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

Clean. Reliable. Nuclear.

ASI Strategic Plan Overview

Advanced Sensors and Instrumentation Annual Webinar

November 6, 2019

Craig Primer

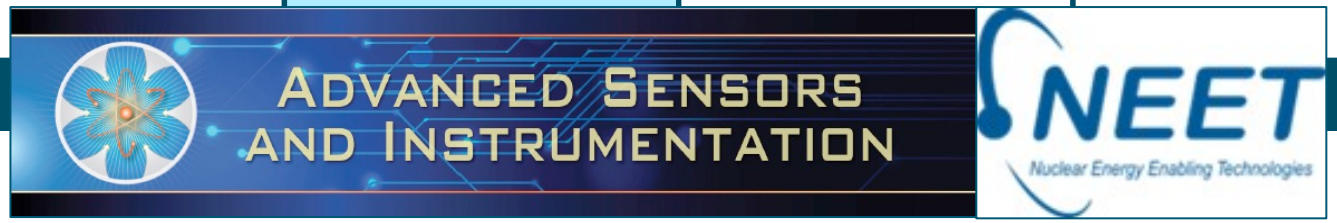
National Technical Director

U.S. DOE Nuclear Energy Enabling Technologies

U.S. DEPARTMENT OF ENERGY

NEET: Cross-cutting technology development

Nuclear Energy Advanced Modeling and Simulation (NEAMS) Energy Innovation Hub for Modeling & Simulation (Hub)	Advanced Sensors and Instrumentation (ASI)	Advanced Methods for Manufacturing Transformational Challenge Reactor	Nuclear Cybersecurity	Integrated Energy Systems	Nuclear Science User Facility (NSUF) Gateway for Innovation in Nuclear (GAIN)

