

Solar Thermal

Making Solar Cool!



SOLAR POLAR

The company



Solar Polar is a ground-breaking innovator in solar thermal technology, developing products that address worldwide energy problems. We are aiming to provide cost-effective and competitive solutions to customers, make a substantial contribution to reducing global carbon emissions and generate significant sales revenues and profits for shareholders.

Solar Polar is bringing to market two patented products:

- **Solar Cooling** – solar thermal cooling for electronics, refrigeration, vaccine fridge, crop storage, air conditioning.
- **Solar Concentrator** – high temperature solar thermal for industrial applications.

Both these products replace existing technologies with products that match existing product performance but do it without electricity or gas. In addition, all products have a very short payback period



Solar Cooling



S[^]LAR P_^LAR

Large scale solar cooling

This has been done but requires equipment to concentrate the sunshine to get the right temperatures. Very expensive until now...



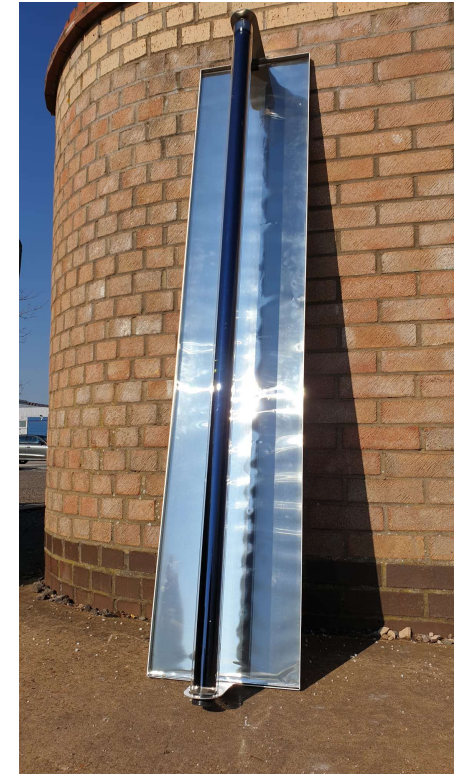
Traditional dish concentrators



Traditional trough concentrators



SP's unique printed Concentrator



Examples – Off-grid Solar Chillers

Cooling Capacity (±3%) 1000kW

Heat Input	725kW (Solar Thermal)
Input temperature	180C
Electrical Input	20kW
Sizes (Footprint)	
Absorption Chiller	6.2m x 2.9m + Plant building
Solar thermal	100m x 100m array
Solar PV 20kW)	30m x 30m array (80kW to give constant
Approximate prices ex-works UK	
Chiller	£230,000
Solar thermal	£1,200,000
Solar PV	£90,000
Groundworks and plant building	£200,000 (approx.)
Total	£1,720,000
Payback (VS diesel power)	<1 year

Cooling Capacity (±3%) 350kW

Heat Input	250kW
Input temperature	180C
Electrical Input	5kW (24.2kVA)
Sizes (Footprint)	
Absorption Chiller	18 m ² (6.2m x 2.9m)
Solar thermal	2200 m ² (47m x 47m)
Solar PV	125 m ² (20kWp to give constant 5kW)
Approximate prices ex-works UK	
Chiller	£ 110,000
Solar thermal	£600,000
Solar PV	£25,000
Annual Saving (@22p/kWh)	£220,000

Next Steps



Demonstration Chiller Project – Reducing running costs by providing part of the cooling for an ILA or Edge DC

Placed in sun-belt location

Sized to provide 10-30% of cooling needs for existing facility

Will give confidence whilst not removing current cooling provision

Provides real-world performance proof for justification of scaling to provide larger proportion or all of cooling needs

