

NIC/INL ADVANCED MANUFACTURING & SUPPLY CHAIN SUMMIT & SHOWCASE

The Case for Nuclear

Tom Miller, *Director, Office of Accelerated Innovation*

Office of Nuclear Energy
U.S. Department of Energy

October 3-4, 2017

Administration Actions

Impacting the Future of Nuclear Energy in the US



- ✓ President Trump has ordered a review of U.S. nuclear energy policy
"[W]e will begin to revive and expand our nuclear energy sector... which produces clean, renewable and emissions-free energy. A complete review of U.S. nuclear energy policy will help us find new ways to revitalize this crucial energy resource."
- ✓ Executive Order Promoting Energy Independence and Economic Growth
- ✓ Executive Order Reducing Unnecessary and Burdensome Regulations
- ✓ Revisiting National Waste Policy

"If you really care about this environment that we live in... then you need to be a supporter of this [nuclear energy] amazingly clean, resilient, safe, reliable source of energy."

Secretary Rick Perry at Press conference, May 10th



DOE Nuclear Priorities:

- Stabilize and Expand Existing Nuclear Fleet
- Establish Advanced Reactor Pipeline
- Re-establish National Fuel Cycle Infrastructure

NE Research Programs:

- Stabilize and Expand Existing Nuclear Fleet
 - *Light Water Reactor Sustainability Program*
 - *Accident Tolerant Fuels Development Program*
- Establish Advanced Reactor Pipeline
 - *Advanced Water-based Reactor Development*
 - *Advanced Non-Water Reactor Development*
 - *Gateway for Accelerated Innovation in Nuclear (GAIN)*
- Re-establish National Fuel Cycle Infrastructure
 - *Fuel Cycle R&D*
 - *Used Nuclear Fuel Disposition R&D*

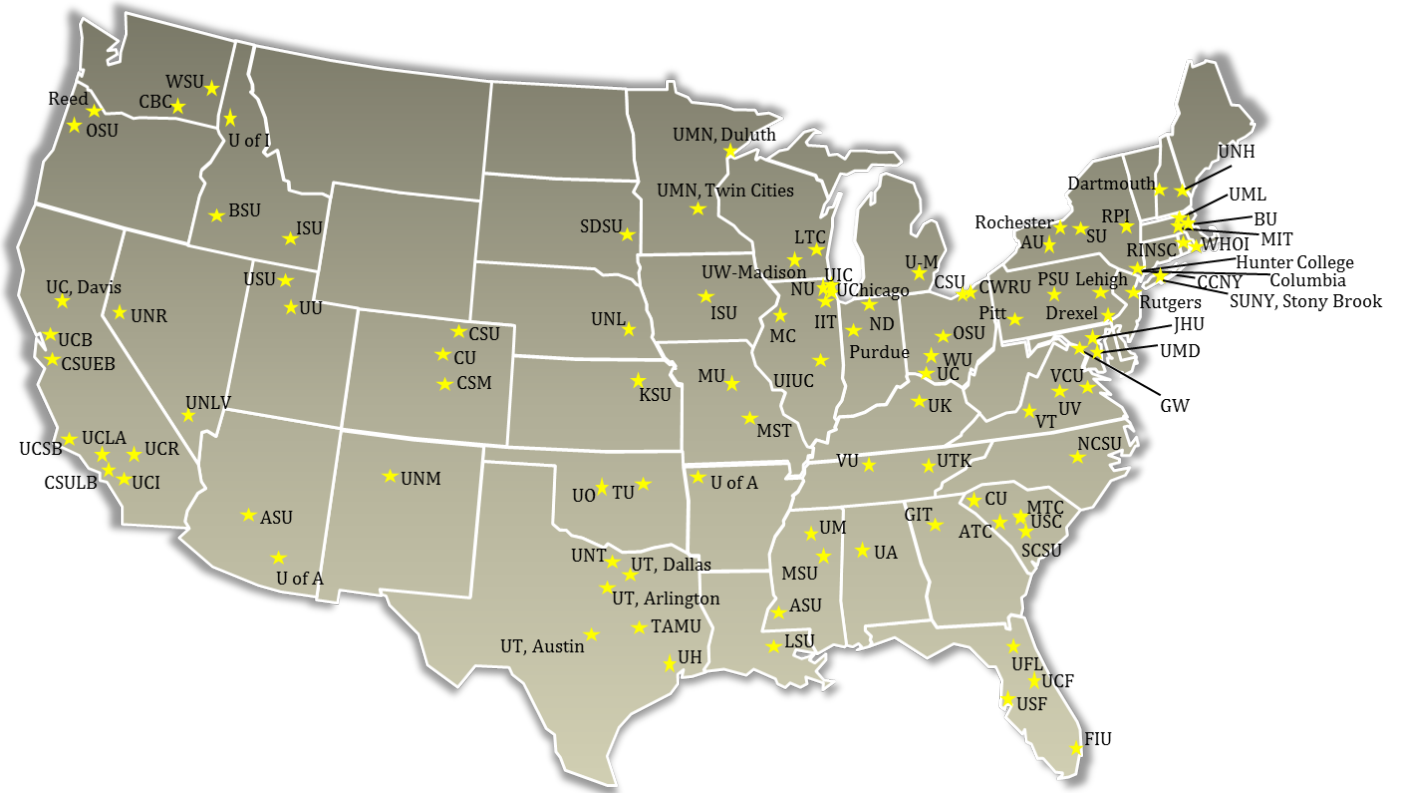
- Cross-Cutting R&D:
- Advanced Modeling & Simulation
 - Advanced Sensors, I&C
 - Nuclear Science User Facilities
 - **Advanced Methods for Manufacturing**
 - Cybersecurity

