U.S. DEPARTMENT OF ENERGY | Nuclear Energy

Nuclear Science User Facilities

NSUF Changes and Work Scopes FY 2018 Consolidated Innovative Nuclear Research FOA DE-FOA-0001772

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NSUF Nuclear Science User Facilities

CINR Webinar
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Outline

NSUF Nuclear Science User Facilities

- FOA Changes from FY 2017
- Partner Changes from FY 2017
- NSUF-2 Work Scope
- NSUF Questions

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Changes from FY 2017

NSUF Nuclear Science User Facilities

- **Increased focus on applicant readiness for NSUF access**
- **A summary of readiness is required with the pre-application**
- **A detailed description of readiness is required in the full application**
- **NSUF will review readiness prior to invitation and award**
- **Complete prior to application**
  - Development and qualification of fabrication techniques, processes and methods Pre-irradiation characterization (physical, mechanical, thermal, chemical and other applicable properties)
  - Material interaction studies (at irradiation pressure, temperature, chemistry)
  - Corrosion studies (at irradiation pressure, temperature, chemistry)

Changes from FY 2017

- **Increased focus on applicant readiness for NSUF access**
- **Address Readiness in Narrative**
  - Structural and cladding materials for neutron irradiation must be supplied to NSUF three months after project initiation (provide supplier commitments and lead times) in order for the material to be machined to proper sample configuration prior to encapsulation
  - For previously irradiated fuels and materials not residing in the NSUF Fuels and Materials Library, identify the location (as specific as possible), condition, provenience, pedigree, radioactivity levels, isotopic content, material composition, configuration, ownership and any other available information that will be needed in order to ship and/or prepare the fuel or material for examination
  - For any fuels or materials supplied for the purpose of neutron irradiation, the applicant must own and have full authority to transfer ownership and title (free of any liens, claims of ownership, or other liabilities) to DOE
  - For fuels or materials coming from other DOE programs (not NSUF), a statement of program commitment is required

Changes from FY 2017

- **Formalized Statement of Work submittal**
  - SOW is a key element of the NSUF Feasibility Review to determine cost
  - Previously handled in a less formal process (email)
  - Now mandatory submittals through the NEUP website
  - Preliminary SOW due November 17, 2017
  - Final SOW due January 22, 2018
  - SOW Template provided in the FOA
- **User Agreement**
  - Acceptance of the NSUF User Agreement moved from LOI to Pre-application / Full Application
  - Standard agreement in Appendix E
  - Special version for Colorado public institutions

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Reminders

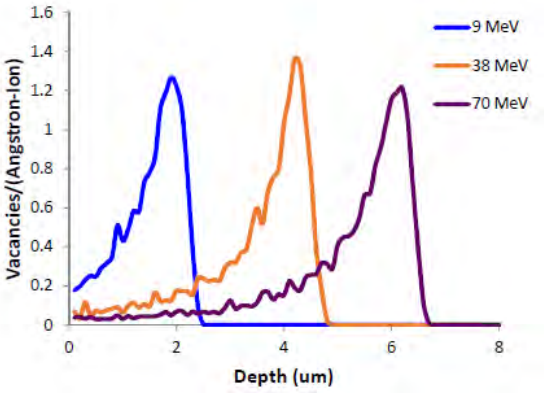
NSUF Nuclear Science User Facilities

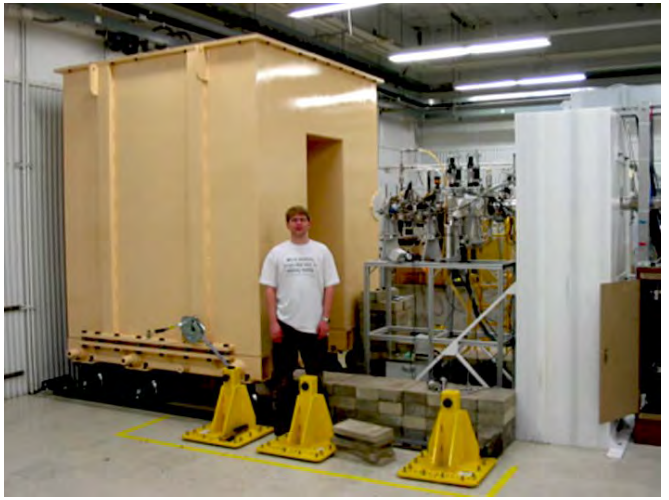
- **Uninvited applications will not be reviewed for NSUF Access**
- **DOE reserving option to decouple R&D request from NSUF Access and evaluate and fund either portion if feasible**
  - Applicable in the NEAMS-2 and NSUF-1 work scopes only
- **High Performance Computing Capability available through NSUF**
- **Source, Scope and Duration of R&D support must be identified for NSUF Access Only**
- **NSUF access process described in Appendix D**
- **LOI due date August 31 - Pre application due date September 20**

