Advanced Test Reactor National Scientific User Facility/NEUP Interface

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Idaho National Laboratory

ATR
National Scientific User Facility

April 2007 - ATR Designated as a National Scientific User Facility

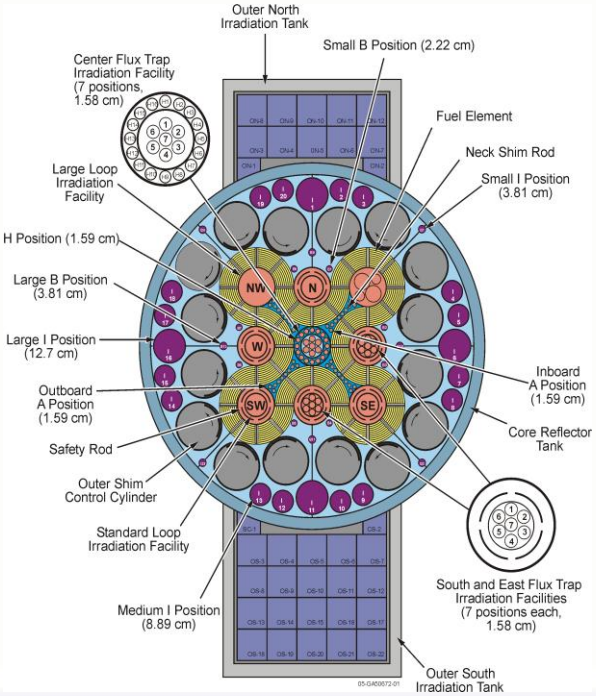
DOE's Objectives

- Advanced Test Reactor (ATR) has capabilities and capacity for nuclear fuel and materials development that are not currently being utilized by industry, universities, and regulatory agencies
- We need to make it easier and more cost effective to use the capabilities of the ATR to:
  - Help reestablish the U.S. scientific and nuclear industry base
  - Help reassert U.S. leadership in nuclear science and technology
  - Strengthen nuclear engineering education in the U.S
  - Provide better access for production of medical, research, and industrial isotopes

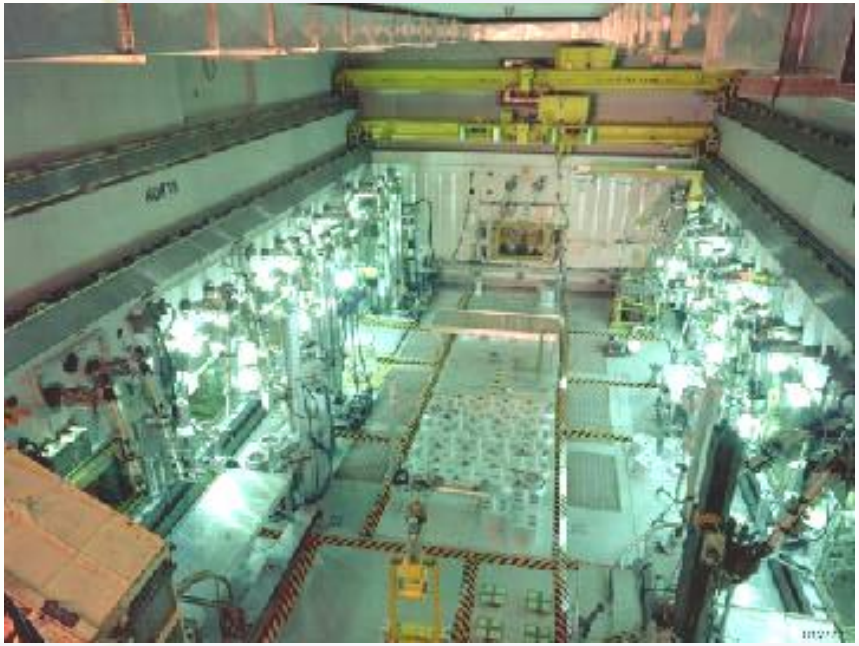
Initial Vision for ATR NSUF

Allow the research community access to test reactor space and existing post-irradiation examination capability – Supported by DOE NE, SC, and NR

