U.S. DEPARTMENT OF ENERGY | Office of NUCLEAR ENERGY

Clean. Reliable. Nuclear.

Nuclear Science User Facilities

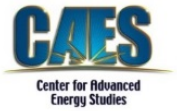
Dan Ogden
Deputy Director - NSUF
Idaho National Laboratory

Nuclear Science User Facilities (NSUF) General

- **Established in 2007 as DOE Office of Nuclear Energy's first and only user facility**
  - Irradiation effects in nuclear fuels and materials
  - Provide access to capabilities and expertise at no cost to the user
  - Support design, fabrication, transport, irradiation, PIE, disposition
  - Link intellectual capital with nuclear research infrastructure to fulfill mission of DOE-NE
- **Projects are selected through an open competitive proposal process**
  - Consolidated Innovative Nuclear Research FOA (1 call/year)
    - Irradiation + PIE ($500K - $4.0M, up to 7 years)
    - PIE only ($50K to $750K, up to 3 years)
    - Irradiation only ($500K - $1.5M)
  - Rapid Turnaround Experiments (3 calls/year)
    - Not part of the CINR FOA
  - Proposals welcome from University, National Laboratory, Industry, and Small Business

NSUF Capabilities

Neutron Irradiations	Ion Irradiations	Gamma Irradiations	Post Irradiation Examination	Beamlines	High Performance Computing



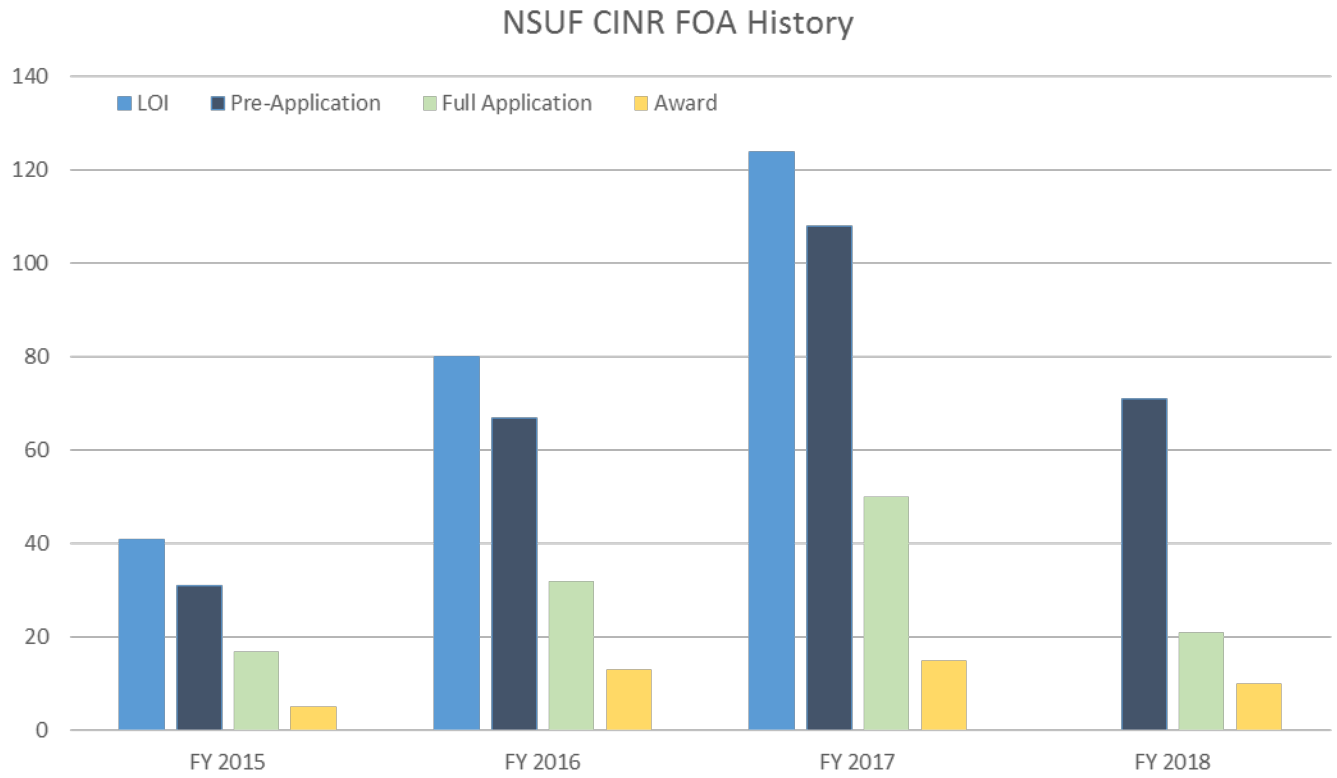
Nuclear Fuels and Materials Library (NFML)

