



INDUSTRIAL SOLAR
renewables onsite

Process Heat
Direct Steam Process Cold
Renewable Energy Solutions Onsite
Desalination Photovoltaic Air Conditioning
Polygeneration Power Generation
Process Air Combined Heat and Power
Water Treatment



Solar Process Steam

Exploring market entry opportunities in Chile

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Industrial Solar GmbH

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About us

Founded in 2008 in Freiburg/Germany, the German greentech hub.


World leader in Fresnel projects for industrial energy supplies. Complete and customized solutions.

Our mission

Reduce industrial energy costs and emissions by implementing reliable and efficient renewables onsite.



CONSULTANCY
CO₂ Reduction
Energy Optimization
ISO 50001



POWER GENERATION
Photovoltaic
PV Carports
Fluid Turbines



ENGINEERING
District / Process Heating
Cooling / Heating / Steam

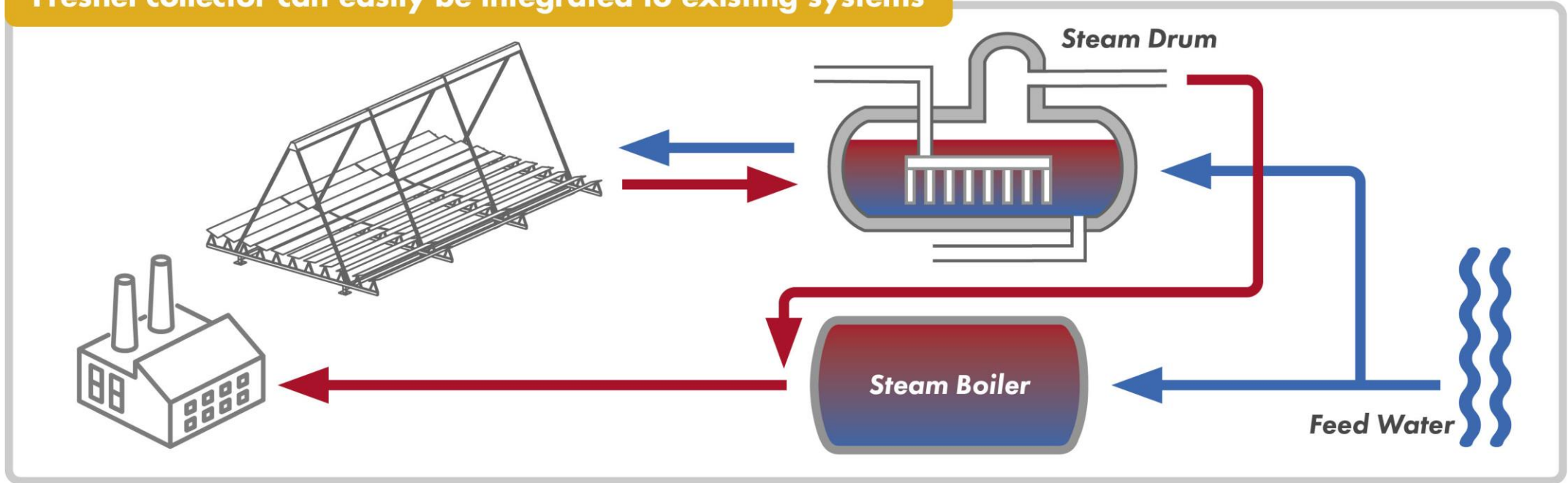


HEATING/COOLING
Solar Thermal / Heat Pumps /
Absorption Chillers / Storages



PROCESS WATER
Water Treatment
Resource Recovery

Fresnel collector can easily be integrated to existing systems

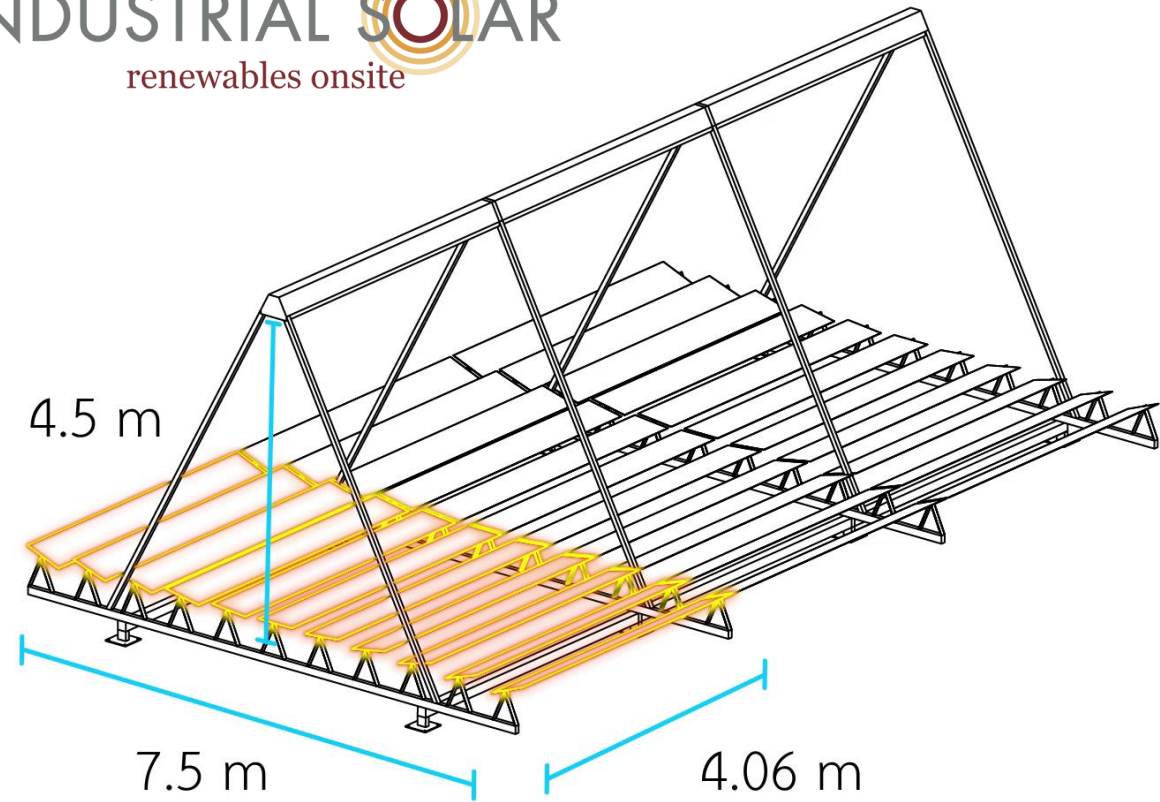


Solar Steam generation with Fresnel Collectors

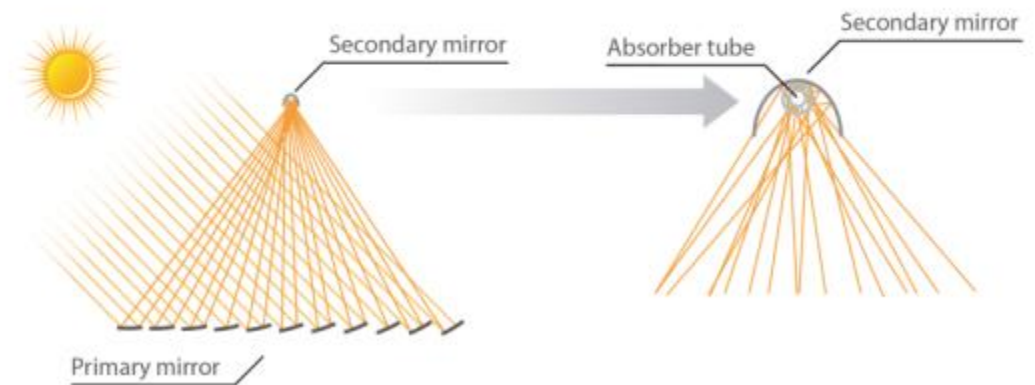
- Solar steam integrated on supply level is much simpler and the production line / process remains untouched.
- Solar steam can also be supplied in process levels

Technology of Fresnel Collectors

- Uniaxially tracked mirrors concentrate sunlight onto an absorber tube where heat is generated

