

January 31, 2024

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Advanced Test Reactor Complex

An Overview of INL's Advanced Test Reactor

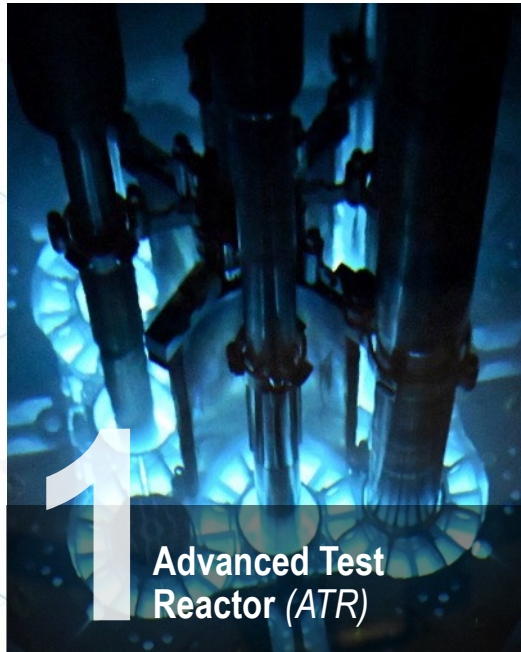
LINE Commission

Battelle Energy Alliance manages INL for the
U.S. Department of Energy's Office of Nuclear Energy



Idaho National Laboratory

INL's four operating research reactors in 2024



Advanced Test Reactor (ATR)

