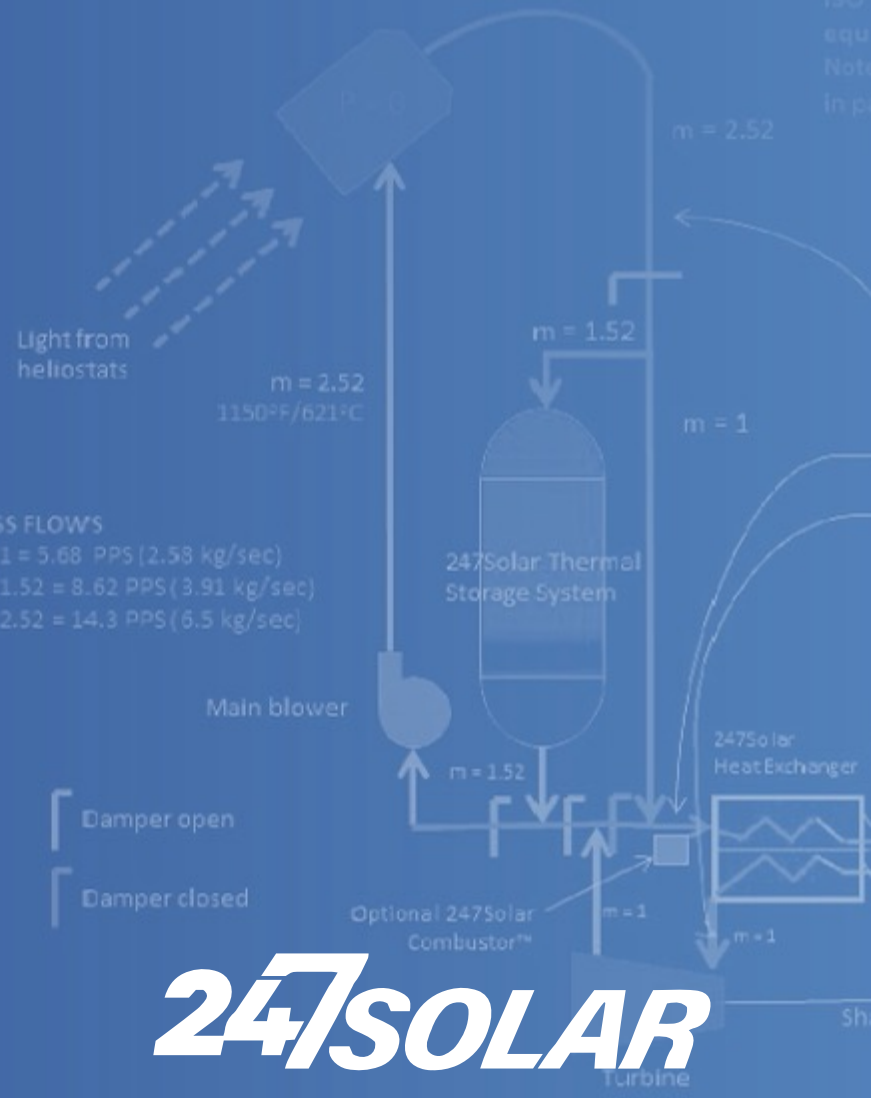
The next big leap
in clean power



Bruce Norman Anderson | CEO |
Bruce.Anderson@247Solar.com

247SOLAR

Disruption

CSP – Concentrated Solar Power

Concentrate Solar Power

CSP

An industry with huge potential but stuck with old technology and not going anywhere

247SOLAR

247Solar Inc has developed the disruptive technology the CSP industry needs to relaunch and reach its potential

KEY DISRUPTIONS

1. Pre-engineered, standardized modules
2. Rapid, sharp cost reductions with mass production
3. Lower CAPEX, OPEX, LCOE
4. Considerably larger market

Disruption

LDES – Long Duration Energy Storage

Long Duration Energy Storage

LDES

An emerging industry with huge potential as market penetration of wind and PV increases.