- **The library includes over 6000 specimens as part of the NSUF awarded research**
- **Most materials are neutron irradiated with small number of ion irradiated materials**
- **Web-based searchable database through nsuf.inl.gov**
- **Materials Include:**
  - Steels
  - Other alloys
  - Ceramics
  - High purity elemental materials
  - Actinides

Nuclear Energy Infrastructure Database (NEID)

- A searchable and interactive database of all pertinent infrastructure supported by, or related to, the DOE Office of Nuclear Energy (DOE-NE)
- Used for support of infrastructure calls and provide information to NSUF users
- Infrastructure information collected can be combined with information on R&D needs analyses to identify needs, redundancies, efficiencies, distributions, etc., to best understand the utility of DOE-NE's available infrastructure, inform the as part of infrastructure gap analysis

Historical and Projected Growth



- **CINR type projects support**
  - FY 2015 - $14.1M, 41 LOIs, 31 pre-proposals, 17 full proposals, 5 awards
  - FY 2016 - $10M, 80 LOIs, 67 pre-proposals, 13 awards
  - FY 2017 - $10M, 124 LOIs, 108 pre-proposals, 50 full proposals, 15 awards
  - FY 2018 - $10M, 71 access requests, 21 full proposals, 10 awards

NSUF Workscopes

University Led

- NEAMS-2:Separate Effects Irradiation Testing for Validation of Microstructural Models in Marmot
- FC-2.5: Separate Effects Testing in TREAT using Standard Test Capsules

University, National Laboratory, Industry Led

- NSUF 1.1: Testing of Advanced Materials or Advanced Sensors for Nuclear Applications
- NSUF 1.2: Irradiation Testing of Materials Produced by Innovative Manufacturing Techniques

Industry Led

- NSUF-2.1: Core and Structural Materials
- NSUF-2.2: Nuclear Fuel Behavior and Advanced Nuclear Fuel Development
- NSUF-2.3: Advanced In-reactor Instrumentation

NSUF Changes from FY 2018

- **Reinstated Letter of Intent and Pre-Application**
- **Submittal of Preliminary Statement of Work and Final Statement of Work**
- **IIT MRCAT Beamline at the Advanced Photon Source not offered this year**
  - Currently resolving challenges in handling radioactive material
- **NSUF-2 workscopes are open to industry leads only**
- **NSUF-2 2.4 workscope eliminated**
  - Synchrotron radiation available at NSLS-II X-ray Powder Diffraction Beamline
  - NSLS-II available in all NSUF workscopes
- **Declaration of Proprietary Data**
  - Data the Applicant wishes to protect during Irradiation or PIE phase
  - Such as chemical composition or physical properties
  - May negatively impact feasibility of the project

NSUF Reminders

- Uninvited full applications will not be reviewed for NSUF Access
- High Performance Computing Capability available through NSUF
- Source, Scope and Duration of R&D support must be identified for NSUF Access Only
- NSUF access process described in Appendix D
- Non negotiable User Agreement in Appendix E
- LOI due on August 30, 2018
- Pre-application due September 20, 2018
- Preliminary Statement of Work due on November 15, 2018
- Final Statement of Work due on February 12, 2019

NSUF-2: NSUF Access Only Workscopes

- **Objective**
  - Provide access to the capabilities of the NSUF for research projects supporting the DOE Office of Nuclear Energy mission
- **Types of Projects**
  - Irradiation only
  - Irradiation and PIE
  - PIE only
  - Beamline
- **Restrictions**
  - Open to Industry leads only
  - R&D support funding for Applicant not provided
  - Source, scope and duration of R&D funding must be identified
  - NSUF does not fund travel, salaries, or other user costs
  - Initial development effort should be complete and ready for irradiation

NSUF-2 Focus Areas

- **NSUF 2.1 Core and Structural Materials**
  - Understanding irradiation effects such as aging and material degradation (e.g. fatigue, embrittlement, void swelling)
  - Development of radiation resistant materials for current and future reactor applications
- **NSUF 2.2 Nuclear Fuel Behavior and Advanced Nuclear Fuel Development**
  - Increase fundamental understanding of the behavior of nuclear fuel
  - Improve performance of current fuels or develop advanced fuels
  - Irradiation and thermal effects on microstructure, thermophysical and thermomechanical properties and chemical interactions
  - Projects should aim at proposing simple irradiation experiments with post irradiation examination investigation of fundamental fuel performance aspects such as radiation damage, species diffusion or fission products
  - Coupling of experimental methods with modeling and simulation is encouraged

NSUF-2 Focus Areas

- **NSUF 2.3 Advanced In-reactor Instrumentation**
  - Support qualification of advanced in-reactor instrumentation
    - For characterization of materials under irradiation in test reactors
    - For on-line condition monitoring of power reactors
  - Advanced instrumentation, sensors, and measurement techniques for use in advanced reactors is encouraged

Contact Information

- Federal Program Manager: Tansel Selekler
  TanselSelekler@nuclear.energy.gov

- Technical Lead: J. Rory Kennedy
  Rory.Kennedy@inl.gov


NSUF
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User Facilities