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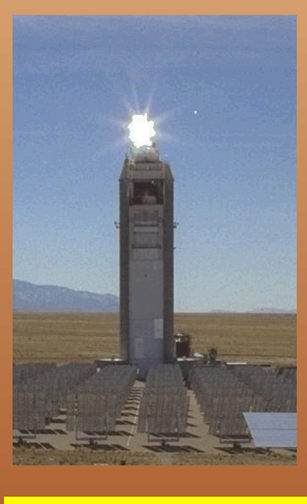

System Design of a 1 MW North-Facing Solid Particle Receiver

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Introduction and Approach

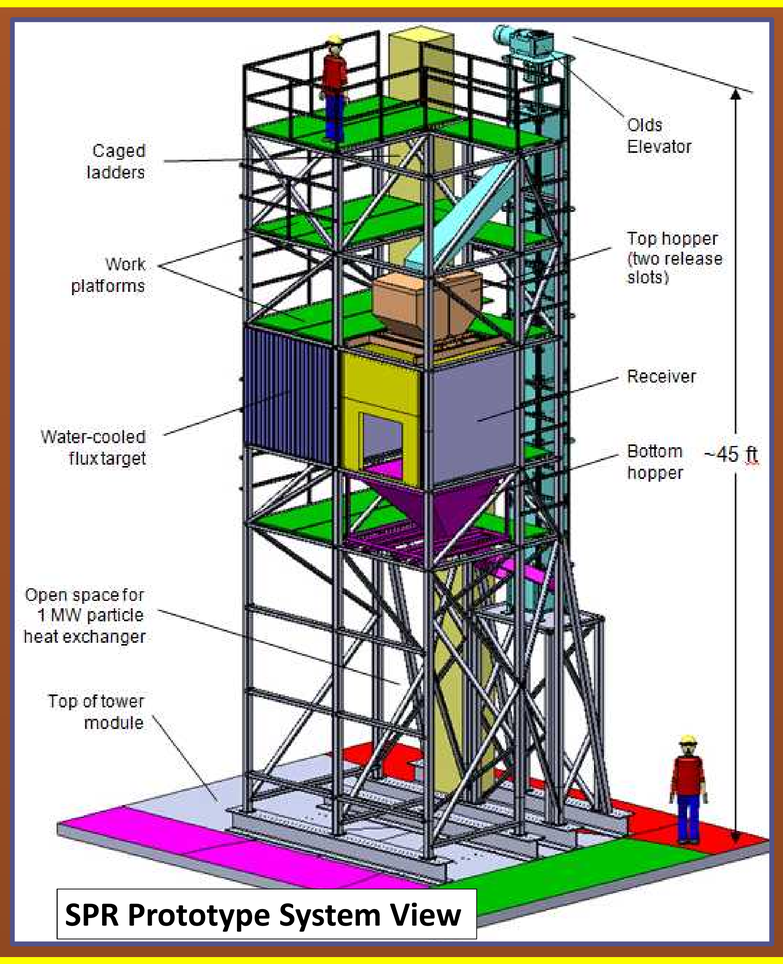
Background

- Falling solid particle receivers (SPR) can enable increased working-fluid temperatures for central receiver power plants and reduced thermal storage costs

  Targets:
  - Thermal efficiency >90%
  - 700 °C particle outlet temperature

Features

- 1 MW_{th} falling particle receiver
- Continuous flow of solid particles (1 – 8 kg/s)
- > 700 °C operation



