

Sensible Thermal Energy Storage – High-Temperature Particles



PRESENTED BY

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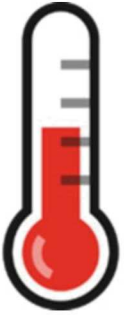
Sandia National Laboratories, Albuquerque, NM



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“Sensible” Thermal Energy Storage



- Sensible (single-phase) storage
 - Use temperature difference to store heat
 - Molten salts (nitrates $< 600\text{ }^{\circ}\text{C}$; carbonates, chlorides $700 - 900\text{ }^{\circ}\text{C}$)
- Solids storage (sand, rocks, ceramic particles, concrete)
 - Wider temperature range (below freezing to $> 1000\text{ }^{\circ}\text{C}$)
 - Low cost ($\sim \$0.01 - \$1 / \text{kg}$)

Sensible Molten Salt Storage

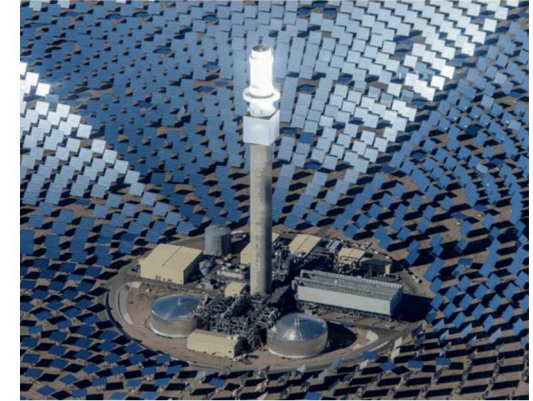


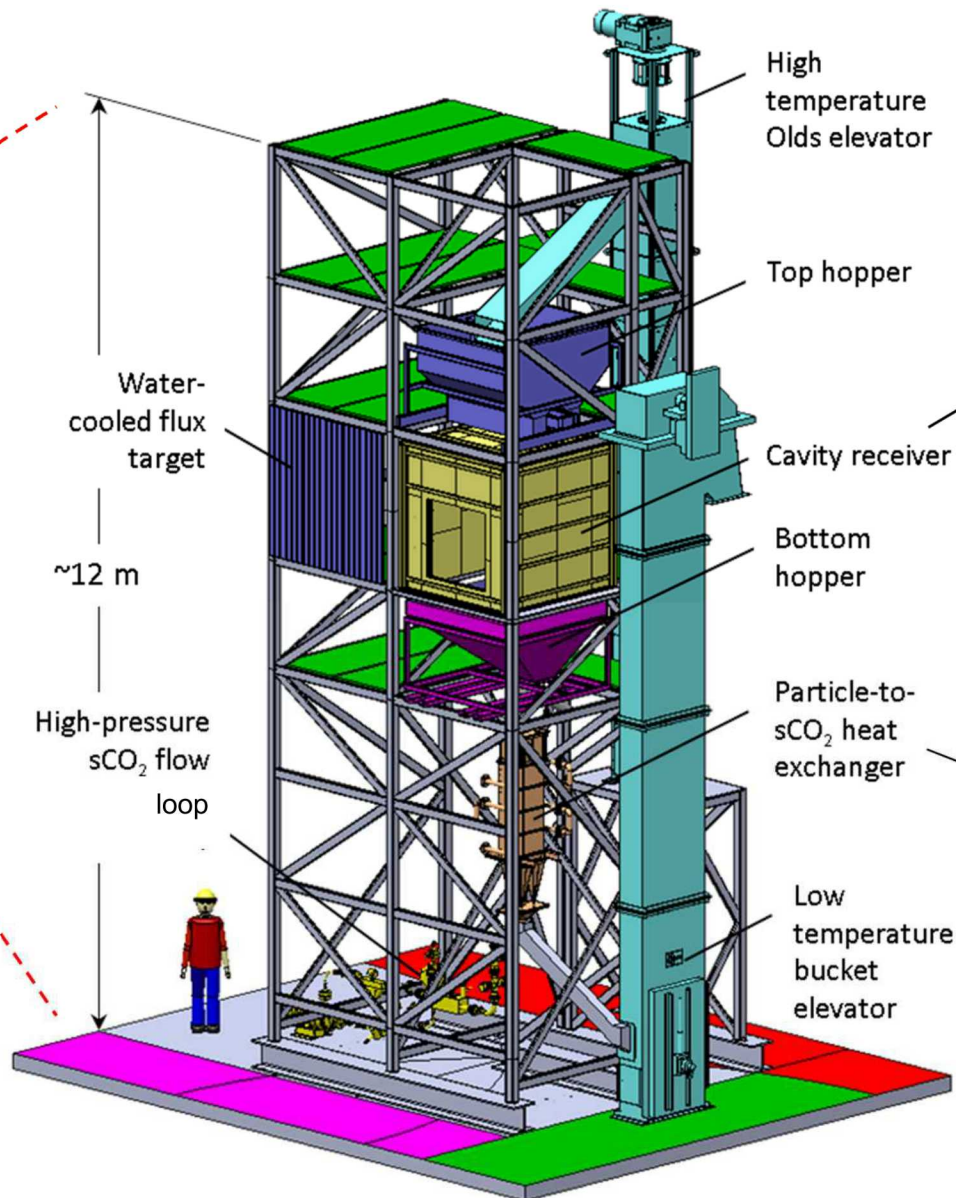
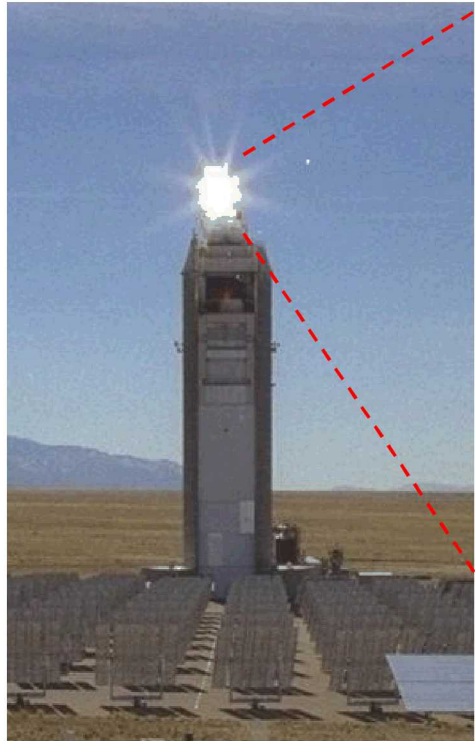
photo credit: Mary Grikas, Wiki commons, 10/9/15
Crescent Dunes CSP, Nevada
100 MW/1 GWh