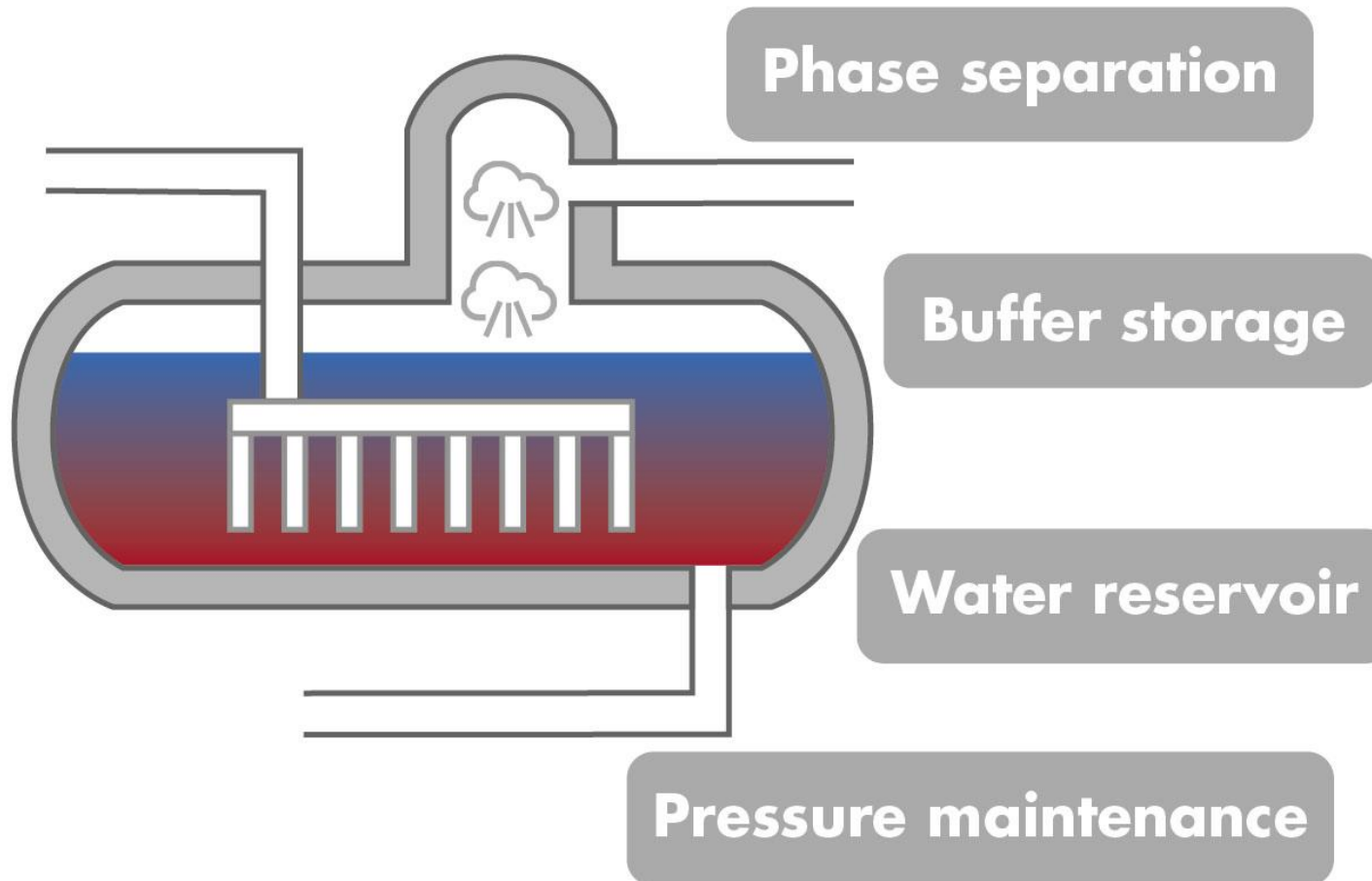


Generates heat up to 400 °C and 120 bar

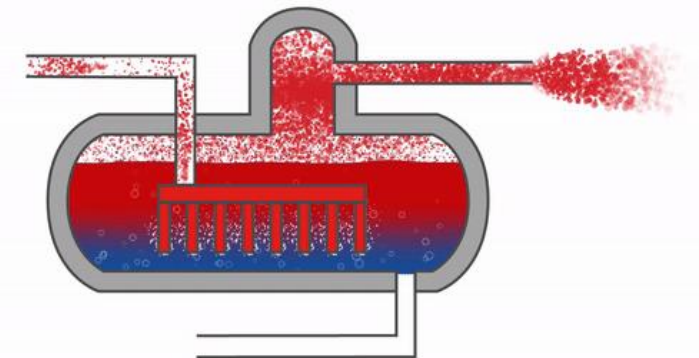


Steam Drum – steel pressure vessel provides various functions

Steam Drum Storage concept



- Large pressure vessel
- mainly filled with liquid water (80% of volume)
- partly filled with steam (20% of volume)