Center for Accelerator Mass Spectrometry

- 10-MV FN tandem Van de Graaff accelerator
- Can work with plutonium samples (0.5gm)
- Can accelerate Pu ions (low flux)
- Main competency is AMS
- Radioactive material up to 100mr/hr @ 30cm

	H/D	He	Heavy ions (C, Fe, U)	Noble Gases
Typical energy	2-18 MeV	4-27 MeV	20-100 MeV	Under development
Maximum current	20-30 uA	5-10 uA	1-10 uA	
Applications	Isotope production, H injection	He injection	dpa	Fission product injection





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Los Alamos National Laboratory

NSUF Nuclear Science User Facilities

CMR Wing 9 Hot Cells

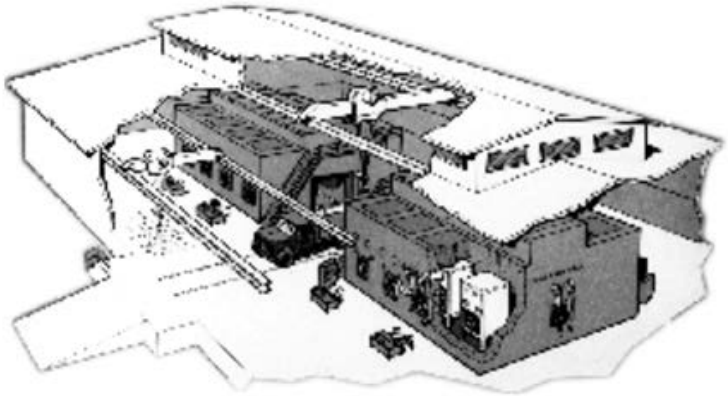
- Mechanical testing capability
- Sample preparation (alpha decontamination)

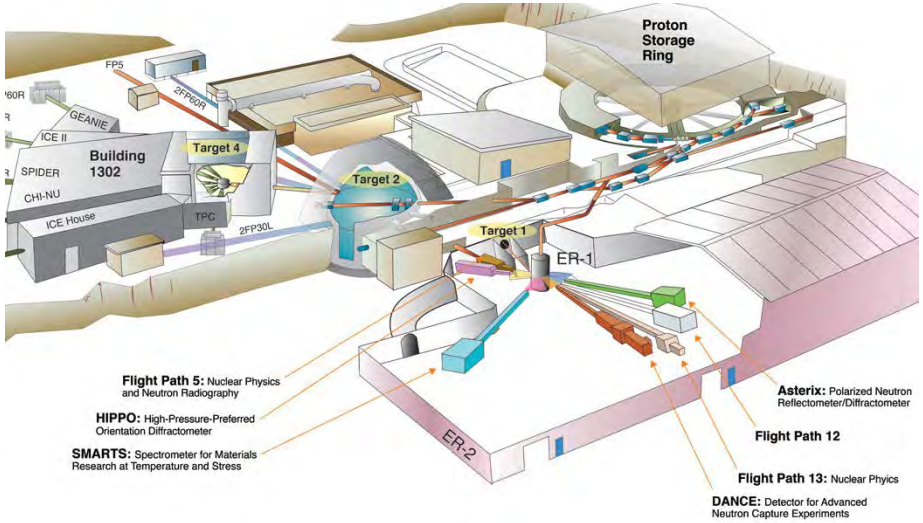
LANSCE & Lujan Neutron Scattering Center

