



A Magnet for the World's Top Nuclear Scientists & Students

In addition to providing world-class facilities and instrumentation to aid in R&D, the INL ATR NSUF is committed to:

- Fostering collaboration among researchers on high-quality experiments
- Supporting nuclear programs at universities that lack a dedicated research reactor through research awards
- Providing nuclear technology internships that focus on the underpinnings of reactor operations
- Offering short courses where industry researchers, university faculty, postdoctoral researchers and graduate students can gain specific high-level knowledge and network within the nuclear research community
- Sponsoring ATR NSUF Users Week, an annual education and outreach program for ATR NSUF users where participants learn about ATR NSUF research and capabilities

Advanced Test Reactor National Scientific User Facility

By establishing the Advanced Test Reactor National Scientific User Facility (ATR NSUF) in 2007, DOE-NE opened up the world of material test reactors, beamlines, and post-irradiation examination facilities to researchers from U.S. universities and colleges by granting access to world-class nuclear research facilities. This National Scientific User Facility designation allows research teams to obtain access to Idaho National Laboratory's Advanced Test Reactor (ATR), ATR-Critical, Hot Fuel Examination Facility (HFEF), Analytical Laboratory and Electron Microscopy Laboratory, as well as facilities at nine affiliated partner institutions (Center for Advanced Energy Studies, Illinois Institute of Technology, Massachusetts Institute of Technology, North Carolina State University, Oak Ridge National Laboratory, University of California-Berkeley, University of Michigan, University of Nevada-Las Vegas, and University of Wisconsin-Madison).

Advancing the State of the Art in Nuclear Technology

Testing in a controlled neutron environment allows for advances in fuels and materials

of an actual reactor. Thus the ATR NSUF provides a rich field for scientific investigation.

performance, instrumentation and detection capability, neutronics benchmarks and thermal performance. Reactor testing can prove the performance of advanced technologies as well as provide critical data to validate modern computational techniques. These advances all must ultimately be



The Advanced Test Reactor Complex located in the Idaho high desert at Idaho National Laboratory.

proven in the extremely complex environment

ties, researchers can build on current knowledge and advance the state of the art.

ATR NSUF & Partner Capabilities

	CAES	INL	IIT	MIT	NCSU	ORNL	UC Berkeley	U of MI	UNLV	U of WI
Reactor		X		X	X	X				
PIE	X	X			X	X	X	X	X	X
Beamline			X		X			X		X



Idaho National Laboratory Facilities

Partner Facilities



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- **Advanced Test Reactor (ATR)**—large-volume, high-flux neutron irradiations in a prototypic reactor environment
- **Advanced Test Reactor-C (ATR-C)**—low power prototype ATR environment for neutronics benchmarks and detector studies
- **Hot Fuel Examination Facility (HFEF)**—heavily shielded, alpha-gamma hot cell facility designed for remote examination of highly irradiated fuel and structural materials
- **Analytical Laboratory**—analysis of irradiated and radioactive materials
- **Electron Microscopy Laboratory**—radiological facility containing optical, scanning and analytical electron microscopes



Engineers use robotic manipulators to perform Post-Irradiation Examination in hot cells at the Hot Fuel Examination Facility (HFEF) at INL.

Partner Facility Capabilities

- **Center for Advanced Energy Studies (CAES) Microscopy and Characterization Suite (MaCS)**—materials characterization laboratory equipped to handle low-level radiological samples as well as nonradiological samples. Offers several high-end pieces of equipment, including a LEAP 4000X HR.
- **Illinois Institute of Technology**—synchrotron radiation at the Materials Research Collaborative Access Team (MRCAT) beamline located in the Advanced Photon Source offers X-ray diffraction, X-ray absorption, X-ray fluorescence and 5µm spot size fluorescence microscopy.
- **Massachusetts Institute of Technology**—5 MW research reactor offering a variety of experimental positions including in-core, beam ports, pneumatic tubes, graphite-reflector irradiation positions and shielded medical rooms.
- **North Carolina State University**—PULSTAR reactor offers neutron powder diffraction, neutron imaging, intense positron source, ultra-cold neutron source, neutron activation analysis, isotope production and reactor irradiations.
- **Oak Ridge National Laboratory**—unique irradiation facilities in the High Flux Isotope Reactor (HFIR) including materials irradiations, isotope production, neutron activation analysis (NAA), and gamma irradiation. Irradiated materials processing facilities offer materials analysis, chemical processing and fuels research.



Researchers use the MRCAT at ATR NSUF's IIT partner facility.

- **University of California, Berkeley**—materials group in the nuclear engineering department offers sample preparation, micro- to nano- indentation over a wide temperature range and Focused Ion Beam (FIB) sample manufacturing available for low to medium level radioactive samples.
- **University of Michigan**—offers the Tandatron accelerator facility for proton irradiation experiments, as well as the Irradiated Materials Complex to conduct high-temperature mechanical properties, and corrosion and stress corrosion cracking experiments on neutron irradiated materials in an aqueous environment.
- **University of Nevada, Las Vegas**—Radiochemistry Laboratories offer Metallographic microscopy, X-ray powder diffraction, Rietveld analysis, scanning electron microscopy, electron probe microanalysis, analytical transmission electron microscopy and X-ray fluorescence (XRF) spectrometry.
- **University of Wisconsin, Madison**—Characterization Laboratory for Irradiated Materials (CLIM) is capable of examining neutron-irradiated transmission electron microscopy specimens, and the Tandem Accelerator Ion Beam can produce high-energy ion beams.