Idaho National Laboratory

Advanced Test Reactor Core Internals Changeout

Frequently Asked Questions

What missions does ATR support?

ATR's strategic missions include support for the U.S. Department of Energy's Office of Nuclear Energy as well as the U.S. Navy. ATR also supports university research, assists the U.S. and international nuclear energy industries, and enables the creation of valuable isotopes for medical treatments and NASA's space exploration missions. Periodic core overhauls help renew ATR so it can continue accomplishing its important missions.

The core overhaul outage periods also provide opportunities to upgrade and replace ATR's experimental capabilities and other infrastructure around the plant.

What is a Core Internals Changeout?

The Core Internals Changeout, or CIC, refers to the periodic overhaul of the key internal components of INL's Advanced Test Reactor. ATR's design allows for replacement of the components that receive the most wear and tear during routine operation of the reactor. The core overhaul process can be compared with rebuilding the engine of a high-end sports car that restores performance, efficiency and reliability.

Why are the core overhauls necessary?

ATR operates at low temperatures compared with a commercial power reactor, but it produces very high levels of neutron irradiation, or flux, for its research missions. ATR's high neutron flux takes its toll on some of the reactor's components, especially the beryllium reflectors. Microscopic swelling and cracking of the reflectors are modeled using computer simulation and closely monitored. Core overhauls are needed when the swelling approaches the point of interfering with refueling and the motion of ATR's control and safety systems.

When was the last core overhaul? How often does it happen? How long will it extend the life of ATR?

ATR's last CIC was performed in 2004. Changeouts are performed on average every 10 years, though the interval has grown since the reactor first achieved criticality in 1967 due to improvements in reflector design and operational improvements. The overhaul starting in April will be the reactor's sixth. Current DOE and Navy projects call for ATR's irradiation mission to continue until at least 2040.

How long does it take to complete a CIC?

The core overhaul process is scheduled to last about nine months, beginning when ATR's current cycle is scheduled to end on April 23. It is expected to complete by mid-January 2022.

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Who performs the core overhaul, and what are some of the important roles in the process?

Every division at the ATR Complex is involved, supported by many other groups across INL and specialized subcontractor support. INL groups that assist include INL's environmental, safety, Radiological Controls and Human Performance staff, among others. Subcontractors include companies with expertise supporting the nation's largest commercial nuclear power plants. Outage periods are always the busiest times at any operating reactor, and ATR is no exception. During routine minor outages that occur about every 60 days, the ATR team replaces fuel, installs or removes new experiments, and performs some maintenance and repair activities. ATR's extended nine-month overhaul outage will include all of this in addition to the complex task of replacing the core components and installation of several new experiment capabilities. Planning and preparation for a successful core overhaul begins more than five years in advance.

Why is CIC important for INL as a whole?

The thermal irradiation capabilities provided by ATR form a major part of the foundation of the U.S. nuclear energy research infrastructure and for INL and its sister labs nationwide. The core overhaul process maintains these capabilities at peak efficiency. They are needed to support a wide range of vital missions for the U.S. Department of Energy's Office of Nuclear Energy as well as the U.S. Navy. ATR also supports university research and the U.S. and international nuclear energy industries. Plus, the reactor creates valuable isotopes for medical treatments and for NASA's space exploration missions.

What measures are taken to protect workers and the public during the CIC?

Just as we do during routine operations and refueling outages, each hazard that might be changed or introduced during the core overhaul is carefully analyzed and addressed. One example would be the potential for falls near the 35-foot reactor vessel, which is addressed with temporary railing and platforms for key steps, along with fall protection harnesses and personal protective equipment for the workers. There is also increased radiological hazard for workers during some activities, which is addressed using additional shielding, distance and other controls as needed.

Are there added environmental concerns during the core overhaul?

The environmental concerns for a core overhaul are not substantially different than during routine operations. All fuel is removed from the reactor during the overhaul and safely stored while the work proceeds, and existing engineered and administrative radiological controls are expanded to wider areas as needed while reactor disassembly and installations are underway.

Where will waste be disposed if we are taking out radioactive material?

Some components that are replaced during the overhaul are stored and disposed as radiological waste, as appropriate to their waste classifications. Components are stored in ATR's stainless-steel-lined storage canal and then sent to licensed storage and disposal facilities based on the waste classification, in accordance with INL's agreements with the state of Idaho and EPA requirements.