247SOLAR

247Solar Inc has developed the disruptive technology the LDES industry needs to address several difficult to address applications

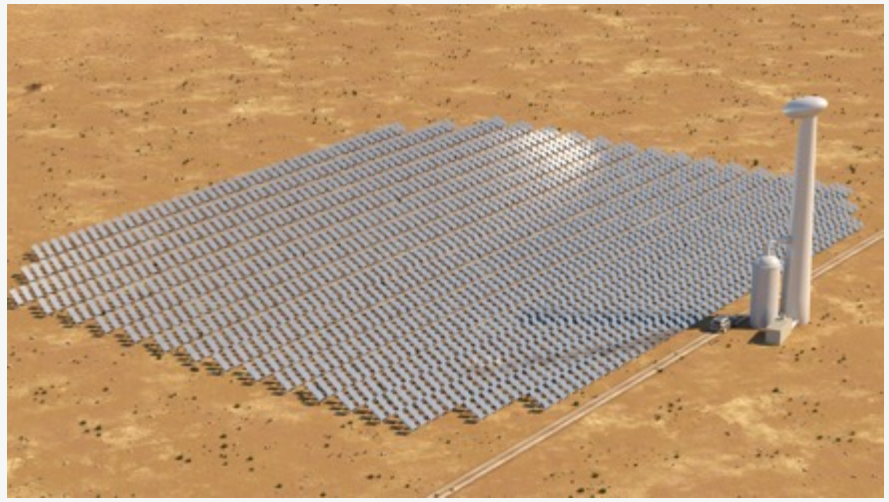
KEY DISRUPTED MARKETS

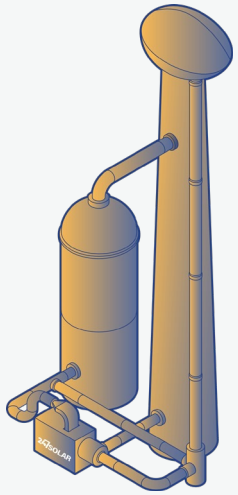
Batteries with 21st Century turbines provide on demand, 24/7, reliable dispatchable power even when fully discharged

Disruptive Product One CSP - Concentrated Solar Power

The Next Great Leap in 24/7 Clean Power

TWO remarkable new products made possible by an ultra-high temperature platform of THREE breakthrough technologies

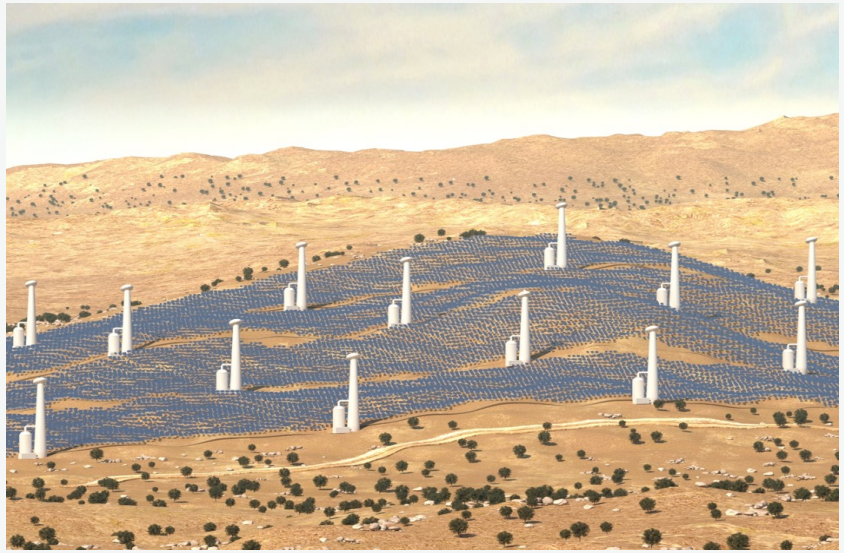




400kW, 600 kWth 247Solar Plant™

247Solar Plant™

- Targeting to be lowest-cost 24/7 emissions-free power solution
- Complete disruption of the CSP industry
- Developing 2 MW system



