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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CHANGING WHAT'S POSSIBLE

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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:

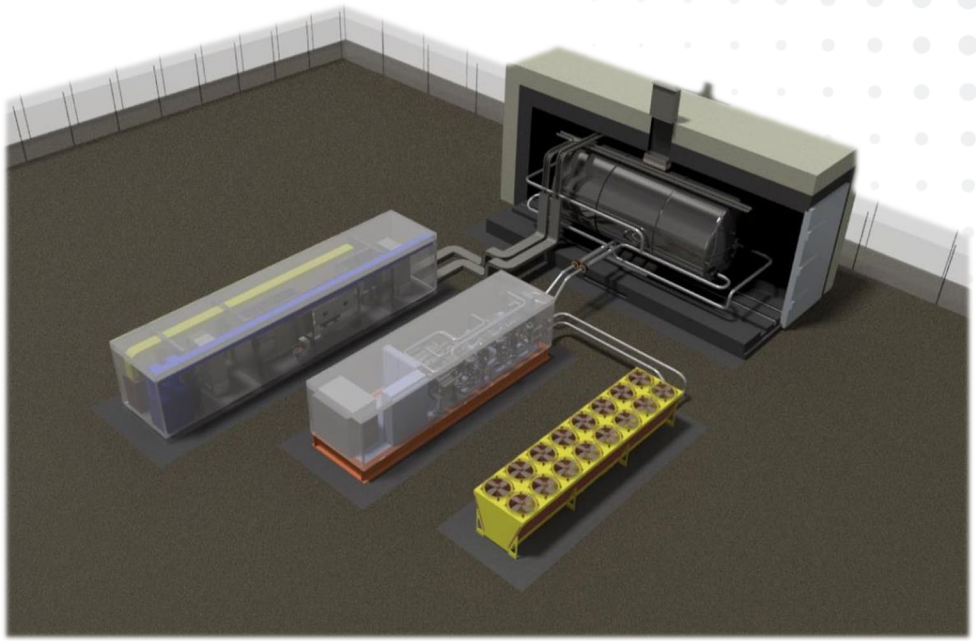
- Monolith- <10^-6 torr leak tight
- HP rate > 3KWth/HP

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*