World's most powerful and versatile thermal spectrum test reactor



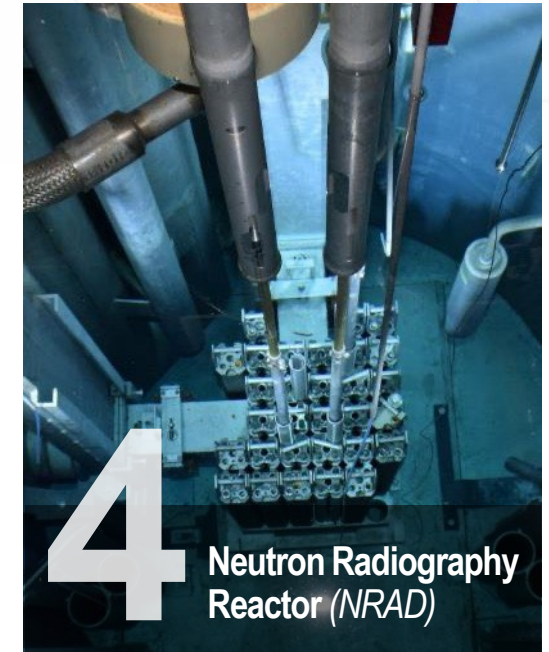
ATR Critical Facility

Low power support facility for ATR



Transient Reactor Test (TREAT) Facility

World's most versatile reactor for testing under accident scenarios

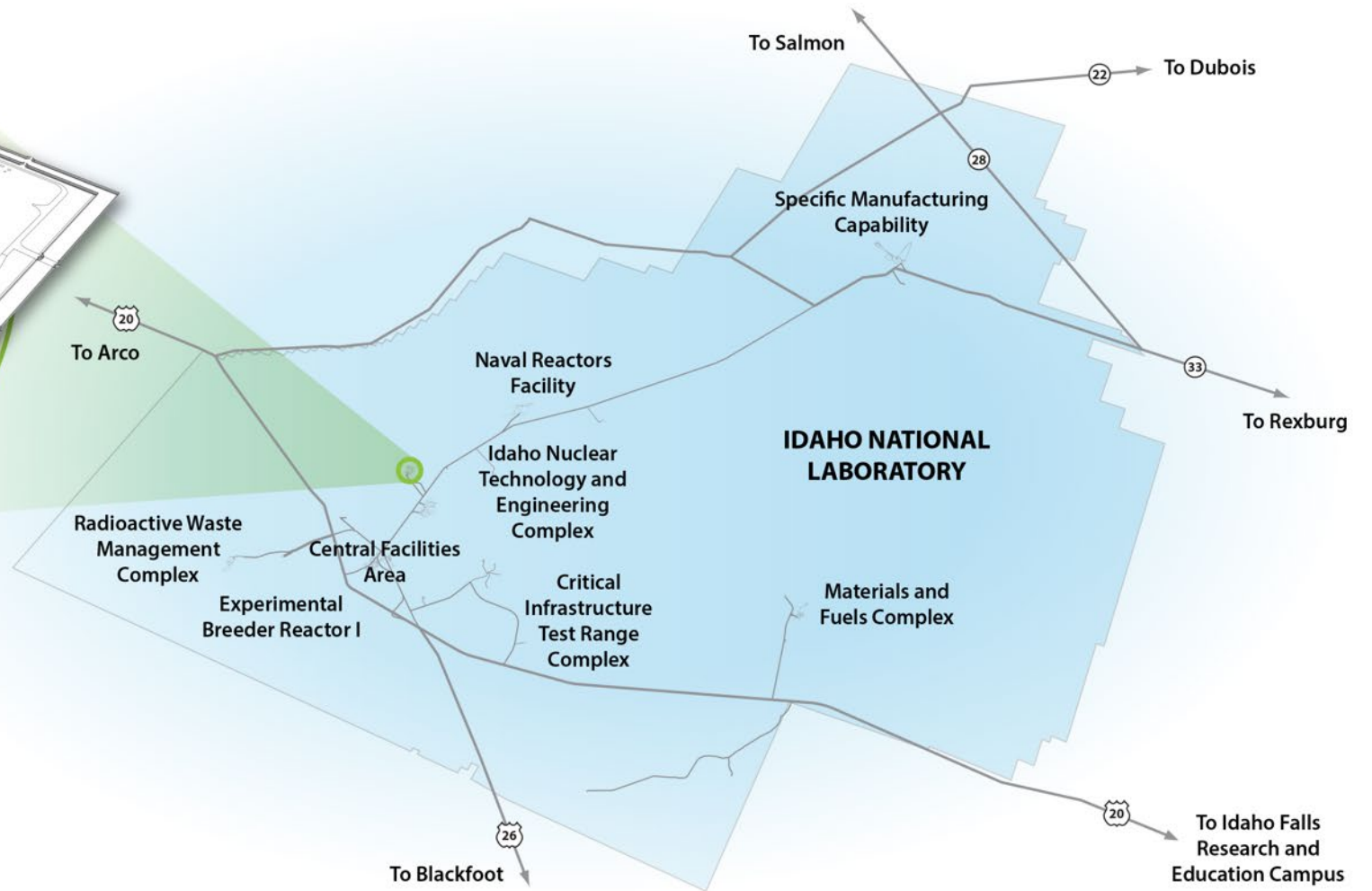
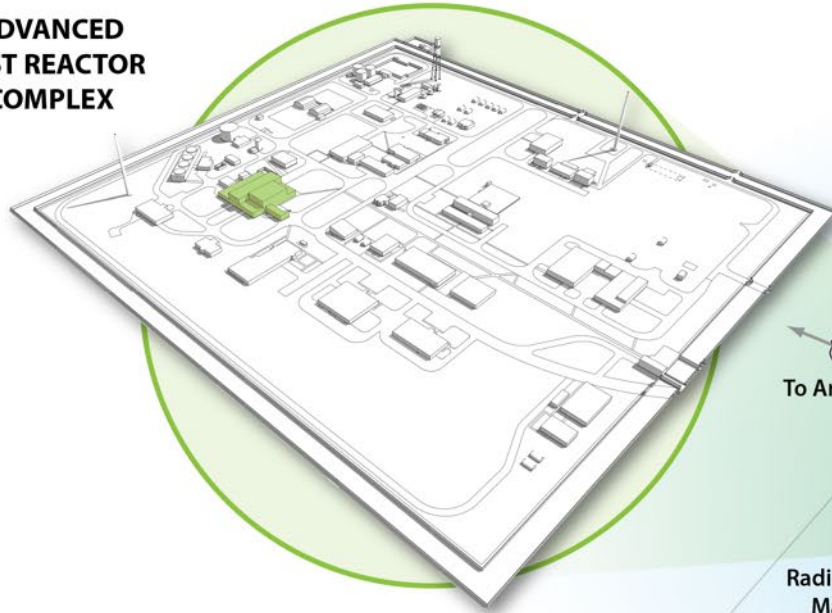


Neutron Radiography Reactor (NRAD)