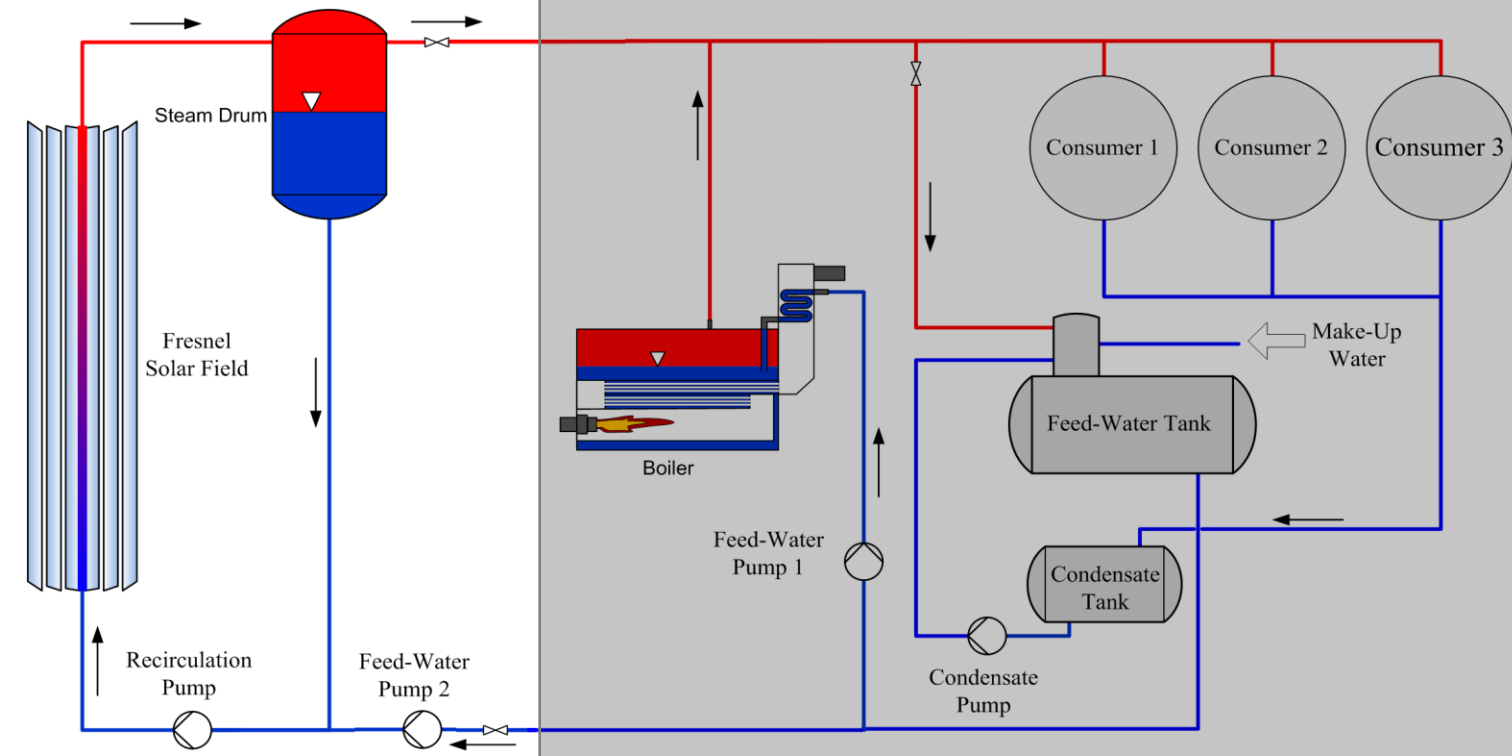


System integration

Solar Steam generation systems can easily be integrated in steam grids with fossil fired boilers.

