Project ID. 34211

Headline. Fluidized particles move solar energy

1. Impact

4.7 c$/kWh, base load
10.3 c$/kWh, peak load

2. Project Goal

-Manufacture and test a 2.5 MW_{th} fluidized particle-in-tube solar receiver.
-Integrate all the components of a particle-CSP power plant.
-Identify the key issues for upscaling.

3. Method(s)

-Examine the fluidized particle flow regimes in the absorber tubes of the solar receiver and associated heat transfer. Determine the maximum tube length and receiver unit power. Test a prototype-scale solar receiver.
-Test a compartmented fluidized bed heat exchanger.
-Implement the complete solar prototype and test it.
-Quantify the cost of main components at commercial scale for a 150 MW peaker plant.

4. Outcome(s) – First SR test campaign

Particle mass flow rate: 0.6-3.5 kg/s
P_{solar}: 550-850 kW
ΔT particle: 100-400 °C
Efficiency: 40-75%

5. Conclusion/Risks

-The solar receiver is highly flexible: tuning the aeration mass flow rate results in a precise control of particle mass flow rate and solar receiver starting and shut down steps are very fast (10-15 minutes).
-Risk: large difference of solar flux distribution on tubes can result in particle circulation stop due to air velocity difference.

6. Team

Next-CSP EU project Team: CNRS, INPT, Comessa, EDF & Euronovia (France), Whittaker Engineering Limited (Scotland), IMDEA (Spain), SBP (Germany), EPPT & KU Leuven (Belgium).

Visuals

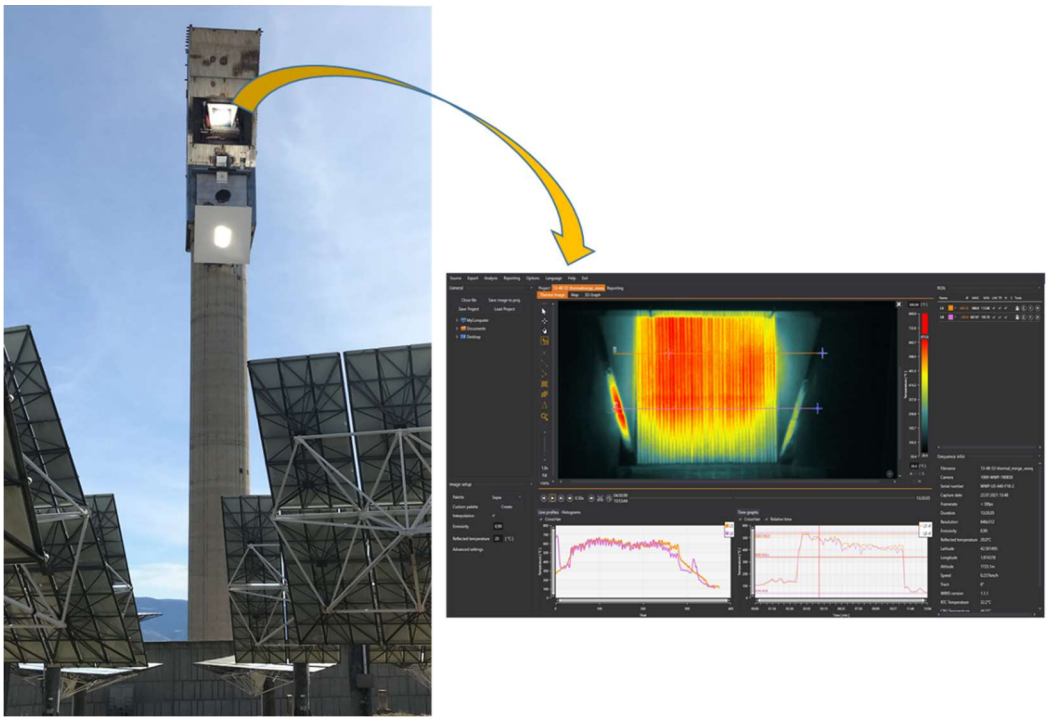

Figure 1. Solar receiver testing at Themis tower and IR image of the tubes from a drone.