HiFlex

HIFLEX –
HIgh Storage Density Solar Power Plant for FLEXible Energy Systems

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Kinetics Technology

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SUGIMAT
Efficient Engineering Solutions

HELIOHEAT

DÜRMEIER
ANLAGENBAU & VERFAHRENSTECHNIK

John Cockerill

Barilla
The Italian Food Company. Since 1877.

TEKFEN ENGINEERING

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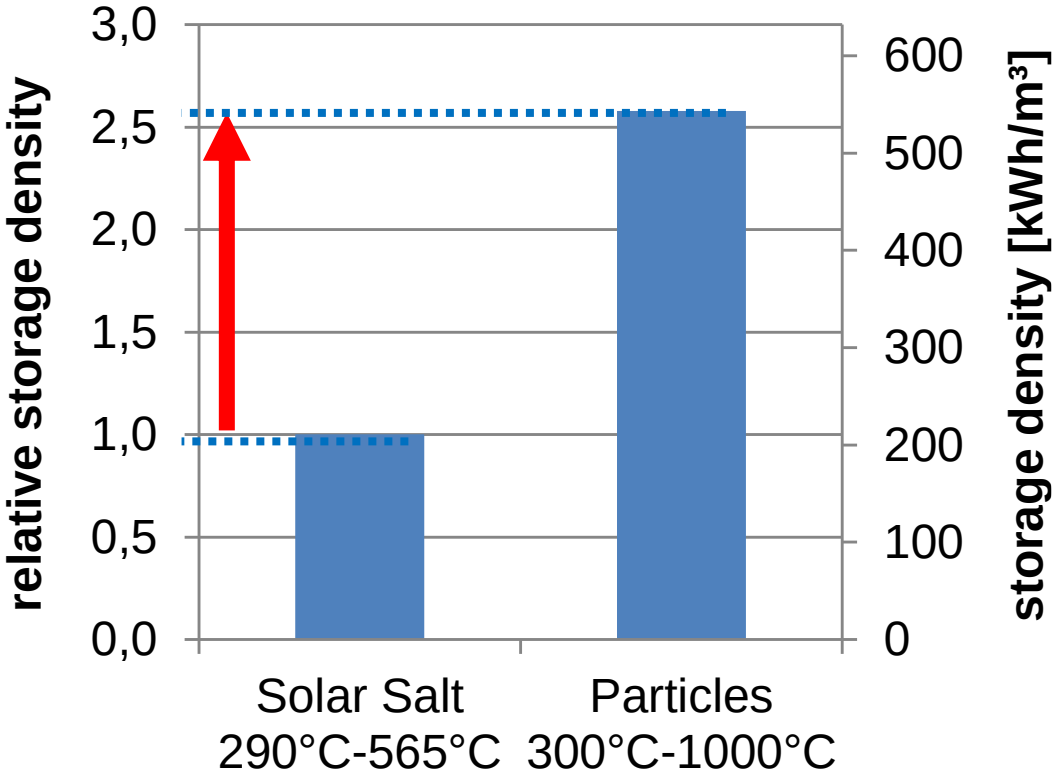
Motivation - HIFLEX – HIgh Storage Density Solar Power Plant for FLEXible Energy Systems

- Solid particles
- As heat transfer and storage medium
  - Increase process temperature
  - Two times higher storage densities



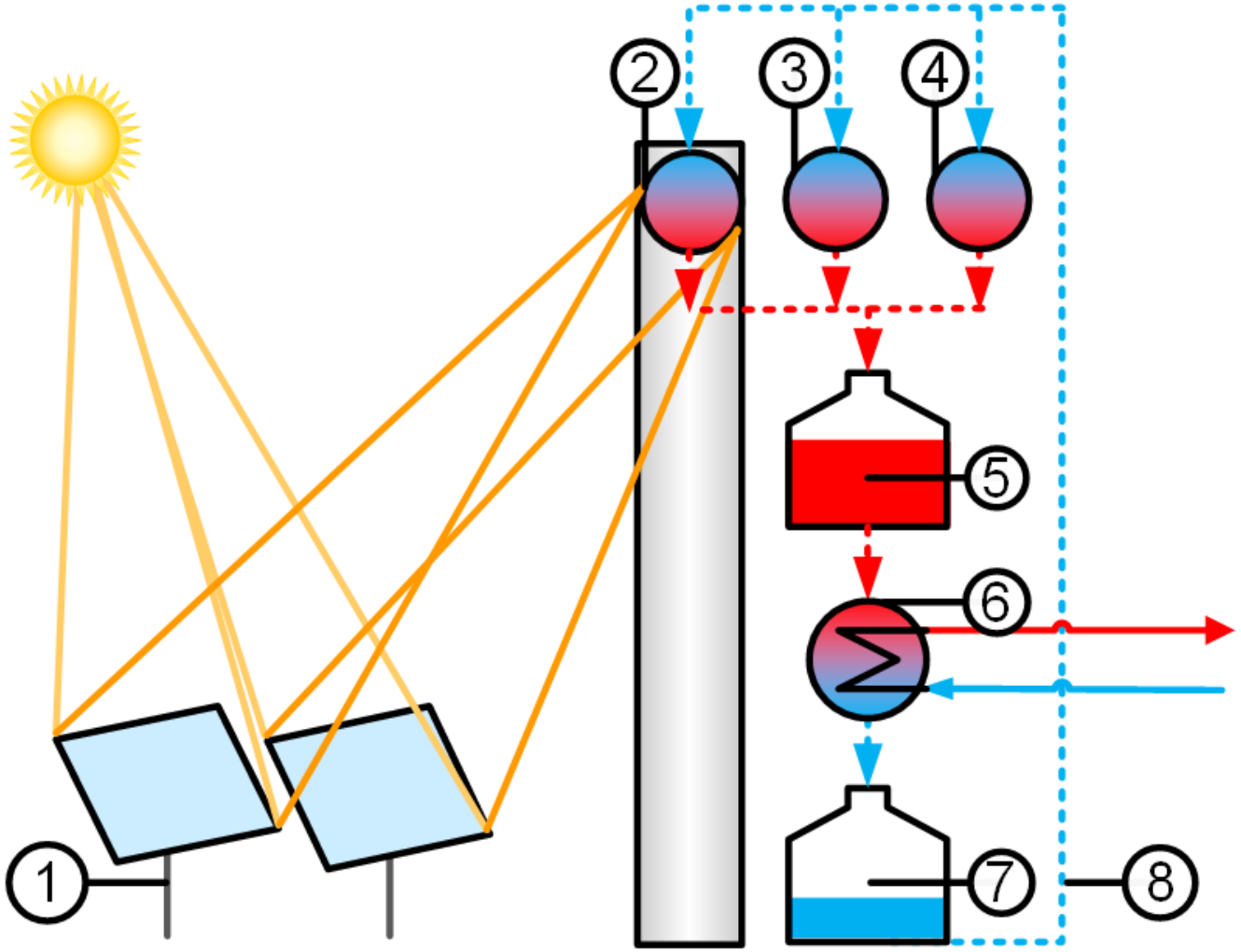
Ambition and Objectives

- Demonstrate pre-commercial CSP plant
- 24 hour steam production for process heat
- Supply to industrial application of Barilla in Italy
- Drying 7000 t/a