Advanced Test Reactor



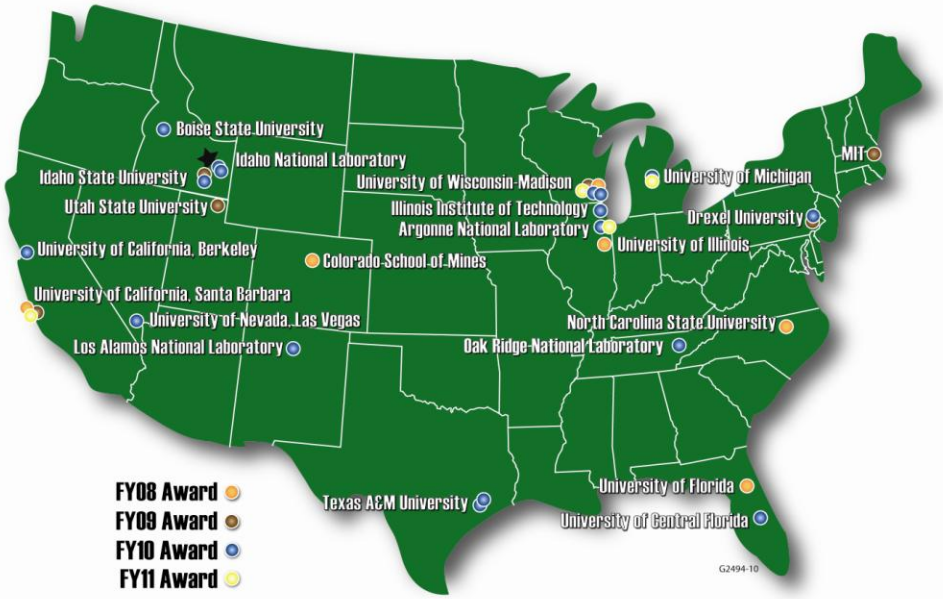
INL Post Irradiation Examination (PIE) Facilities (HFEF, EML)



Plans to upgrade ATR (by adding PWR loop and hydraulic shuttle) and PIE equipment

Sponsorship of Non-Proprietary Experiments

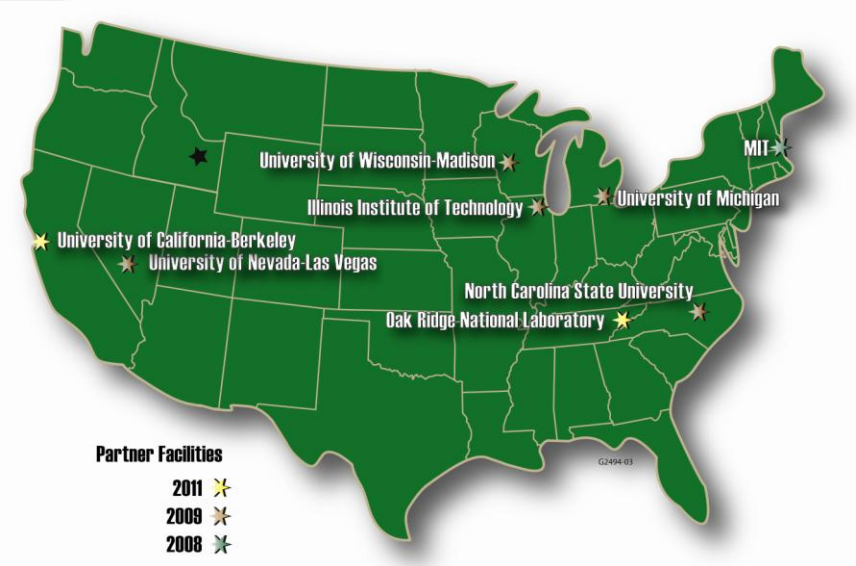
- Initiated in 2008
- Must be led by US Universities
- Partnerships Encouraged
  - Other universities
  - National laboratories
  - Industrial entities
- Can Include Irradiation, PIE, Instrumentation, or Combinations
- Peer Reviewed for Technical Merit
- Reviewed for Relevance to DOE- NE Programs
- Awarded for Implementation in both INL and Partner Facilities
- Student Internships Offered for Awarded Projects

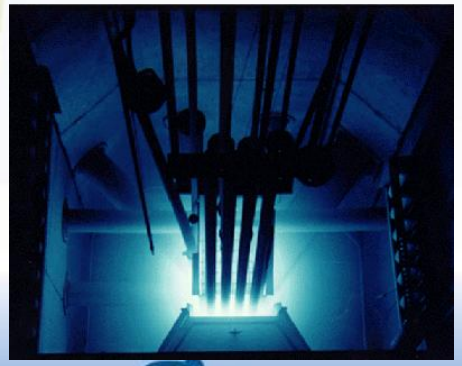


What ATR NSUF Has Become

- Continued Access to ATR
- ATR Critical Facility
- PIE Sample Library/Rapid Turnaround Projects
- Upgraded Examination Equipment
- Network of University and Laboratory Partners Providing Irradiation and Examination Capability
- Microscopy and Characterization Suite
- LWR Industry Research Support
- Instrumentation Development
- Expanded Educational Program
- Connections to other User Facilities
  - LANSCE
  - APS
  - SHaRE
  - NIST

