Advanced Methods for Manufacturing

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Vision

- To improve the methods by which nuclear equipment, components, and plants are manufactured, fabricated, and assembled by utilizing ‘state of the art’ methods derived from other high tech industries.

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
1. Factory and Field Fabrication Techniques

2. Advances in Manufacturing Processes for components
Improvements in Fabrication Technologies

- Continue to improve on welding speed and quality in the fabrication environment
- Seeking new joining technologies for common applications
- Applying new surface modification (coating) techniques to make fabricated structures less susceptible to corrosion
- Improving the thru-put of shop floor and site operations
Advances in manufacturing processes

- Reactor internals, fuel cladding and fuel support assemblies
- Vessels, pressure boundary components
- Replacements or improvements for conventional manufacturing processes
- Cladding or surface modification methods
  - Corrosion and wear resistant applications for components
1. Advanced and innovative manufacturing techniques for irradiation testing to demonstrate performance
Previously Awarded Projects

**FY2011**
- Laser-Arc Hybrid Welding of Thick Section Ni-base Alloys: Penn State University - Complete
- Development of Seismic Isolation Systems using Periodic Materials: University of Houston – Complete

**FY2012**
- Monitoring and Control of the Hybrid Laser-GMAW Process: Idaho National Laboratory - Complete
- Laser Direct Manufacturing of Nuclear Power Components Using Radiation Tolerant Alloys: Lockheed Martin – Complete
- Modular Connection Technologies for SC Walls of SMRs: Purdue University - Complete
Previously Awarded Projects

**FY2013**
- Ultra-High-Performance Concrete and Advanced Manufacturing Methods for Modular Construction: University of Houston - Complete
- Self-Consolidating Concrete Construction for Modular Units: Georgia Institute of Technology - Complete

**FY2014**
- Periodic Material based Seismic Isolators for SMR’s: University of Houston
- Improvement of Design Codes to Account for Accident Thermal Effects on Seismic Performance: Purdue University
Previously Awarded Projects

- **FY2015**
  - Environmental Cracking and Irradiation Resistant Stainless Steel by Additive Manufacturing: GE Global Research
  - Advanced Onsite Fabrication of Continuous Large-Scale Structures: Idaho National Laboratory
  - Advanced surface plasma nitriding for development of corrosion resistance and accident tolerant fuel cladding: Texas A&M University
  - Prefabricated High-Strength Rebar Systems with High-Performance Concrete for Accelerated Construction of Nuclear Concrete Structures: University of Notre Dame
Previously Awarded Projects

■ FY2016

- Integrated Computational Materials Engineering (ICME) and In-situ Process Monitoring for Rapid Qualification of Components Made by Laser-Based Powder Bed Additive Manufacturing (AM) Processes for Nuclear Structural and Pressure Boundary Applications Advanced Onsite Fabrication of Continuous Large-Scale Structures: Idaho National Laboratory: Electric Power Research Institute
- All-position surface cladding and modification by solid-state friction stir additive manufacturing (FSAM): Oak Ridge National Laboratory
- Irradiation Performance Testing of Specimens Produced by Commercially Available Additive Manufacturing Techniques: Colorado School of Mines
- Enhancing irradiation tolerance of steels via nanostructuring by innovative manufacturing techniques: Idaho State University
Summary of Expectations

- The technologies developed will increase the reliability of nuclear power plants while decreasing the cost of fabrication and construction.

- The development of products and components will be able to gain acceptance by the appropriate regulatory or standard-setting bodies.

- Specific products should be capable of being deployed in commercial nuclear power plants.
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