Decrease levelized cost of heat / electricity (LCOH / LCOE)

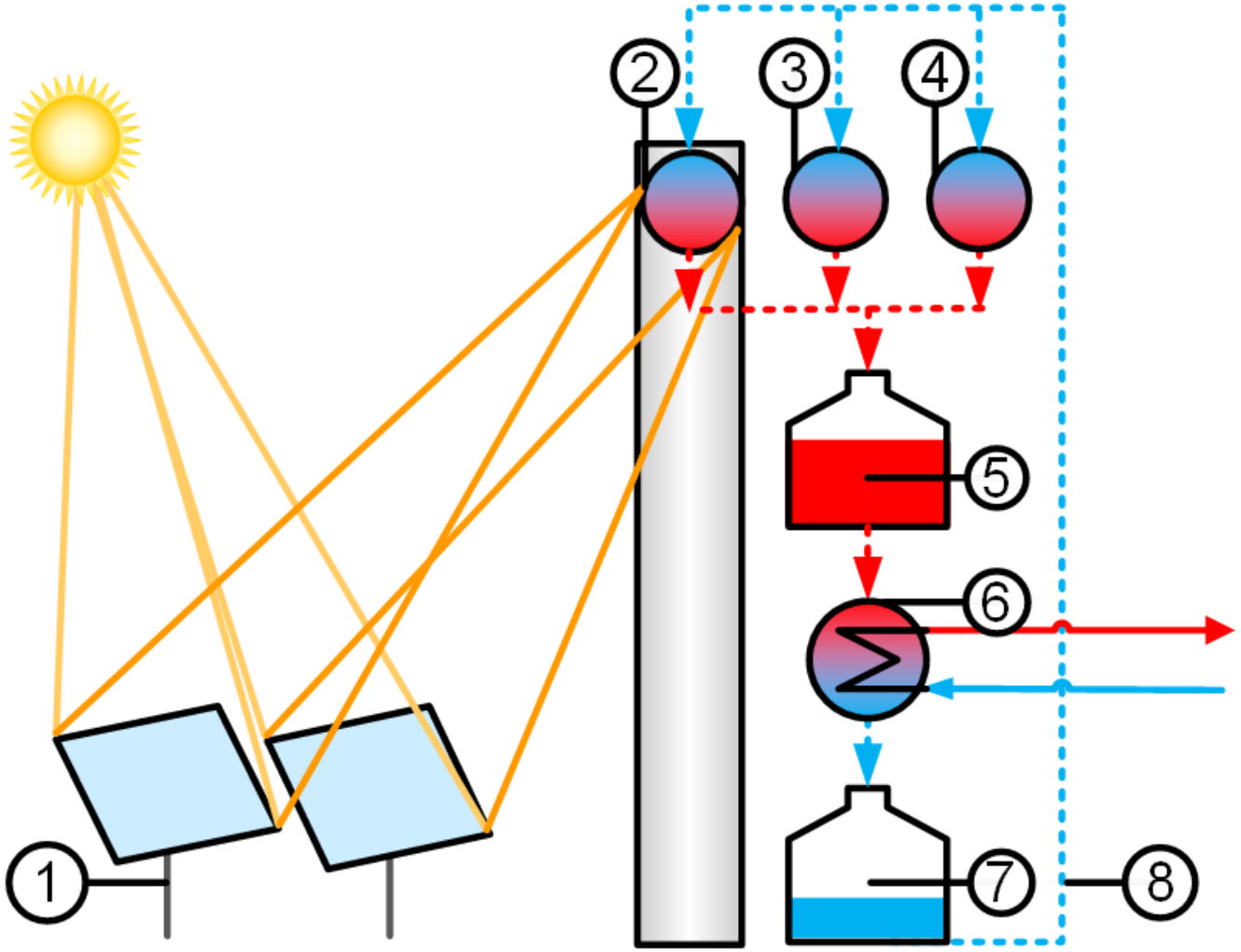
14,000 x

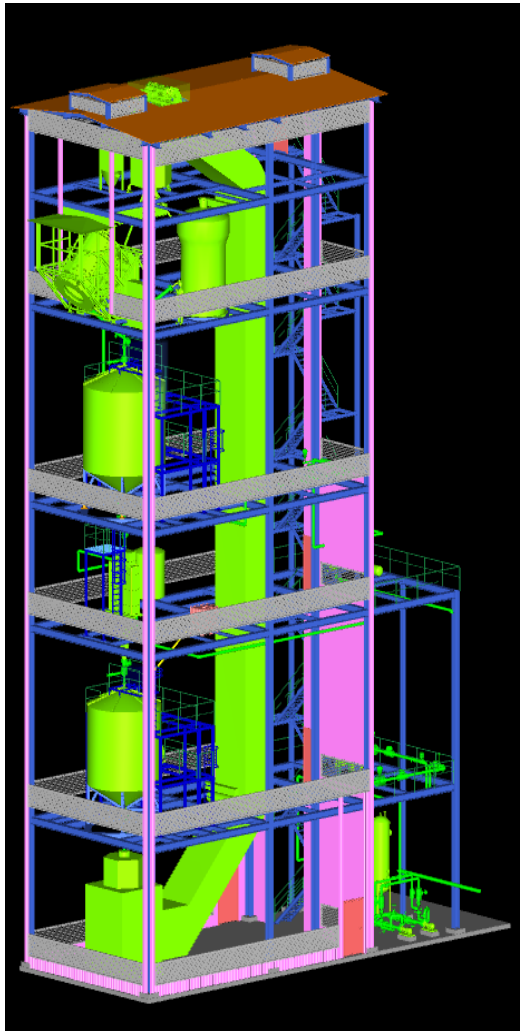
HIFLEX - plant



1. Heliostat Field
2. Direct Absorption Particle Receiver
3. Electric Particle Heater
4. Backup Particle Heater
5. Hot particle storage
6. Steam generator
7. Cold Particle storage
8. Particle Transport System

