



U.S. DEPARTMENT OF
ENERGY

Nuclear Energy

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

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Nuclear Energy Enabling Technologies: Advanced Sensors and Instrumentation

■ Vision

Develop the scientific basis for crosscutting sensors and supporting infrastructure technology to address critical technology gaps for monitoring and controlling advanced reactors and fuel cycle facilities

■ Goal

To provide crosscutting research that:

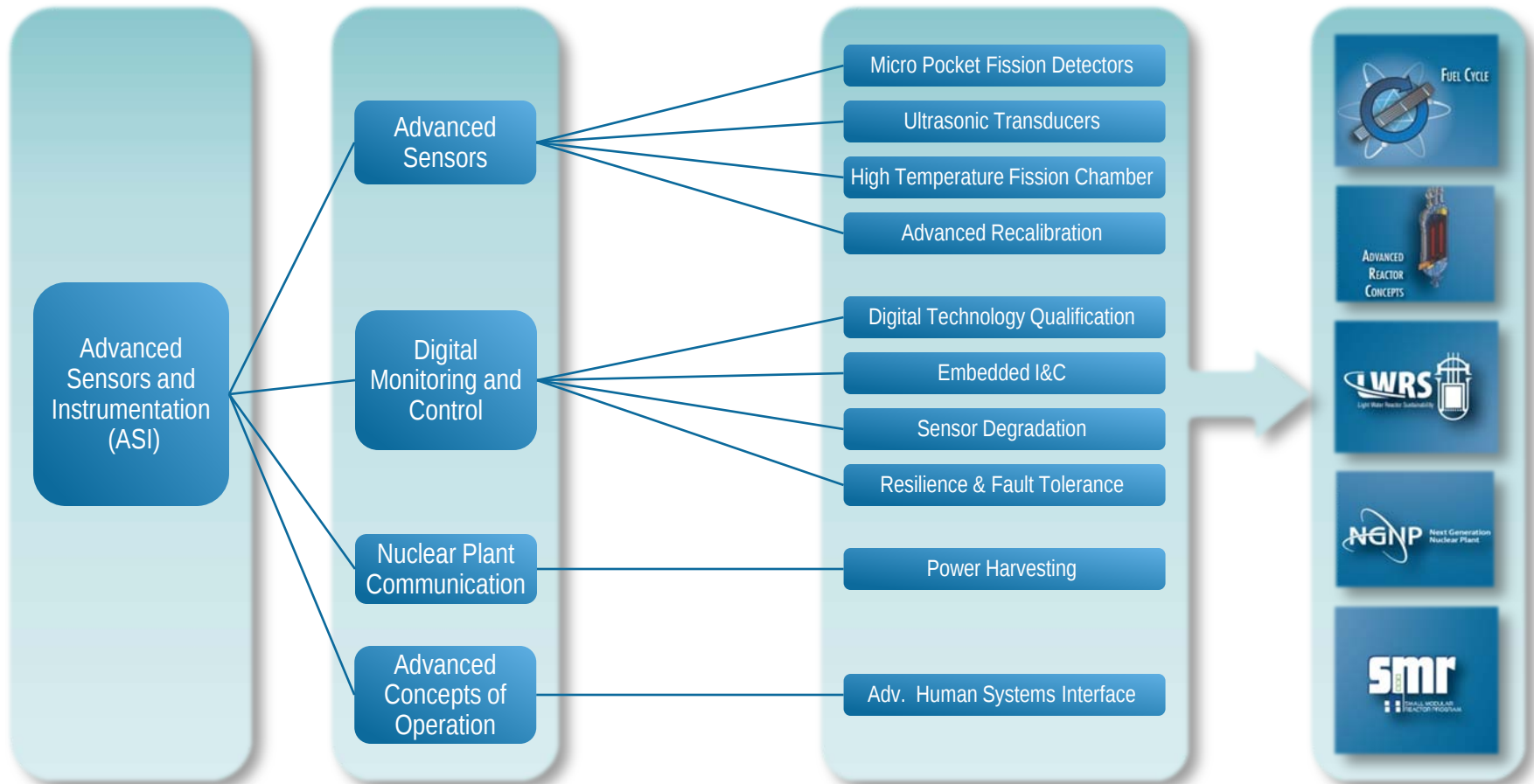
- **Contributes to the success of the DOE-NE R&D programs**
- **Supports common I&C technology development needs**
- **Overcomes current I&C barriers to nuclear energy system deployments**

A new model of I&C innovative RD&D to overcome nuclear power's impediments to new I&C technology usage



ASI Program Structure

NEET Program ...divided into... **R&D Topics**...target gaps that will be met through... **R&D Projects** ... that map to... **NE R&D Programs Needs**





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NEET- ASI FOA TOPIC 1

Deployable Radiation Tolerant Electronics

■ Custom radiation tolerant electronics system

- Operates under severe nuclear environment
- Uses best available commercial or near-commercial technologies
- Can be incorporated in a radiation-tolerant multi-functional robot

Note: This topic is NOT looking for instrumentation technologies for measurements during severe accident conditions and standoff detection system. (RC-6 request)

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NEET- ASI FOA TOPIC 2

Methods and Demonstration for Software-based I&C Systems

- **Methods to quantify software-based instrumentation and control (I&C) systems characteristics in NPPs:**
 - ▶ Dependability ▶ Reliability ▶ Quality ▶ Safety
- **Demonstration of a quantitative science-based safety case to reduce cost and regulatory uncertainty**
- **Research could include development of**
 - Specific measures or metrics
 - Comprehensive methodology
 - Automated tools or toolset

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NEET- ASI FOA TOPIC 3

Wireless Communication Resiliency

■ **Highly secure, wireless communication infrastructures**

- Support flexible, expandable I&C architectures
- Reduce plant cost
- Enable greater information access and plant automation
- Allow add-on sensors and instruments

■ **While addressing communication resiliency**

- ▶ Security ▶ Reliability ▶ Data integrity ▶ Interference resistance
- ▶ Quality of service

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Summary of ASI FOA Expectations

- Improvements and advancements in ASI technologies will **enhance economic competitiveness** for nuclear power plants and **promote** a high level of nuclear **safety**.
- 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.