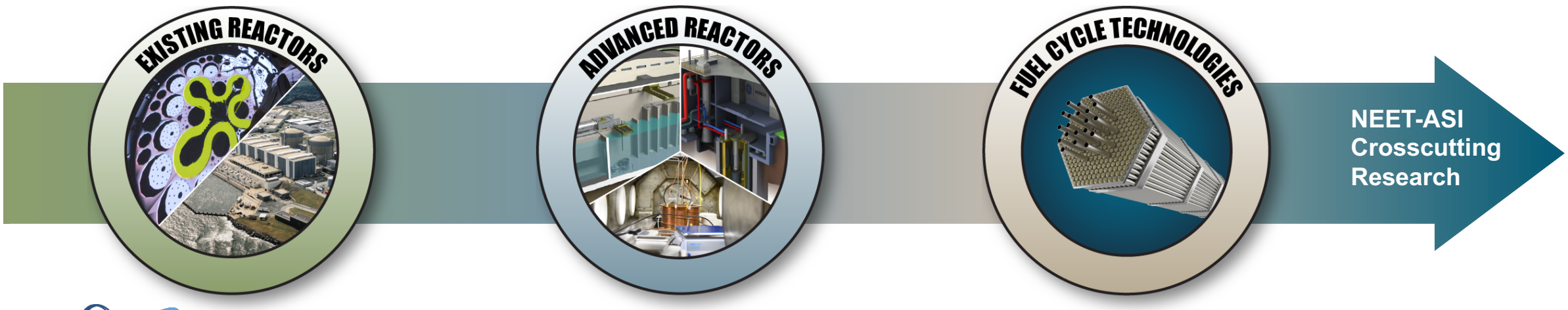


Program Mission

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

Program 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



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Stakeholders

DOE NE Programs

ART ADVANCED REACTOR TECHNOLOGIES

LWRS LIGHT WATER REACTOR SUSTAINABILITY

AFC Advanced Fuels Campaign

NSUF Nuclear Science User Facilities

GAIN Gateway for Accelerated Innovation in Nuclear

NEAMS NUCLEAR ENERGY ADVANCED MODELING & SIMULATION PROGRAM

JUMP Joint Use Modular Plant

Industry

Southern Company

TERRESTRIAL ENERGY USA

Flibe ENERGY

Exelon

Westinghouse

framatome

Dominion Energy

Kairos Power

HITACHI

Xcel Energy

