



U.S. DEPARTMENT OF  
**ENERGY**

**Nuclear Energy**

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# **Nuclear Energy Enabling Technologies (NEET) Advanced Sensors and Instrumentation (ASI)**

**Suibel Schuppner**  
Office of Nuclear Energy  
U.S. Department of Energy

**Office of Nuclear Energy Webinar on ASI**

October 18, 2017



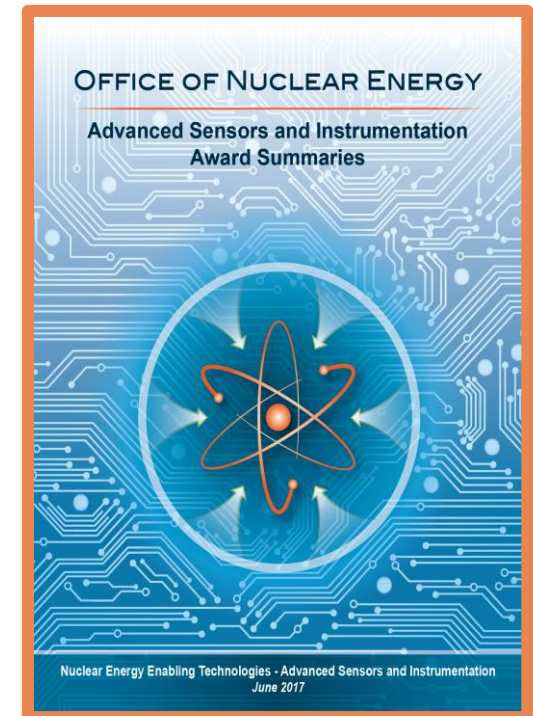
# Nuclear Energy Enabling Technologies: Advanced Sensors and Instrumentation

## ■ Vision

Develop advanced sensors and instrumentation technologies that address critical technology gaps for monitoring and controlling advanced reactors and fuel cycle facilities

## ■ Goals

- **Support DOE-NE R&D programmatic needs and the Gateway for Accelerated Innovation in Nuclear (GAIN) Initiative**
  - Fuel & material studies, integral tests
- **Provide new capabilities for measurement and control**
  - Sensors for harsh environments, advanced control capabilities, fault tolerant operations
- **Address R&D needs for successful deployment**
  - Digital technology qualification, advanced operational concepts



[www.energy.gov/ne](http://www.energy.gov/ne)



# NE Mission Strategic Linkage

## ASI Supports NE's Priority Mission Elements

- **New & Innovative Sensor Capability**
- **Enhanced Monitoring and Control System**
- **Greater Data Generation and Transmission**
- **Advanced Concepts of Operation**

Existing Fleet



Advanced  
Reactor  
Pipeline



Fuel Cycle  
Infrastructure





# NEET-ASI Current Awards

FY	Project Title	Principal Investigator
2014	Enhanced Micro-Pocket Fission Detector (MPFD) for High Temperature Reactors	Troy Unruh, Idaho National Laboratory
2014	Nanostructured Bulk Thermoelectric Generator for Efficient Power Harvesting for Self-powered Sensor Networks	Yanliang Zhang, Boise State University
2014	Robust Online Monitoring Technology for Recalibration Assessment of Transmitters and Instrumentation	Pradeep Ramuhalli, Pacific Northwest National Laboratory
2014	Operator Support Technologies for Fault Tolerance and Resilience	Richard Vilim, Argonne National Laboratory
2014	Embedded Instrumentation and Controls for Extreme Environments	Roger A. Kisner, Oak Ridge National Laboratory
2014	High Spatial Resolution Distributed Fiber-Optic Sensor Networks for Reactors and Fuel Cycle Systems	Kevin Chen, University of Pittsburgh
2015	Nuclear Qualification Demonstration of a Cost Effective Common Cause Failure Mitigation in Embedded Digital Devices	Matt Gibson, Electric Power Research Institute
2015	Development and Demonstration of a Model Based Assessment Process for Qualification of Embedded Digital Devices in Nuclear Power Applications	Richard Wood, University of Tennessee
2016	Transmission of Information by Acoustic Communication along Metal Pathways in Nuclear Facilities	Richard Vilim, Argonne National Laboratory
2016	Wireless Reactor Power Distribution Measurement System Utilizing an In-Core Radiation and Temperature Tolerant Wireless Transmitter and a Gamma-Harvesting Power Supply	Jorge Carvajal, Westinghouse Electric Company
2016	Self-powered Wireless Through-wall Data Communication for Nuclear Environments	Lei Zuo, Virginia Tech



# NEET-ASI New Awards

FY	Project Title	Principal Investigator
2017	Integrated silicon/chalcogenide glass hybrid plasmonic sensor for monitoring of temperature in nuclear facilities	Maria Mitkova, Boise State University
2017	High temperature embedded/integrated sensors (HiTEIS) for remote monitoring of reactor and fuel cycle systems	Xiaoning Jiang, North Carolina State University
2017	3-D Chemo-Mechanical Degradation State Monitoring, Diagnostics and Prognostics of Corrosion Processes in Nuclear Power Plant Secondary Piping Structures	Douglas Adams, Vanderbilt University
2017	Versatile Acoustic and Optical Sensing Platforms for Passive Structural System Monitoring	Gary Pickrell, Virginia Polytechnic Institute and State University

