
# Advanced Test Reactor

*Meeting international nuclear energy research challenges*

*The Advanced Test Reactor, with its unique cloverleaf fuel arrangement, forms an essential part of INL's nuclear energy research capability.*

Idaho National Laboratory's nuclear research capabilities rely heavily on the Advanced Test Reactor (ATR), located at the ATR Complex on the INL Site, 47 miles west of Idaho Falls.

As the national laboratory for the U.S. Department of Energy's Office of Nuclear Energy (DOE-NE), INL serves a key role in U.S. nuclear energy research initiatives and programs, such as the National Reactor Innovation Center.

## MANY USES

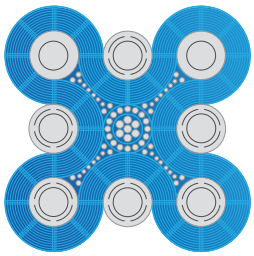
ATR's capabilities and infrastructure are accessible through various programs that support the U.S. and international nuclear research efforts. ATR is the only U.S. research reactor capable of providing large-volume, high-flux thermal neutron irradiation in a prototype environment. The reactor's singular design makes it possible to study the effects of intense neutron and gamma radiation on reactor materials and fuels.

## NATIONAL SECURITY

Over the years, ATR has provided vital irradiation testing capability supporting the U.S. Navy's nuclear propulsion program. The Navy remains a key customer of ATR and testing has contributed to the exceptional operational performance of the nuclear-powered fleet.

## REACTOR TYPE

ATR is a one-of-a-kind pressurized water test reactor. As a test reactor, it operates at very low pressures and temperatures compared to a large commercial nuclear power plant. Instead of heat, the main product of a test reactor is the neutrons it produces. ATR uses 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:

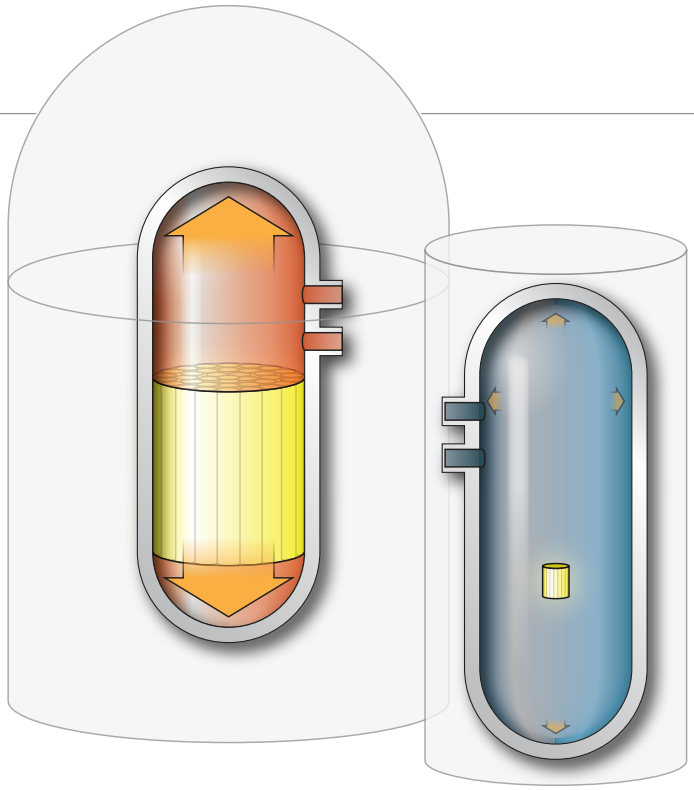
- Large test volumes—up to 48 inches long and 5.25 inches in diameter
- 75 testing positions with individual experiment control
- High neutron flux enables accelerated testing for fuel and materials development

Idaho National Laboratory

**COMMERCIAL POWER REACTOR**
Confinement structure

***Operating conditions***
2250 psia
600° F (3,400 MW thermal)

***Reactor core***
12 x 12 feet (1,700 cubic feet)
200,000 pounds of uranium



**ADVANCED TEST REACTOR**
Confinement structure

***Operating conditions***
360 psia
160° F (250 MW thermal)

***Reactor core***
4 x 4 feet (50 cubic feet)
95 pounds of uranium

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

- Fast/thermal flux ratios ranging from 0.1 – 1.0
- Constant axial power profile
- Power tilt capability for experiments in same operating cycle
- Frequent experiment changes
- Core internals replacement every 10-16 years
- Solid stainless-steel reactor vessel
- Seismic shutdown system

## NUCLEAR ENERGY

Experiments conducted at ATR provide a critical look at reactor components and systems. Testing at ATR supports reactor research around the world to extend the life of current nuclear power plants, develop designs for the reactors of the future, and test new types of stronger nuclear fuels that reduce waste generation and proliferation risks.

## ISOTOPE PRODUCTION

ATR is the only U.S. source of the valuable medical grade cobalt-60 isotope needed for "gamma knife" therapy used to treat brain tumors, and produces plutonium-238 for NASA's deep space exploration missions.

## COLLABORATIVE RESEARCH

ATR's capabilities are an essential part of efforts to support nuclear energy research and development in the U.S. and around the world. ATR capabilities are accessible to universities, industry and international partners through DOE's Nuclear Science User Facilities, the Gateway for Accelerated Innovation in Nuclear, and the National Reactor Innovation Center, as well as other research partnerships. ATR's capabilities are also key to INL's certification to the International Atomic Energy Agency (IAEA) International Center of Excellence based on Research Reactors (ICERR) standard.

## INVESTING IN THE FUTURE

ATR employs a unique design in which key internal components can be completely replaced every 10-16 years to enable long-term operations; numerous upgrades and improvements have been done since ATR entered service in 1967. The Department of Energy is continuing to invest in infrastructure upgrades on the reactor and key plant facilities to ensure ATR can continue to serve the nation's needs for decades to come.

This planning includes the procurement and availability of critical spare parts, including one-of-a-kind components such as core internal components and beryllium reflectors. Planning also addresses staffing requirements and identifies the funding, schedule, and prioritization for replacing key components and systems.

## FOR MORE INFORMATION

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