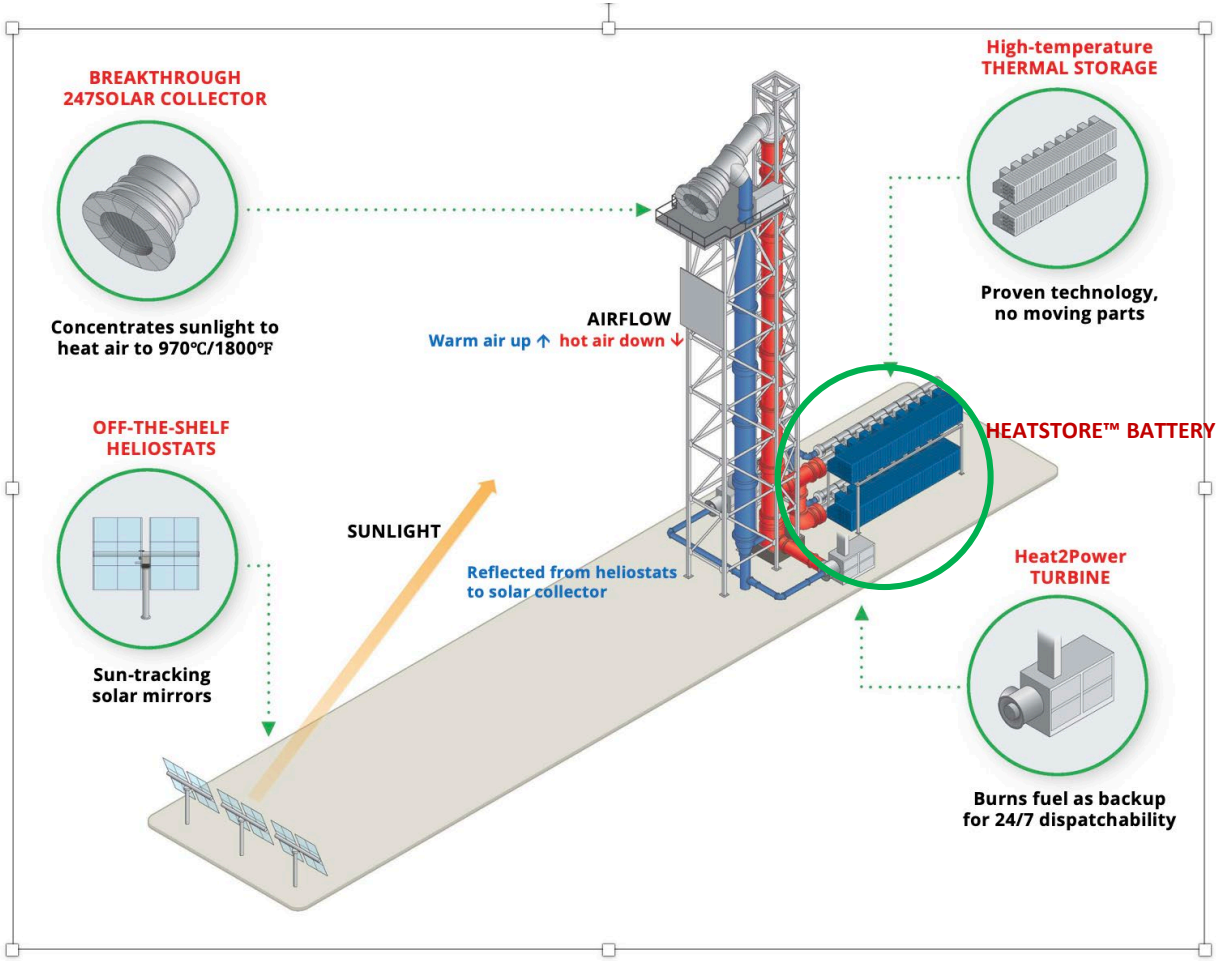
CSP Farm

The 247Solar Plant ™

Here's how the power Plant works

- Sun-tracking mirrors reflect light to the power Plant's Collector, converting sunlight to heat
- The Collector heats ambient pressure air to 970°C/1800°F
- Solar-heated air drives the Heat2Power Turbine to produce electricity
- Some of the solar-heated air heats the thermal storage for later use
- Turbine burns fuels as need for 24/7 dispatchable power

