

ADVANCED TEST REACTOR NATIONAL SCIENTIFIC USER FACILITY



The Idaho National Laboratory's Advanced Test Reactor (ATR) National Scientific User Facility (NSUF) offers scientists and engineers an opportunity to perform novel research in the only U.S. research reactor capable of providing large-volume, high-flux neutron irradiations in a prototypic reactor environment. Once irradiated, a variety of post irradiation examination capabilities are offered for characterization of research results.

Advancing the State-of-the-Art in Nuclear Technology

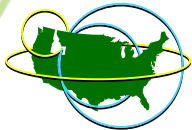
Testing in a controlled neutron environment allows for advances in fuels and materials performance, instrumentation and detection capability, neutronics benchmarks, and thermal performance. Reactor testing can prove the performance of advanced technologies as well as provide critical data to validate modern computational techniques. These advances all must ultimately be proven in the extremely complex environment of an actual reactor. Thus the ATR NSUF provides a rich field for scientific investigation. Through access to the world-class capabilities offered by the Advanced Test Reactor and post-irradiation examination facilities at the Idaho National Laboratory, and the variety of reactors, beam lines and instruments at the partner facilities, researchers can build on current knowledge and advance the state-of-the-art. Some of the capabilities offered by the ATR NSUF include:

Idaho National Laboratory:

- **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

Partner Facilities:

- **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
- **University of Michigan** – ion beam laboratory offers use of accelerators to study radiation effects by emulating neutron damage in nuclear reactor materials; and the irradiated materials complex laboratory which provides the capability 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 microscope, x-ray powder diffraction, Rietveld analysis, scanning electron microscopy, electron probe micro-analyzer, analytical transmission electron microscopy, and x-ray fluorescence
- **University of Wisconsin** – characterization laboratory for irradiated materials is capable of examining neutron-irradiated transmission electron microscopy specimens, and the tandem accelerator ion beam which can produce high-energy ion beams
- **Illinois Institute of Technology** – synchrotron radiation at the Advanced Photon Source offers x-ray diffraction, x-ray absorption, x-ray fluorescence and 5 μ m spot size fluorescence microscopy.

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

The ATR NSUF understands that creating a user nexus where research is shared, discussed, and debated is critical to ensuring that significant advancements occur in nuclear research and development. In addition to providing world-class facilities and instrumentation to aid in R&D, the INL 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



Meeting the Challenge

By maximizing the opportunity for researchers in academia, industry, and other national laboratories to access one of the largest, most flexible, and highest flux test reactors in the world, paired with a modern suite of examination tools, and the host of capabilities offered through the partner facilities, the ATR NSUF will help foster important advances in science that will impact the energy security of the United States.

Visit our website at: <http://atrnsuf.inl.gov>