



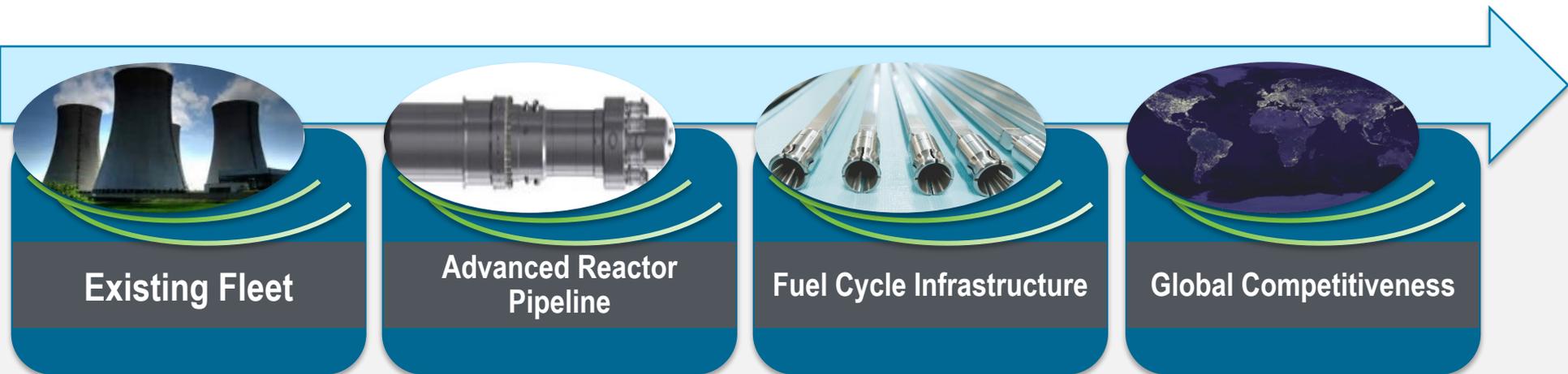
***Office of Nuclear Energy
Research and Development
Funding Opportunities***

Alice Caponiti
Director for Nuclear Energy Technologies
Office of Nuclear Energy

May 16, 2019 – ARPA-E Optimal Operations Workshop

Office of Nuclear Energy – Mission Pillars

- Advance nuclear power to meet the Nation's energy, environmental and national security needs
- Resolve technical, cost, safety, security and regulatory issues through research, development and demonstration



Nuclear Beyond Electricity – Advanced Reactors

NOW



Baseload Electricity Generation

FUTURE

Large Light Water Reactors



Small Modular Reactors



GEN IV Reactors



New Chemical Processes



Heat



e⁻



Hydrogen H₂

Hydrogen Production

Electricity

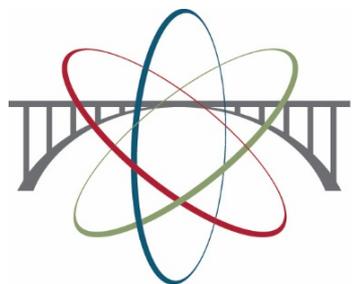


Industrial Applications



Office of Nuclear Energy Research Areas

- Light Water Reactor Sustainability
- Advanced Reactors
 - Advanced small modular reactors
 - Gas-cooled reactors
 - Fast reactors
 - Molten salt reactors
 - Micro reactors
- Crosscutting Technology Development
 - Advanced Sensors and Instrumentation
 - Advanced Methods for Manufacturing
 - Hybrid Energy Systems
 - Cybersecurity
- Advanced Modeling and Simulation
- Advanced fuels



GAIN

Gateway for Accelerated
Innovation in Nuclear

U.S. nuclear industry access to technical, regulatory, and financial support

- Funding opportunities to accelerate deployment
- Nuclear research expertise and capabilities
- Advanced computational tools
- Legacy U.S. research data

<http://gain.inl.gov>

DOE-NE Competitive Solicitations

- U.S. Industry Opportunities for Advanced Nuclear Technology Development
- NE-Voucher Program
- Consolidated Innovative Nuclear Research (CINR)
 - Nuclear Energy University Program
 - Nuclear Science User Facilities
 - Nuclear Energy Enabling Technologies
- Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR)



<http://gain.inl.gov> – Funding Opportunities tab

U.S. Industry Opportunities for Advanced Nuclear Technology Development FOA

- Support innovative, industry-driven designs and technologies that have high potential to improve the overall economic outlook for nuclear power in the U.S.
- Key features:
 - Very broad scope
 - Open to U.S. companies with the expectation that resulting products will be manufactured in U.S.
 - Continuously open
 - Up to quarterly award cycles
- Over \$115 million awarded to date (four rounds)

