



Advanced Methods for Manufacturing

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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.

Existing Fleet



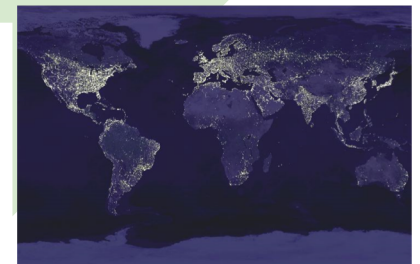
Advanced
Reactor Pipeline



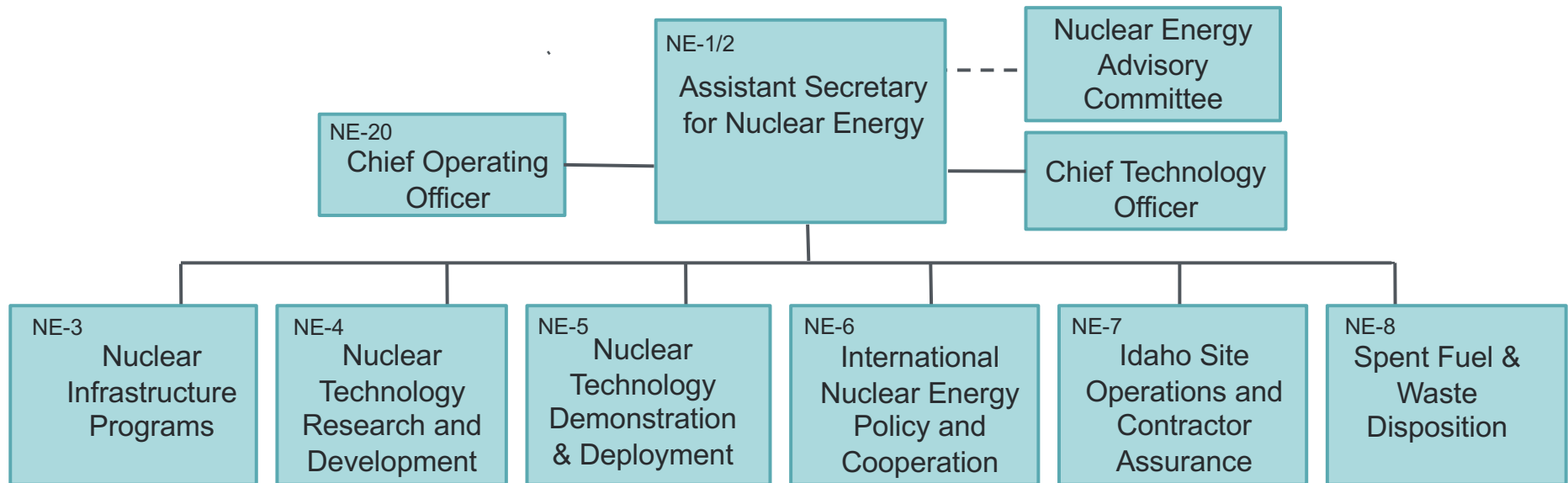
Fuel Cycle
Infrastructure



Global
Competitiveness



Office of Nuclear Energy Realignment*

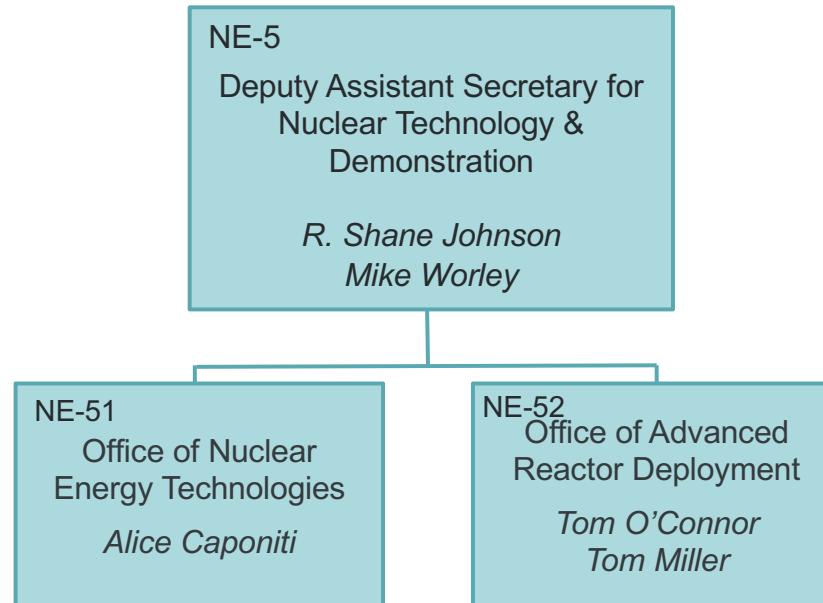


- Realignment executed in Oct 2018 moved Advanced Reactor Technologies from NE-4 to NE-5
- Merges advanced reactor technology programs to single organization
- Versatile Test Reactor and fuel development remain in NE-4

*Ink not dry!

Realigned NE-5*

*Ink not dry!



Nuclear Energy Enabling Technologies

Industry and University Support

- Industry funding opportunities
 - Industry FOA & GAIN Vouchers
- Nuclear Energy University Program
- Research Reactor Infrastructure
- Integrated University Program

Light Water Reactor Sustainability

