HELIAC

SOLAR GENERATED PROCESS HEAT

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Process heat

<200ºC

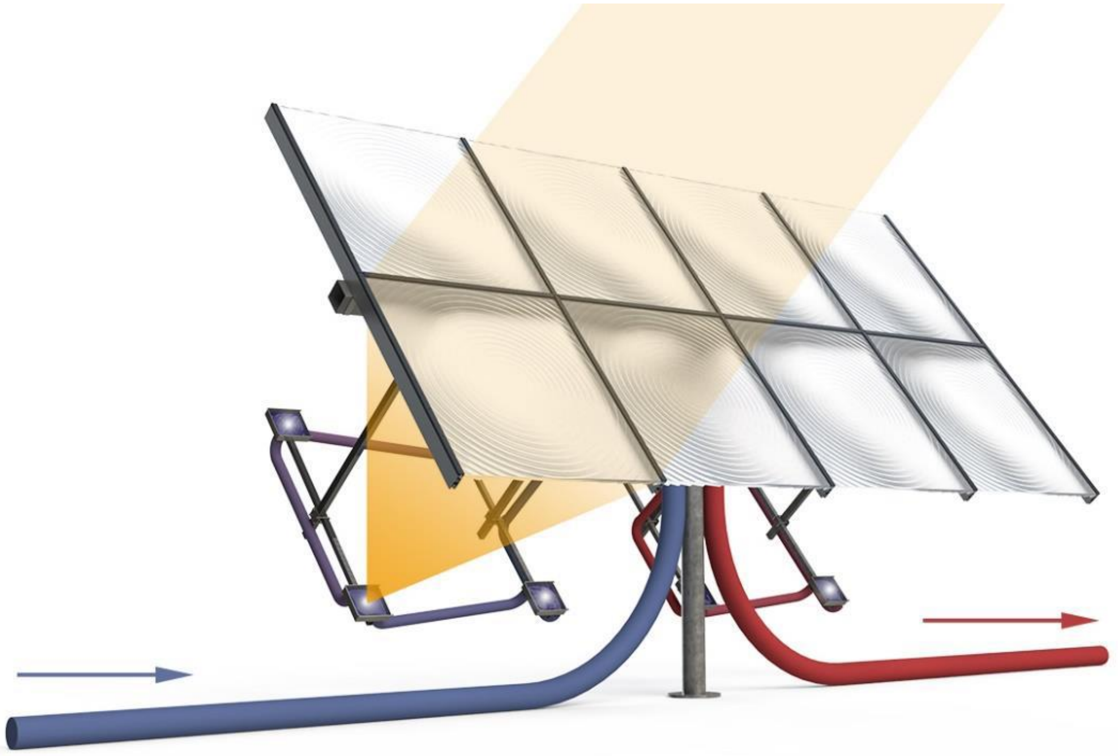
through heat purchase agreements

- no capex
- no opex
- no risk

Technology

HELIAC panels focus light through the Fresnel lenses that are engraved in the polymer film. The focused light is directed at a heat exchanger through which a liquid flow. This process heats up the liquid. The temperature of the liquid is controlled by controlling the flow-rate of the liquid. The slower it flows the higher the temperature increase. The heated liquid is then led to a central heat exchanger from where the users can harvest the heat.

Different liquids that can serve as heat transfer fluids are commercially available. For temperatures below 100C water is the best choice. For temperatures up to 400C a number of thermal oils exist that are used in CSP today. Oils that can handle even higher temperatures are also available, but as some of them freeze at temperatures below ~300C they cannot be used for solar thermal since solar thermal doesn't produce heat 24/7.



Technology

The Heliac panels have only **two unique components**.

- The light-focusing lens → produced on a standard packaging machine at DF.
- The receiver → custom-designed, but simple heat exchanger. Receivers are produced by Alfa Laval, a company that annually produces >100 million heat exchangers for all kinds of other purposes. This receiver is key to the present configuration of the panels.

Other than these two components, Heliac's solution consists entirely of standard industrial components abundantly available everywhere.

