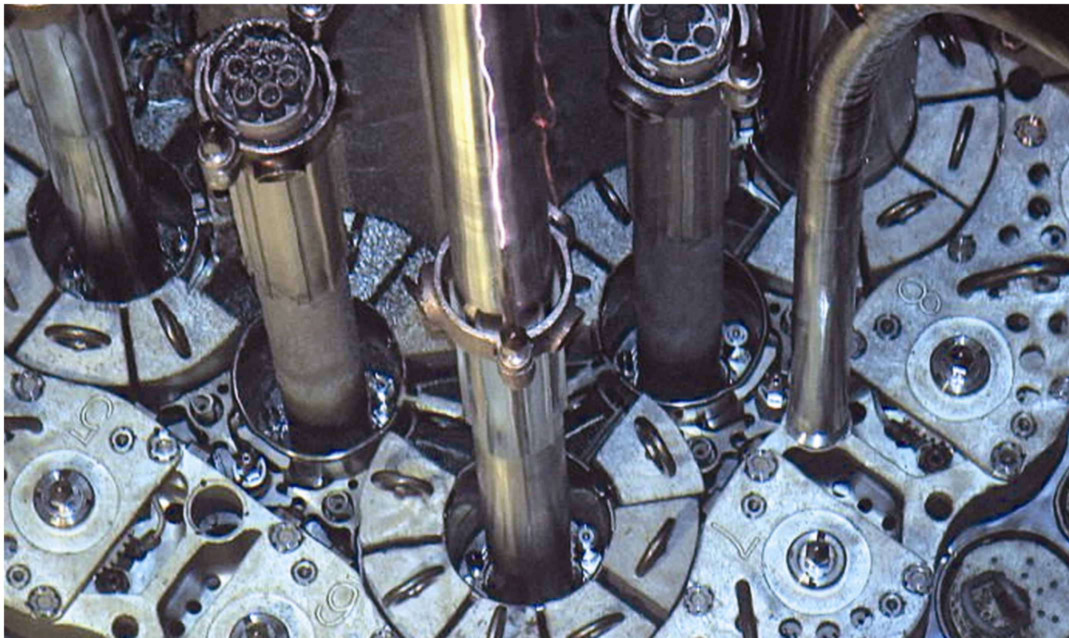


The Advanced Test Reactor, with its unique serpentine core, is the center of INL's nuclear energy R&D capabilities.

Advanced Test Reactor

Meeting U.S. nuclear energy research challenges

As the national laboratory for the U.S. Department of Energy's Office of Nuclear Energy (DOE-NE), Idaho National Laboratory serves a unique role in U.S. nuclear energy research, providing its capabilities and infrastructure as a shared resource for the entire nuclear energy enterprise. INL's capabilities center around the Advanced Test Reactor (ATR), located at the ATR Complex on the INL Site 40 miles west of Idaho Falls.

Many uses

The ATR is the only U.S. research reactor capable of providing large-volume, high-flux neutron irradiation in a prototype environment, and the reactor makes it possible to study the effects of intense neutron and gamma radiation on reactor materials and fuels. ATR has many uses, supporting a variety of government and privately sponsored research.

- ***National security***
  Over the years, ATR has provided the critical testing capability that has helped develop the U.S. Navy's nuclear propulsion program. The Navy remains a key customer and user of ATR, and testing there has contributed to the exceptional operational performance of the nuclear-powered fleet.

- ***Reactor type***
  The ATR is a pressurized water test reactor that operates at low pressure and low temperature. It contains a beryllium reflector to help concentrate neutrons in the core, where they are needed for fuels and materials testing.

- ***Design features***
  ATR's unique serpentine core allows the reactor's corner lobes to be operated at different power levels, making it possible to conduct multiple simultaneous experiments under different testing conditions. Other key features:
  - Large test volumes – up to 48 inches long and 5 inches in diameter
  - 77 testing positions
  - High neutron flux
  - Fast/thermal flux ratios ranging from 0.1 – 1.0
  - Constant axial power profile
  - Power tilt capability for experiments in same operating cycle
  - Individual experiment control

Continued next page

The Energy of Innovation

Idaho National Laboratory

Continued from previous page

- Frequent experiment changes
- Core internals replacement every 10 years
- Solid stainless steel reactor vessel approximately 48 inches from core region to minimize embrittlement
- Accelerated testing for fuel and materials development
- Seismic shutdown system can automatically shut down the plant if even very low levels of seismic activity are detected

- ***Nuclear energy***

Experiments conducted at ATR provide a critical look at reactor components and systems; this supports planning for the long-term operation of the reactors as well as DOE-NE's mission. Testing at ATR supports reactor research around the world to extend the life of current nuclear plants, develop designs for the reactors of the future, and test new types of nuclear fuels that reduce waste generation and proliferation risks.

