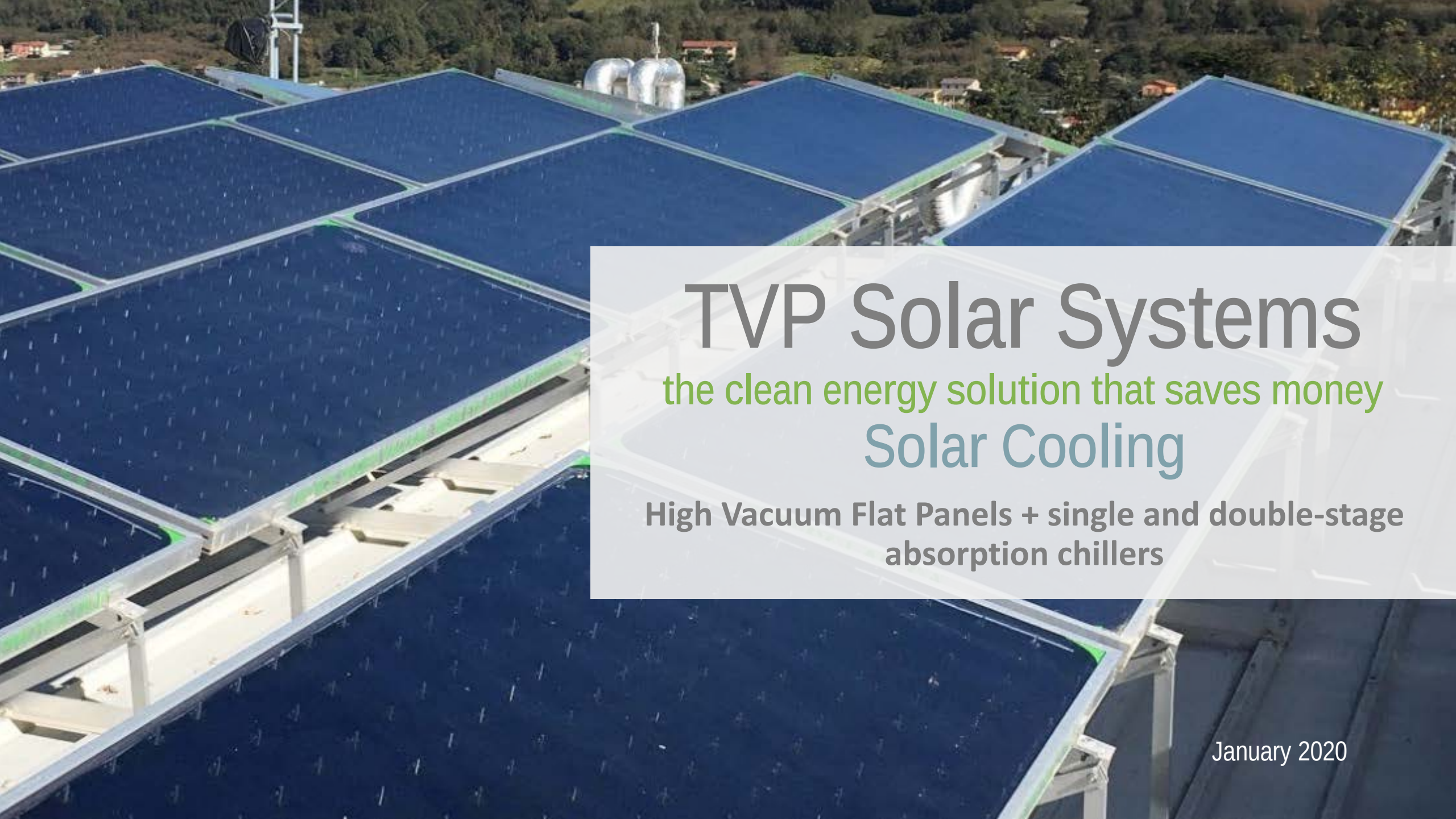


TVP Solar Systems

the clean energy solution that saves money

Solar Cooling

High Vacuum Flat Panels + single and double-stage absorption chillers

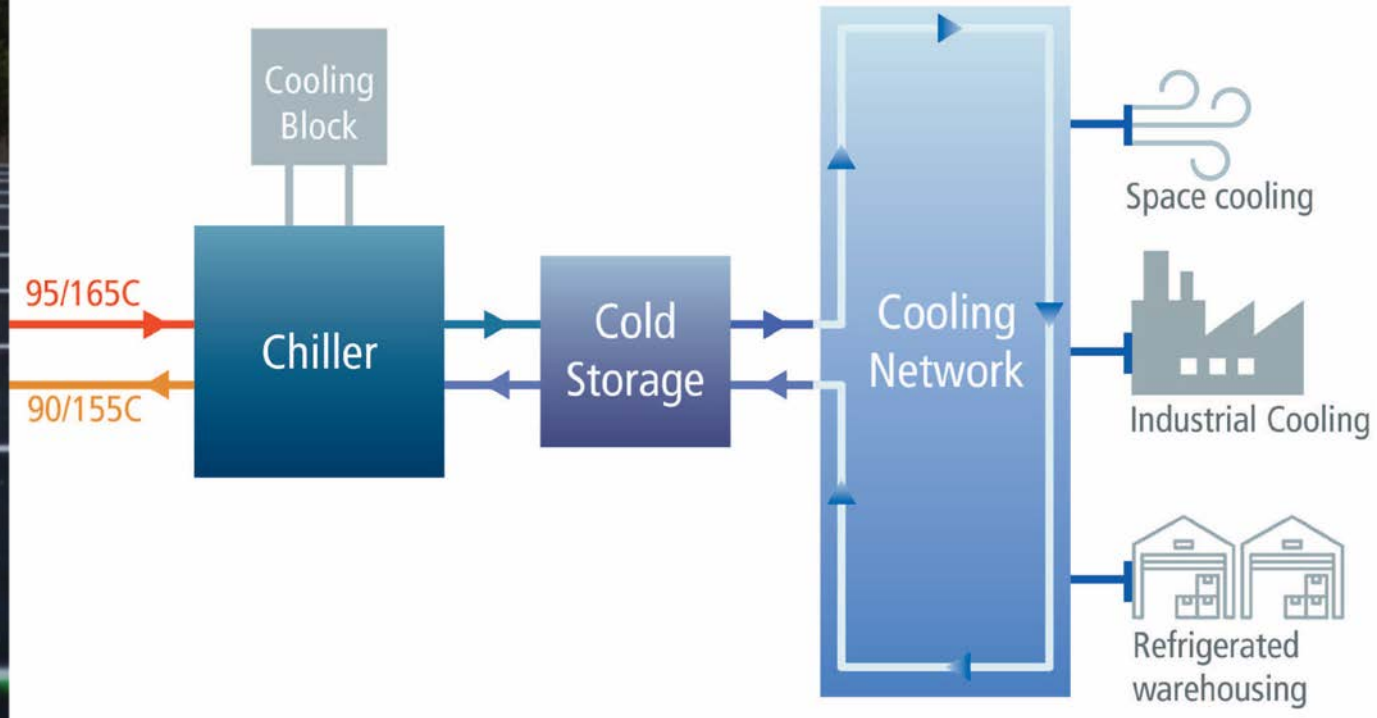
January 2020

Solar Cooling Systems

the clean energy solution that saves money

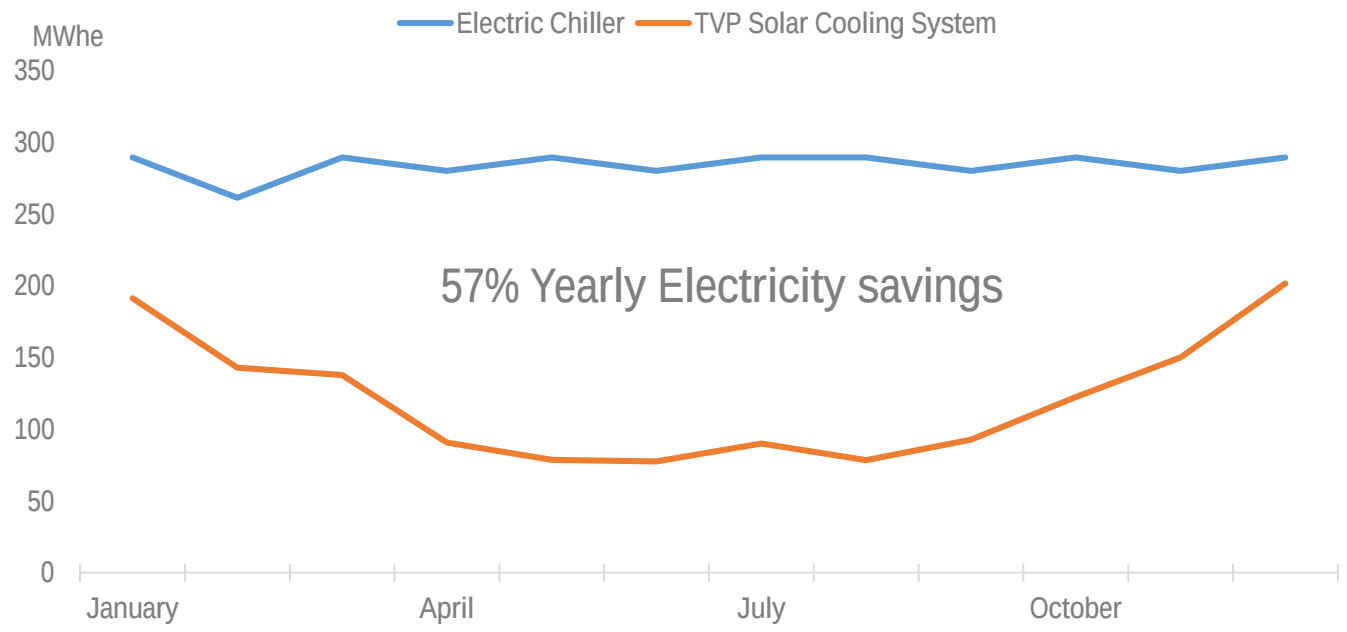
TVP SOLAR
thermal energy. better