Solar Steam Boiler

Existing Steam Network

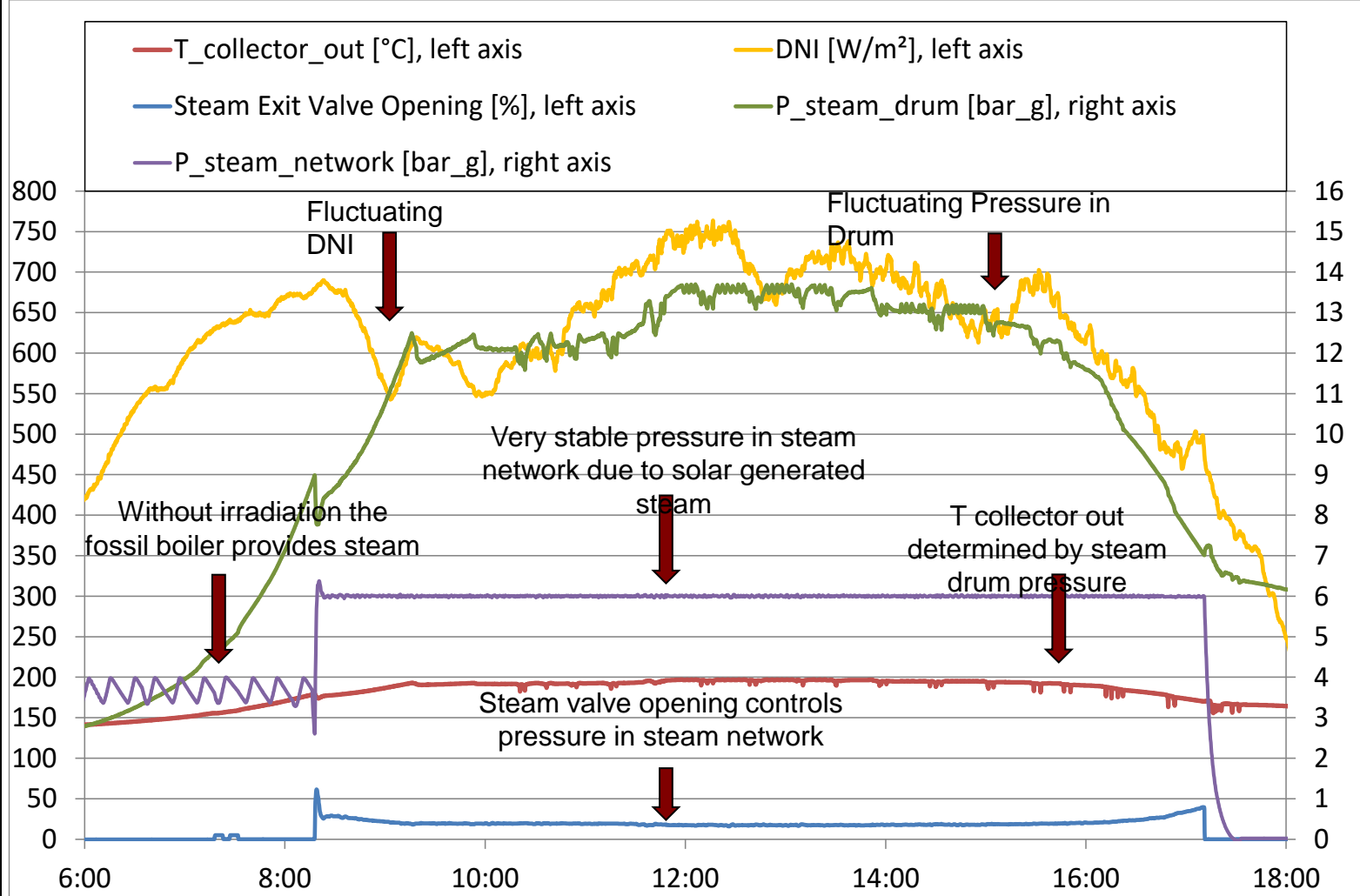


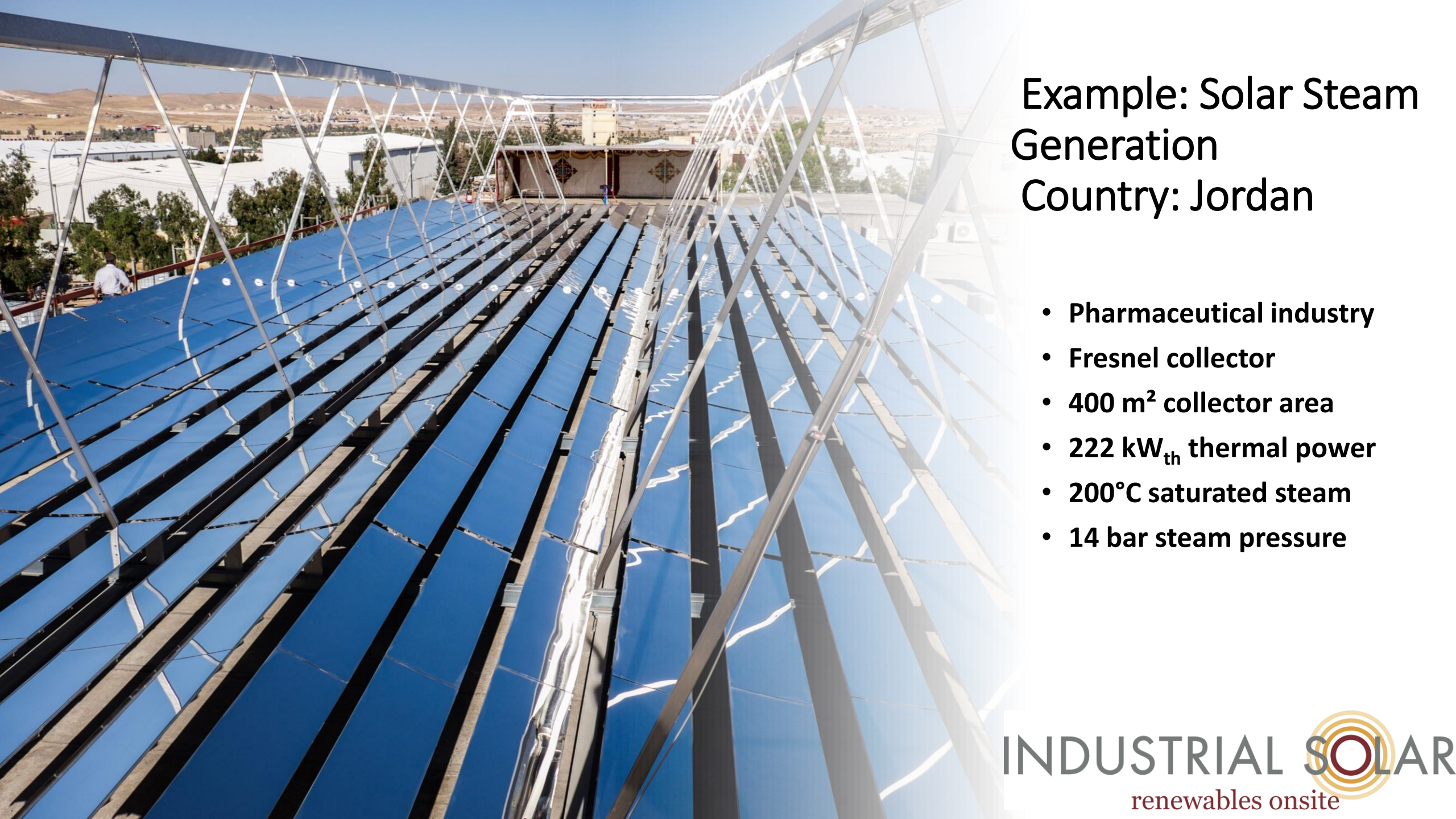
Modular system sizes:
 500 kW = ~ 1500 m²
 30 MWth = ~ 80.000 m²



Solar Steam Generation

Despite fluctuating solar irradiation, the solar steam generation system can maintain the target steam pressure





Example: Solar Steam Generation

Country: Jordan

- Pharmaceutical industry
- Fresnel collector
- 400 m² collector area
- 222 kW_{th} thermal power
- 200°C saturated steam
- 14 bar steam pressure