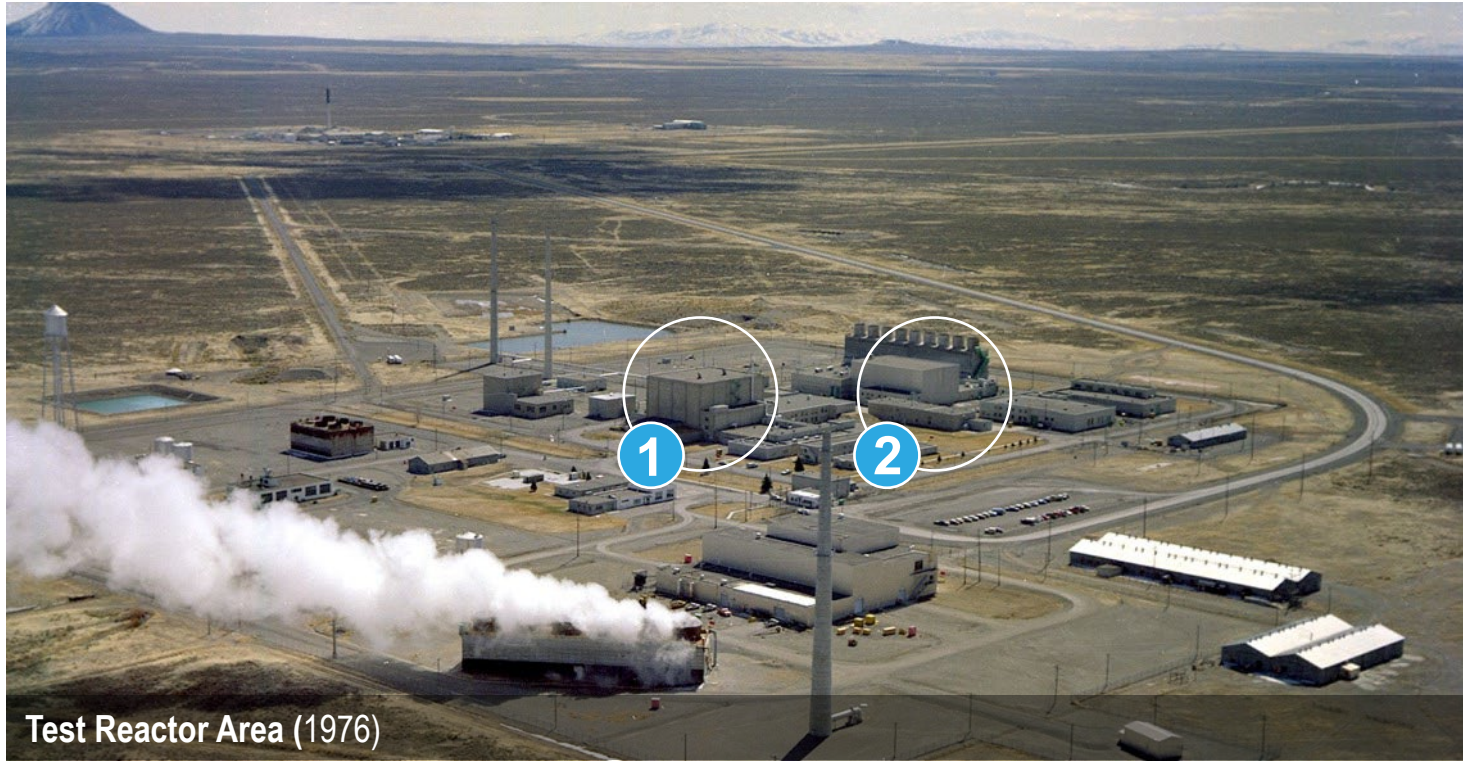
250KW research reactor used for neutron radiography and advanced imaging