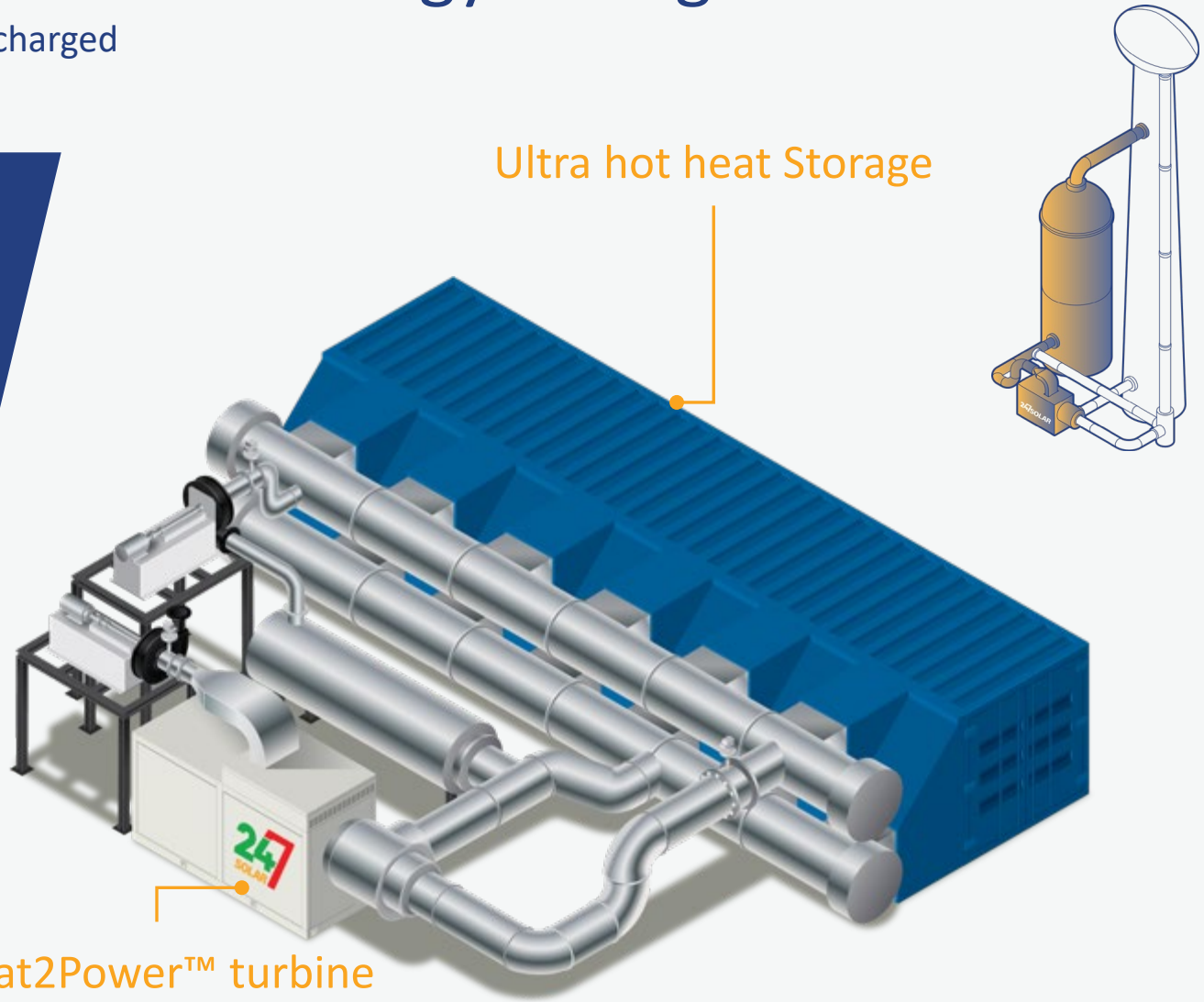
The 247Solar Plant **creates solar heated air** to charge the HeatStorE ™ Battery



