

Advanced Sensors and Instrumentation

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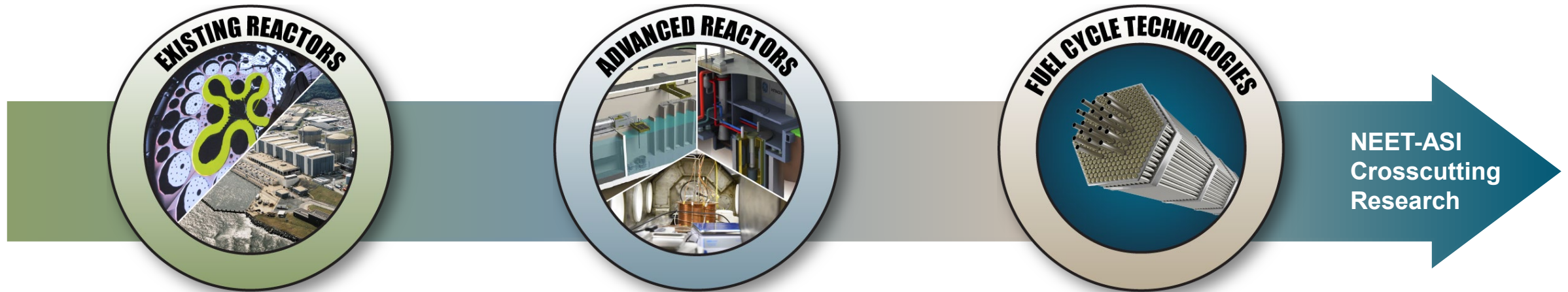
Mission, Vision, Goals and Strategic R&D

Mission

Develop advanced sensors and I&C that address **critical technology gaps** for monitoring and controlling existing and advanced **reactors** and supporting **fuel cycle** development

Vision

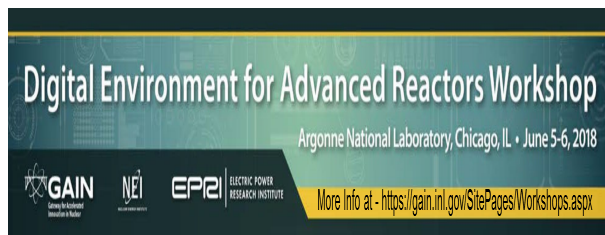
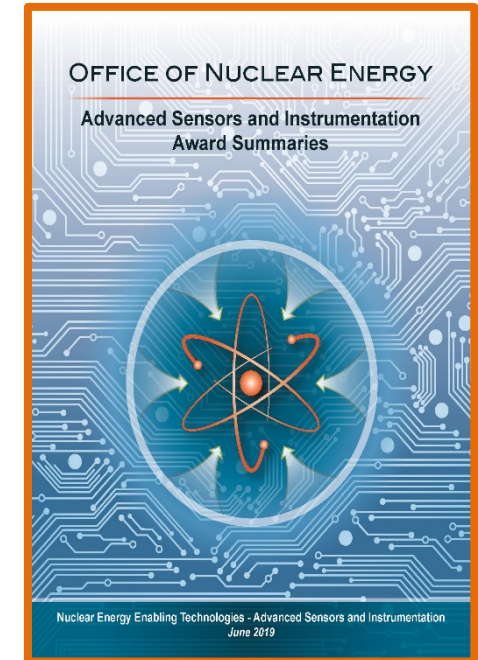
NEET ASI research results in advanced sensors and I&C technologies that are qualified, validated, and ready to be adopted by the nuclear industry



Mission, Vision, Goals and Strategic R&D (Cont.)