- Neutron and proton tomography
- Neutron diffraction at HIPPO and SMARTS

Plutonium Surface Science Laboratory

- XPS, UPS, TOF-SIMS





The Ohio State University Research Reactor

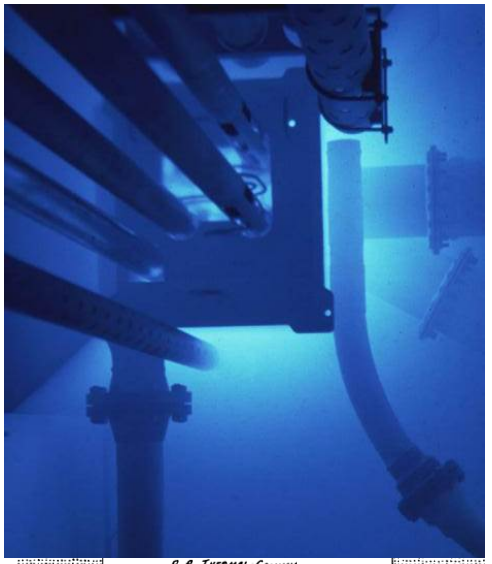
500kW LEU pool-type research reactor

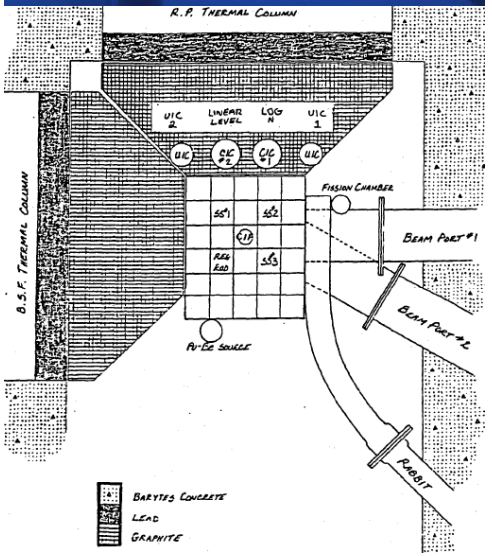
- Detector testing expertise
- **CIF:** 1.3” dry tube near core centerline
- **AIF:** 2.5” dry tube near core edge
- **Rabbit system:** 2.0” capsules

- **7 & 10” Dry Tubes** at core edge
  - Temperature control from 4-1873K
  - Significant sensor development and irradiation testing expertise.

- Neutron imaging and transmission capabilities.

Facility	Thermal Flux [nv < 0.5eV]	Fast Flux [nv > 1Mev]	Gamma Dose Rate [MR/hr]
CIF	1.4E+13	4.7E+12	87
10” Dry Tube	3.1E+11	1.6E+11	4.4





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Sandia National Laboratories

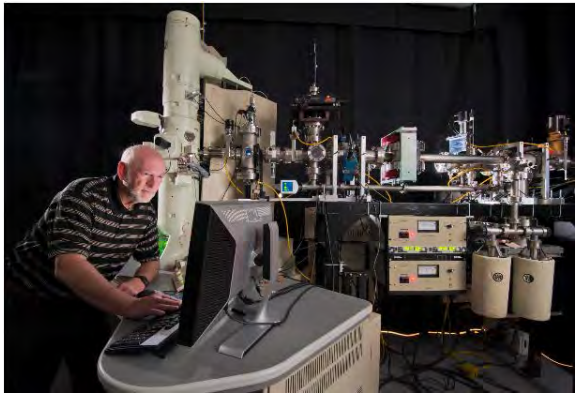
NSUF Nuclear Science User Facilities

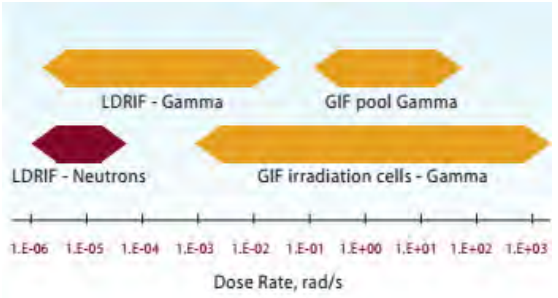
Sandia Ion Beam Laboratory

- In-situ Ion Irradiation Transmission Electron Microscope (I^3TEM)
- In-situ Ion Irradiation Scanning Electron Microscope (I^3SEM)
- Seven accelerators, incl. high-energy protons and fusion neutrons

Technical Area - V

- Annular Core Research Reactor
- Gamma Irradiation Facility (^{60}Co)

