ANS Winter Meeting 2024

November 19, 2024

MIS-24-81995

# Panelist

- Joe Halackna, Director, eVinci Technology, Westinghouse Electric Company
- Bob Urberger, Chief Technology Officer, Radiant
- Matthew Griffin, Director of Licensing and Engagement, Antares
- Brad Tomer, Acting Director, National Reactor Innovation Center

# NRIC Enables Advanced Nuclear Technology Tests & Demonstrations

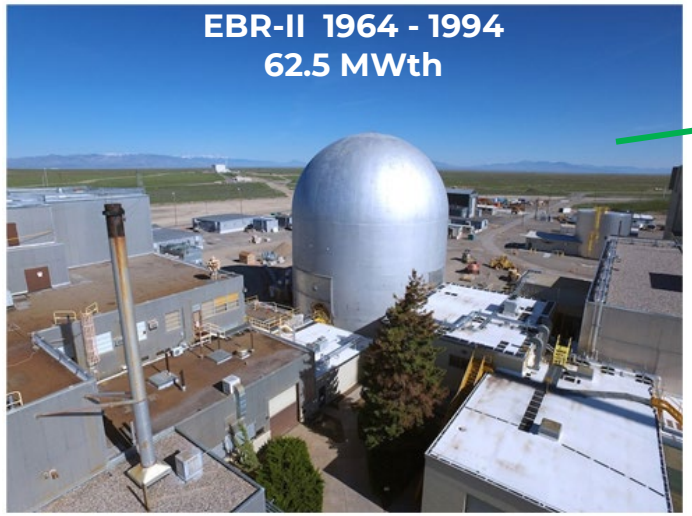
- DOE program launched in October 2019
- Authorized by the Nuclear Energy Innovation Capabilities Act (NEICA)
  - DOE-Office of Nuclear Energy; INL Nuclear Science & Tech
- Partner with industry to bridge the gap between research and commercial deployment
- Leverage national lab expertise and infrastructure

# Portfolio Built to Empower Innovators

- **Infrastructure for Testing Advanced Nuclear**
  - Advanced Reactor Test Beds
  - Experimental Facilities
  - Virtual Test Bed

- **Addressing Costs & Markets**
  - Advanced Construction
  - Digital Engineering for Nuclear
  - Maritime Applications