TVP Solar Cooling System - Designed for Datacenters; Warehouses; Commercial; Industries; Hospitals



Solar Cooling Systems
measurable results - savings

TVP SOLAR
thermal energy. better



System description

Location	Gulf Countries	
Solar field operating T	165	ºC
Solar field size	5350	m^2
Solar Cooling Power	1000	TR
Electricity saved	1952	MWh_e/y
CO_2 saved	1171	ton/year

Solar Cooling Systems

MT-Power Collectors – Best Solar Thermal

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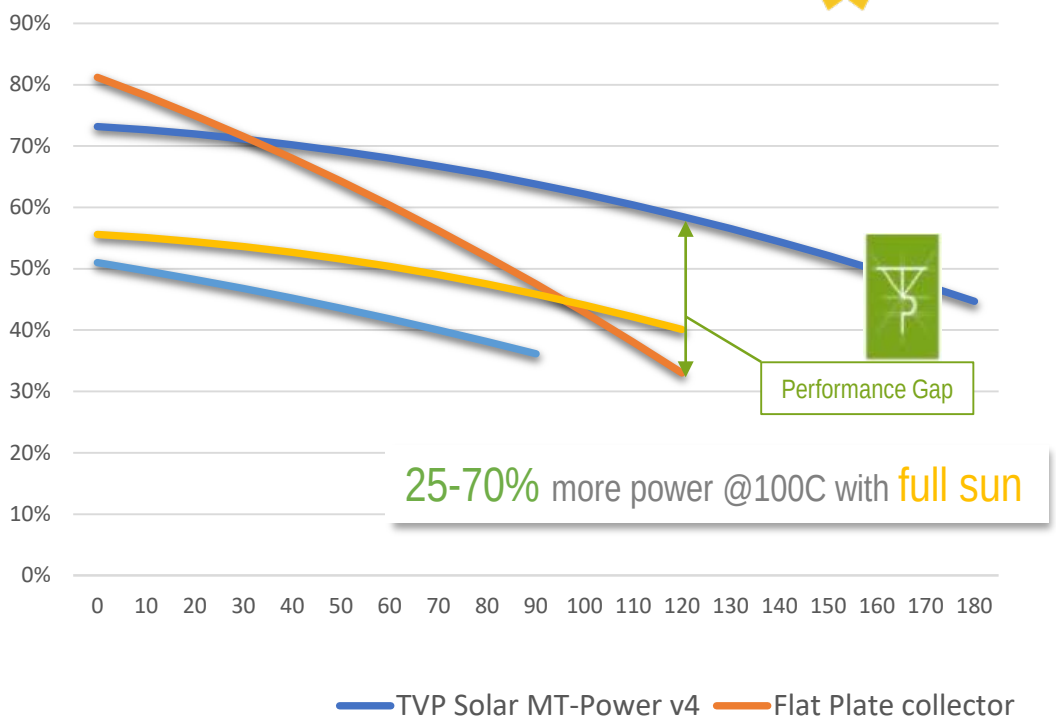
Best efficiency and energy output in any climate conditions, with any irradiance, at any operating temperature up to 200C Comparison with the most popular flat and evacuated collectors (SolarKeymark certified data)