Partners





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Microscopy and Characterization Suite (MaCS)

- Managed by Boise State University
- ATR NSUF prepays for a specified percentage of instrument use
- ATR NSUF purchased some instruments
- Open access to researchers

April 2010

Equipment approved

Sept 2010

Facility remodeled; equipment procured and acceptance testing completed

March 2011

Rad pilots completed with limited operating envelope

August 2011

Plan to begin rad sample prep

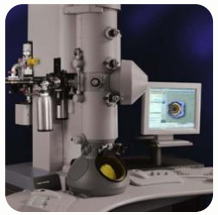
MaCS

ATR National Scientific User Facility

Providing state-of-the-art tools to students and researchers

Local Electrode Atom Probe
Creates 3-D images of atoms in solids

Focused Ion Beam
Sections materials at micro- and nano-scales for TEM and LEAP microscopy.



Transmission Electron Microscope
Images nano-scale material structures

Spark Plasma Sintering
Creates fully dense metals, ceramics and metal-ceramic composites

Atomic Force Microscope
Measures mechanical properties on very small scale samples

Automated Hardness Tester
Measures and evaluates the micro-hardness of materials

Scanning Electron Microscope
Images material surfaces at the nano-scale

Fabricate novel metals, ceramics, and composites optimized for energy applications including fuels, vessels, piping, cladding, etc.

Condition materials with mechanical stress, heat and radiation (ATR)

Test material properties by destructive and nondestructive means

Characterize materials with state-of-the-art microscopy

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ATR NSUF Education Programs - Build a Cadre of Experimenters

- User Week June, 2011
  - Experimenter course
  - Introduction to Nuclear Fuels and Fuel Cycle
  - Fundaments of Defects and Radiation Effects
  - Approaches to Modeling Defects and Radiation Effects
  - PIE Techniques
  - Techniques in Microstructure Characterization and Analysis
  - ATR NSUF Research Forum
  - Facility tours
- Internships
- Faculty-student Research Teams
- ANS Student Conference Workshop, April 2011, Poster Awards
- Colloquium Series
- University Seminar Visits
- Reactor Testing Textbook

ATR NSUF Experiment Funding

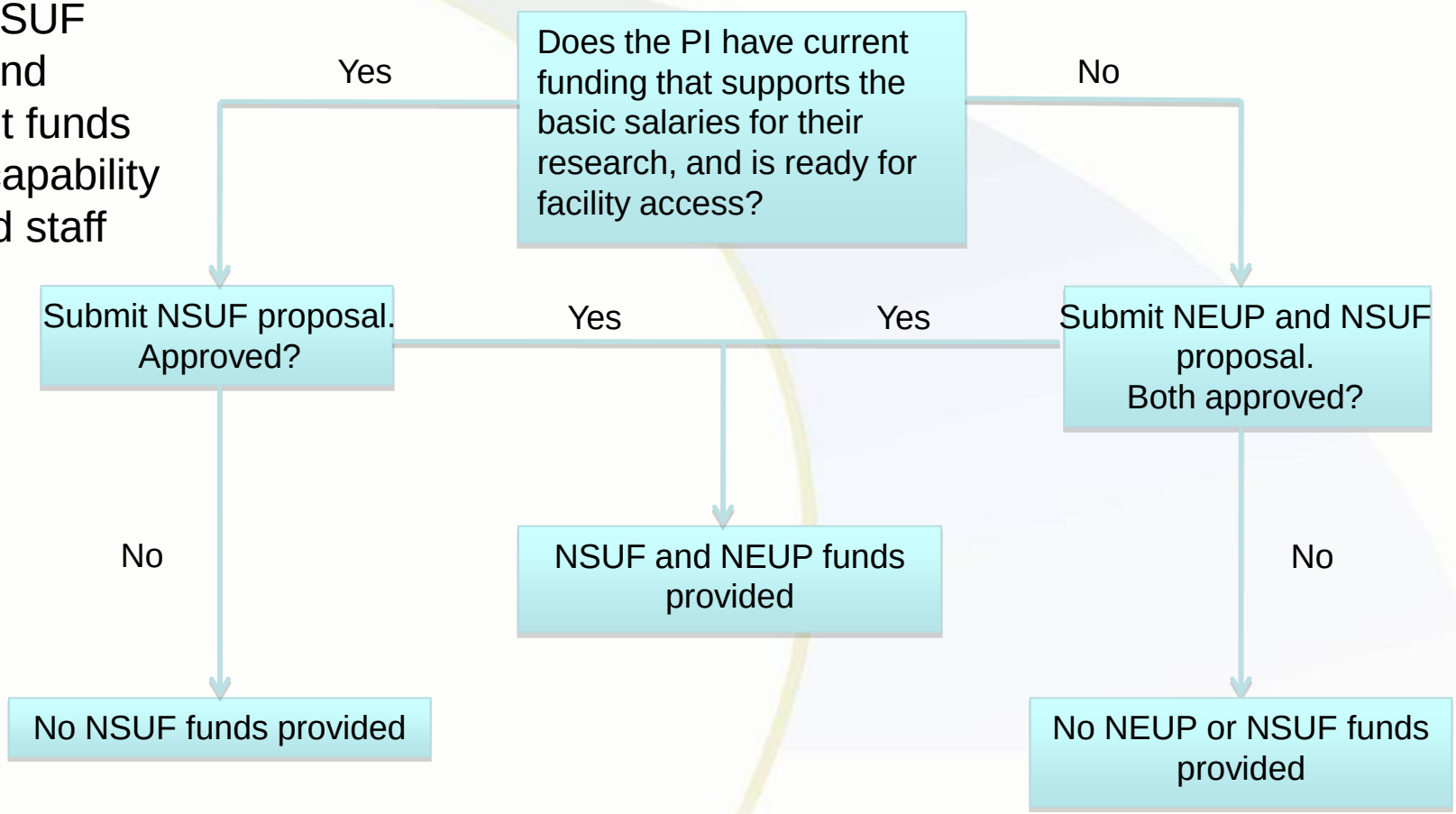
- Majority of Research Performed Primarily at INL or Partner Facility
- Project Funding Not Intended for Student or Faculty Salaries
- Some “Bridge” Funding Available to Universities
  - Preparatory (not developmental) work required prior to access to facilities
  - Student or faculty travel to facilities
  - Research time spent at facilities
  - Limited funds available
  - Proposed by PI and negotiated with NSUF
- Projects Funded Annually

