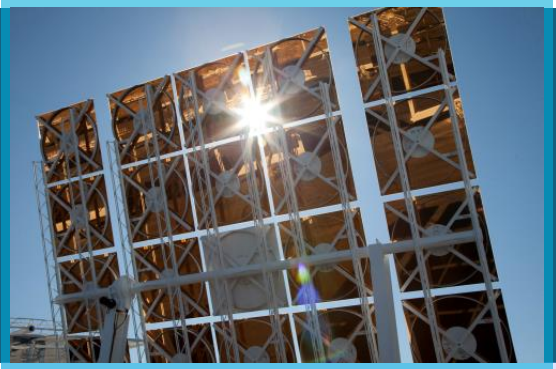
Presented at the 2020 Thermal-Mechanical-Chemical Energy Storage (TMCES) Workshop, February 4, 2020, Pittsburgh, PA

Sandia National Laboratories

High-Temperature Falling Particle Receiver with Thermal Storage



PRESENTED BY

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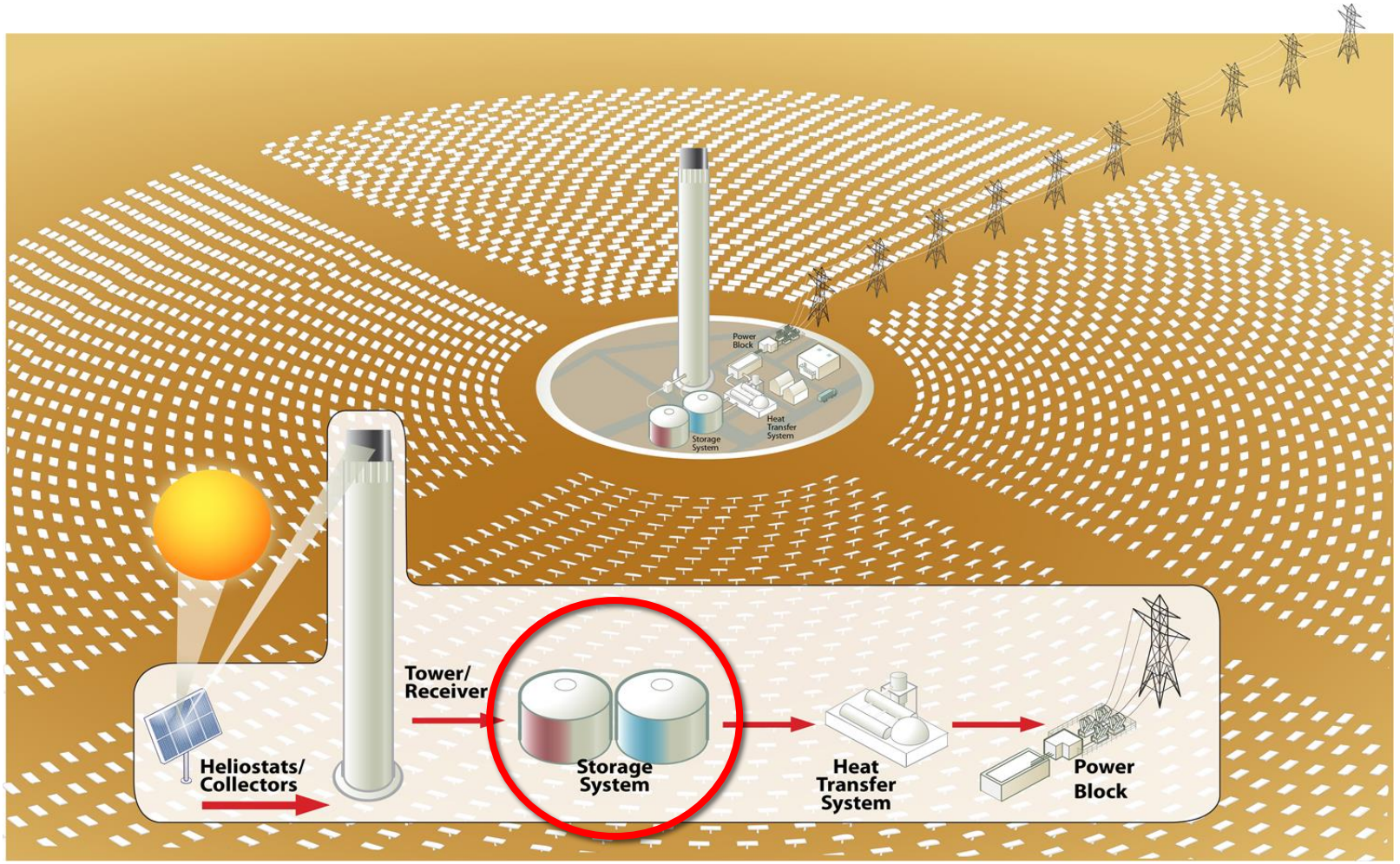
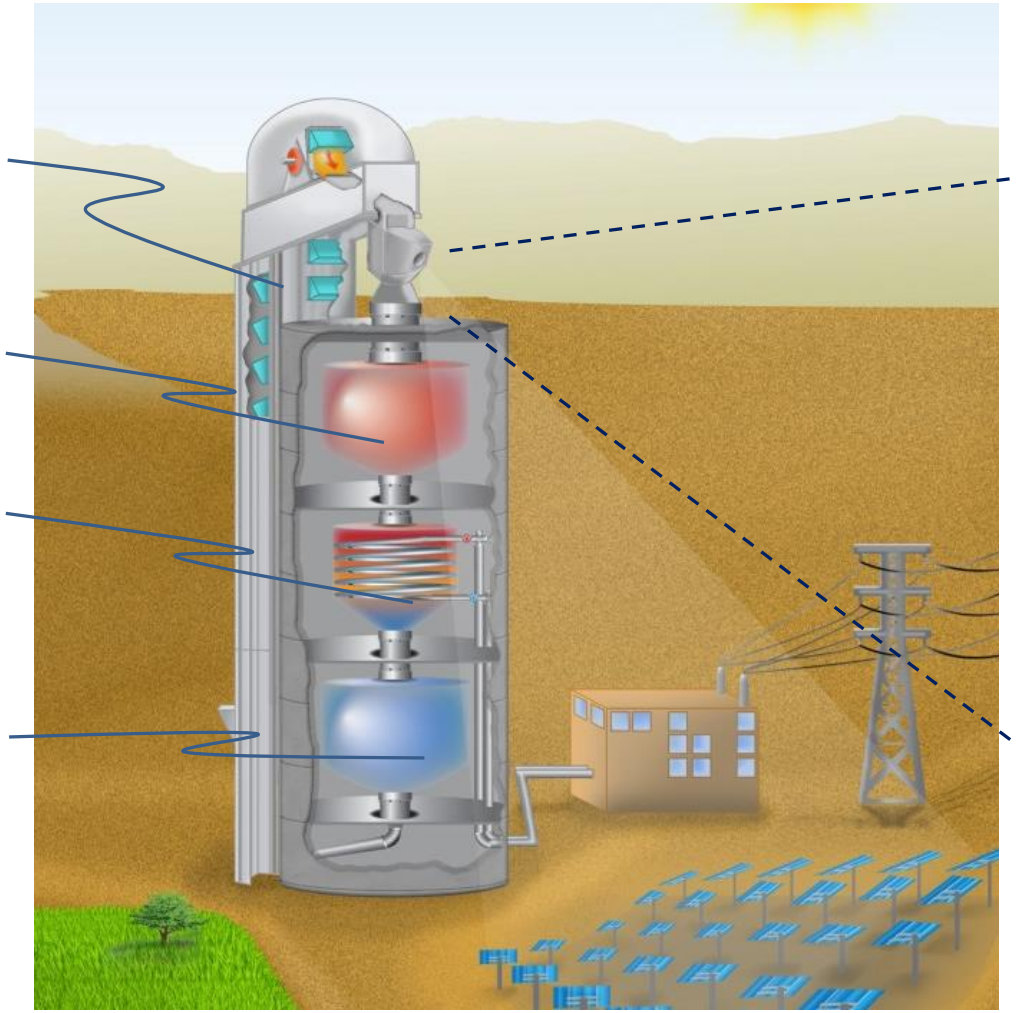
SAND2020-1206 PE