Advanced Reactor Technologies

- Advanced non-LWRs R&D
- Microreactors
- Regulatory Support

Advanced SMR R&D

Gateway for Accelerated Innovation in Nuclear (GAIN)

gain.inl.gov

Nuclear Energy Enabling Technologies (NEET)

NEET

Conducts research and development (R&D) and makes strategic investments in research capabilities to develop innovative and crosscutting nuclear energy technologies to resolve U.S. industry nuclear technology development issues

Program Elements

- Crosscutting Technology Development:
 - Advanced Sensors and Instrumentation
 - **Advanced Methods for Manufacturing**
 - Advanced Cooling Technologies
 - Hybrid Energy Systems
 - Cybersecurity
- Advanced Modeling and Simulation – both NEAMS and Hub
- Nuclear Science User Facilities
- Transformational Challenge Reactor

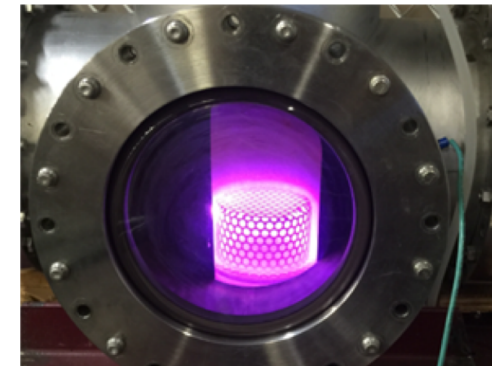
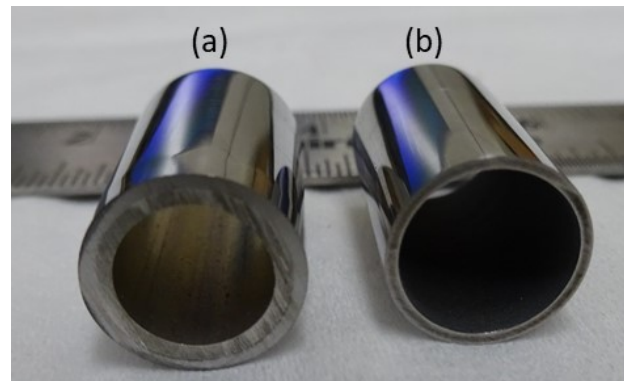
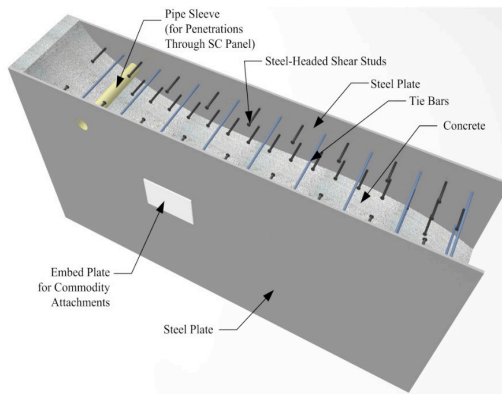
Advanced Methods for Manufacturing Vision and Goals