HIFLEX - plant





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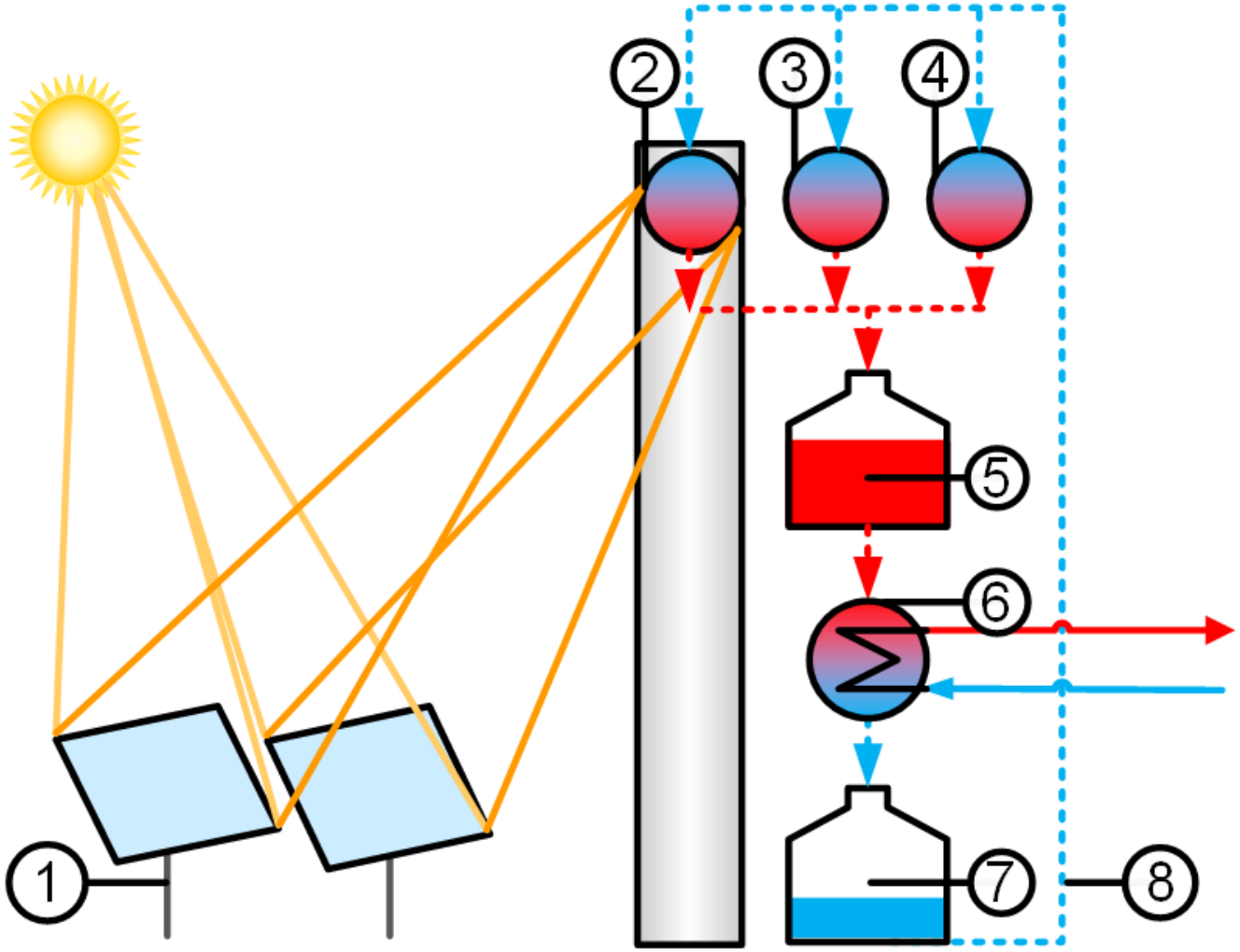
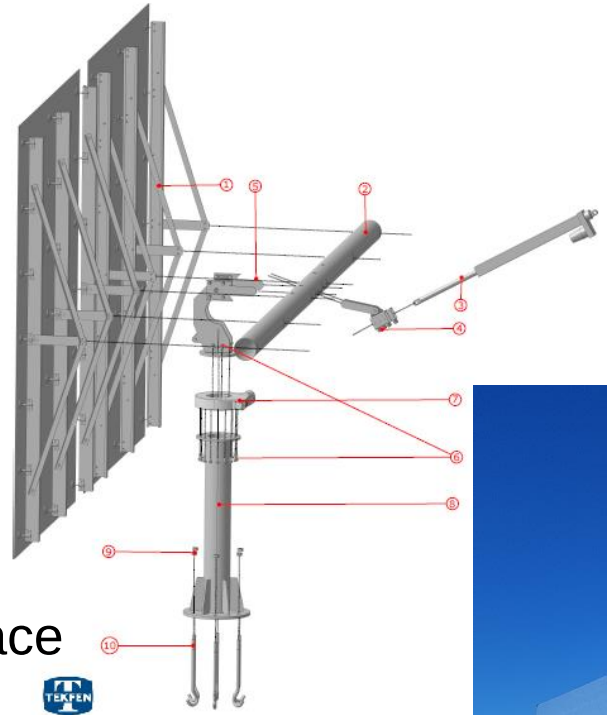
HIFLEX – Heliostat field

