U.S. DEPARTMENT OF ENERGY | Nuclear Energy

Nuclear Energy University Programs (NEUP) Fiscal Year (FY) 2015 Annual Planning Webinar

Advanced Technologies, Development and Demonstration (RC-2)

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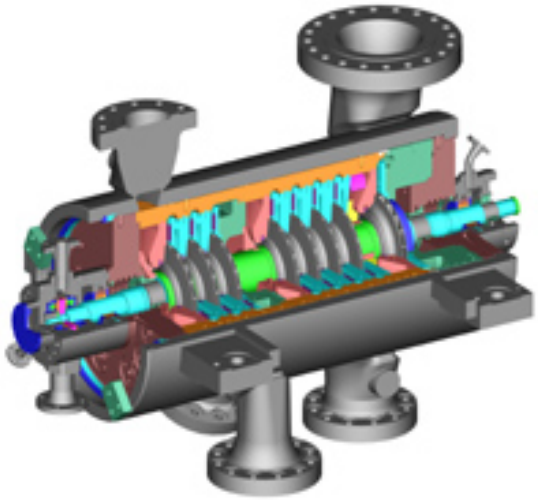
Advanced Reactor Technologies Program Overview, Mission & Structure

- **Program Mission:**
  - To research and develop advanced technologies to significantly improve the efficiency, safety, and performance of advanced reactor systems.
- **The Advanced Reactor Technologies Program (new in 2015) includes the following focus areas:**
  - Fast Reactor Technologies
  - High Temperature Reactor Technologies
  - Advanced Reactor Generic Technologies
  - Advanced Reactor Licensing
  - Advanced Reactor System Studies
- **Program Structure (RC-2):**

Program Director – Tom O'Connor (DOE-HQ)

Federal POC – Carl Sink (DOE-HQ)

Technical POC – Dr. Robert Hill (ANL)



- **R&D efforts support draft Nuclear Energy RD&D Roadmap Objectives 2 & 3**
  - R&D Objective 2: Meet the Administration's energy security and climate change goals by developing technologies to support the deployment of affordable advanced nuclear reactors.
  - R&D Objective 3: Optimize energy generation, waste generation, safety, and nonproliferation attributes by developing sustainable nuclear fuel cycles.

NUCLEAR ENERGY RESEARCH, DEVELOPMENT AND DEMONSTRATION ROADMAP

(draft) 2014

Research Questions

R&D programs are working to address several high level questions related to advanced reactor development and eventual deployment including:

- How can we improve affordability of nuclear power?
- How can we improve inherent safety of advanced nuclear reactors?
- How can we improve proliferation resistance of advanced reactors?
- How can we address nuclear waste through advanced fuel cycle options?
- How can we expand nuclear technologies into non-traditional nuclear energy markets?
- How can we increase performance and efficiency of advanced nuclear plants through new materials, advanced systems or components?

Workscope Description: Component and Technology Development

- **For advanced reactors to achieve their potential, various components and technologies need to be developed including:**
  - Improved design approaches (e.g., compact configuration) to reduce cost and improve component performance
  - In-service inspection technology/techniques for innovative reliability and maintenance applications
  - Compact heat exchanger or innovative steam generator designs
  - Advanced reactor technology solutions for hybrid energy systems (clean baseload power sources and intermittent renewables integrated on the grid)

Experimental demonstration and validation is encouraged

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Recent NEUP Awards

Examples of awarded NEUP Advanced Reactor Technology R&D:

FY12

- Nonlinear Ultrasonic Techniques to Monitor Radiation damage in RPV and Internal Components
- Advanced Supercritical Carbon Dioxide Brayton Cycle Development
- Thermoelectric-Driven Sustainable Sensing and Actuation Systems for Fault-Tolerant Nuclear Incidents
- Integral Reactor Containment Condensation Model and Experimental Validation
- Investigation of Natural Circulation Instability and Transients in Passively Safe Small Modular Reactors

FY13

- Novel High Temperature and Radiation Resistant Infrared Glasses and Optical Fibers for Sensing in Advanced Small Modular Reactors
- Advanced High Temperature Inspection Capabilities for Small Modular Reactors
- Compact Heat Exchanger Design and Testing for Advanced Nuclear Reactors and Advanced Power Cycles
- New Mechanistic Models of Creep-Fatigue Crack Growth Interactions for Advanced High Temperature Reactor Components
- Advanced I&C for Fault-Tolerant Supervisory Control of Small Modular Reactors
- **A complete list of FY13 winning proposals can be found at:**

https://inlportal.inl.gov/portal/server.pt/community/neup_home/600/fy13_r_d_awards

Questions?