

PROJECT OBJECTIVES

Goal: to evaluate and demonstrate a metal hydride-based TES system for use with a CSP system.

Innovation: metal hydrides have a unique ability to deliver low-cost, high capacity and energy efficient TES systems for CSP applications. New higher capacity and lower cost materials have recently become available. SRNL's combined and integrated modeling and metal hydride material research approach to help solve technical challenges.

1st Year Major Milestones:

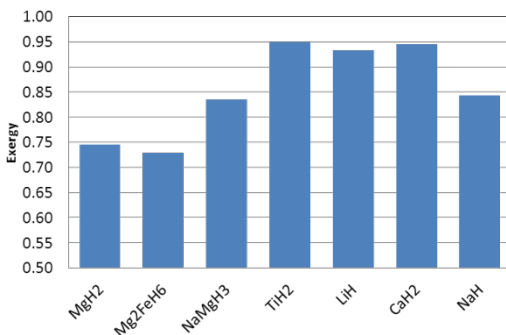
- Determine the material properties of for at least 10 MH material pairs.
- Screen at least 10 MH pairs to arrive at 2-3 candidate materials meeting SunShot targets
- Approve the final design and construction of the bench-scale MH cycling system.

APPROACH

- Make use of the hierarchal modeling methodology developed by the SRNL combined with the extensive material knowledge and expertise at both SRNL and CU to screen several promising metal hydride candidate materials and then select the best candidates for more thorough evaluation through experiments and more detailed models.
- During subsequent years, material optimization, bench-scale testing and more detailed component and system models will lead to a proof-of-concept demonstration and a preliminary system design. The culmination of this proposed research will be the design, fabrication and evaluation of a prototype metal hydride TES system aimed at meeting the SunShot cost and performance targets.

KEY RESULTS AND OUTCOMES

Preliminary Exergetic Efficiencies Results For Several MH TES Candidate Materials



- 350 cycles have been achieved on our lead LT storage material (NaAlH₄) and performance studies have begun on two HT candidates: Mg₂FeH₆ and TiH₂.
- Sensitivity analyses have been carried out showing the influence of several parameters on the specific cost of selected material pairs
- The bench-scale MH TES system is undergoing pressure and leak testing prior to final completion.

NEXT MILESTONES

- Modified screening models and additional, more detailed material data, are being used to further down select the possible candidate pairs to arrive at the best 2-3 candidate pairs.
- A joint technical paper with CU reporting on some of the screening methodology and the material data has been submitted for publication and an additional more detailed paper on the SRNL/SunShot material screening and modeling activities is in progress.
- The bench-scale MH TES system is on track to complete the system by the end of the FY.

Go/No-Go Milestone:

Successful completion of all milestones in Budget Period 1. Engineering materials property data evaluation is complete indicating that the performance of the MH TES system can meet the proposed system technical targets.