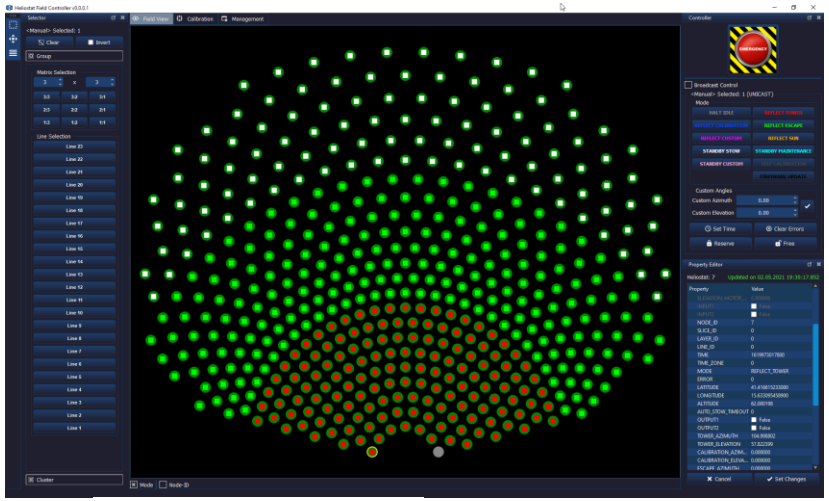


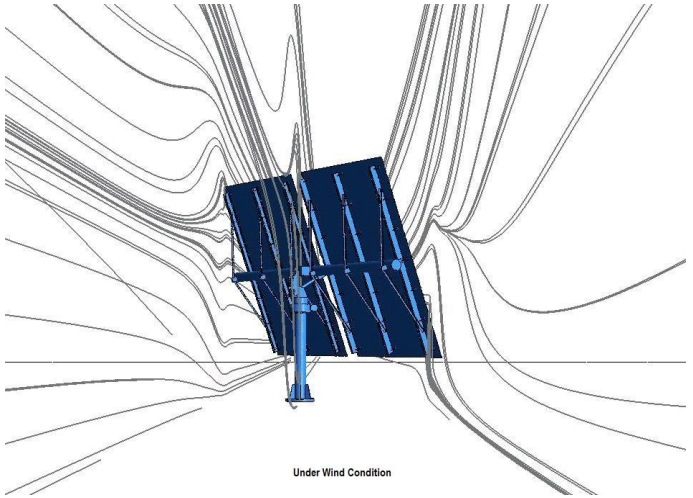
① Heliostat Field

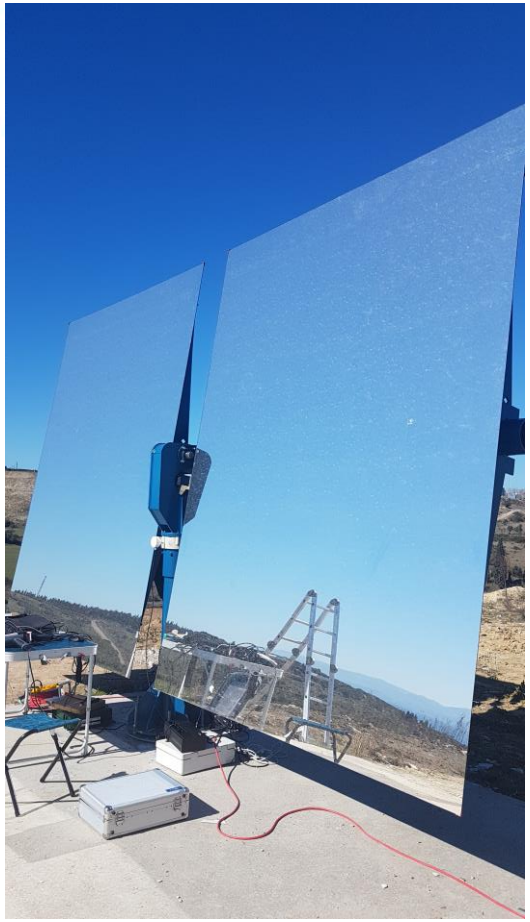
Heliostat

- Two mirror facets, each 2.5 m wide and 3.2 m long with a total reflecting surface of ~16 m².
- Total 432 heliostat to provide 2.8 MW_{th} energy.
- High tracking accuracy especially under wind condition
- Heliostat control system HeliOS with a user-friendly interface

