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Yasir Arafat, Westinghouse Electric Company

Self-Regulating, Solid Core Block for an Inherently Safe Heat Pipe Reactor

Team Members

- **Westinghouse** – Alex Levinsky, Jurie Van Wyk, Clint Armstrong, Richard Wright
- **LANL**- DV Rao, Tom Lienert, Bob Reid
- **INL** – Shannon Bragg-Sitton, Jim Sterbentz
- **Echogen Power Systems** – Jason Miller
- **University of Pittsburgh** – Kevin Chen

Goals

1. eVinci™ micro reactor is self-regulating for all operation modes, requiring no safety-related instrumentation and control (I&C) system
2. The solid core block (SCB) can be fabricated using advanced manufacturing techniques
3. Factory fabrication & construction will be practical, repeatable & economical

What is the MEITNER technology?

- **Coupled Modeling and Simulation** – Self-regulating behavior of core
- **Heat Pipe Characterization** – high temperature separate effects tests
- **Monolith Manufacturability**
- **Materials Test**- SS316, TZM and P91
- **Integrated Sensors**
- **Autonomous Control System**
- **Techno-economic Modeling**



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How is your system transformational?

Micro reactors have the potential to open up a new market for nuclear

- DoD Remote Operating Bases
- DoD Forward Operating Bases
- Remote off-grid communities
- Remote mines

Project Performance Targets:

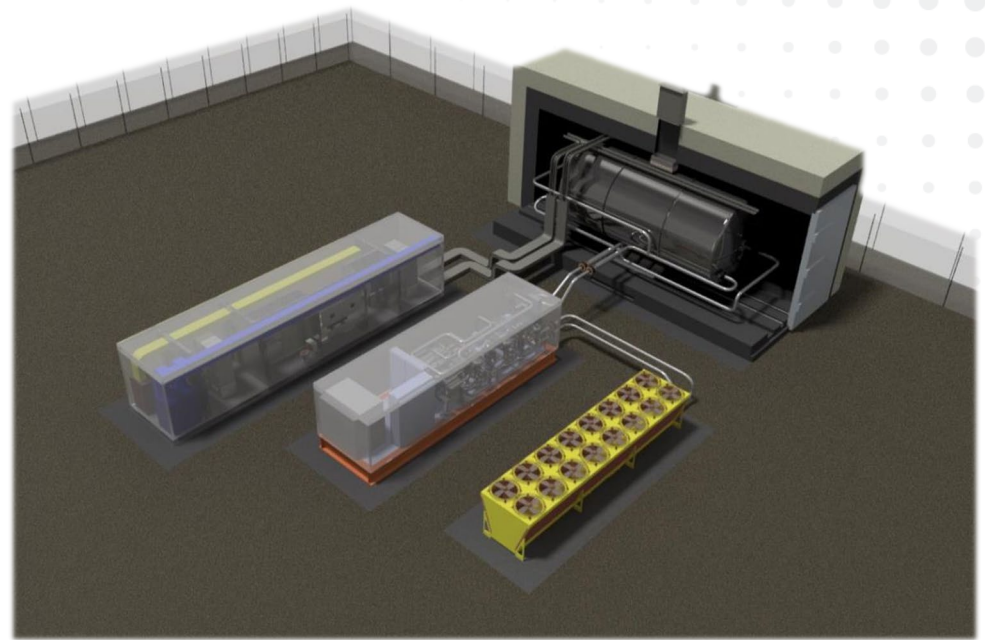
- Monolith- $<10^{-6}$ torr leak tight
- HP rate $> 3\text{KWth/HP}$

Self-regulating Core enables:

- No safety-related I&C
- Minimum operators
- Simplified plant

Cost Drivers:

- Minimize Operation & Maintenance
- Reduce capital cost: reduce off-site fabrication and on-site installation cost



- **Transportable energy generator**
- **Combined Heat & Power, 0.2-15 MWe**
- **Fully factory built, fueled and assembled**
- **Target $<$ one month on-site installation**
- **10 years' life with inherent safety**
- **Autonomous load management capability**
- Unparalleled proliferation resistance
- High reliability with minimal maintenance
- Green field Decommissioning & Remediation

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What challenges do you anticipate?

- **Integration of all key components in a solid block**
 - Core monolith (houses fuel)
 - Primary heat exchangers
 - Embedded sensors
 - Heat pipes
- **Needs proven/validated**
 - Modeling & Simulation tools
 - Material reliability for 10 years
 - Heat pipe performance & reliability
 - Strain sensors

Topics of Interest to Team

- Customer/market requirements
- Tech-Economic modeling
- Regulatory feedback on approach
- Shared development challenges
- Resource team collaboration

