
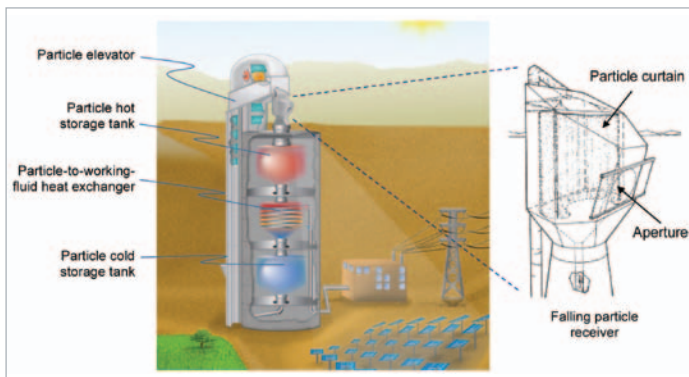


# High-Temperature Falling-Particle Receiver

<b>SANDIA NATIONAL LABORATORIES</b> 	
PROGRAM:	SunShot CSP R&D 2012
TOPIC:	Advanced Receivers
LOCATION:	Albuquerque, New Mexico
AWARD AMOUNT:	Up to \$4.4 million
PROJECT TERM:	2012–2015



This conceptual drawing illustrates a high-temperature falling-particle receiver system that will achieve greater efficiencies and lower costs. *Illustration from Sandia National Laboratories*

## CONTACTS

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**Partnering Organizations:**

- Georgia Institute of Technology
- King Saud University
- Bucknell University
- German Aerospace Center (DLR)

## MOTIVATION

Conventional central receiver technologies are limited to temperatures of around 600°C. At higher temperatures, nitrate salt fluids become chemically unstable. In contrast, direct absorption receivers using solid particles that fall through a beam of concentrated solar radiation for direct heat absorption and storage have the potential to increase the maximum temperature of the heat-transfer media to more than 1,000°C. Once heated, the particles may be stored in an insulated tank and/or used to heat a secondary working fluid (e.g., steam, carbon dioxide, air) for the power cycle.

## PROJECT DESCRIPTION

The objective of this work is to make revolutionary advancements in falling particle receivers for concentrating solar power applications that will enable higher temperatures and greater efficiencies at a lower cost. The research team aims to meet the technical targets set forth by DOE, including:

- Temperature of heat transfer fluid exiting receiver  $\geq 650^\circ\text{C}$
- Annual average receiver thermal efficiency  $\geq 90\%$
- Number of thermal cycles without failure  $\geq 10,000$
- Cost of receiver subsystem  $\leq \$150/\text{kW}_{\text{th}}$

## IMPACT

The falling particle receiver appears well-suited for scalability in power tower systems ranging from 10–100 MW<sub>e</sub>. Thermal energy storage costs can be significantly reduced by directly storing heat at higher temperatures in a relatively inexpensive medium (i.e., sand-like particles). In addition, the flux limitations associated with tubular central receivers are significantly relaxed because the solar energy is directly absorbed by the sand-like working fluid.

For more information, visit the project page at: [www.solar.energy.gov/sunshot/csp\\_sunshotrnd\\_snl.html](http://www.solar.energy.gov/sunshot/csp_sunshotrnd_snl.html).