NE Support for U.S. Nuclear Work Force:

NE executes a well established, highly competitive process for awarding R&D, research infrastructure, and Scholarships and Fellowships to the U.S. university community.

FY 2017 Awards

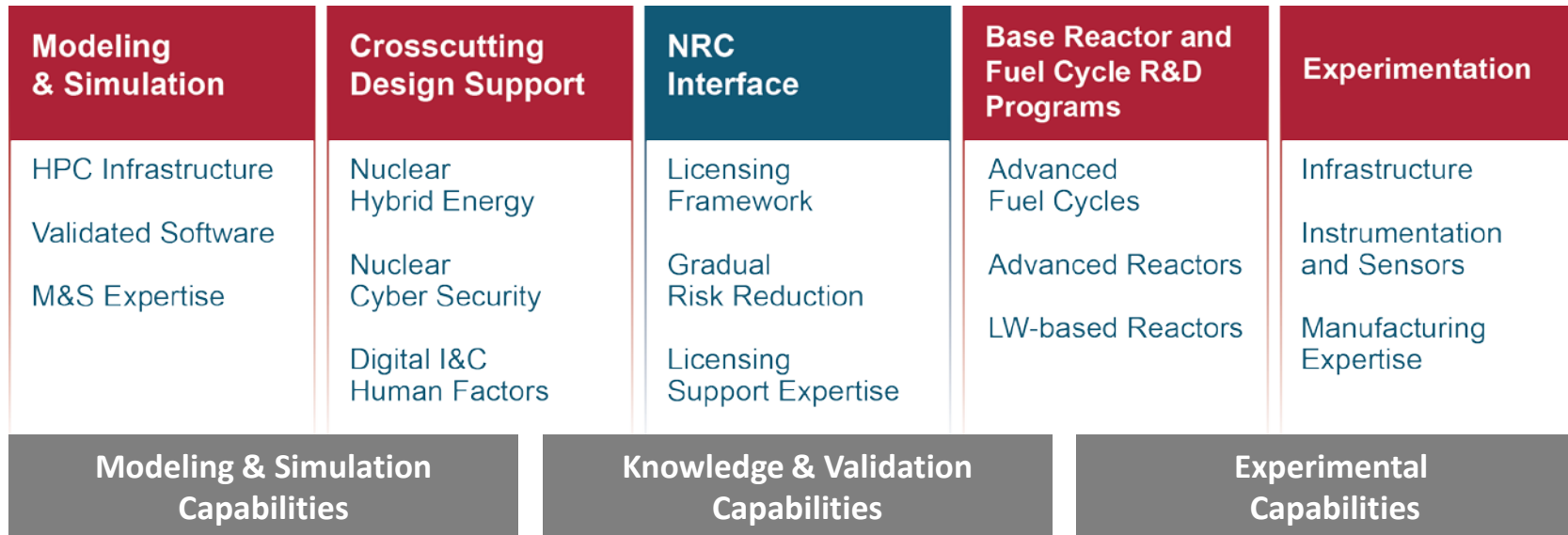
- 66 R&D and Infrastructure awards - \$48M
- 58 scholarships and 31 fellowships - \$5M



Since 2009, NE has awarded \$517M to 119 schools in 40 States and the District of Columbia

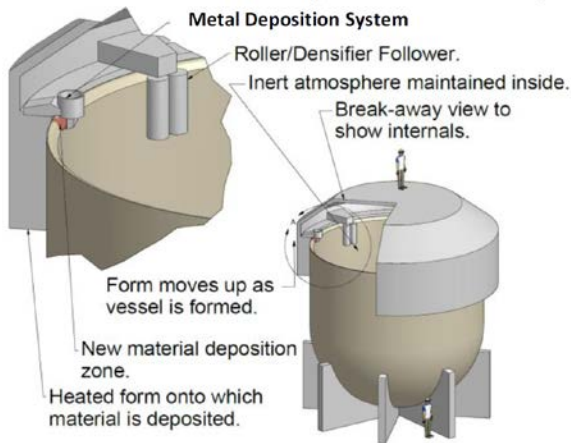
Gateway for Accelerated Innovation in Nuclear