Goals

- Support **DOE-NE R&D** programmatic needs
 - Fuel and material studies, integral tests
- Provide **new capabilities** for measurement, control, and operation
 - Sensors for harsh environments, advanced control capabilities, semi-autonomous and fault-tolerant operation, and predictive analytics
- Address R&D needs for **successful deployment**
 - Digital technology and instrumentation qualification



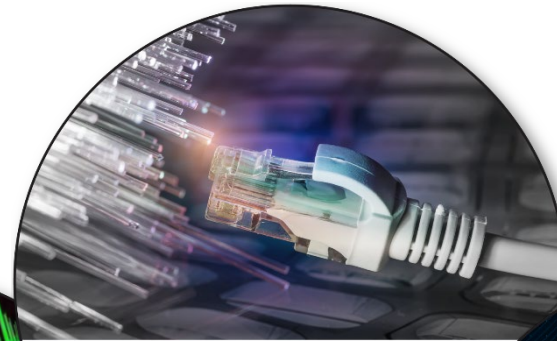
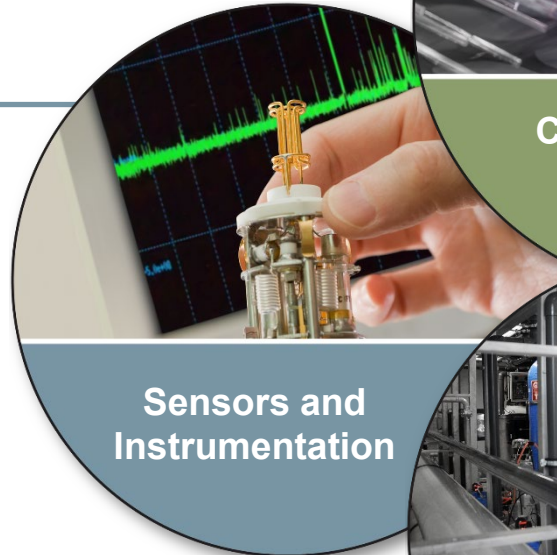
Advanced Sensors and
Instrumentation (ASI) Webinar
Oct. 31, 2018 - Nov. 1, 2018



Mission, Vision, Goals and Strategic R&D (Cont.)

Strategic R&D Areas

Reliable, cost-effective, real-time, accurate, and high resolution measurement of the performance of existing and advanced reactors core and plant systems



Resilient and enable real-time transmission of sufficient data for online monitoring and advanced data analytics



Machine learning and artificial intelligence processes to enable semi-autonomous operations and maintenance by design



Enable near real-time control of plant or experimentation process variables to enhance plant thermal performance

NEET-2: WIRELESS TECHNOLOGY FOR NUCLEAR INSTRUMENTATION AND CONTROL SYSTEMS

Challenge: The ASI program seeks applications to develop wireless instrumentation for nuclear applications, especially for advanced reactors. Results should enable data generation and transmission within the containment structure. Proposed technologies should seek to have as wide an application as possible, including the potential to operate in harsh environment conditions present inside the reactor vessel.

Objectives:

- Develop wireless technology to measure and transmit data on system temperature, pressure, forces, acceleration, vibration, and the health of structural components. Multimodal sensors (i.e., capable of detecting two or more independent parameters simultaneously) or technologies applicable to more than one measurement type should be prioritized.
- Provide clear description of the impact of the proposed wireless technology on the system cost-effectiveness, including fabrication aspects and the integration with advanced control mode if applicable (i.e., supporting autonomous operation) by providing a cost-benefit analysis.

NSUF 1.1 TOPIC: Testing of Advanced Materials for Sensors or Advanced Sensors for Nuclear Applications

Challenge: Conduct irradiation testing and post-irradiation examinations of
1) advanced materials for sensors, or 2) advanced sensors for nuclear applications

Successful Applications will include:

- A description of the materials/sensors
- Irradiation and post irradiation examination needs
- The role of the materials in new sensors, controls, communications or associated applications
- The purpose and application of the developed sensor in nuclear energy systems
- Technology gap analysis to assess the impact of the proposed technology in comparison with existing solutions.

Note: This funding does not support research and development activities to develop materials or sensors, but rather the irradiation of sensors and materials that leads to rapid deployment and/or commercialization of sensor technologies.

Summary of ASI Proposals Expectations

- Research shall improve and advance ASI technologies to
 - enable advances in nuclear reactor and fuel cycle system development
 - enhance economic competitiveness for nuclear power plants
- Organizations performing this research will be expected to produce concepts, techniques, capabilities, and equipment that are or can be demonstrated in simulated or laboratory test bed environments representative of nuclear plant applications
- Successful applications will describe truly innovative and crosscutting sensors and instrumentation that offer the potential for revolutionary gains in reactor and fuel cycle performance and that can be applied to multiple reactor designs and fuel cycle concepts

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

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