The ATR Complex

**ADVANCED
TEST REACTOR
COMPLEX**

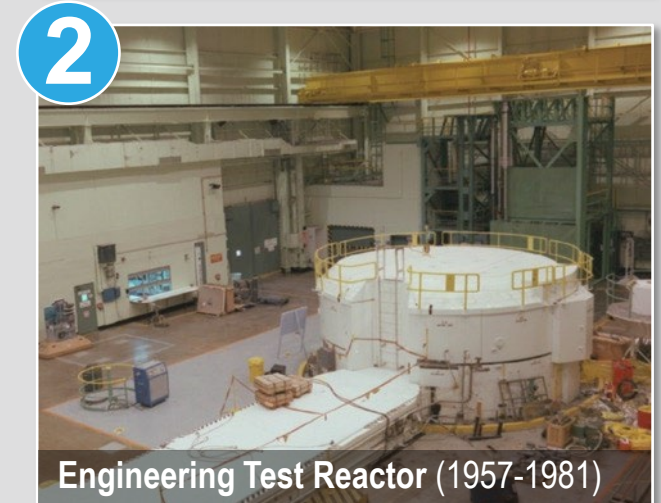
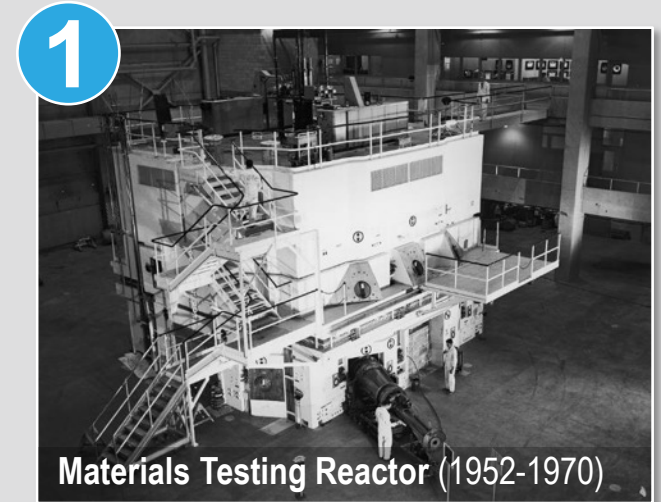


High-flux test reactors



Fuel and material irradiation testing is a foundational capability for the INL site, continuing uninterrupted since 1952.

Our mission is tied to US national security through partnership with the Navy and energy security through DOE and other customers.