# Demonstration of Microreactor Experiments (DOME)

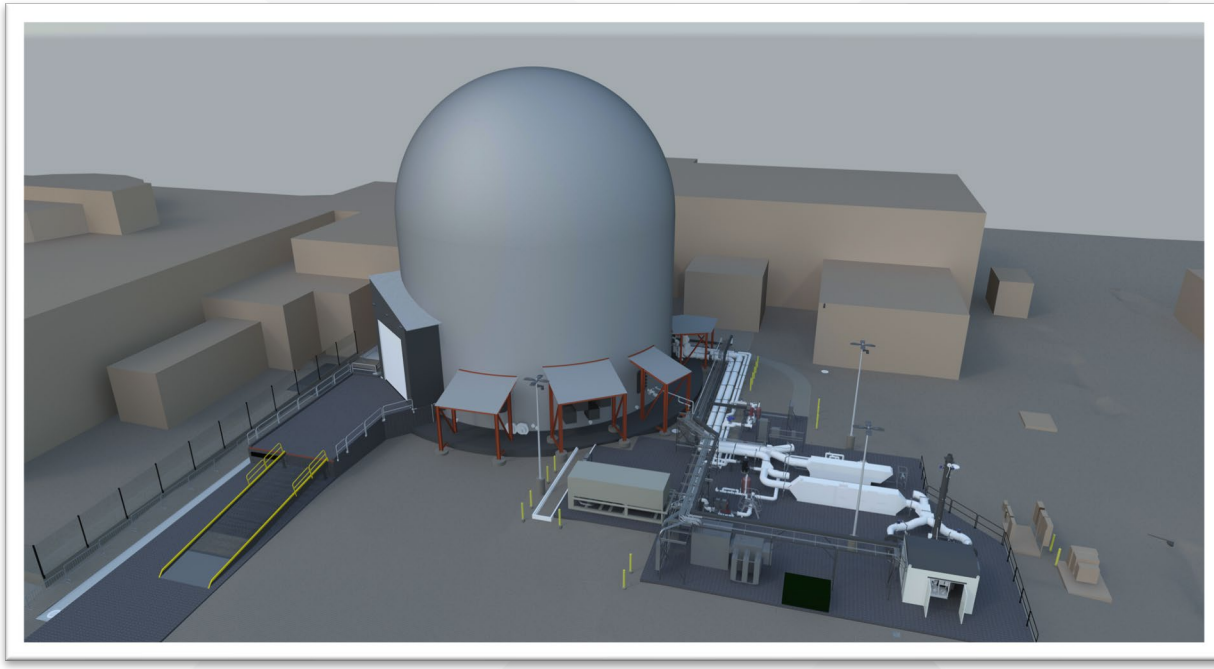


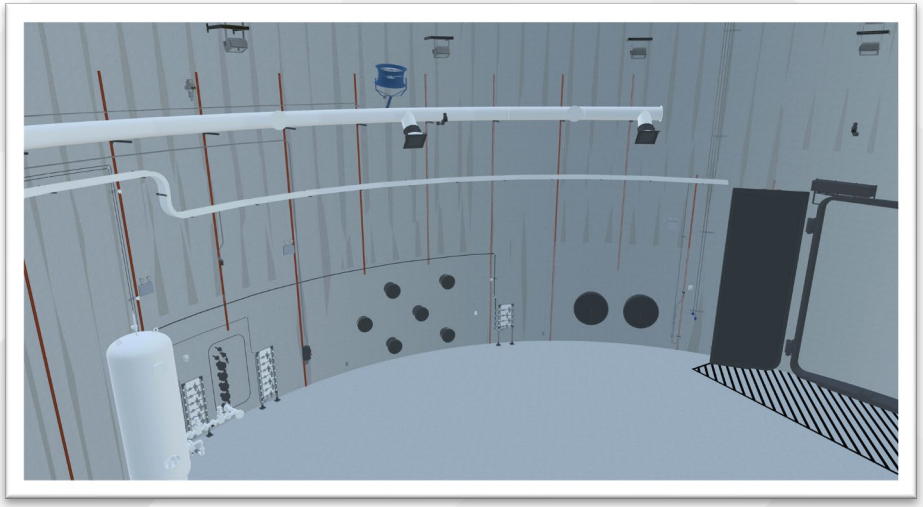

Materials & Fuels Complex at INL

- DOME is the repurposed EBR-II structure
- Designed for Advanced Microreactors up to 20$MW_{th}$
- Designed for High-Assay Low-Enriched Uranium (HALEU) fuels < 20% enrichment
- Accommodates ISO 668 High-Cube Shipping Containers up to 40ft long
- Limited to one reactor test at a time

# NRIC-DOME Test Bed

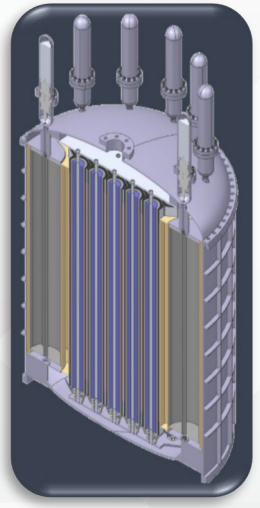
- **Facility Specifications**
  - Hazard category 2 facility
  - Provides safety class confinement
  - Large floor space for reactor experiments
    - ~65-ft. (~19.8 m) diameter
    - ~46-ft. (~14 m) height to crane
  - Hatch opening
    - ~15 ft. (~4.6 m)wide × ~17 ft. (~5.2 m) tall
  - Penetrations
    - Small penetrations for process
    - Large penetrations for primary reactor cooling

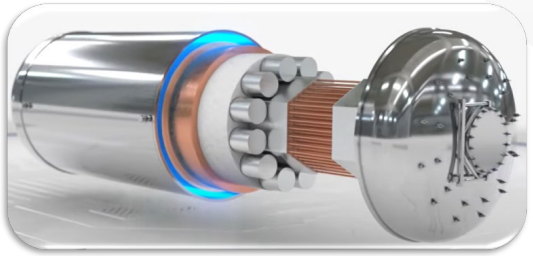




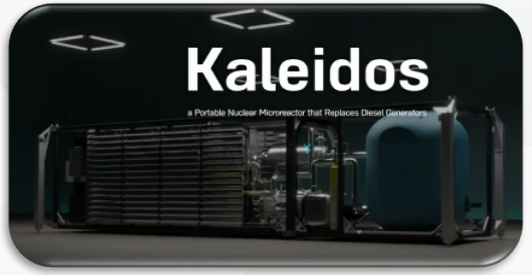
# NRIC-DOME Testbed

- Construction Start Q4 2023
- Operational Readiness – June 2026
- 4 users engaged in front-end engineering and experiment design (2 complete)





Westinghouse - eVinci




| Developer | Reactor Name | Design | Power Mwe | Power MWth | Fuel Type | Fuel Enrichment | Primary Coolant | Moderator | Refueling Interval (Years) | Power Conversion System |
|---|---|---|---|---|---|---|---|---|---|---|
| **Radiant** | Kaleidos | HTGR | 1.2 | 3.5 | TRISO | 19.75% | Helium | Graphite | 6 | Brayton Cycle |
| **USNC** | Pylon | HTGR | | 1 | TRISO | 9.90% | Helium | Graphite | | Rankine |
| **Westinghouse** | eVinci NTR | Heat Pipe | 1 | 3 | TRISO | 19.75 | Sodium | Graphite | 8 | Brayton Cycle |
| **Antares** | Antares R1 | Heat Pipe | 0.1+ | 0.25 | TRISO | | Sodium | Graphite | 3-5 | Brayton Cycle |

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12/5/2024

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