ATR NSUF –NEUP Relationship

- Currently, No Formal Relationship – PIs Propose to Both Programs if Need Funds From Both
  - ATR NSUF Focus is Access to Experimental Facilities
  - NEUP is Grant Program
- ATR NSUF has Two Open Proposal Calls Each Year
- PI's Risk Not Completing Work if Not Selected by Both Programs
- Review Process Similar (3 peer reviewers), From Same Reviewer List
- DOE-NE Requested ATR NSUF and NEUP to Consider Joint Proposal Process

Proposed NSUF NEUP Linkage-FY 2012

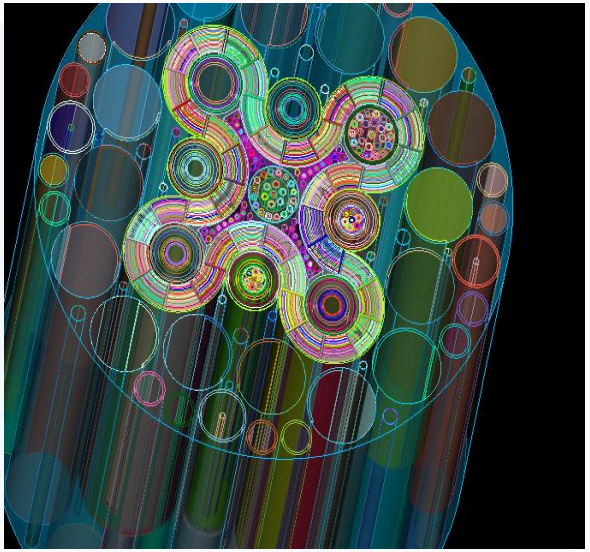
Premise: NSUF does not fund programs, it funds access to capability and needed staff support.



Linking the ATR NSUF and NEUP solicitations will streamline process for both ATR NSUF and NEUP PIs.

ATR NSUF Future

- The Program Structure and Operating Model is Flexible, to Support Experimental and Institutional Innovation
- Continue to Enable University-based Research to Support DOE (Nuclear Energy) Strategic Objectives, and Support Industry Research Needs
  - Involve Broader INL Capability (e.g., computation and visualization, radiochemistry labs, fuel fabrication)
  - Connect to Additional User Facilities (e.g., IVEM)
  - Add National Non-reactor Capability (e.g., major thermal testing loops)



Portal to national capability, pairing ideas to assets

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