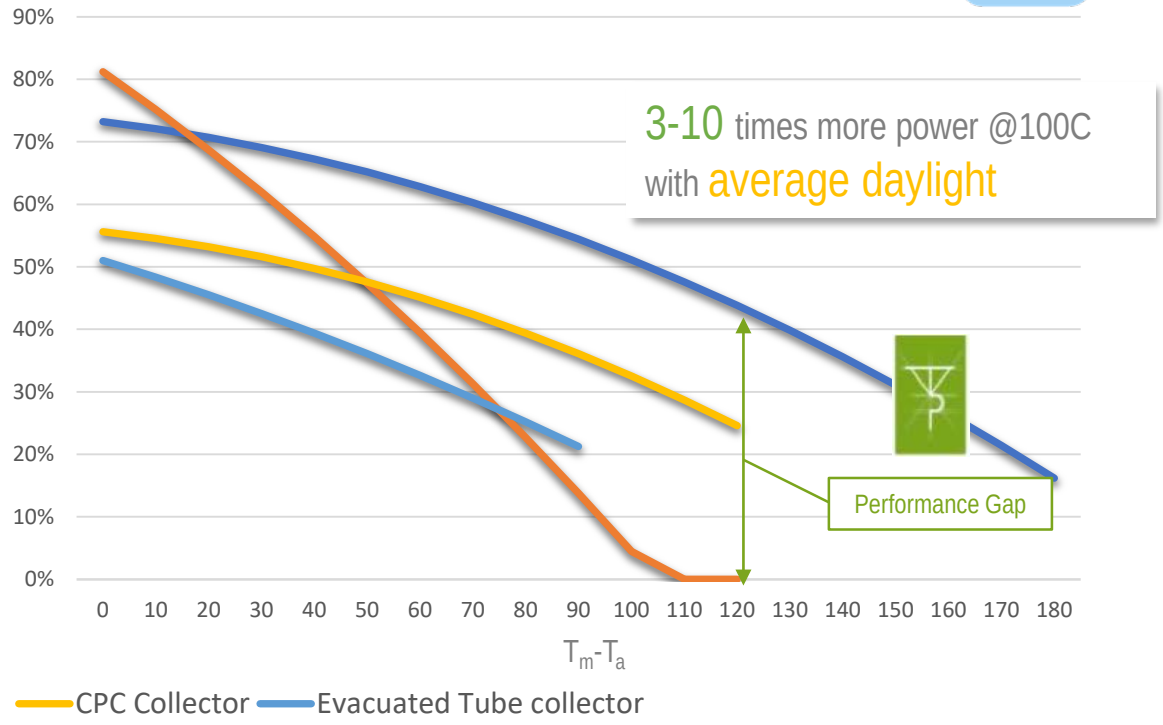
Solar Collectors Efficiency @ 1000 W/m2 (full sun)

full sun ~1 h/d



Solar Collectors Efficiency @ 500 W/m2 (average daylight)