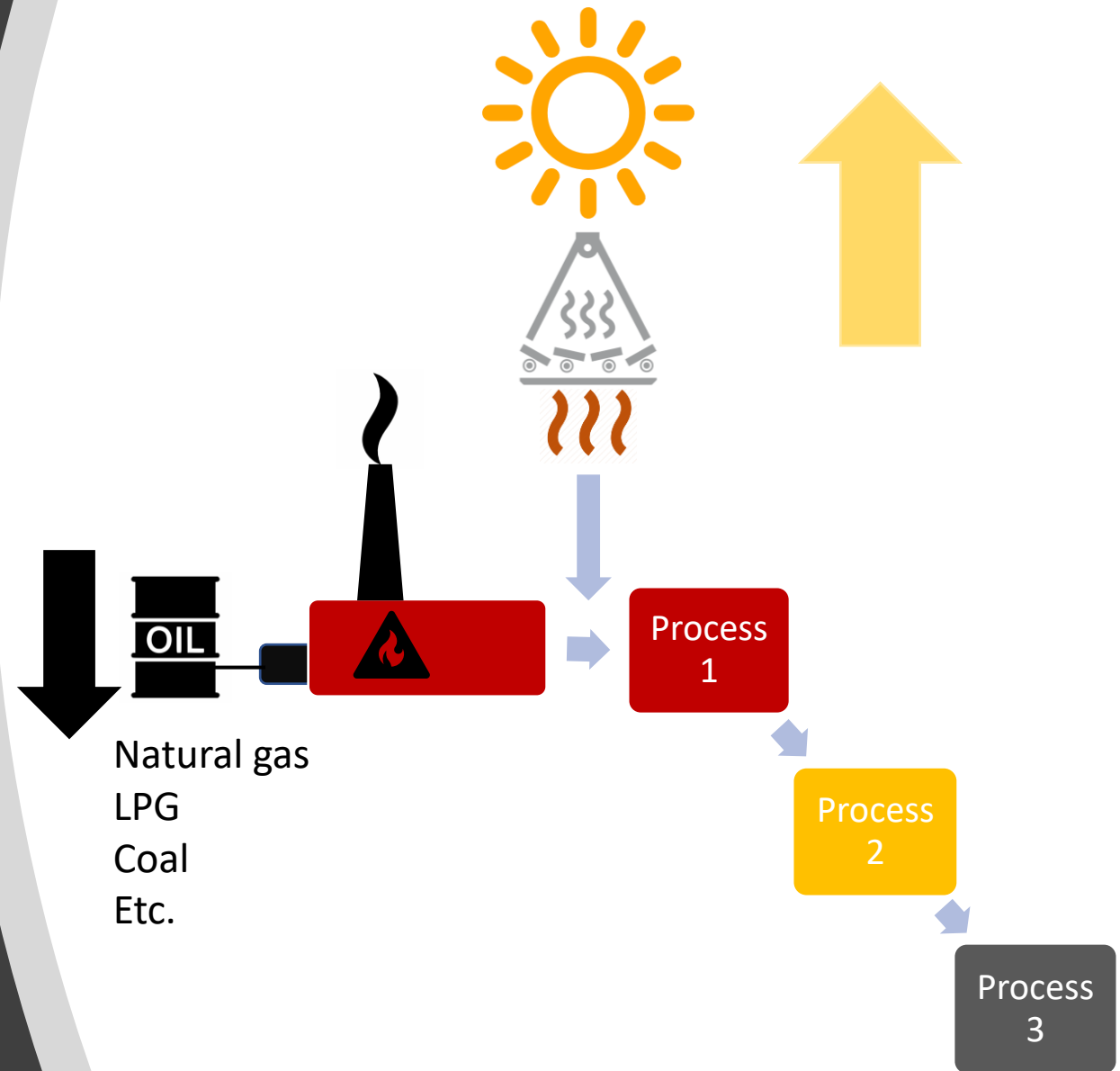


Example: Solar Steam Generation & Solar Cooling Country: Jordan

- Tobacco Industry
- Fresnel collector
- 1254 m² collector area
- 705 kW_{th} thermal power
- 225°C saturated steam
- Absorption chiller
- 580 kW_{th} cooling capacity

Chilean market opportunity

- ✓ Solar steam replaces a share of the fuel consumption
- ✓ Reduces Chile's dependency on fuel imports: natural gas, LPG, coal
- ✓ Chilean industry can reduce emissions and comply with sustainable development

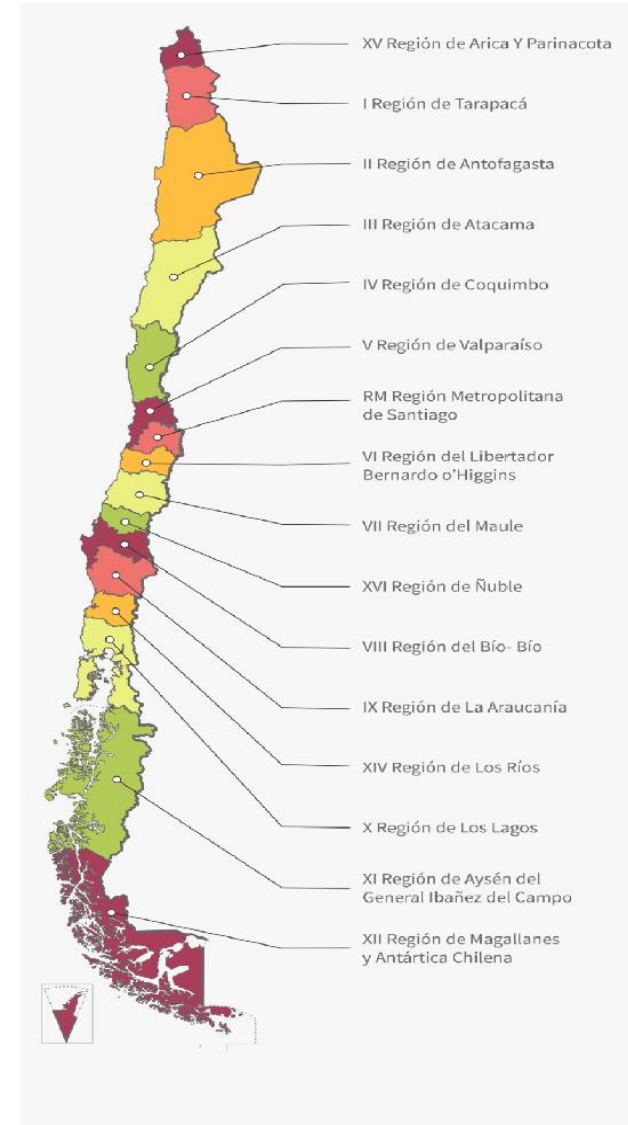


Chilean sectors with steam demand

Industrial sectors	Geographic location
Chemical	Center
Meat and derivatives	Center - south
Dairy products	Center - south
Fishing and sea products	North – Center - South
Sauces, preserves, dried and ready meals	Center - south
Beverages	Center
Metallic mining	North - Center
Non-metallic mining	North