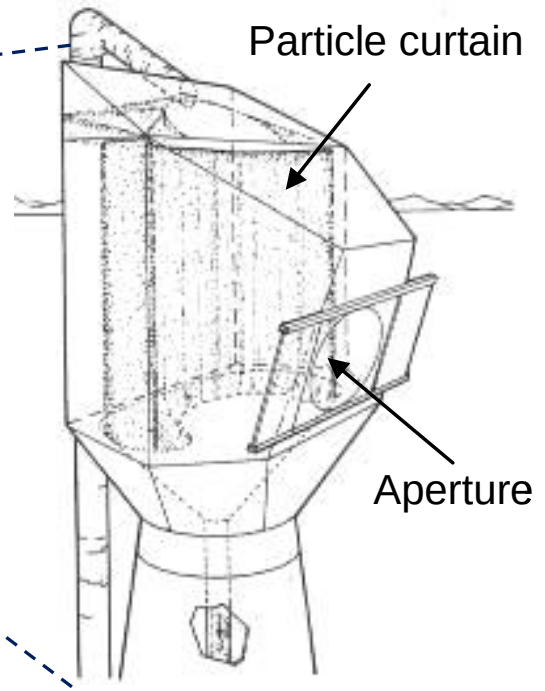
Concentrating Solar Power and Thermal Energy Storage

- Concentrating solar power uses mirrors to concentrate the sun's energy onto a receiver to provide heat to spin a turbine/generator to produce electricity
- **Hot fluid can be stored as thermal energy efficiently and inexpensively** for on-demand electricity production when the sun is not shining



High Temperature Falling Particle Receiver (DOE SunShot Award FY13 – FY16)