Demonstrate capability to make cooling more robust

Show significant reduction in carbon footprint of facility



Solar Concentrator



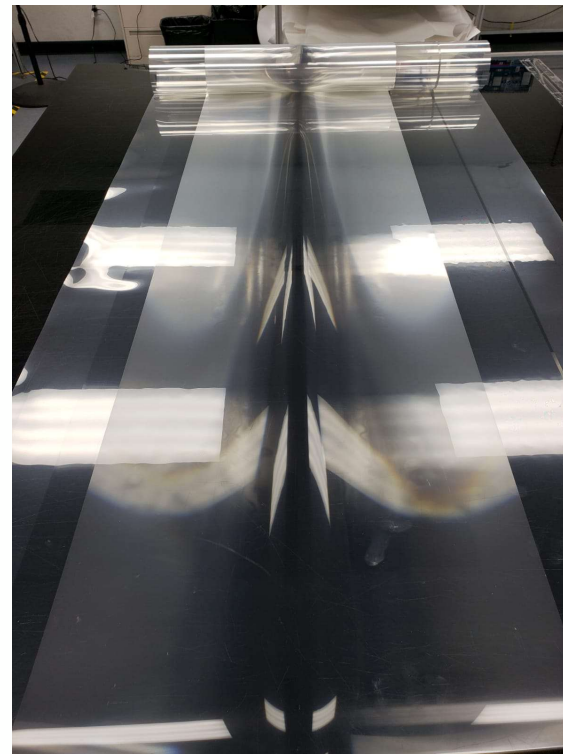
S[^]LAR P_^LAR

Solar Concentrator

Solar Polar (SP) innovative solar thermal cooling and heating technologies use concentrated solar heat. For these applications, SP has developed its own solar concentrator.

The concentrator was designed using SP's design philosophy of producing the cheapest Watt of heat.

SP has developed and patented a unique manufacturing process to produce its solar concentrator. This results in an order of magnitude drop in the cost of producing high-temperature solar heat.



Solar Concentrator

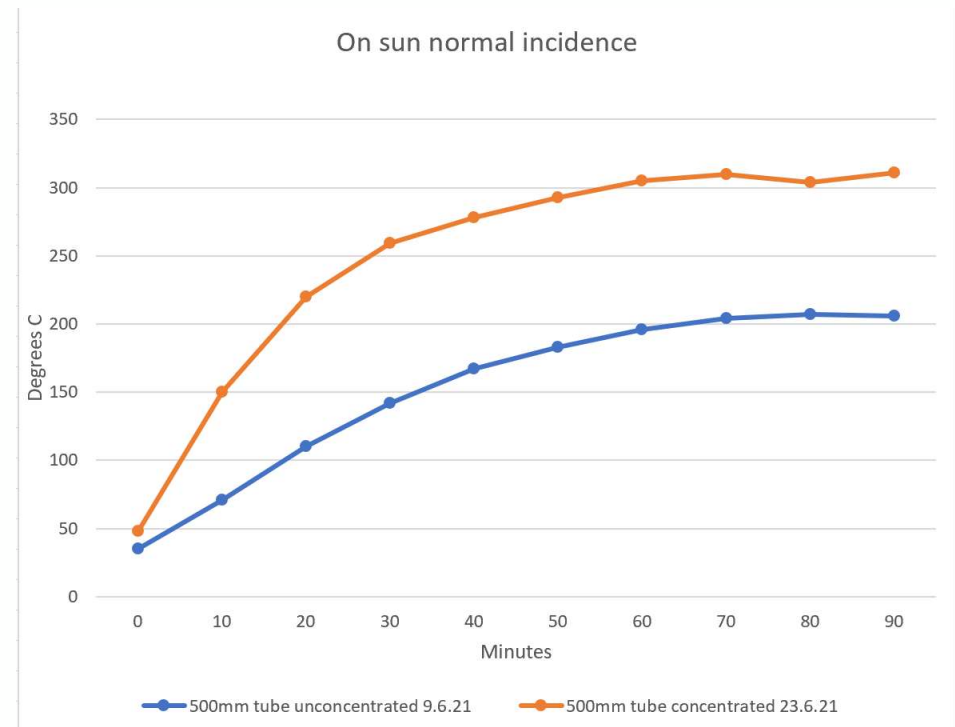
We conducted a comparative test using a standard \$5 evacuated solar thermal tube from China, testing with and without the concentrator.

Without the concentrator and a solar input of $968\text{W}/\text{m}^2$, the tube reaches a stagnation temperature of 200C after 70 mins.

With the Solar Polar concentrator again with the same input ($968\text{W}/\text{m}^2$), the tube reaches 310C after 70 mins. But, more importantly, it reached 200C in less than 20 mins.

In addition, the concentrator has improved low light performance, producing hot water at $50\text{-}60\text{C}$ at $100\text{W}/\text{m}^2$

This comparative testing was done outdoors "On Sun" in Peterborough. The dates were chosen because they had the same levels of sunshine($968\text{W}/\text{m}^2$).