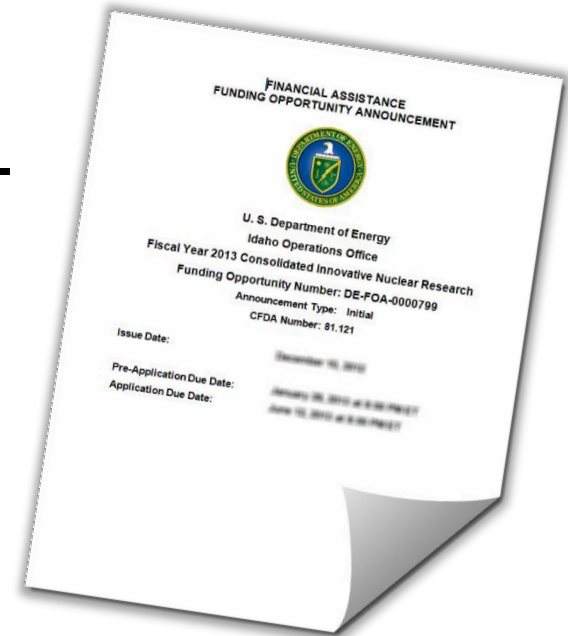


# FY 2018 Consolidated Innovative Nuclear Research (CINR) Funding Opportunity Announcement (FOA)

- **University-led R&D [Nuclear Energy University Programs (NEUP)]**
  - Program and Mission Supporting
- **Industry-, University-, or National Laboratory-led R&D [Nuclear Energy Enabling Technologies (NEET) Program]**
  - Advanced Sensors and Instrumentation
  - Advanced Methods for Manufacturing
  - **At least 20% cost share for industry leads**
- **University-led, Program Directed Integrated Research Projects [NEUP]**
  - Program Directed work

## FOA dates

- **Webinar: August 2017**
- **FOA release: October 2017**



Announcement: <http://www.energy.gov/ne>  
FOA information: <http://www.grants.gov>  
Application: <http://www.neup.gov>



# Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STT) : Advanced Technologies for Nuclear Energy

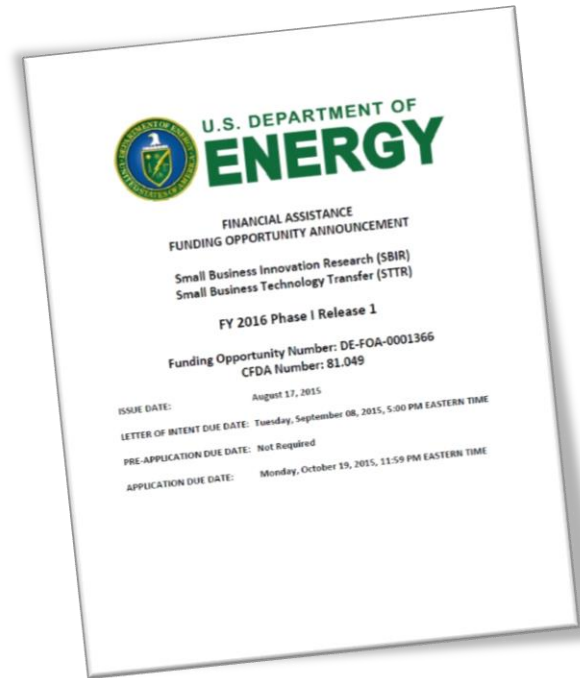
- Competitive awards for small businesses only
- Winners keep the rights to any technology developed and are encouraged to commercialize the technology
- Funded by federal R&D budgets set aside

## NE funds SBIR and STTR projects

- Office of Nuclear Energy Section

## Phase I Release 2

- Topics Issued: **October 30, 2017**
- Webinar: **Week of November 06, 2017**
- FOA Issued: **November 27, 2017**
- LOI Due: **December 18, 2017**
- Application Due: **February 06, 2018**



[www.science.energy.gov/sbir](http://www.science.energy.gov/sbir)

# Industry-Focused Funding Opportunity Announcement (FOA)

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- **Supports innovation and competitiveness of the U.S. nuclear industry by directly sharing costs on crosscutting applied research and development activities, specifically:**
  - All aspects of advanced reactor development
  - Methods to improve the cost and schedule for delivery of nuclear products, services and capabilities, and
  - Resolution of regulatory/certification issues.
  
- **FOA to service nuclear technology developers from early concept to more mature designs. Low to mid-level technology readiness levels and/or first-of-a-kind engineering (FOAKE) development.**





# Summary

- Improvements and advancements in **ASI technologies** will
  - enable advances in nuclear reactor and fuel cycle system development
  - enhance economic competitiveness for nuclear power plants, and
  - promote a high level of nuclear safety.
- NEET-ASI research produces **concepts, techniques, capabilities, and equipment** that are or can be demonstrated in simulated or laboratory test bed environments representative of nuclear plant systems or fuel cycle systems.
- Innovative and crosscutting research is funded through **competitive**, peer-reviewed, **solicitations**.

*I&C technologies are a vital key to enabling the expansion of clean, safe and economical nuclear power.*

# ASI Contact Information

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