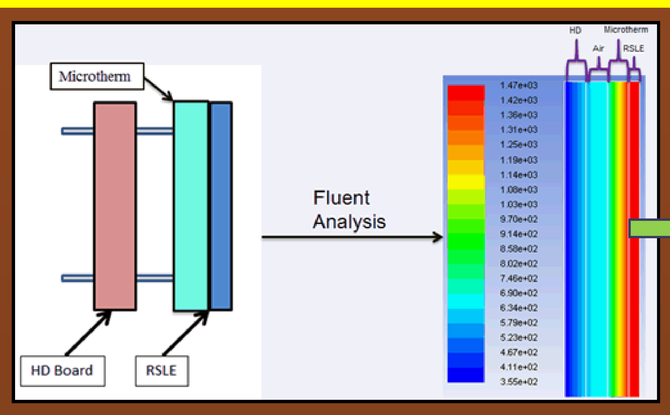
SPR Prototype System View

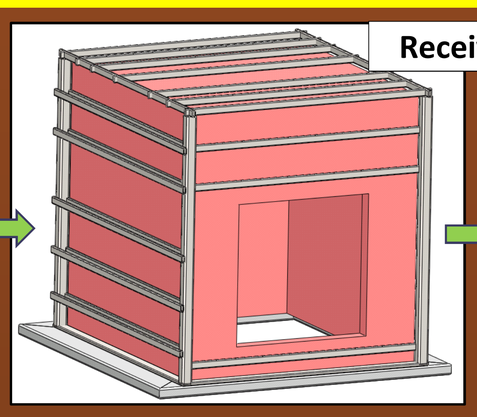
Approach

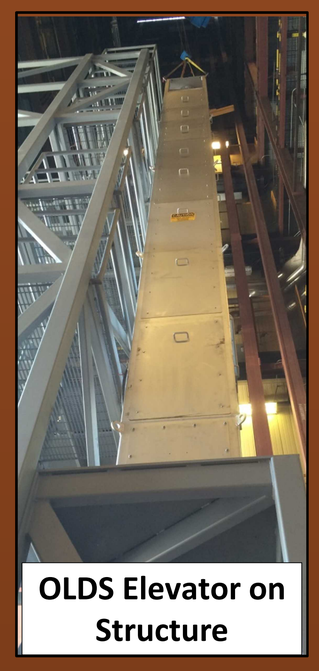
- CFD analysis performed in previous work to determine appropriate receiver geometry dimensions
- Analytical calculations (thermal resistive network) utilized to estimate system temperatures
- FEA performed on structural components (top hopper, bottom hopper, receiver frame)
  - Thermal Loads
  - Mechanical Loads
- Component fabrication and installation
- Instrumentation includes thermocouples and flux gauges

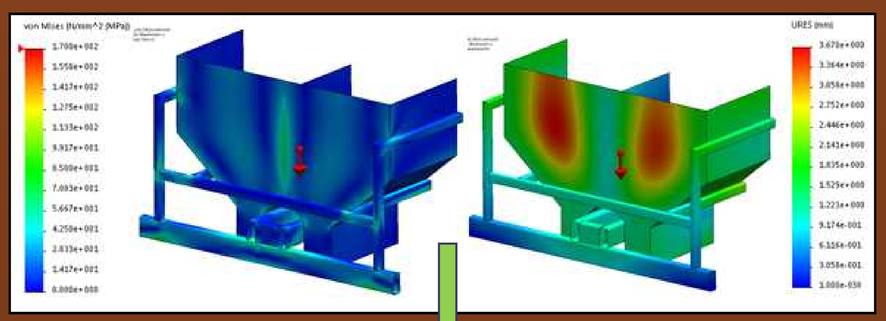
Results – Component Design and Fabrication

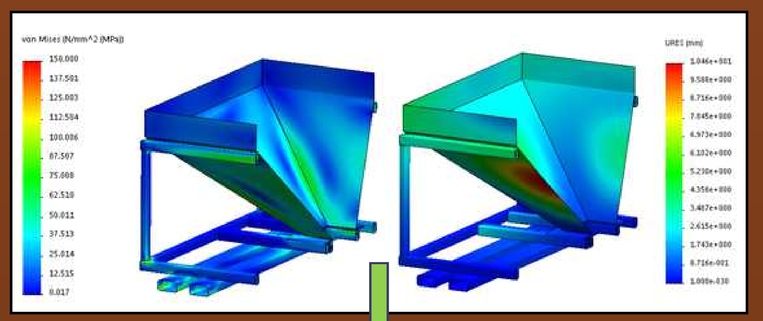

Support Structure with BCS and Bottom Hopper in place

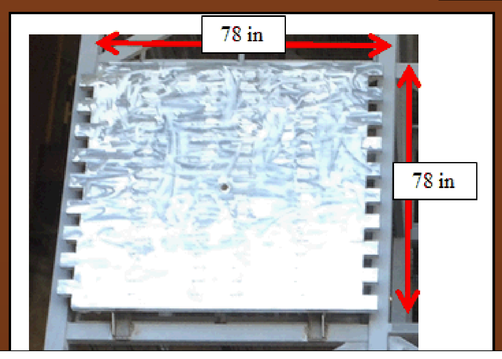



Receiver Cavity


OLDS Elevator on Structure



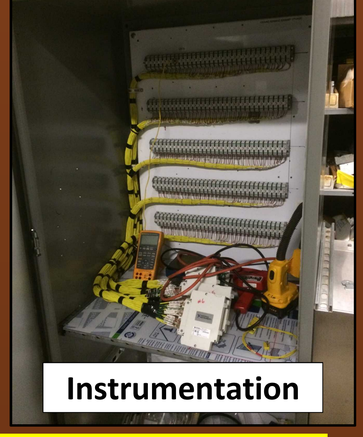




Beam Characterization Panel (BCS)


Top Hopper


Bottom Hopper


Instrumentation

Conclusions

- Prototype components have been designed and fabricated and are ready to be installed for testing
- On-Sun testing will commence at the National Solar Thermal Test Facility (NSTTF) in Albuquerque, NM, in FY15

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