Disruptive Product Two - Long Duration Energy Storage

On-demand power every hour of the year, even when fully discharged

TWO remarkable new products made possible by an ultra-high temperature platform of THREE breakthrough technologies



HeatStorE™ - goodbye gensets

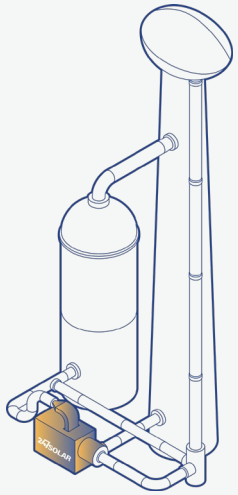
Batteries with 21st Century heat turbines provide baseload, 24/7, reliable dispatchable power for

- Off-grid mines, islands, communities
- Microgrids
- Edge of grid substations for power and energy grid support

$US 1.5 – 3 trillion market to 2040, McKinsey & Co:
https://reneweconomy.com.au/world-needs-up-to-140twh-of-long-duration-energy-storage-to-meet-net-zero-goals/

1st Breakthrough Technology - Heat2Power™ turbine

Ultra-high temperature technology - Electricity from hot air without emissions



- The first-ever commercial turbine able to convert atmospheric pressure hot air to electricity, with no combustion or emissions.
- The first-ever commercial turbine able to convert industrial wasted hot air into valuable electricity without combustion.
- The first-ever commercial turbine able to burn most dirty flare gases and low-grade methane from old landfills.
- Can burn almost any liquid or gaseous fuel if needed.
- Delivers critical grid services such as primary frequency regulation, secondary frequency response, fast frequency response, peak shaving, voltage regulation, power factor regulation, non-spinning reserves, solar energy time-shifting, reactive power, and inertia. No inverter required.

- Enables power generation from hot air, not combustion.
- Uses world's most versatile, reliable power generator.
- Low O&M, long MTBF, remote operation, monitoring
- 200 kWe, 300 kWth

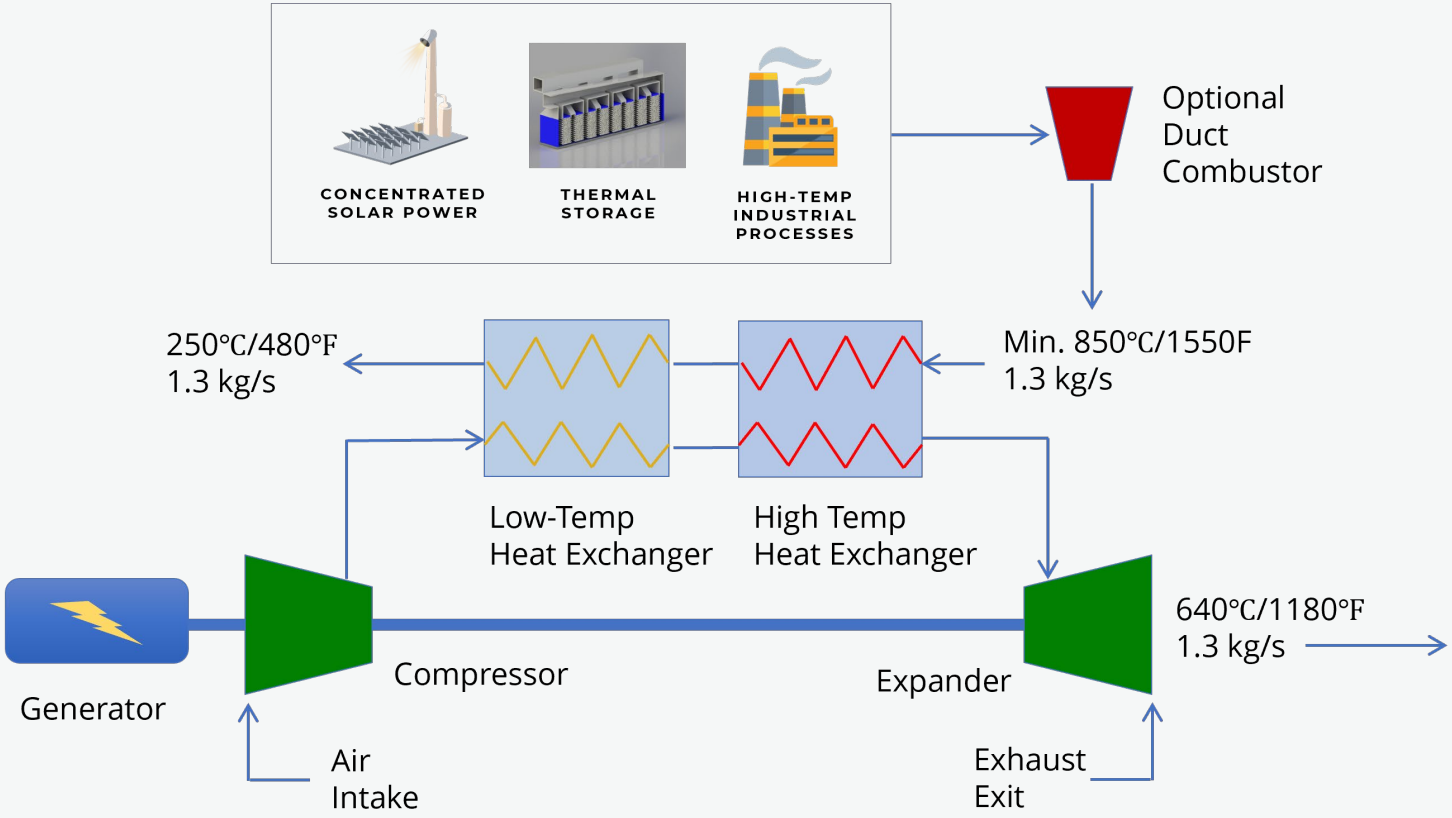
Manufactured by Capstone Green Energy Corporation (NASDAQ: CGRN) under license.