■ Vision

- To improve the methods by which nuclear equipment, components, and plants are manufactured, fabricated, and assembled by utilizing 'state of the art' methods

■ Goal

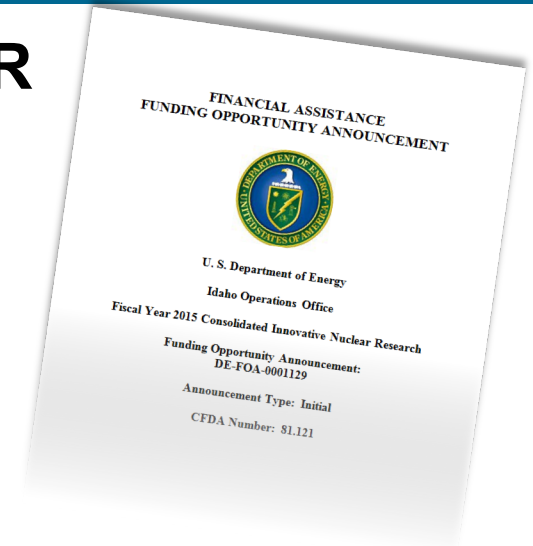
- To reduce cost and schedule for new nuclear plant construction
- To make fabrication of nuclear power plant (NPP) components faster, less expensive, and more reliable



AMM Projects

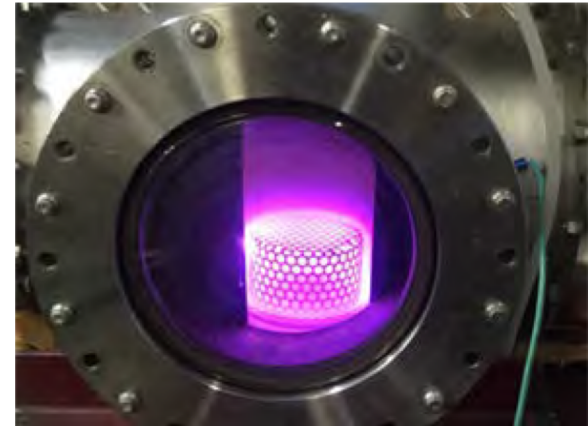
▪ **Competitively selected projects via CINR**

- AMM initiated in FY 2012
- Open to universities, national laboratories and Industry
- R&D and irradiation/PIE projects funded
- FY2012 – FY 2017: ~\$15M
 - In FY 2018 – 38 AMM CINR proposals received
 - 2 CINR projects – awarded - \$2M
 - 3 Phase I SBIR projects – awarded \$450K
 - 2 Phase II SBIR projects – awarded \$2M
- FY 2019: Currently 31 AMM CINR proposals under review