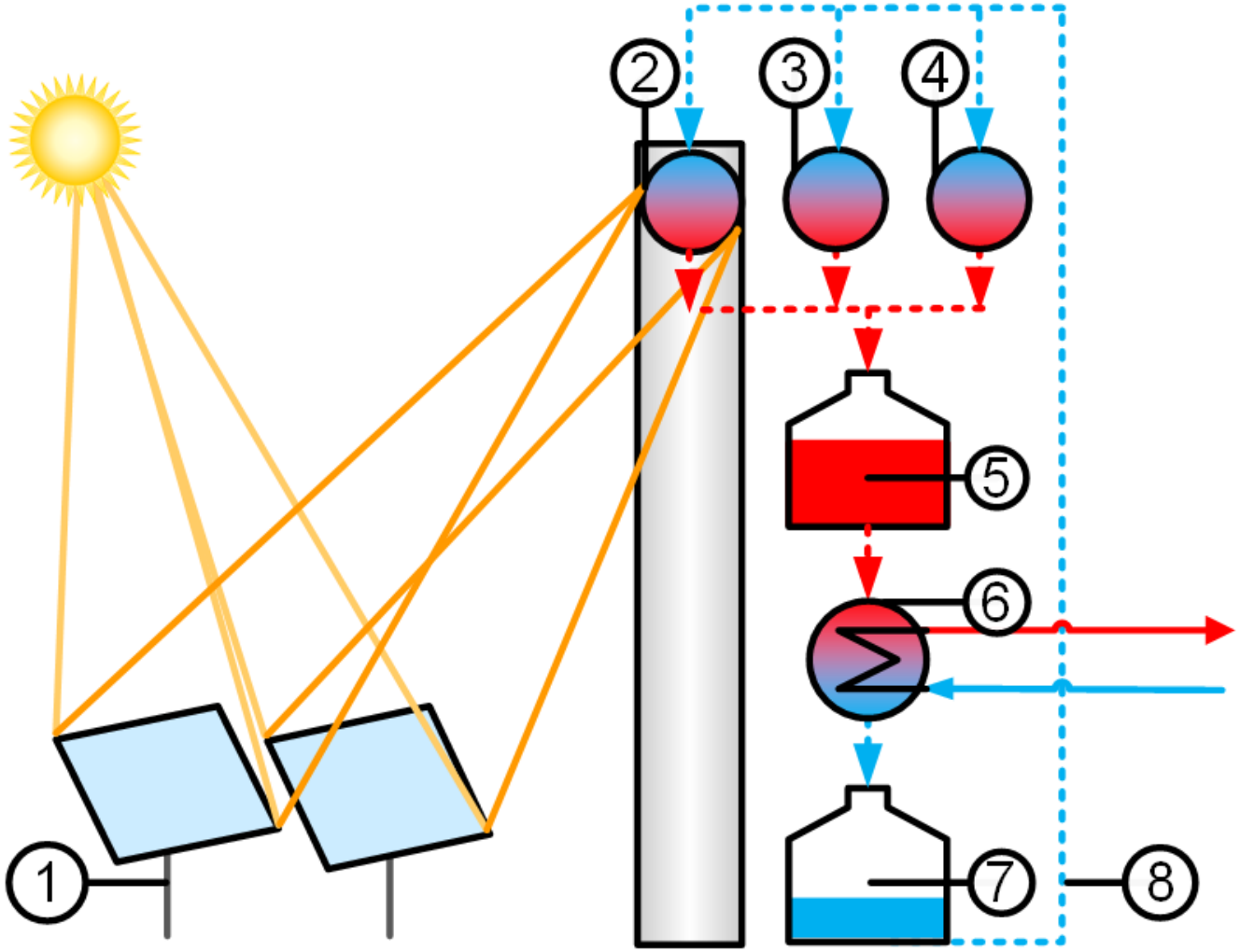








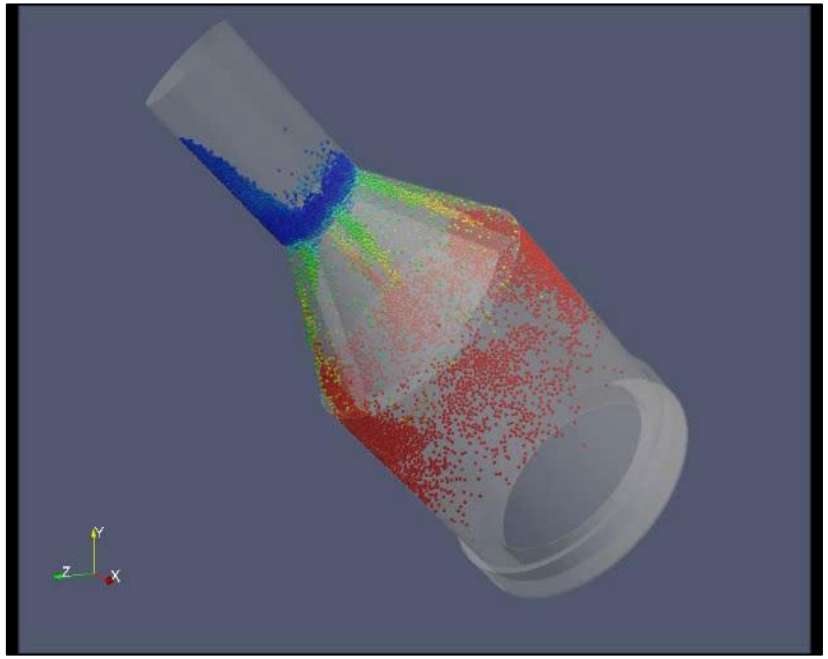
HIFLEX – Direct Absorption Particle Receiver



2 Direct Absorption Particle Receiver

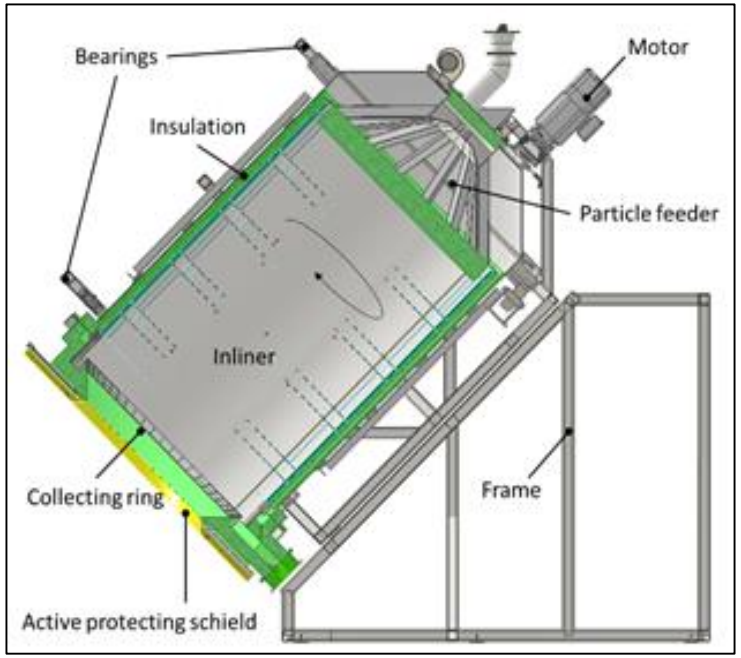
Direct Absorption Particle Receiver

- Patented direct absorption concept
- Thermal power: 2.5 MW_{th}, peak
- Particle outlet temperature: up to 1000°C
- High receiver efficiency even in part-load