TerraPower

GSE SYSTEMS

DUKE ENERGY

HolosGen™

NUSCALE

Outreach

Webinars

NEET-ASI

Conferences

NPIC HMIT 2019

American Nuclear Society Utility Working Conference

ANIMMA 2019 Portorož Slovenia 17 – 21 June

Industry Workshop/Surveys

GAIN Gateway for Accelerated Innovation in Nuclear

Digital Environment for Advanced Reactors Workshop

Meetings

EPRI ELECTRIC POWER RESEARCH INSTITUTE

Southern Company

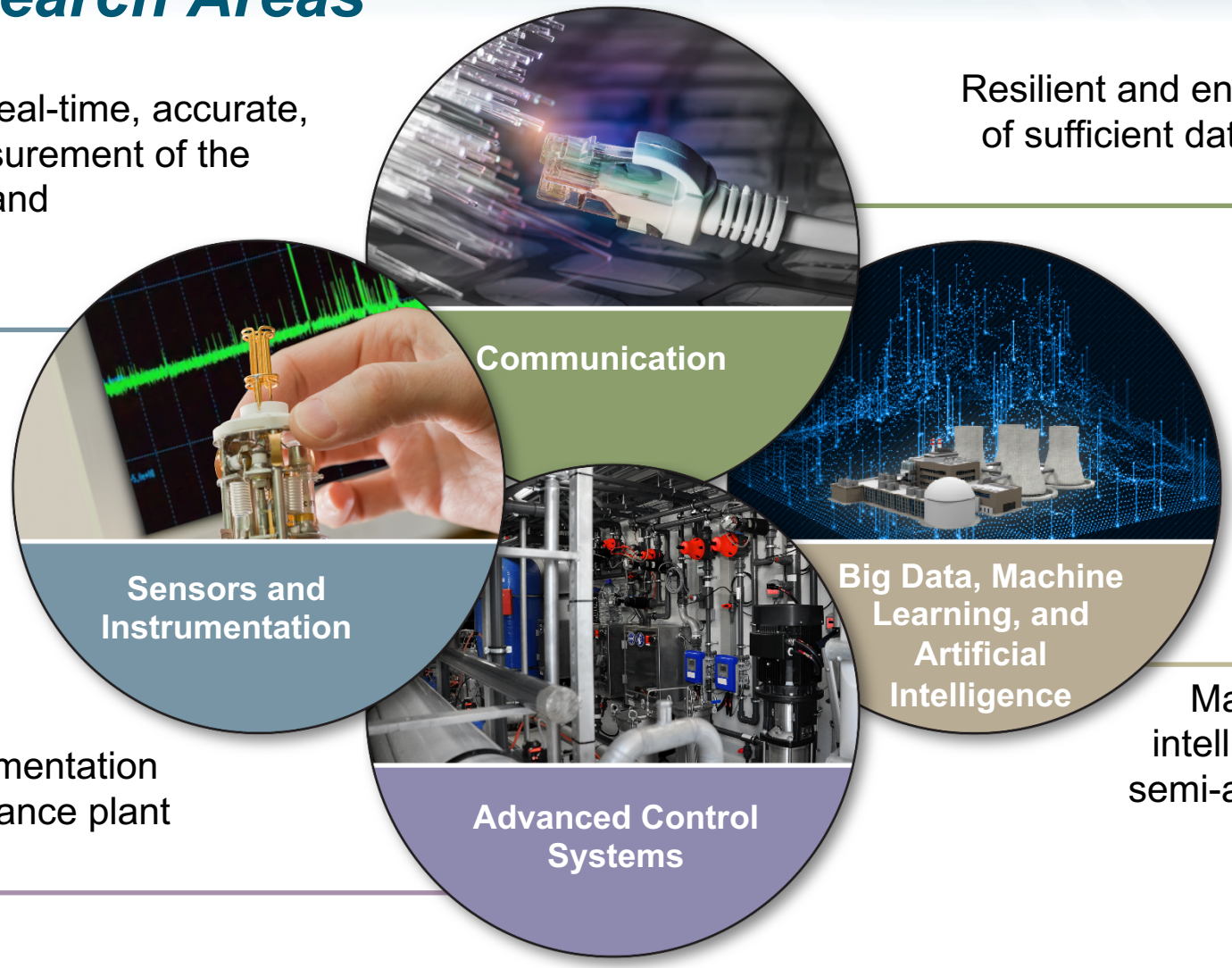
Westinghouse

U.S.NRC

NEET ASI Research 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

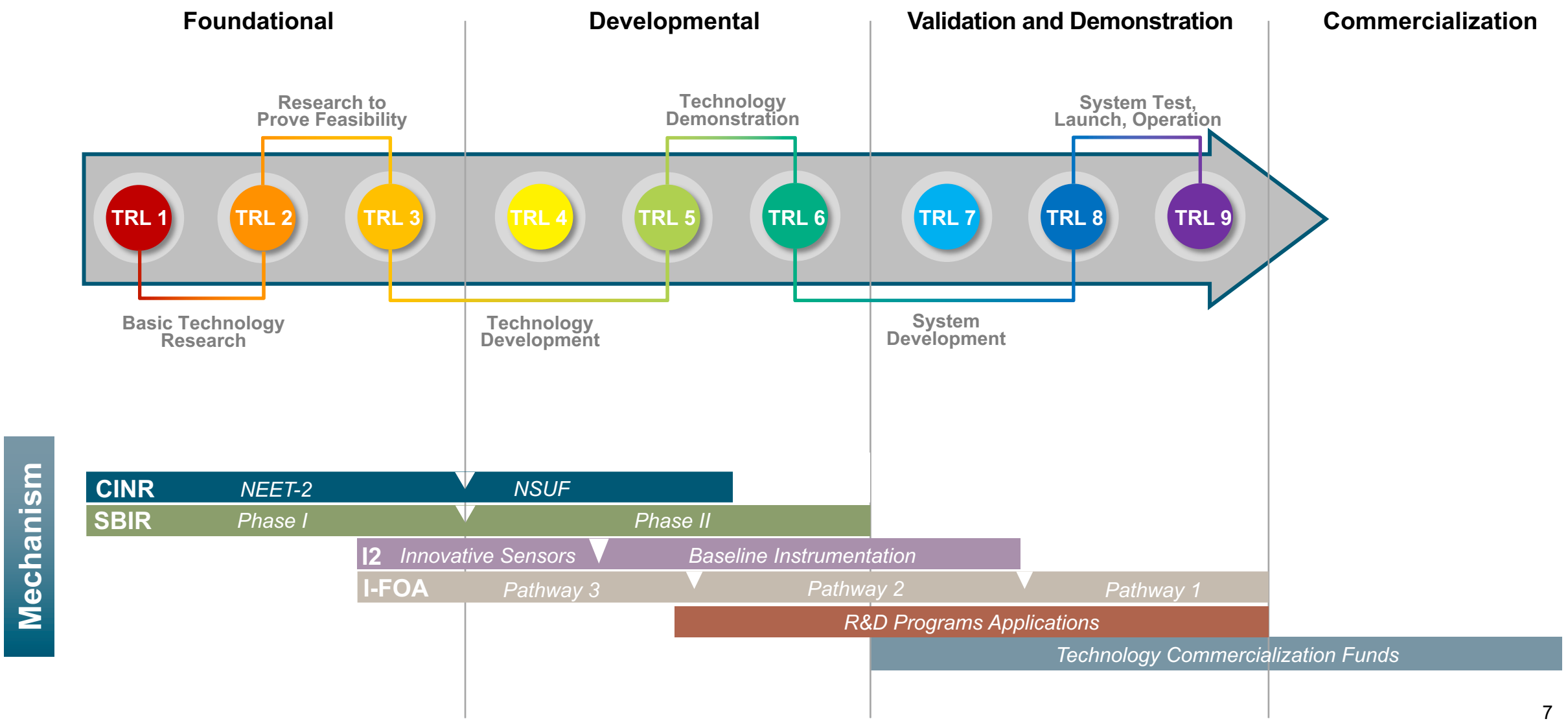


Enable near real-time control of plant or experimentation process variables to enhance plant thermal performance

