## Development of an Integrated TES HEX for CSP #08382

## Optimized integrated TES HEX system can exploit LHTES system to meet SunShot goal.

## **1**. Impact

An optimized and cost-effective TES system reduces the cost of solar energy for making it competitive at large scale with other forms of energy. It also establishes a more robust technical foundation and commercialization pathway of an integrated PCM heat exchanger for sCO<sub>2</sub> CSP applications.

## 2. Project Goals

- Demonstrated viability of fixed position integrated HEX LHTES system for CSP.
- Cost-optimized system design meeting the Sunshot target of \$150/kWT for HEX and \$15/kWT for thermal storage.

## 3. Method(s)

- Comparative analysis of different heat exchanger types, PCM matrix and their arrangement.
- Prepare a thermodynamic cycle model to optimize the system for cost and performance.

 Durability analysis to show 30 years of creep and cyclic life.

## 4. Outcome(s)

- Designed, built, and successfully tested scaled version of integrated HEX-PCM TES.
- Graphite foam (GF) is an excellent matrix for PCM but expensive (~50 % of TES cost).
- Proposed copper honeycomb matrix as an alternative based on its comparable thermal performance and cost (~ 3 x less than GF).

## 5. Conclusion/Risks

- Integrated HEX PCM TES is technically viable but requires optimization to achieve Sunshot goals.
- Copper is a suitable alternative to GF as a thermal conductor, but its compatibility with PCM salt needs to be tested.

#### 6. Team

Jim Nash (PI), Saroj Bhatta Ph.D., Jeff Beach



Figure 1. System optimization for cost and performance: comparative analysis of different TES alternatives

# Visuals