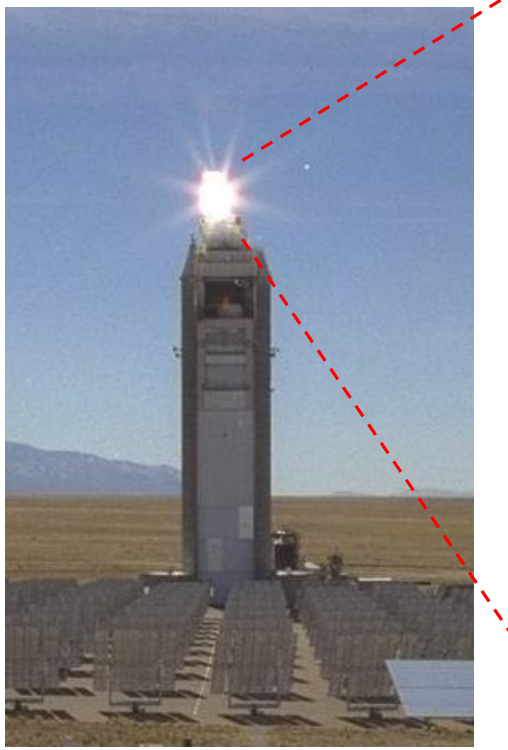


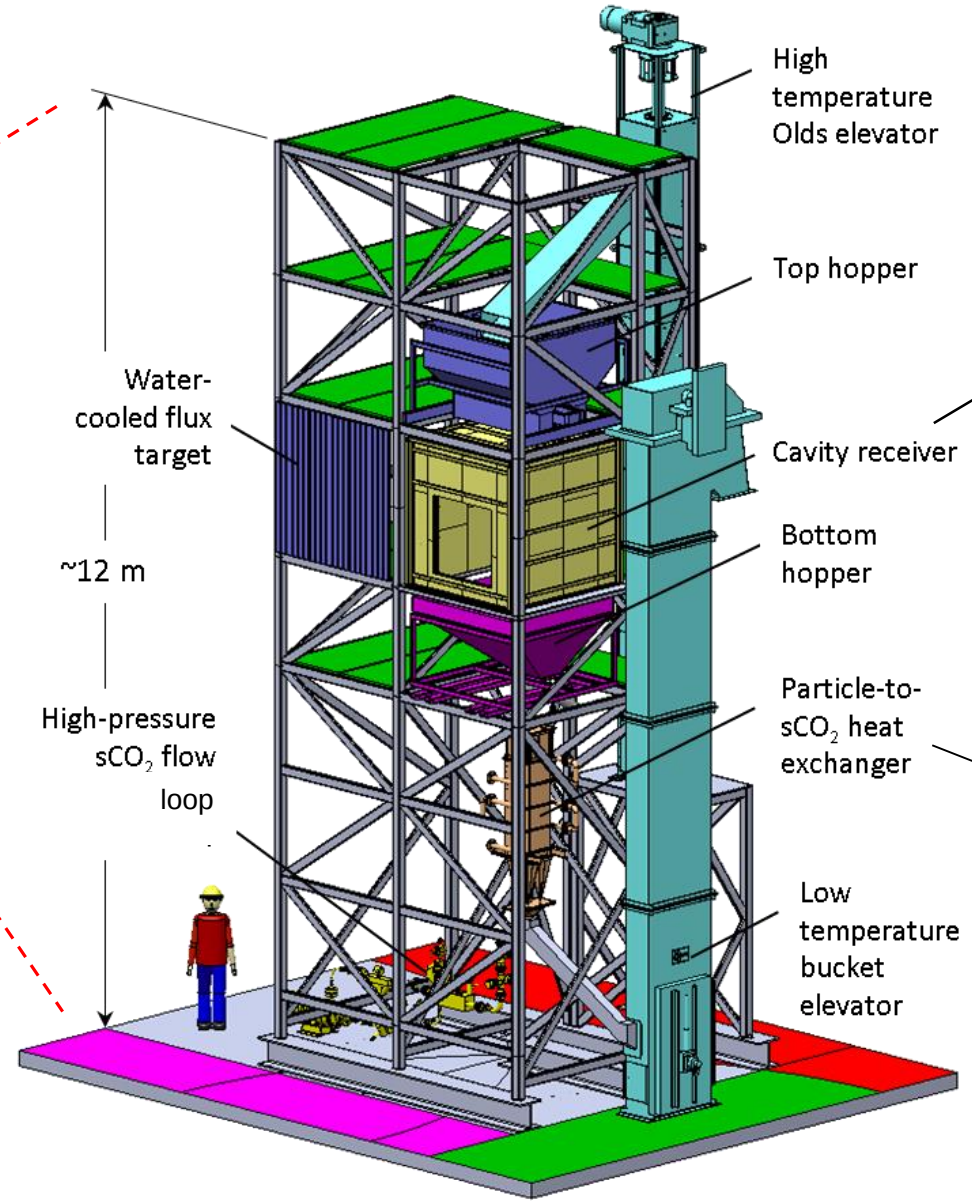


Falling particle receiver

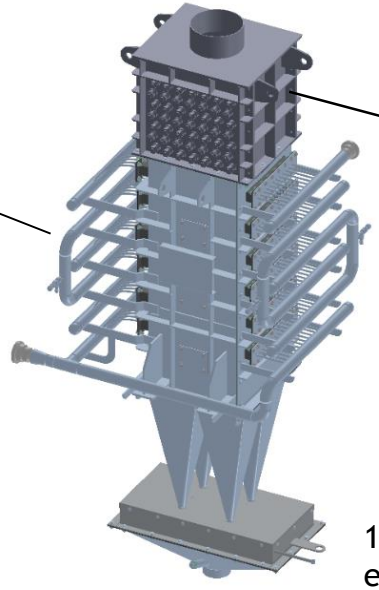
Goal: Achieve higher temperatures, higher efficiencies, and lower costs

