

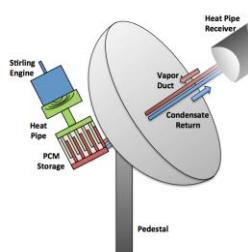
## PROJECT OBJECTIVES

**Goal:**

- Demonstrate the feasibility of significant thermal storage for dish Stirling systems to leverage their existing high performance to greater capacity
- Demonstrate key components of a latent storage and transport system enabling on-dish storage with low exergy losses
- Provide a technology path to a 25kW<sub>e</sub> system with 6 hours of storage

**Innovation:**

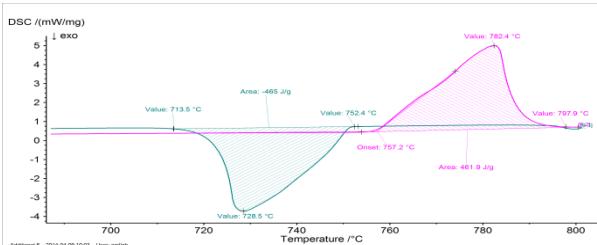
- Leverage high performance heat pipes to support feasible system layout
- Develop and test high temperature, high performance PCM storage
- Optimize storage configuration for cost and exergy performance
- Latent storage and transport matches Stirling cycle isothermal input<sup>1</sup>



<sup>1</sup>Andraka, C.E., Rawlinson, K.S., Siegel, N.P., "Technical Feasibility of Storage on Large Dish Stirling Systems," Sandia report SAND2012-8352 (2012).

## Q2 KEY RESULTS AND OUTCOMES

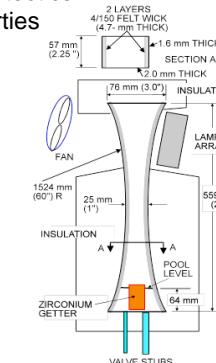
- PCM Candidate Evaluation
  - Two metallic PCM candidates successfully fabricated
  - Melt point and heat of melting characterized
  - Completed evaluation of novel screening of protective coating chemistries, selecting several for coating development
  - Identified additional coating chemistries to pursue
  - Began solution coating development of leading coatings
- Heat pipe advanced wick development
  - Heat pipe wick fabrication completed (2), awaiting delivery



DSC data from leading metallic PCM showing heat of melting 462 J/g and melt initiation at 757°C

## APPROACH

- PCM development and selection
  - Literature searches and modeling to develop candidate eutectics
  - Sample fabrication and characterization to develop properties
  - Modeling of compatibility with potential containment
  - Long-term testing of compatibility
- PCM Compatibility enhancement
  - Identify and develop or optimize coating chemistries to protect containment materials
  - Short-term and long-term compatibility exposure testing
  - Compatibility coating development and testing
- Heat Pipe
  - Felt wick enhancements for robust high performance<sup>2</sup>
  - Long-term performance and durability testing
- Proof-of-concept hardware subscale demonstration



<sup>2</sup>Baturkin, V., Vladilen Zaripov, Charles E. Andraka "Development of Advanced Capillary Porous Structures of High Temperature Heat Pipes for Solar Receivers for Dish/Stirling Systems," Proc. 14th international heat Pipe Conference (14th IHPC).

## NEXT QUARTER

PCM candidate evaluation

- Complete development of solution coating techniques for selected coating chemistries
- Identify and procure alternative coatings by commercial means
- Complete short-term exposure tests of coatings and PCM's in "boats"
- Complete design for long-term PCM/coating compatibility test apparatus

Heat pipe advanced wick development

- Complete fabrication of advanced wick(s) on test device substrate, and assemble wicks into test device at Sandia
- Begin heat pipe throughput testing