GAIN = Partnership with U.S. Industry to accelerate deployment of advanced nuclear technology

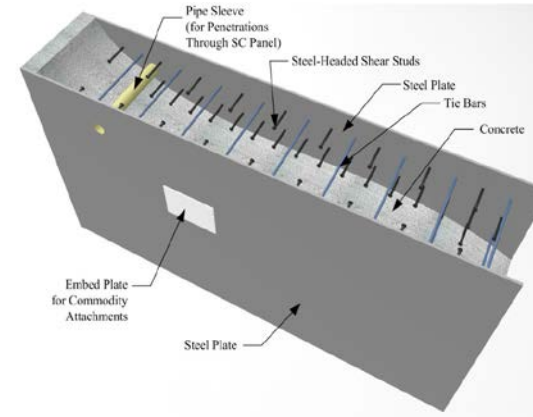


Advanced Methods for Manufacturing

- **Vision** - To improve the methods by which nuclear equipment, components, and plants are manufactured, fabricated, and assembled.
- **Goals** - To reduce cost and schedule for new nuclear plant construction



- To make fabrication of nuclear power plant (NPP) components faster, cheaper and more reliable



Current AMM Focus Areas:

- Factory and Field Fabrication Techniques
- Assembly and Material Innovation to Enhance Modular Building Techniques
- Advances in Manufacturing Processes
- Improved Concrete Inspection, Acceptance and Construction Methods
- Data Configuration Management

Key AMM Areas of Interest

Powder Metallurgy/ Hot Isostatic Processing (PM/HIP)

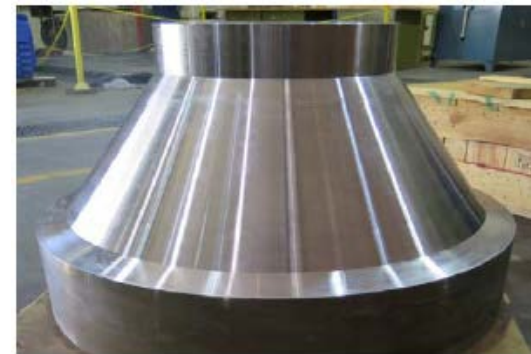
- 316L Stainless Steel has been approved through the ASME Code Cases for use in components such as valves, pump housings, elbows, and flanges
 - Grade 91 has also been approved
- Project also investigated low alloy steels and nickel based alloy
 - SA508
 - Alloy 600M
- Samples will be neutron irradiated in FY 2017 at the Advanced Test Reactor at the Idaho National Laboratory



Large 316L SS Valve Body



**Steam Separator
Inlet Swirler**



3700 lb BWR nozzle

SMR Reactor Vessel Manufacture/ Fabrication/Demonstration Project

- Overall industry goal is to produce a code acceptable SMR Reactor Pressure Vessel (RPV) within 12 months
 - 18 month schedule reduction
 - 40% cost reduction
- R&D project objective to manufacture the major components for a 2/3 scale (44' long x 6' in diameter) of a NuScale RPV utilizing:
 - Powder Metallurgy/ Hot Isostatic Processing (PM/HIP)
 - Diode Laser Cladding
 - Electron Beam Welding
 - Cryogenic Machining
- Partners include EPRI, Carpenter Powder Products, Synertech, TWI, the UK's Nuclear Advanced Manufacturing Research Center (NAMRC), Sheffield Forgemasters, Sperko Engineering and others

65mm (thick) x 3m length x 1.8m diameter
Welding time: <10 minutes
Photograph provided courtesy: TWI



Representative
model of NuScale
Power Reactor Vessel

NE Support for U.S. Industry Initiatives:

New Industry-Focused Funding Opportunity Announcement (FOA)

- To be issued in early FY 2018
- Supports innovation and competitiveness of the **U.S. nuclear industry** by directly sharing costs on cross-cutting applied research and development activities, specifically:
 - All aspects of advanced reactor development
 - Methods to improve the cost and schedule for delivery of nuclear products, services and capabilities, and
 - Resolution of regulatory/certification issues.
- FOA to service **nuclear technology developers** from early concept to more mature designs. Low to mid-level technology readiness levels and/or first-of-a-kind engineering (FOAKE) development.

NE Support for U.S. Industry Initiatives:

Notional Framework for New Reactor Development FOA

Tier	Delineation of Tiers	Task Funding Range	Cost Share	Typical No. of Tasks	Length of Tasks
3	License Application with NRC and/or Contractual Arrangement w/ End User(s)	\$10M-\$100M	50/50	1-2	24-36 months
2	Reactor Technologies and/or Concepts at varying levels of technical and/or regulatory maturity*	\$1M-\$10M	80/20	4-6	12-30 months
1	Technical and Regulatory Vouchers for work to be performed by DOE labs or licensing discussions w/ NRC	Less than \$1M	80/20 (non-WGs) 100/0 (WGs)	20+	6-18 months

*single company, consortium of companies, or working group (WG) of companies