THE PROJECT

General context
The thermodynamic solar power plants present a current water consumption of 4 m3/MWh mainly needed to dicharge the waste heat of their Rankine cycle. Under arid area, this aspect induces potentially a major conflict of use on a much more fundamental ressource than electricity. Therefore, their is a critical need in alternative dry cooling systems still allowing high efficiencies.

The DryRSP concept
The solar field of a CSP plant represents 50% of its initial cost and is used only daily. For a 50 MW CSP plant, this solar field has a surface of 150.000 m² for a cost of about 100 M€. The DryRSP concept consists to use this solar field as a macro heat exchanger under convective and radiative transfers. Under arid conditions, the earth atmosphere offers an open window to the infra red spectra available for heat discharge toward space at -270°C. This cooling effect allows also the condensation of the surounding humidity producing about 0.12 L/m²/night. The plant does not consume water any more but produces water !

Scientific and industrial impacts

Scientific
Optimisation of mixed convective and radiative transfers on dynamic complex surfaces,
Interactions between coupled heat transfer phenomena and water condensation,
Optimization of the surface propeties for enhanced radiative transfer.

Industrial
New CSP plants without water consumption offering a difference in the market,
CSP plants producing water by condensing humidity, potentially applied to water desalination in costal areas,
New generation of solar fields including innovative integrated heat exchangers and active surfaces used 24h/day.

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