



Modular and Low-Cost Latent Thermal Energy Storage for Solar Industrial Process Heat

Decarbonizing Industrial Process Heat with Shape Stable Composite PCM

Goal

Impact Innovations will design, test, optimize and validate the performance of a modular and low-cost SS-CPCM TES intended for integration with CST technology that output heat up to 300 °C and deliver heat in the temperature range of 100-250 °C for industrial applications. This system is intended for integration with line-focusing solar collectors that typically operate at temperatures up to 300 °C using mineral oil or water/steam as the heat transfer fluid. The primary challenge with adoption of solar thermal for industrial process heat is intermittency that reduces the capacity factor of solar thermal systems, decreases its reliability to supply continuous and on-demand heat, and increases levelized cost of heat (LCOH). The proposed development of low-cost (SS-CPCM) TES for integration with CST will increase system resiliency to provide on-demand/continuous heat supply and reduce levelized cost of heat from solar thermal to the point that it is competitive with natural gas-based thermal equipment.

Key Personnel/Organizations

Dr. Karthik Nithyanandam, Impact Innovations LLC
 Dr. Prashant Singh, University of Tennessee

Key Milestones

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| Set! Deadline | Optimal manufacturing process and the associated parameters for SS-CPCM |
| Go! Deadline | SS-CPCM TES design optimized for storage cost less than 25 \$/kWh. |
| Final | Laboratory prototype testing for multiple thermal cycles. System optimization for LCOH < LCOH of natural gas boiler. |

Project Impact

SSPCM-TES is a positively disruptive technology, which has the potential to capture the ad-vantages of conventional PCMs while avoiding their shortcomings, resulting in a low-cost, simple, and effective thermal energy storage technology. When widely adopted in the US manufacturing sector for 100-250 °C process heat, SS-CPCM TES integrated with CST could yield annual savings of 4000 trillion BTU at a levelized cost of heat lower than that of natural gas boilers that will avoid 210 million metric tons of carbon emissions per year. The project is aligned with the Justice40 initiative objectives and will contribute towards two specific missions on increasing parity in clean energy technologies and increase clean energy jobs.