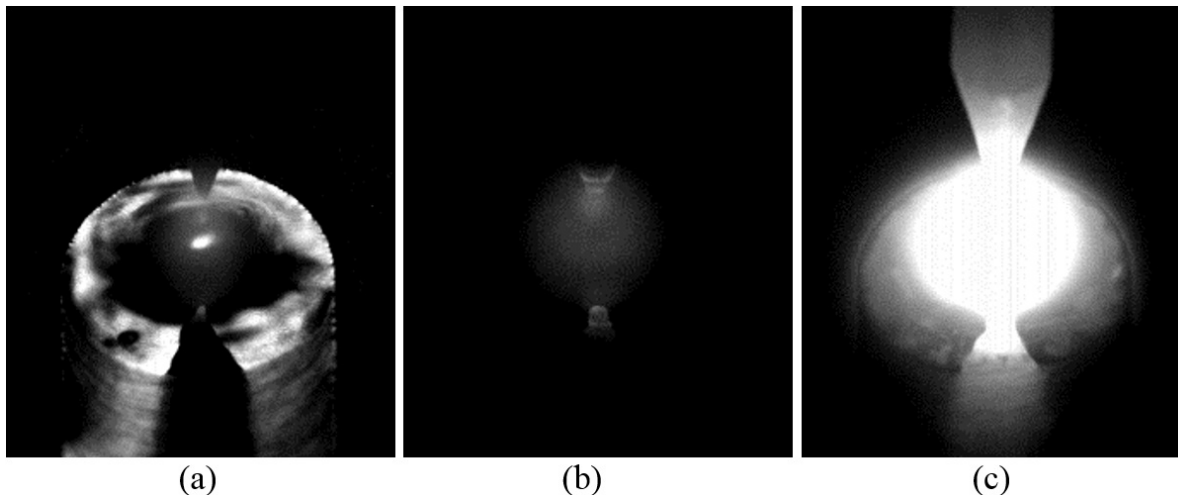


FY 2019 CINR FOA Focus Areas

1. Factory and Field Fabrication Techniques, such as:
 - Welding and joining technologies
 - Modular fabrication and installation
2. Quality Control Techniques and Qualification Methodologies



Advanced surface plasma nitriding for development of corrosion resistance and accident tolerant fuel cladding – Texas A&M University (10/1/2015 – 9/30/2018)



Improving Weld Productivity and Quality by means of Intelligent Real-Time Close-Looped Adaptive Welding Process Control through Integrated Optical Sensors – ORNL, University of Kentucky and EPRI (10/01/2014 – 6/30/2018)

Past and Current AMM Project Focus Areas

- Factory and Field Fabrication Techniques
 - High speed, high quality welding technologies
- Assembly and Material Innovation to Enhance Modular Building Techniques
 - Advances and innovation in high strength concrete and rebar
- Advances in Manufacturing Processes
 - Cladding and surface modification methods
 - Additive manufacturing
- Improved Concrete Inspection, Acceptance and Construction Methods
 - Improved methods to facilitate the curing of concrete
- Data Configuration Management
 - Imaging techniques for as-built design
 - UAV based 3D surveying

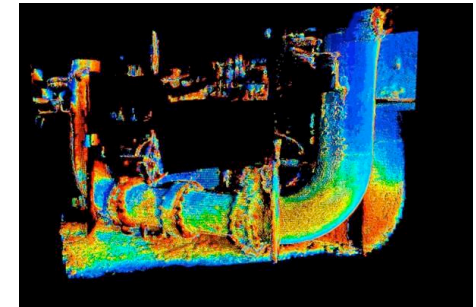


Photo courtesy of TetraVue, Inc.



Grid spacer after application of surface nitriding

FY 2018 Industry FOA Awards

- **First Round – BWXT**

Establish an integrated advanced manufacturing and data science driven paradigm for advanced reactor systems

- Will develop the ability to implement additive materials manufacturing to the fabrication process for nuclear components and sub-components

- **Second Round – HOLTEC**

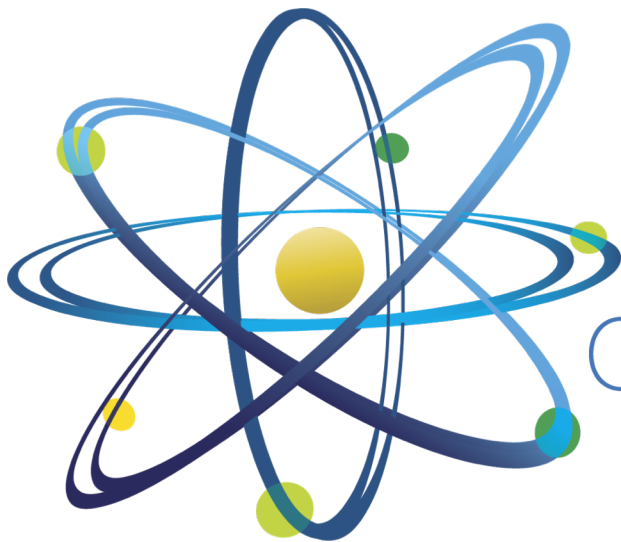
Advance and commercialize hybrid laser arc welding for nuclear vessel fabrication

- Will develop, qualify, demonstrate, and commercialize a metal joining process to solve major manufacturing challenges associated with the fabrication of nuclear components

- **Third Round – EPRI**

- Establish modular in-chamber electron beam welding capability
- Will demonstrate the capability to produce large, thick-section components

Questions?



Clean. **Reliable. Nuclear.**