Working principle of Centrifugal Particle Receiver

Prototype testing at Solar Tower Jülich, 2018



CAD drawing of current HiFlex receiver design, ©HelioHeat

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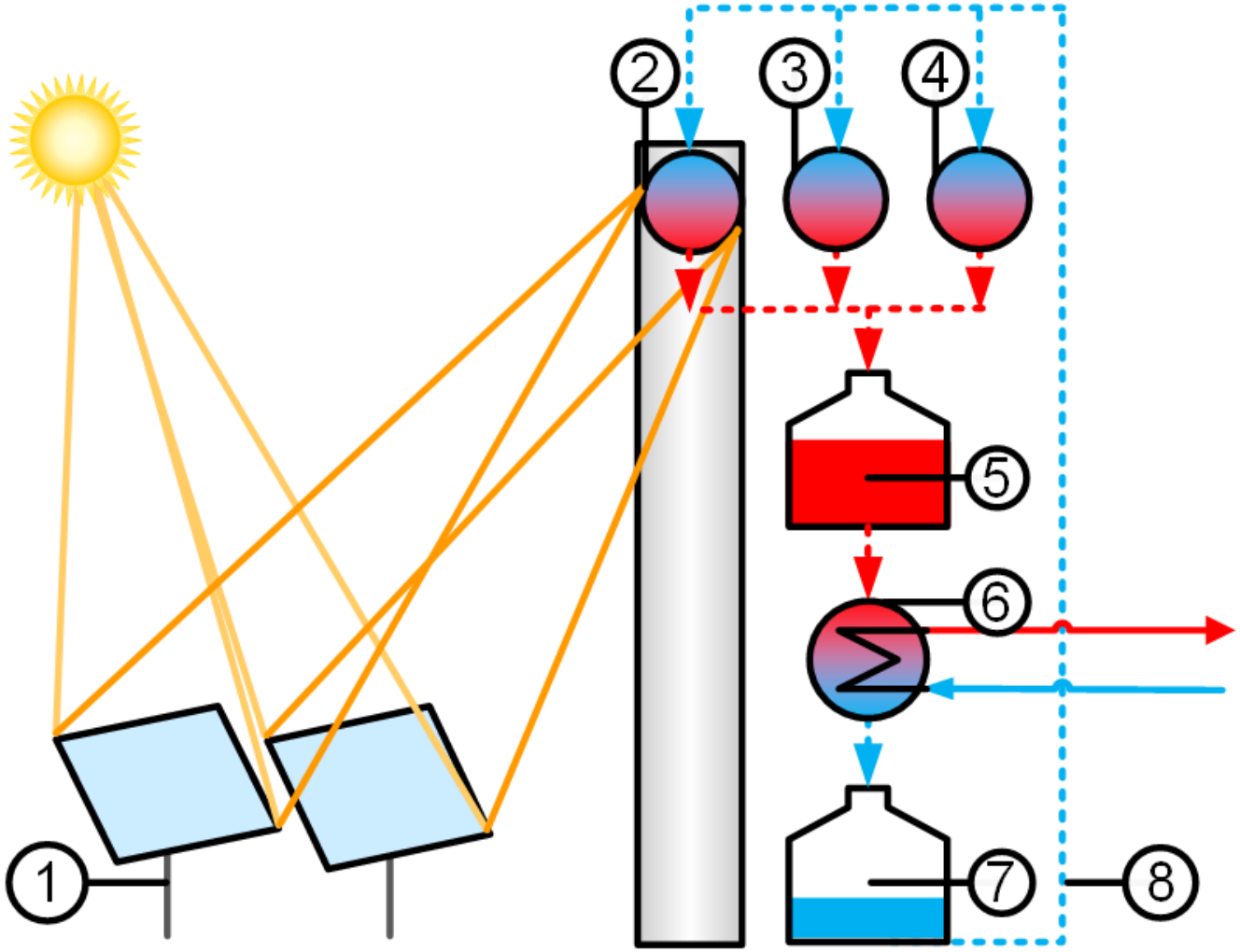
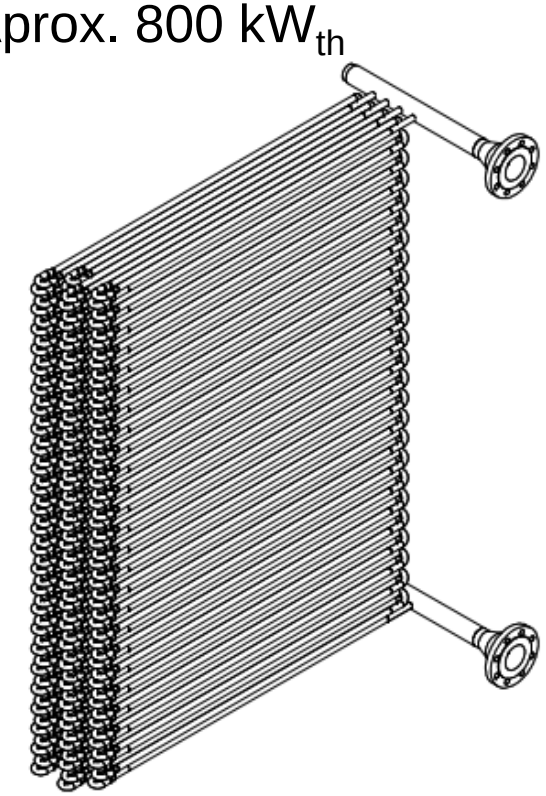
HIFLEX – steam generator

