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Yasir Arafat, Westinghouse Electric Company
Self-Regulating, Solid Core Block for an Inherently Safe Heat Pipe Reactor

<table>
<thead>
<tr>
<th>Team Members</th>
<th>Goals</th>
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<tbody>
<tr>
<td>• <strong>Westinghouse</strong> – Alex Levinsky, Jurie Van Wyk, Clint Armstrong, Richard Wright</td>
<td>1. eVinci™ micro reactor is self-regulating for all operation modes, requiring no safety-related instrumentation and control (I&amp;C system)</td>
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<tr>
<td>• <strong>LANL</strong>– DV Rao, Tom Lienert, Bob Reid</td>
<td>2. The solid core block (SCB) can be fabricated using advanced manufacturing techniques</td>
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<td>• <strong>INL</strong> – Shannon Bragg-Sitton, Jim Sterbentz</td>
<td>3. Factory fabrication &amp; construction will be practical, repeatable &amp; economical</td>
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<td>• <strong>Echogen Power Systems</strong> – Jason Miller</td>
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<td>• <strong>University of Pittsburgh</strong> – Kevin Chen</td>
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**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 $>3$ 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
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