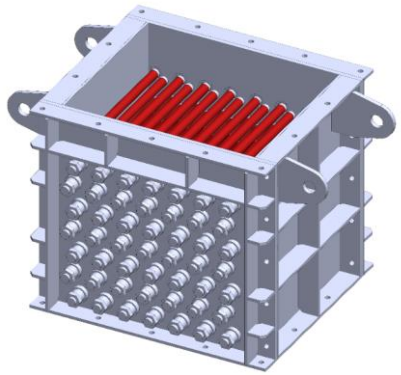
Prototype System Design





Falling particles through slot aperture



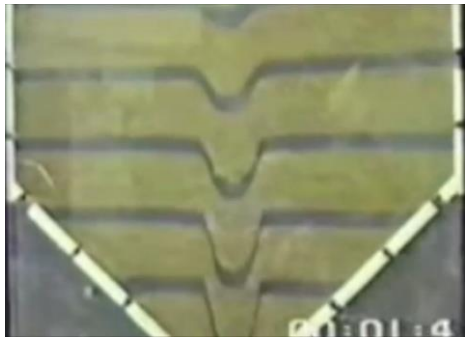


Electrical particle heater

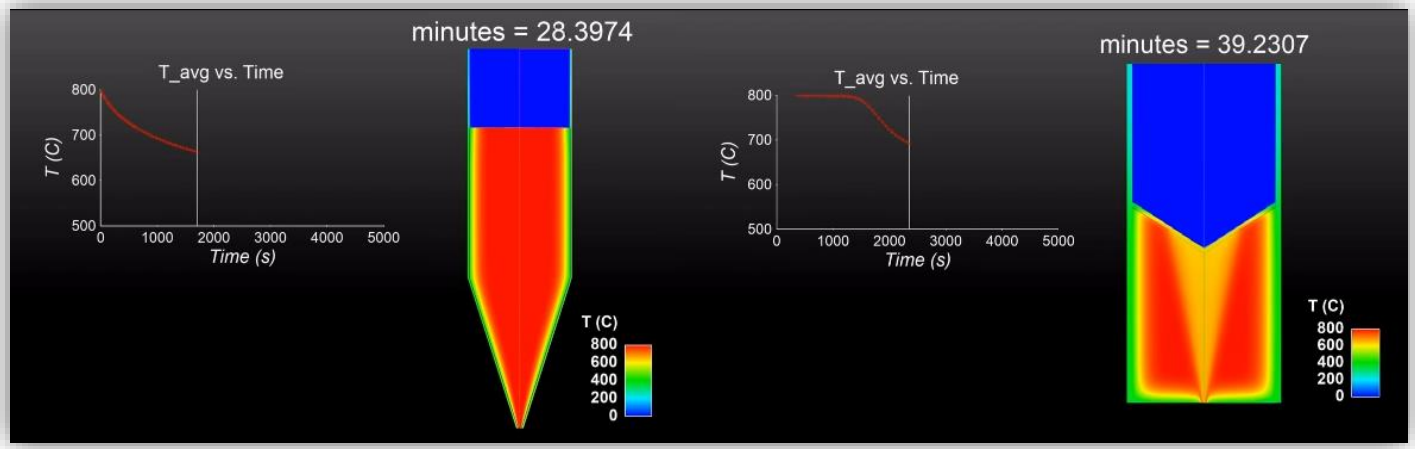
100 kW particle heat exchanger

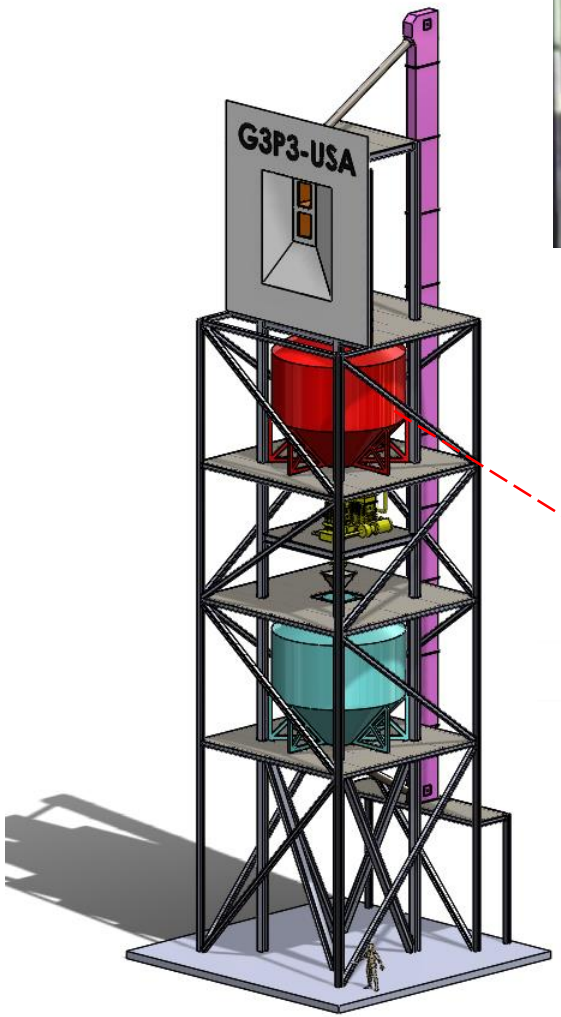
Particle Storage Tank Design

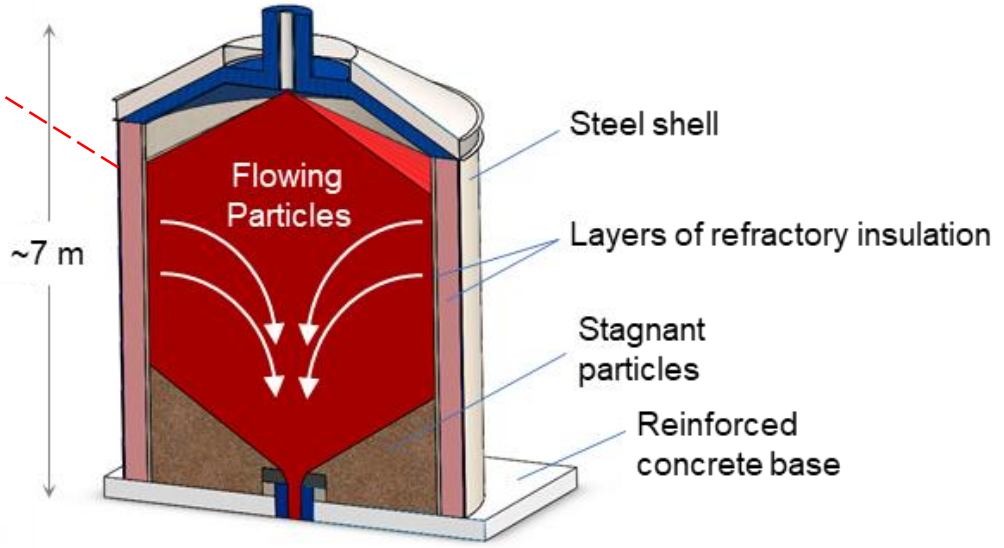
American Institute of Chemical Engineers
https://youtu.be/w_Yd8or3PCk



Particle funnel-flow visualization







Small-scale hot-storage funnel-flow testing in a furnace

- Falling particle system that heats particles to ~800 °C
  - Solar heating
  - Electric heating
- High-temperature particle storage
  - Minimal heat loss
  - Minimal erosion
- Dispatchable heat or electricity production

Questions?

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