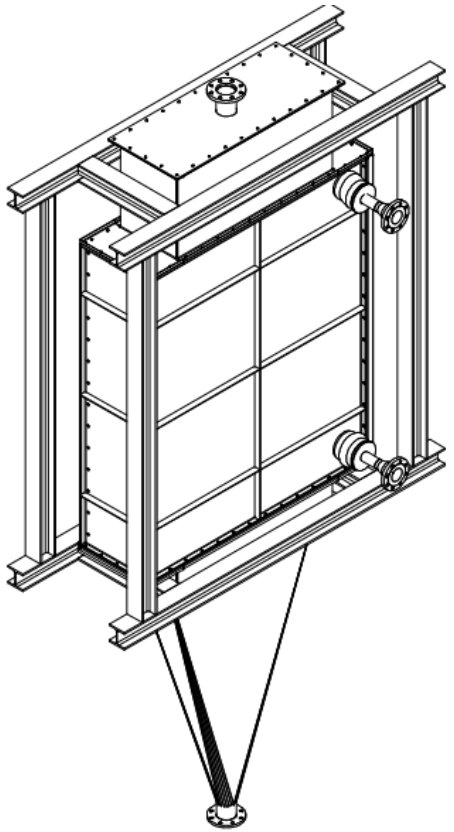


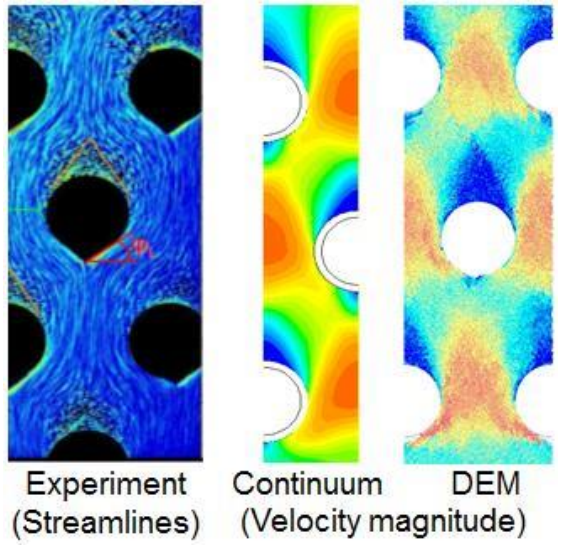
6 Steam generator

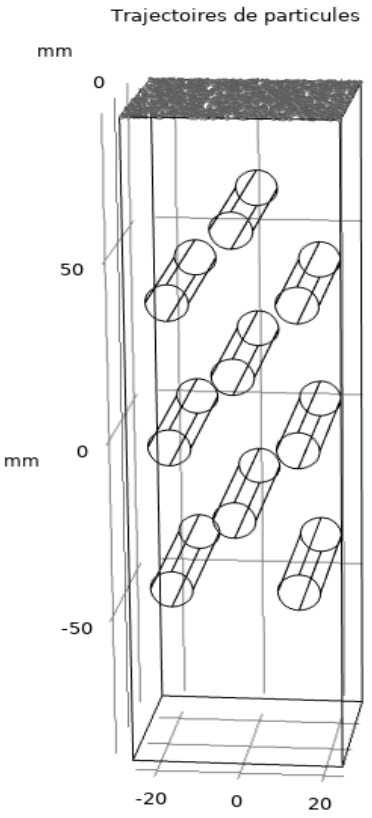
Steam generator

- "Shell with tubes bundle" HEX
- Steam outlet temperatures of up to 620°C
- Aprox. 800 kW_{th}