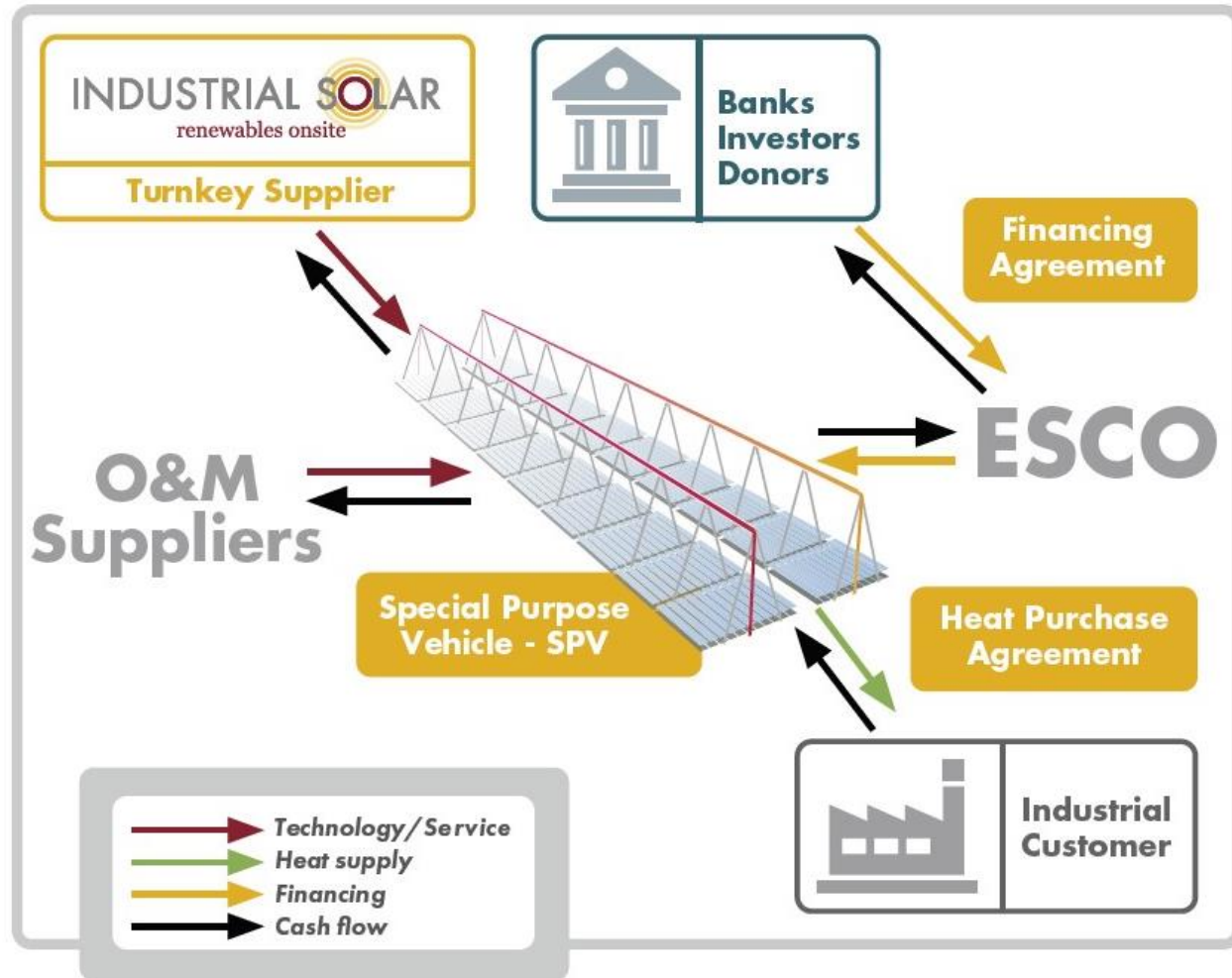
SOLAR RESOURCE MAP

DIRECT NORMAL IRRADIATION
CHILE



SolarSteam-CL – ESCO business model

- Business model attractive for customers with medium-term perspective (5 – 10 years)
- Local supply can represent a large share of the system
- Solar Steam Generator System already complying with main Chilean regulations
- Business study – analysis of location, load profile, solar resource





Thank you for your attention!



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