Industry FOA – Example Technical Topics

- Advanced nuclear reactor designs, including small modular reactors of various technology types;
- Engineering, analyses and experimentation that would address first-of-a-kind reactor design, certification, and licensing issues;
- Advanced manufacturing, fabrication and construction techniques for nuclear parts, components, and full-scale plants, or integrated efforts that could positively impact the domestic nuclear manufacturing enterprise;
- Sensors, instrumentation and control systems;
- Plant auxiliary and support systems;
- Operational inspection and monitoring capabilities;
- Modeling and simulation of various elements of plant life cycle;
- Procedures, processes, and methodologies that can impact operational efficiencies;
- Integration of nuclear energy into micro-grid, non-electric, and/or hybrid applications;
- Efforts to address regulatory and licensing issues with the NRC.

NE GAIN vouchers

- Competitively awarded access to facilities and staff in the DOE national laboratory complex – **not a financial award**. Funds go directly to lab to perform work.
 - Access to capability that isn't available in the private sector
 - Awardee directs work through interaction with lab staff
- Opportunity for industry to work with the laboratories and establish relationships
- Tangible advancement of innovative technologies toward market readiness
- Available to businesses that are majority (51% or greater) U.S. owned and established in the U.S.
- Value ~\$50K - \$500K; duration ~ one year

Consolidated Innovative Nuclear Research (CINR)

- Vehicle for NE to promote integrated and collaborative research, and to deploy innovative nuclear energy technologies to the market in order to meet the strategic goals and optimize the benefits of nuclear energy
- Consolidates DOE-NE's competitively funded programs, which include opportunities for universities, national laboratories and industry/utility
- Research activities are funded to best meet the needs of NE to ensure a balanced R&D portfolio and encourage new nuclear power deployment with creative solutions to nuclear energy challenges
 - Research and Development
 - Infrastructure
 - Integrated Research Projects
 - Scholarships and Fellowships



Crosscutting Research: Advanced Sensors and Instrumentation

Mission

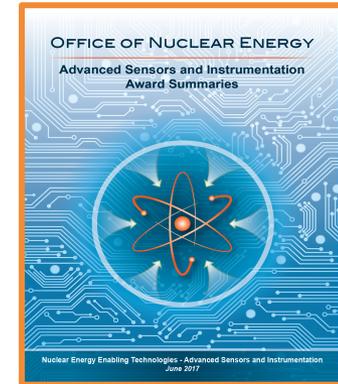
Develop advanced sensors and I&C that address critical technology gaps for monitoring and controlling existing and advanced reactors and support fuel cycle development

Vision

Research results in advanced sensors and I&C technologies that are **qualified, validated and ready to be adapted by the nuclear industry**

Goals

- Support DOE-NE R&D programmatic needs
 - 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



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

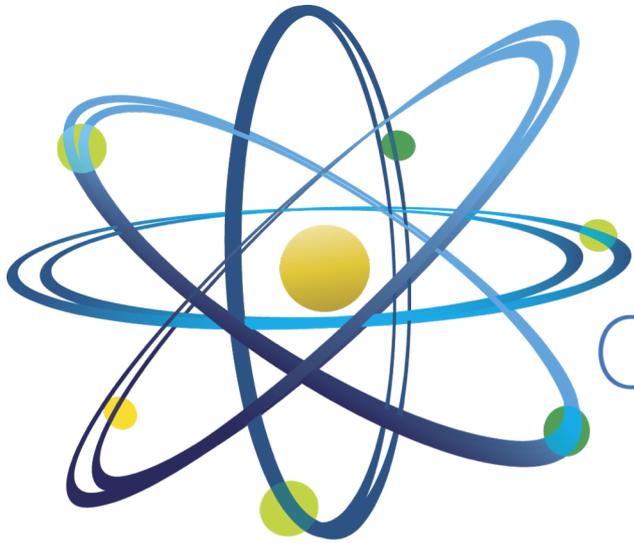
www.energy.gov/ne

Digital Environment for Advanced Reactors

- **Adapt digital technology to:**
 - Improve process efficiency and system performance reliability
 - Standardize engineering processes
- **Develop common technologies that support:**
 - Automating maintenance and inspection activities within containment environments
 - Instrumentation classification in high-passive safety reactors
 - Optical access across containment boundaries
 - Post-accident monitoring for reactors without grid access requirements
- **Engage the regulator and standards organizations for technology acceptance**



Questions?



Clean. **Reliable. Nuclear.**