Sector	Process	Lower	Upper
Paper	Drying	90	240
	Boiling	110	180
	Bleaching	40	150
Food & Beverages	Drying	40	250
	Pasteurization	60	150
	Sterilization	100	140
	Boiling	70	120
	Distillation	40	100
Chemicals	Destillation	100	300
	Compression	110	170
	Boiling	80	110
Automotive	Resin molding	70	130
Metal	Drying	60	200
	Surface treatment	20	120
	Electroplating	30	90
Plastic	Injection molding	90	300
	Pellets drying	40	150
	Preheating	50	70
Textiles	Coloring	40	160
	Drying	60	130
	Washing/Bleaching	40	110
Wood	Glueing	120	180
	Drying	40	150
	Steaming	70	100
Several sectors	Hot water	20	110
	Preheating	20	100
	Washing/Cleaning	30	90
	Space heating	20	80

Temperature (°C): 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250

$\underbrace{60 \ldots 200}_{\text{OPTIMAL FOR HELIAC}}$

HELIAC

Industrial Process Heat

< 200°C

Global demand 5,100 TWh

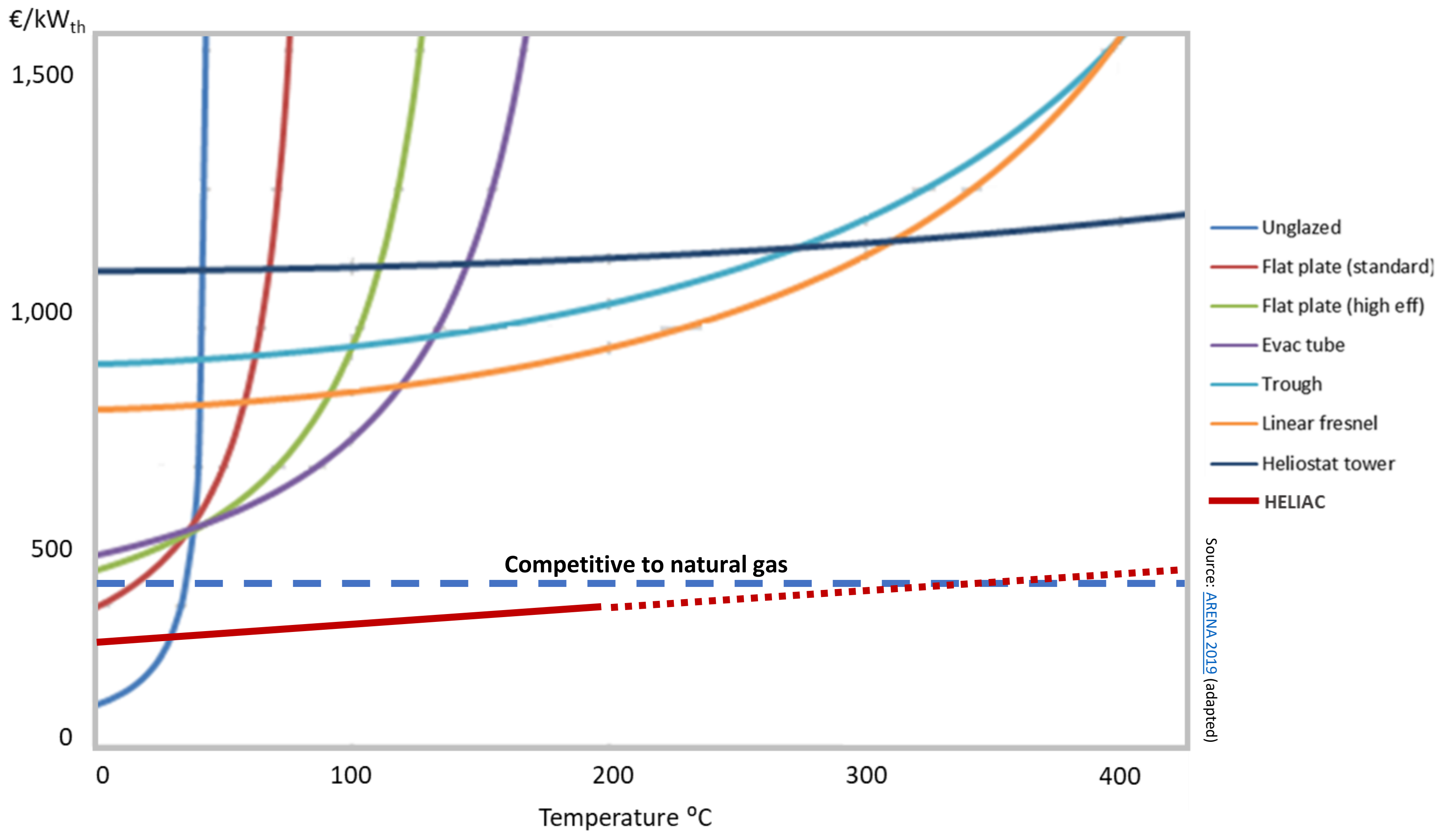
Poland*:

Demand (est.) 10 TWh

Solar field potential: 9,000 MW_{th}

Area needed: 4,300 ha

*Assuming: 20% coverage. DNI 1100.