- Best selling turbine in its class, >10,000 sold
- Tens of millions of hours of operation
- 70 dealers worldwide, sales in >83 countries

How does the Heat2Power™ turbine run on hot air?

Hot air can come from a variety of sources

- High-temperature air (min. 850°C) is supplied to the turbine at ambient pressure, where it passes through a proprietary high-temperature heat exchanger.
- This transfers the heat to the turbine's compressed air to the pressure and temperature the turbine requires.
- No fuel is required, and no emissions are produced by this process.
- Inline duct combustor can burn most fuels for 24/7 operation, regardless of weather.
- Minimal operational requirements.
- Remote monitoring and operation

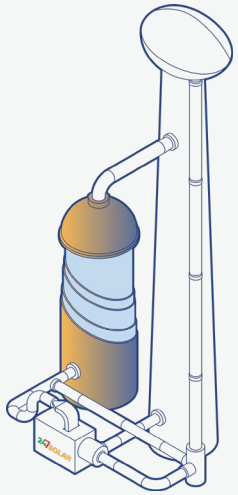


2nd Breakthrough Technology – Low-Cost Thermal Storage

Ultra-high temperature technology - Stores heat to 1800°F (970°C)

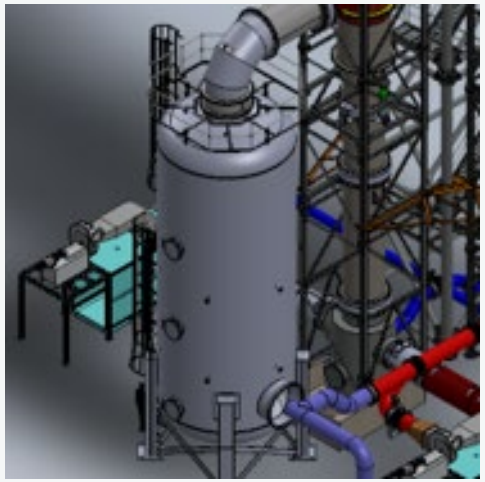
- Stores solar energy as heat instead of electricity
- Solar-heated air from the solar receiver is passed through the storage during the day to heat small ceramic pellets, sand, iron slag waste, etc.
- Air passes through in the opposite direction at night to power the turbine.
- **No moving parts**, decades-long life
- >100-year-old concept, low risk