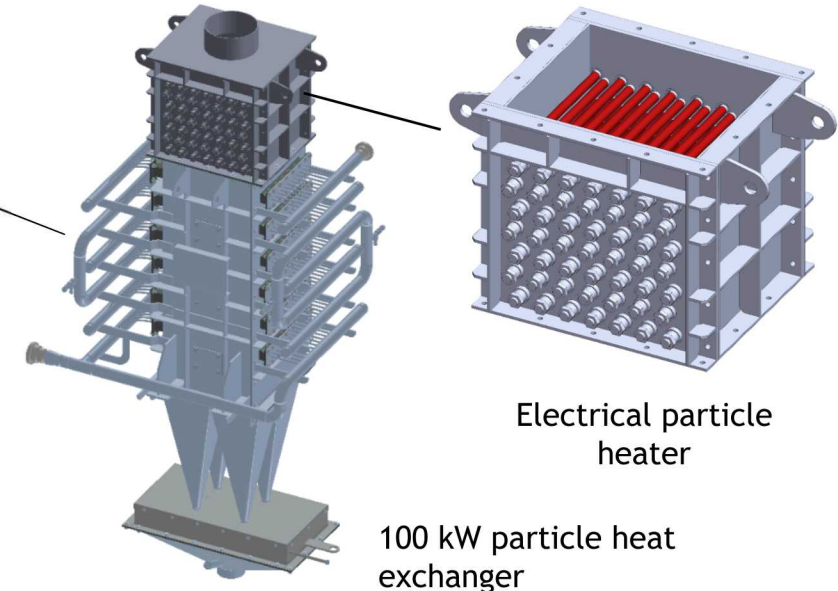
https://en.wikipedia.org/wiki/Solana_Generating_Station


Solana CSP, Arizona
280 MW/1.7 GWh

Prototype Solid Particle Thermal Storage System



Falling particles through slot aperture



Thermal Storage	Method/Materials	Advantages	Challenges/Needs
Sensible 	Temperature difference (e.g., molten salts, rock, sand)	<ul style="list-style-type: none">• Mature technology• Demonstrated large capacity with concentrating solar power (~GWh)• Low cost	<ul style="list-style-type: none">• Achieving higher temperatures*• Heat loss• Large volumes required• Heat exchange to and from storage material

*To achieve higher thermal-to-electric conversion efficiencies

Questions?



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