- ***Isotope production***

The ATR produces the cobalt isotope needed for the "gamma knife" used to treat brain tumors. DOE is expanding its use to produce other medical and industrial isotopes.

- ***Collaborative research***

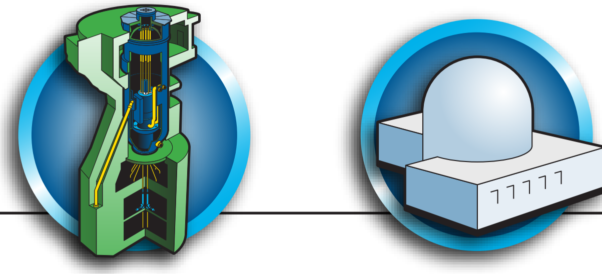
In 2007, DOE designated ATR and INL's post-irradiation examination capabilities as a National Scientific User Facility, changing the reactor's role to include research led by universities in collaboration with other laboratories and industry. Experiments to date have focused on studies of materials and current reactors, which support the development of future reactor designs.

ATR testing has led to development of low-enriched fuels for use in research reactors around the world.

Investing in the future, the Department of Energy has established a life-extension program for the ATR aimed at identifying the actions needed over the next 10 years to assure that safety documentation is current for the reactor and its continued operation. Safety analysis is an important tool for understanding the operating envelope for a reactor, to ensure that the plant can operate in accordance with the most current safety standards.

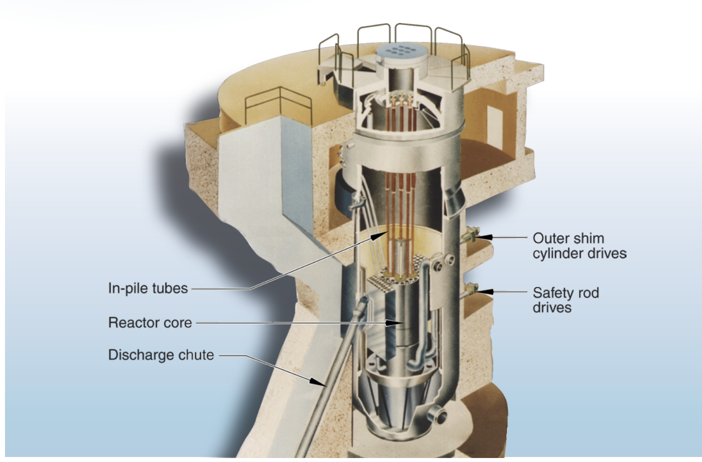
Planning under the life-extension program addresses the procurement and availability of critical spare parts, including one-of-a kind components such as safety rods, core internal components and beryllium reflectors. Planning also addresses staffing requirements and identifies the funding, schedule and prioritization for replacing key components and systems.

The life extension plan is a key part of the strategic plan for the long-term operation of the reactor and the planning basis for DOE's budget requests.



Advanced Test Reactor	Commercial Reactor
Confinement Structure	Containment Structure
Operating Conditions: – 360 psia – 160° F (250 MW thermal)	Operating Conditions: – 2250 psia – 600° F (3,400 MW thermal)
Reactor Core: – 4 feet X 4 feet (50 cubic feet) – 95 pounds of uranium	Reactor Core: – 12 feet X 12 feet (1700 cubic feet) – 200,000 pounds of uranium

Key ATR parameters compared with those of a commercial pressurized water reactor.



The ATR core contains a beryllium reflector to help concentrate neutrons in the core, where they are needed for experiments related to fuels and materials testing.

For more information

Carisa Schultz
(208) 526-9120
carisa.schultz@inl.gov

Joseph Campbell
(208) 526-7785
joseph.campbell@inl.gov

A U.S. Department of Energy National Laboratory

08-GA50044-27 R6-11