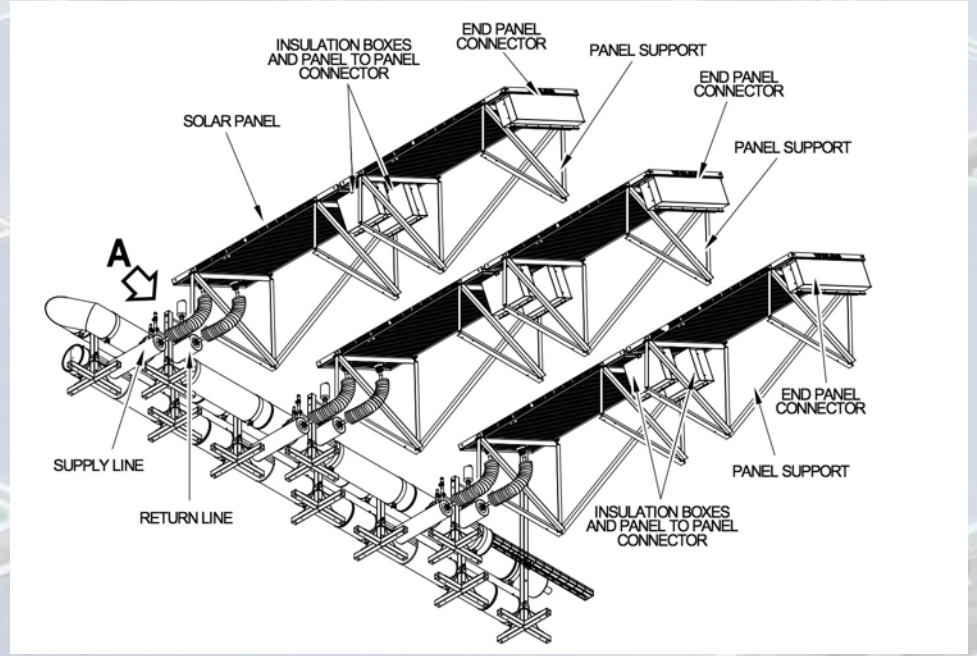
Average daylight



Solar Cooling Systems
will produce cooling. no matter what

TVP SOLAR
thermal energy. better

- Simple installation on any surface
- Plug and play
- Risk-free integration with any process
- No performance degradation over time



- Near zero maintenance
- No cleaning
- No moving parts
- Minimal circuit losses

Solar Cooling Systems
value proposition

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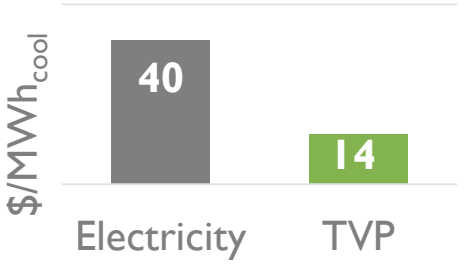
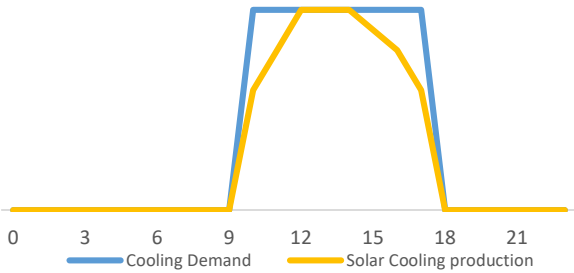
Reduced operating costs → Lower cost of MWh_{cool} compared to fossil fuels or electricity



Sustainability → Cut CO_2
Meet Corporate Sustainability Goals

Off Grid Peak Relief → Reduces power demand from the grid at peak times (and prices)



Solar Cooling Systems
track record

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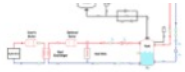
Agility building – Sulabiya - Kuwait

Installed Cooling Power	34	TR
Chiller COP (Thermax)	1.1	
Energy production	240	MWh_{cool}/y
Operating T	165	ºC
Installed since	Feb 2017	
Collector surface	234	m^2
Electricity saved/year	120	Mwh_e
Cost of cooling energy	76	$/$MWh_{cool}$

GHI (kWh/m^2/y)	1957
Solar avg. system eff.	43%
Working Hours	daytime
Storage	no

Solar Cooling Systems
optimal process integration



Absorption Chiller

Solar Cooling Systems
measurable results

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thermal energy. better

typical setup

Collectors gross area	3000 m^2
Footprint	5400 m^2
Peak Cooling Power	600 TR / 2100 kW_{cool}

expected performance

Cooling production	2700-3300 MWh_{cool} (2E@ 165C)
Fuel Savings	900-1100 MWh_e per year
Emission reductions	80-90 t/CO_2 removed

Solar Cooling Systems
economics. real value

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typical setup

Collectors gross area	3,000 m^2
Footprint	5,400 m^2
2E Absorption Chiller	600 TR / 2100 kW_{cool}

cost baseline

Solar CAPEX	1’501'500 €
Solar OPEX	9’300 €/y
Chiller OPEX	5’600 €/y
Cost of Cooling	14€/MWh_{cool}

Possible optimizations

- significant economies for large scale
- include subsidies

Economic assumptions

- OPEX includes O&M, electricity, spares
- solar plant lifetime: 25 y

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LET'S APPROACH YOUR CASE WITH A QUICK SIMULATION