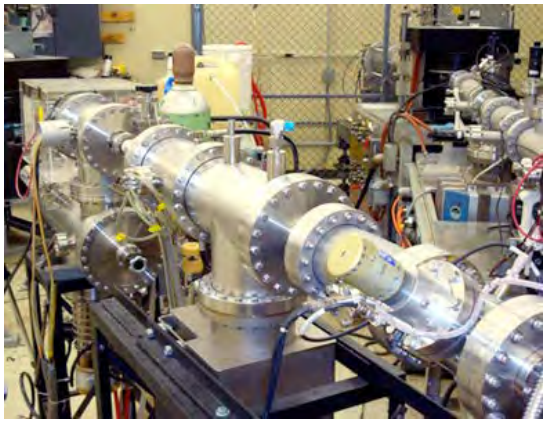


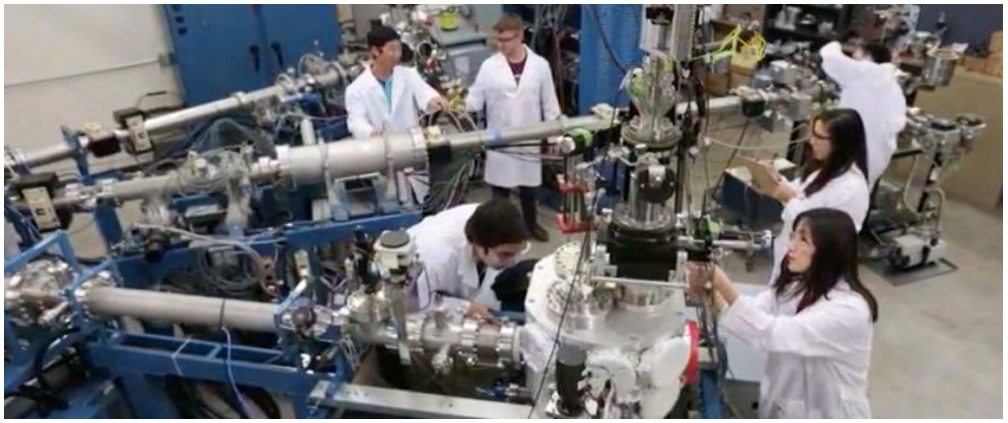


Texas A&M University

TAMU Accelerator Laboratory

- Dual-ion irradiation capability
  - 1.7 MV ion accelerator is a General Ionex Corporation Tandetron accelerator
  - 400 kV Van de Graaff accelerator (single-ended for noble gases)
- 3MV ion accelerator commercial NEC tandem
- Ultra-high dpa (≥1000 peak dpa)
- Ion beam analysis techniques
- Radioactive materials up to 0.1mCi/sample





Nuclear Fuels & Materials Characterization Facility

- FEI HELIOS NANOLAB 600 Dual Beam FIB/SEM
  - in-situ nano-scale mechanical testing unit (Hysitron PI 87xR SEM PicoIndenter with 800ºC heating option
  - equipped with an analytical suite (EDS, WDS, EBSD)
- FEI TECNAI F20 TEM
  - simultaneous EDS and scanning TEM (STEM) tomography capabilities

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NSUF-2
NSUF Access Only

NSUF Nuclear Science User Facilities

- 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
  - R&D support funding not provided
  - NSUF does not fund travel, salaries, or other user costs
  - Source, scope and duration of R&D funding must be identified
  - Preliminary development effort should be nearly complete

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NSUF-2 Focus Areas

NSUF Nuclear Science User Facilities

- **NSUF 2.1 Core and Structural Materials**
  - Understanding material degradation mechanisms due to irradiation or irradiation combined with other environmental effects
  - 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
  - Research and 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

NSUF-2 Focus Areas

NSUF 2.3 Advanced In-reactor Instrumentation

- Characterization of materials under irradiation in test reactors
  - Dimensional Changes
  - Crack Propagation
  - Internal Fission Gas Pressure
  - Non-intrusive to the specimen
- On-line condition monitoring of power reactors
- Non-traditional techniques (optical fibers, ultrasonics, wireless transmission)

NSUF 2.4 Experiments with Synchrotron Radiation

- Fundamental Aspects of Radiation Damage
- Phase Stability and Phase Transformation under Irradiation
- Surfaces and Grain Boundaries in Irradiated Materials
- Deformation and Fracture of Irradiated Materials
- Physics and Chemistry of Nuclear Fuels

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Questions?


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