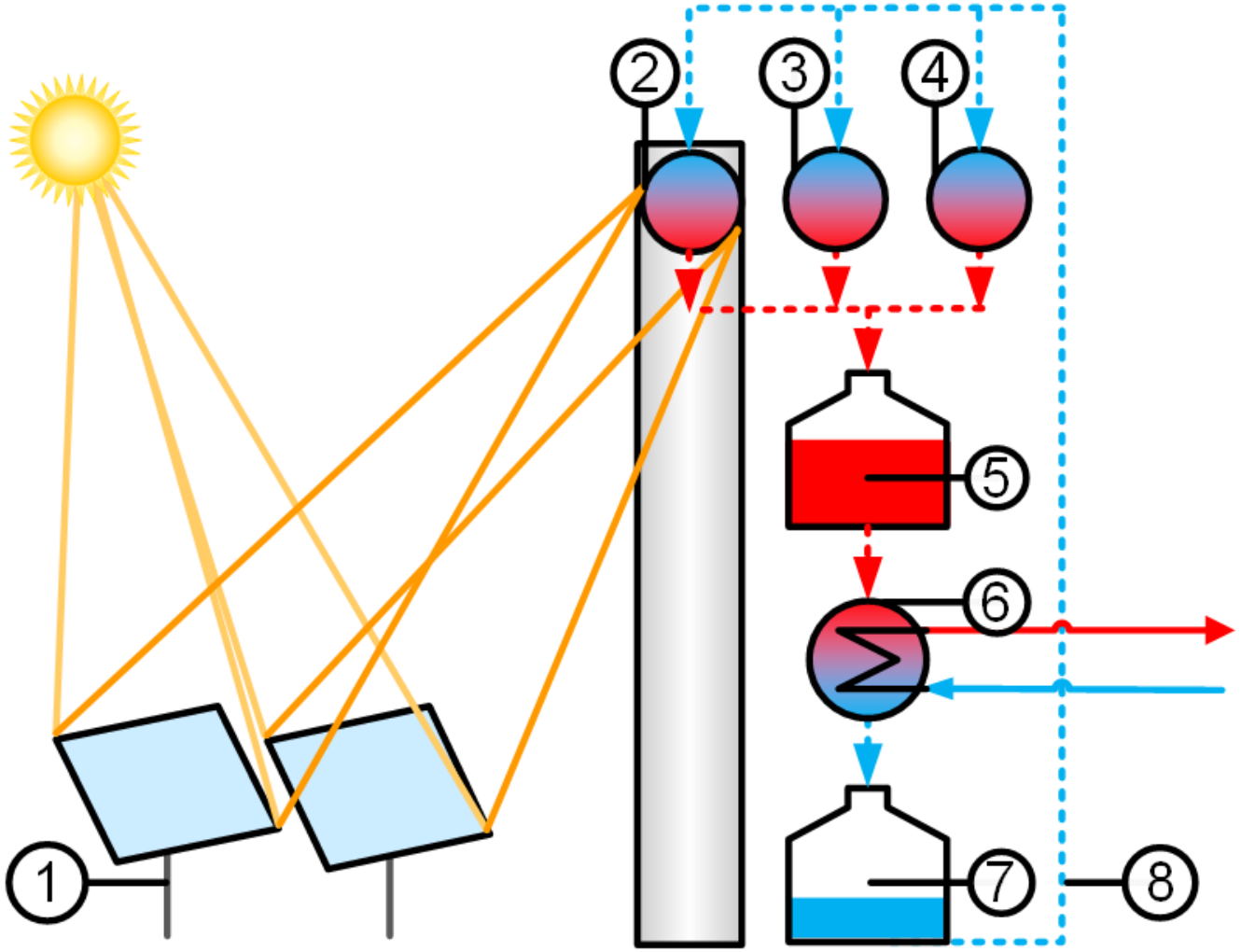








HIFLEX – transport system

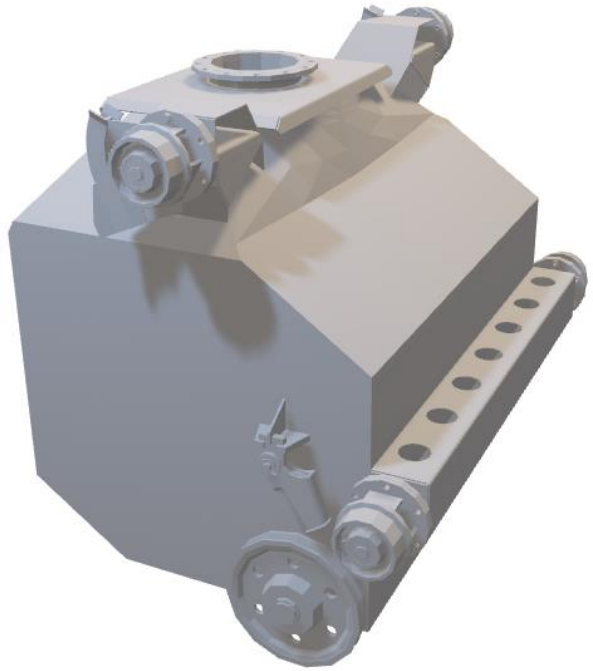


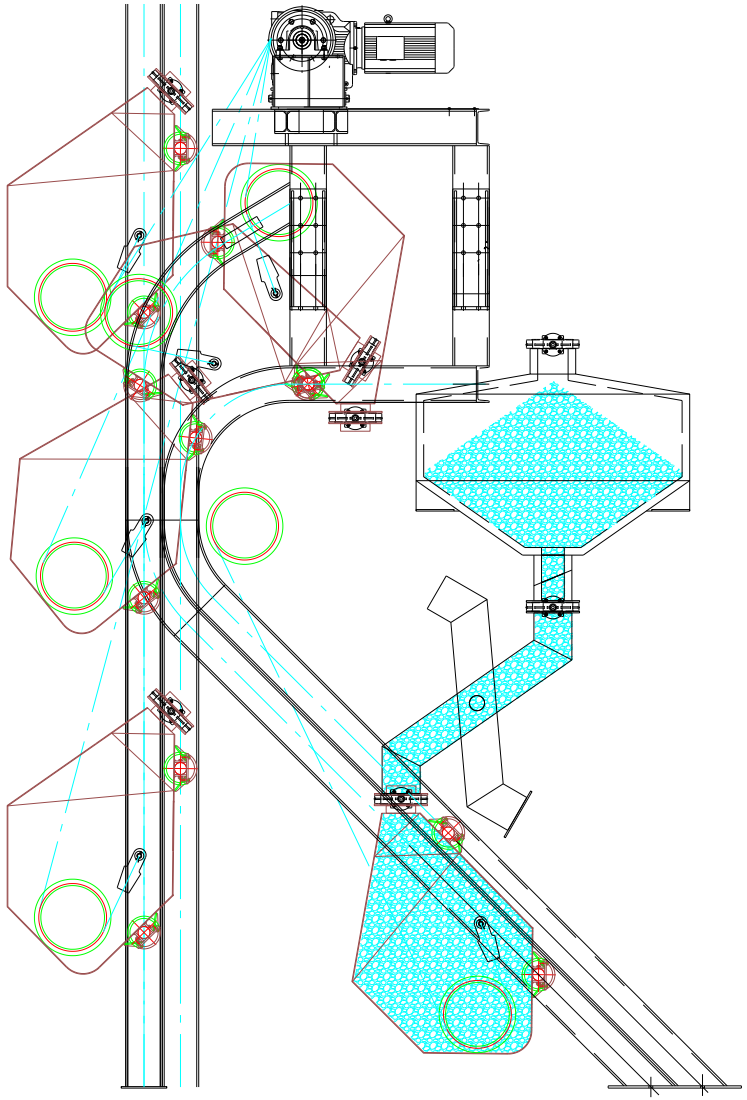
8 Particle Transport System

Transport system

On the right, of course ;-)

- Main characteristic for skip hoist
  - Capacity ~ 13 tons per hour
  - Lifting height ~ 35 m
  - Adjustable lifting speed ~ 1m per sec
  - Product temperature up to 350 °C
  - Capacity of transport container 1cbm
  - Full insulated container
  - Wear lining inside container
  - Automatic filling nuzzle system
  - Automatic unload system
  - Drive unit via rope which

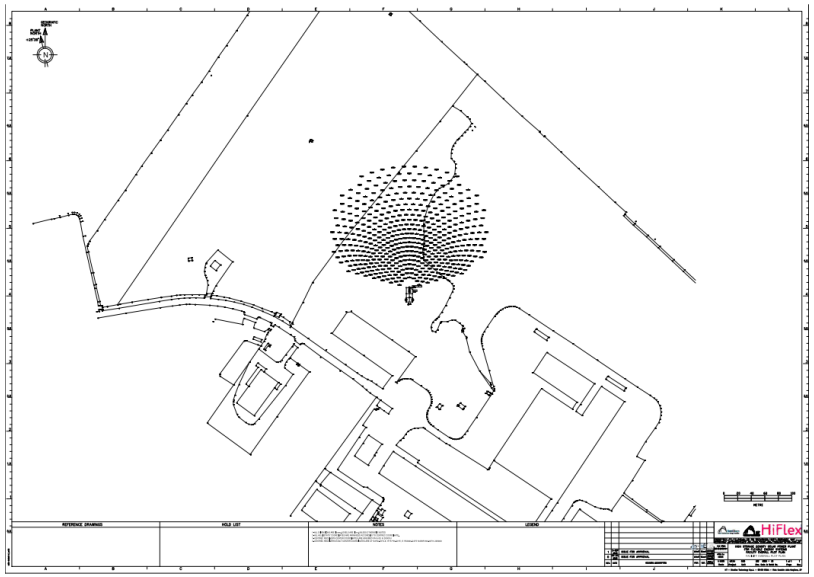


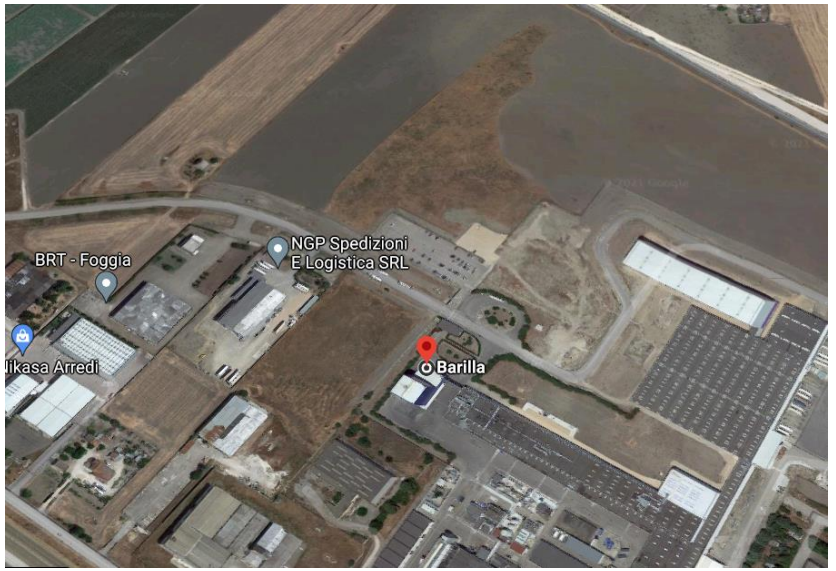


Summary and Outlook

- First central receiver system using solid particles for a process heat application
- Start construction in 2022
- Start solar operation in 2023

- Take wheat and some water, add energy from renewable sources and there you go!





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Thank you for your attention!

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