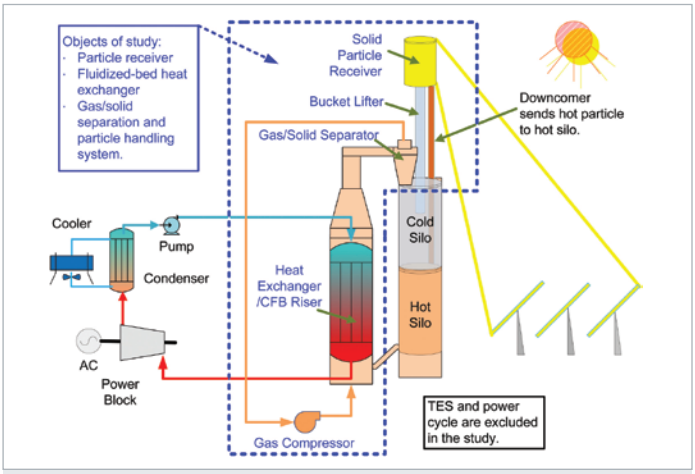
Particle Receiver Integrated with Fluidized Bed

NATIONAL RENEWABLE ENERGY LABORATORY	NREL NATIONAL RENEWABLE ENERGY LABORATORY
PROGRAM:	SunShot CSP R&D 2012
TOPIC:	Advanced Receivers
LOCATION:	Golden, Colorado
AWARD AMOUNT:	Up to $3.8 million
PROJECT TERM:	2012–2015



Schematic of fluidized-bed CSP system with solid-particle receiver and thermal energy storage. *Illustration from NREL*

MOTIVATION

The current state-of-the-art, nitrate-based molten-salt systems have limited potential for cost reduction and improvements in performance. Even with significant improvements, these systems face major challenges to satisfy the SunShot performance targets for a concentrating solar power (CSP) plant, which include high-temperature stability (>650°C), low freezing point (<0°C), and material compatibility with high-temperature metals (>650°C) at a reduced cost.

PROJECT DESCRIPTION

The research team is working to develop a technology that uses gas/solid, two-phase flow as a heat-transfer fluid and separated, stable, solid particles as a thermal energy storage medium. The team is developing a near-blackbody particle receiver and an integrated fluidized-bed heat exchanger with auxiliary components to drive high-efficiency power cycles and achieve greater than 20% cost reduction over current CSP plants.

IMPACT

This project provides a pathway for CSP plants to increase their solar-to-electric conversion efficiency and reduce costs in the areas of solar collection from the solar field to the receiver, energy conversion systems, and thermal energy storage.

CONTACTS

Project Leader:
Dr. Zhiwen Ma
Zhiwen.Ma@nrel.gov

Partnering Organizations:

- Babcock & Wilcox Power Generation Group, Inc.
- Massachusetts Institute of Technology

For more information, visit the project page at: www.solar.energy.gov/sunshot/csp_sunshotrnd_nrel_receiver.html.

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