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

Crosscutting technical challenges in response to stakeholders requirements

ASI Research Evolution



FY 2020 Planned Accomplishments

- Establish a set of reliable instrumentation for the real time measurement of parameters in nuclear reactors and irradiation experiments (temperature, pressure, strain, deformation).
- Integrate sensors and instrumentation in advanced manufacturing processes for the fabrication of nuclear components to enable advanced operation and maintenance strategies for power plants.
- Develop innovative nuclear instrumentation to enable advanced operation and maintenance modes for nuclear systems, in particular optical fibers and acoustic technologies.
- Continue to advance the machine learning research to develop diagnostic and prognostic models using heterogeneous unstructured data to achieve predictive maintenance of critical plant assets.
- Competitively award new projects to develop and demonstrate new digital instrumentation and control for future nuclear plants.

FY20 IPL: competitive funded activities

Idaho National Laboratory

NEET-2.1: Advanced Control systems

Applications are sought for research projects that will design, develop, and demonstrate advanced control for semi-autonomous and remote operation of advanced reactor designs.

NEET-2.2: BIG DATA, MACHINE LEARNING, AND ARTIFICIAL INTELLIGENCE

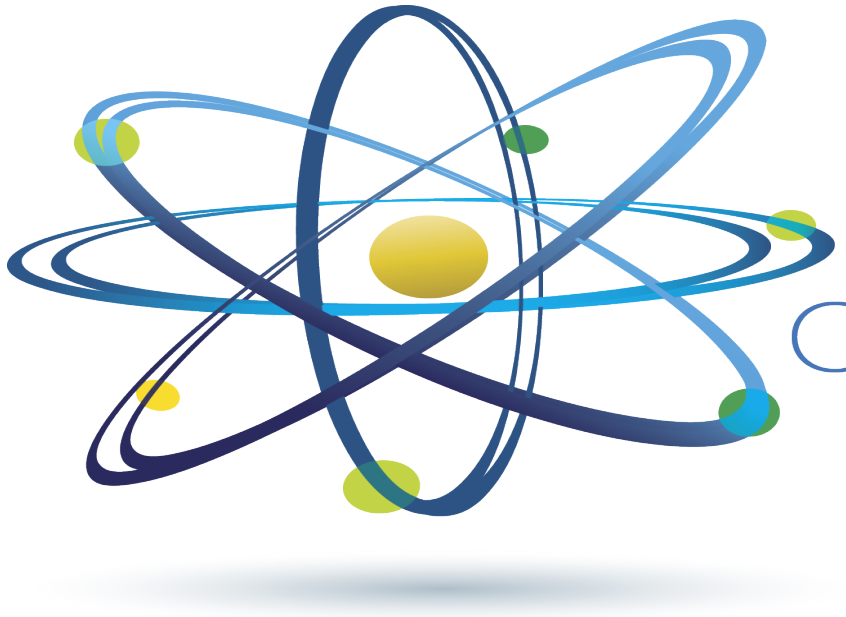
Applications are sought to develop and demonstrate advanced analytics for nuclear plant operation and maintenance systems that support semi-autonomous and remote monitoring of advanced reactor designs. Cost-benefit analysis should be conducted as part of the project to demonstrate technology or product viability

NEET-2.3: Advanced Sensors and Communication

Applications are sought to enable deployment of sensors, instrumentation, and supporting electronics for advanced reactor concepts, with a particular interest in technologies that would enable semi-autonomous and remote operation

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

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



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