

Nuclear Energy University Program (NEUP) Fiscal Year (FY) 22 Annual Planning Webinar

Microreactors

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Mission, Vision, Goals and Strategic R&D

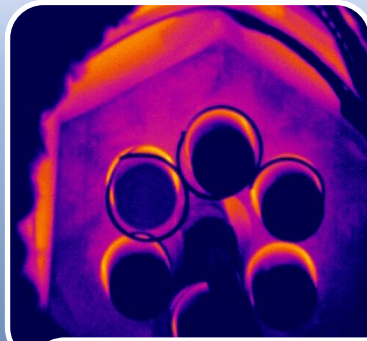
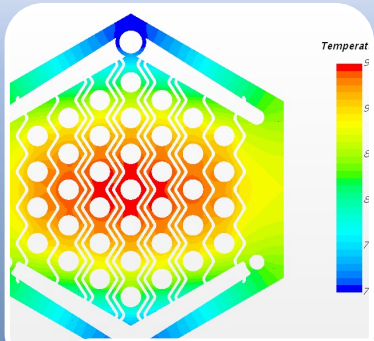
Program Vision

Through cross-cutting research and development and technology demonstration support, by 2025 the Microreactor Program will:

- Achieve technological breakthroughs for key features of microreactors
- Empower initial demonstration of the next advanced reactor in the US
- Enable successful demonstrations of multiple domestic commercial microreactors.

Program Objectives

- Address critical cross cutting R&D needs that require unique laboratory/university capability or expertise
- Develop R&D infrastructure to support design, demonstration, regulatory issue resolution, and M&S code validation
- Develop advanced technologies that enable improvements in microreactor viability



System Integration & Analyses

- Economics & Market Analysis
- Integrated Systems Analysis
- Applications of NEAMS computational Tools
- Technoeconomic Analyses
- Regulatory Development

Technology Maturation

- Advanced Heat Pipes
- Advanced Moderators
- Heat Exchangers
- Instrumentation & Sensors
- Advanced Materials and Material Code cases

Demonstration Support Capabilities

- Single Primary Heat Extraction and Removal Emulator (SPHERE)
- Microreactor Agile Non-nuclear Experimental Testbed (MAGNET)
- Microreactor Applications Research, Validation and Evaluation (MARVEL)

Microreactor Demonstrations & Applications

- Reactor Demonstrations
- Remote heat & power
- Hydrogen co-generation
- District heating
- Desalination

Planned Activities (FY2021 – FY2026)

- Microreactor Applications Research, Validation and Evaluation (MARVEL) procurement/construction
- Test integrated core block, heat exchanger, and power conversion systems in Microreactor AGile Non-nuclear Experimental Testbed (MAGNET)
- Perform validation testing and R&D for operating microreactor demonstrations and emerging innovative microreactor technologies
- Advanced internal characterization of operating heat pipes in Single Primary Heat Extraction and Removal Emulator (SPHERE) facility (operation and testing of advanced heat pipe)
- Complete yttrium hydride post irradiation examination and investigate other advanced moderator technologies (e.g. encapsulation)
- Complete legacy metallic fuel data qualification
- Implement Regulatory Research Plan and update as necessary
- Continue stakeholder engagement and access to SPHERE/MAGNET/MARVEL testing infrastructure to support ongoing demonstrations and emerging innovative technologies
- Address outstanding technology maturation needs as identified through economics analyses, regulatory issue evolution, or direct interactions.

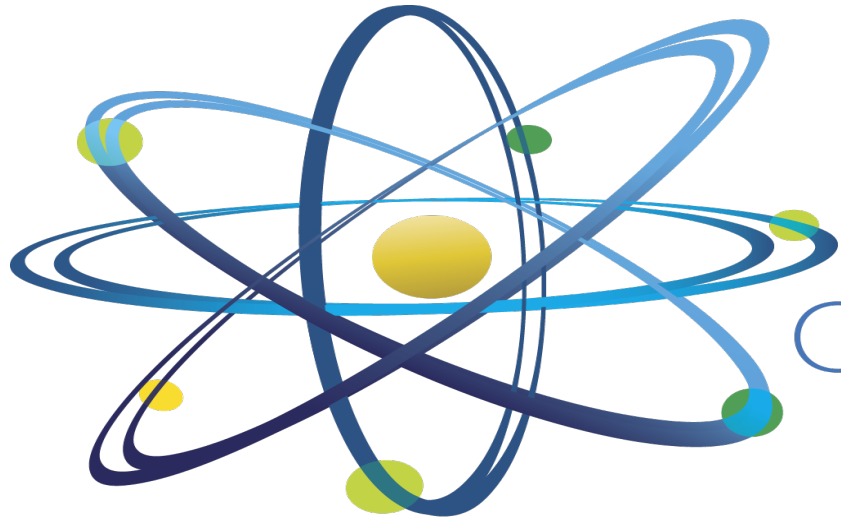
RC-2: Innovative Microreactor Solutions for End-User Applications

- Seek development of technologies that advance the future deployment of microreactors by improving their economic competitiveness and enabling their integration into end-user applications for broad deployment and use. Approaches for reducing microreactor construction, operation, and maintenance costs are of particular interest.
- This call seeks proposals related to:
 - Microreactor designs with transformative economic reduction potential.
 - Readily deployable control technologies and regimes that enable unattended and reliable operations.
 - Moderator, reflector and fuel concept technologies that enable efficient and economic fuel use.
 - Advanced heat transfer and/or power conversion technologies and storage systems.
 - Production approaches that enable standardization, efficient factory manufacturing and assembly, and mass-produced components leveraged from other technology fields.
 - Improved ability to support non-electric applications such as process heat, etc.
 - Enhanced reliability and high-capacity factors, resilience against disruptions.
 - Minimization of on-site construction in remote applications.
 - Compatibility with local microgrids supporting facility operations.
 - Ability to scale to meet changing loads over time, at multiple voltage outputs.

RC-2: Innovative Microreactor Solutions for End-User Applications

Suggested Performance Targets:

	Units	Preferred	Limit
Net Power	MW _{th}	1.0 - 30	< 50
Staff	FTE/MW	0.5-1.5	< 3
Enrichment	%U235	<10	< 19.75
Burnup	MWd/kgU	>10	No less than 5
Specific Power	kWe/kgU	>5	No less than 2.5



Clean. **Reliable. Nuclear.**