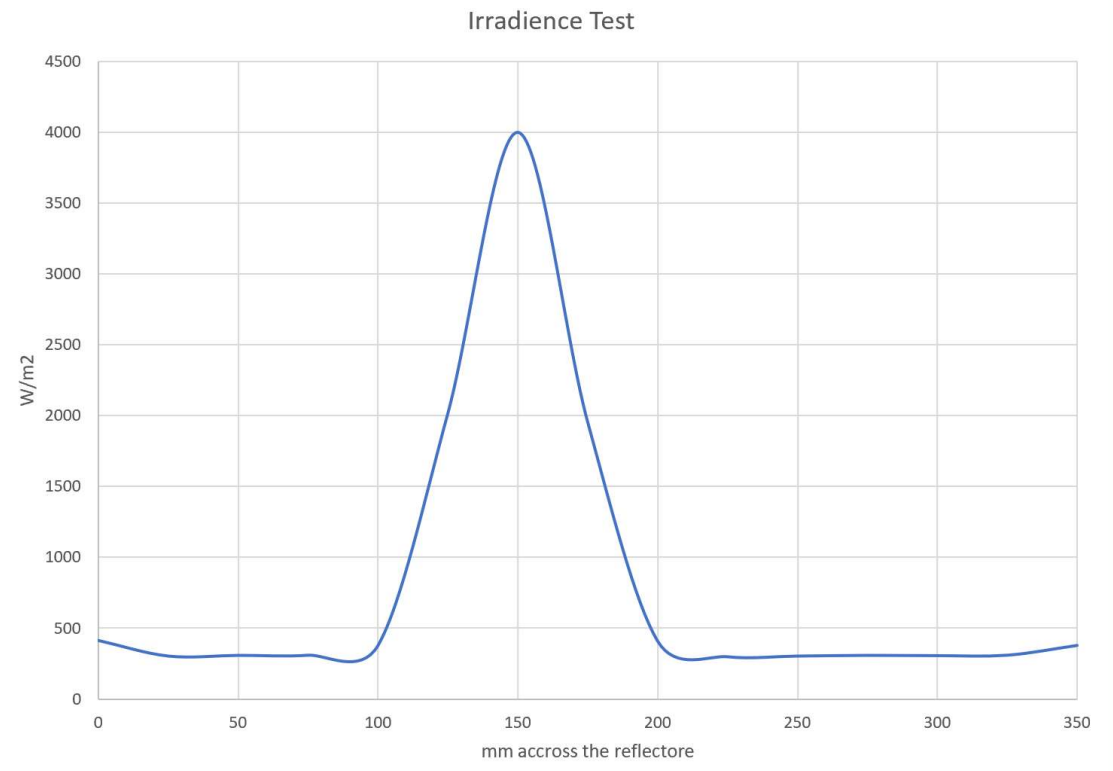




Testing of the concentrator shows that the concentrator delivers 4kW/m²

Irradiance test
 12:40-12:55 BST (solar noon 13.03BST) 17.8.20
 Test to determine the performance of a concentrating fresnel mirror
 Width 360mm
 Length 608mm
 Axis on long dimension
 Tested by Michael Reid

Distance across mirror/mm	Insolation / W/m ²
0	415
25	305
50	310
75	311
100	380
125	2020 >1999
150	4000 >1999
175	1954
200	410
225	300
250	305
275	310
300	308
325	311
350	380



Solar Concentrator



USP

High temperature solar thermal heat (180-220°C).

Lowest cost Watt of high-temperature solar heat.

Unique patented printed concentrator technology.

Improved performance of solar thermal systems at low light conditions. Bathing temperature water even at very low light levels.

Four times solar amplifier. Testing of the concentrator shows that the concentrator outputs 4 kW/m² from a 1 kW/m² input.

Long-life in service with little maintenance.

Applications

Our manufacturing process has enabled us to cut the price of high-temperature solar by ten.

SP has developed and patented a unique printing process to produce its solar concentrator. It has resulted in an order of magnitude drop in the cost of producing high-temperature solar heat.

The current off-the-shelf solar concentrators used to run the solar coolers costs £735. Solar Polar's printed concentrators enable Solar Polar to run its coolers with a collector that costs less than £150.

SOLAR POLAR