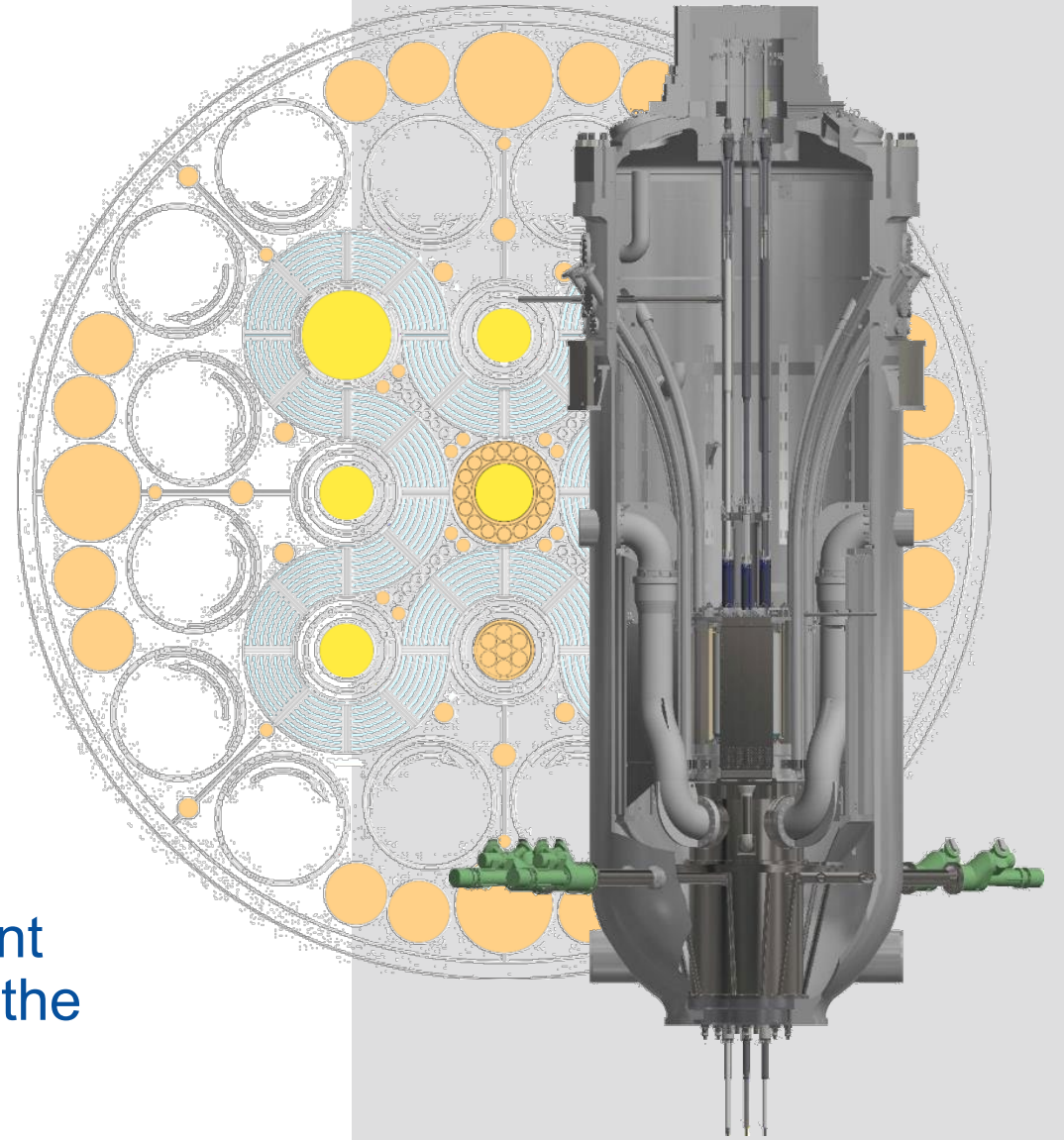
The ATR Complex today



ATR Complex (Today)

What makes ATR unique?

- Highest power and highest capacity test reactor in the world at 250 megawatts.
- One of the highest neutron density reactor in the world today
- Distinctive cloverleaf core design provides large experiment volume and capacity – 9 large flux traps and 68 smaller spaces within the highest flux region
- Independent power control for all four lobes
- Individual experiment control for 6 independent power loops, with additional loop capacity on the way for commercial testing



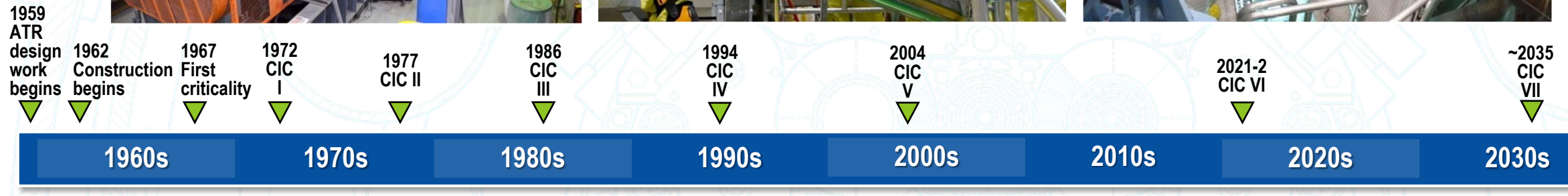
ATR Users Include:

- **Department of Energy**
- **U.S. Navy** (includes AUKUS)
(Naval Nuclear Propulsion Program)
- **NASA**, special isotopes
(e.g., Pu-238), nuclear thermal
propulsion, and nuclear surface power
- **Universities**, primarily through Nuclear
Science User Facilities (NSUF)
- **Industry** (SMRs, Isotopes, Materials)
- **International NE Development**



Ensuring thermal irradiation testing capability through 2085

- ATR's design allows for full core replacements every 10-15 years.
- Other plant infrastructure both within the reactor building and across the complex must also be maintained.



Recognized Enduring Mission for Thermal Test Reactor Capabilities to 2085 at INL

The Department of Energy (Nuclear Energy, Naval Reactors, NNSA) sees the need to continue THERMAL reactor testing at least to the mid-2080s.

DOE is currently considering a project to determine the best path to achieve that goal.

Early documents identifies 5 major capability gaps of the current ATR

- Test Environments (higher local power needed)
- Test Volumes
- Throughput
- Power Level Flexibility (*Steady-state, Transient, Ramp*)
- In Situ Experiment Monitoring

Potential Strategies to 2085

- Maintain ATR to 2080 by Refurbishment
- Expand and Modify ATR Existing Capabilities
- Replace ATR with a new Thermal Test Reactor





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Battelle Energy Alliance manages INL for the U.S. Department of Energy's Office of Nuclear Energy. INL is the nation's center for nuclear energy research and development, and also performs research in each of DOE's strategic goal areas: energy, national security, science and the environment.