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Comparing
solar technologies

- must be <€400/MW$_{th}$ to compete with gas

Assuming: DNI 1100, 25 years, 4% interest, 1% opex.

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Good for beer

160ºC

Global production:	2,000,000,000 hl
Consumption:	54 TWh
Energy costs (€/yr):	1,600,000,000
Potential (MW):	34,000
CO_2 savings (t/yr):	13,500,000

Assuming: Natural gas €35/MWh. Average DNI: 1600. 26.9kWh/hl.

DNI: 2034. NG €35/MWh. 25 years. 0%.

...and for paper

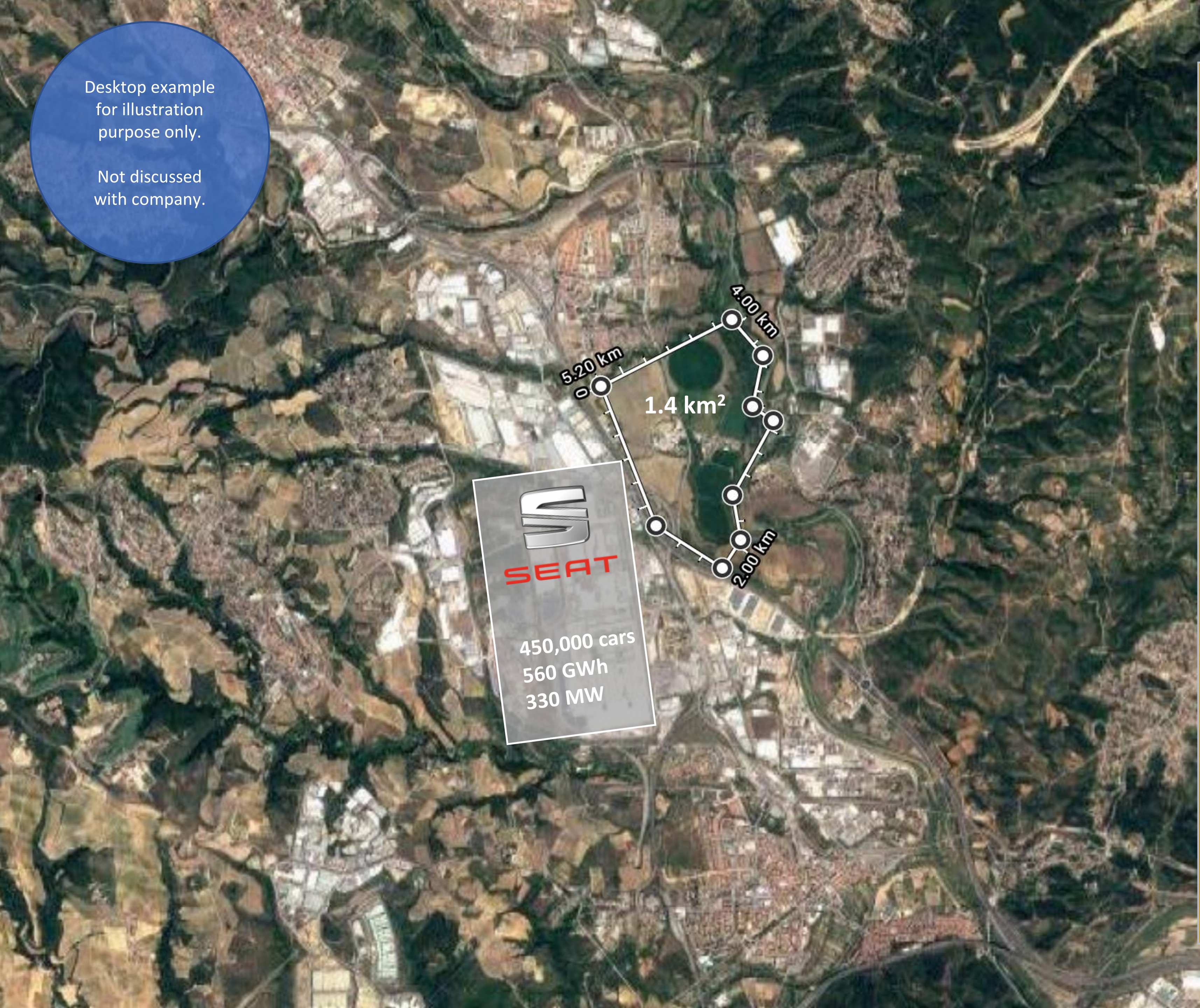
60-150°C

Global production:	400,000,000 tons
Consumption:	920 TWh
Energy costs (€):	32,200,000,000
Potential (MW):	610,000
CO_2 savings (t/yr):	230,000,000

Assumptions for global averages: [2.3MWh/ton](#) of paper. NG €35/MWh. DNI: 1600.

Desktop example for illustration purpose only.

Not discussed with company.



HELIAC

Drying paint on cars

180-220°C

Global production:	80,000,000 cars
Consumption:	100 TWh
Energy costs (€):	3,500,000,000
Potential (MW):	62,500
CO_2 savings (t/yr):	25,000,000

Assumptions for global averages: 1.25MWh/car. Natural gas €35/MWh. DNI:1600

COMPETITION

HELIAC

Performance

as CSP

but much

Lower capex

Lower opex

Faster installation

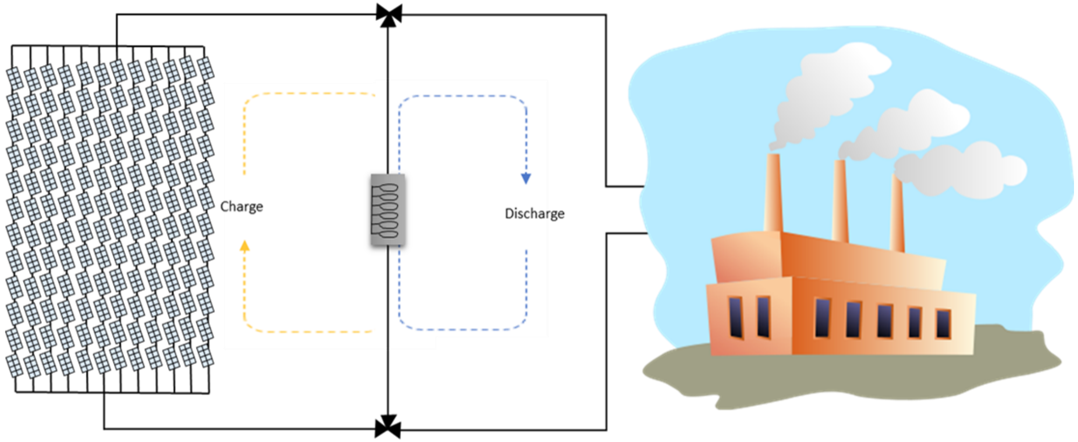
Competitors

Similar products & competitive advantage

Within solar thermal two other competing technologies exist:

Flat panels which are widely used as extra heat source in the Danish district heating system, but not much elsewhere. Flat panels produce heat cheaper than fossil fuels but are limited by only being able to deliver 60-70C. Their output is further limited by the panels being stationary, thus not being aligned optimally towards the sun during most of the day. Heliac's panels produce heat at costs ~20% below, and do so on a smaller area as output is 40% - partly due to the panels tracking the sun, and partly due to the panels' receivers having a much smaller surface thereby experiencing much losses from heat radiation.

Concentrated solar power, which delivers the same temperatures as Heliac's panels but does so at much higher costs. The higher costs come from a number of parameters including curved surfaces with large ross-sections to the wind requiring heavy foundation and heavy structures, and the fact that it's mirror-based solutions that require customized, relatively slow production processes.



HELIAC

Versatile

End-users extract the heat from a central heat exchanger.

Heliac solar fields are designed the same way no matter the application. Only parameters that change are

- Number of collectors depending on capacity needed and the local solar conditions
- Heat transfer fluid and the flow rate of the heat transfer fluid depending on the required temperature.

The produced heat is integrated into the customers' heat-driven systems via simple heat exchangers.

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