- World's lowest cost high-temperature heat storage.
- <10% the cost of electrochemical batteries
- 4-20+ hours duration



Developed with NorPro division of Saint Gobain

SAINT-GOBAIN | NORPRO

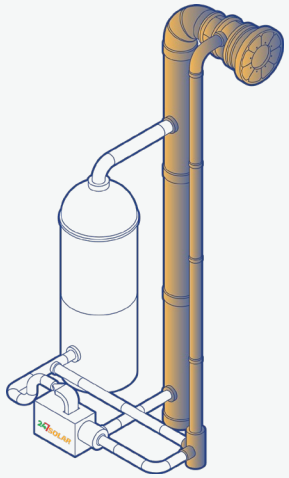


Version 1 – for 247Solar Plants

Version 2 – for HeatStorE

3rd Breakthrough Technology – 247Solar Collector™

Ultra-high temperature technology - Converts sunlight to heat air to 1800°F (970°C), 25% higher than competition



- Powers 247Solar Plants
- Provides super-heat for cement making, glass, metal processing, fertilizer production, etc.
- Enables **thermal chemical processes**, e.g., gasification of biomass, methane reforming, making hydrogen, calcination to produce cement, thermochemical water splitting for producing solar fuels, and ammonia synthesis for producing fertilizer.

- Sits on a common truss tower of ~35 meters to receive reflected sunlight from heliostats.
- Converts light to heat ambient pressure air to >1800°F (970°C).

Developed with German Aerospace Center and Fraunhofer Institute

Fraunhofer DLR

Summary Product One: 247Solar Plant™

24/7 power at low daytime-only PV prices, <4 UScents/kWh

TWO remarkable new products made possible by an ultra-high temperature platform of THREE breakthrough technologies

COMBINES THE 247SOLAR COLLECTOR™ WITH HEATSTORE™ FOR BASELOAD 24/7 GREEN POWER

- Lowest-cost 24/7 emissions-free power and CHP solution
- **Standardized module** for rapid cost reduction through mass production
- Super reliable complement to intermittent wind, solar, and batteries for uninterruptible 24/7 power
- Few moving parts, remote operation and monitoring

STANDARD 247SOLAR PLANT

- Output: 400kWe, 600 kWth
- Storage: 8-10 hours
- Footprint: ~5 acres

Summary Product Two: HeatStorE™

A huge business opportunity: <1/10 the cost of lithium-ion batteries

TWO remarkable new products made possible by an ultra-high temperature platform of THREE breakthrough technologies

HEAT2POWER TURBINE™ PLUS HEAT STORAGE

- 4-20 hours typical duration, longer an option. 24/7 dispatchability: can burn hydrogen & most clean fuels when storage is depleted
- Power capacity from 200 kWe to 100s MW
  >20-year operation with little or no performance degradation

DISRUPTIVE DISPLACEMENT OF GENSETS

- Stores excess power from wind/PV systems
- 24/7 generation backup alternative to gensets

STANDARD HEATSTORE™ BATTERY

- Output: 200kW
- Capacity: 1.8MWH, 8-10 hours
- Footprint: ~30ft x 50ft (10m x 16m)
  7500 sq ft/1 MW (800 sq m)

Battery Farm

3 Technologies / 2 products / many applications

- ***CHP*** *Lowest-cost 24/7 Combined Heating & Power for industry*
- ***Microgrids*** *Delivering baseload emissions-free electricity and heat for islands, mines, communities, and other microgrids*
- ***24/7 Baseload power*** *Lowest-cost 24/7 solar electricity*
- ***Green Hydrogen*** *Lowest-cost 24/7 solar electricity and heat to power electrolysis 24/7*
- ***Green Desalination*** *Lowest-cost 24/7 solar electricity and heat to purify water 24/7*
- ***Ultra Heat*** *Supplying ultra-high temperature heat (up to 1000°C+) to industrial processes 24/7 such as cement, glass, and steel making*

Lowest cost 24/7 solutions

Baseload 24/7 zero-carbon power at low daytime-only PV prices

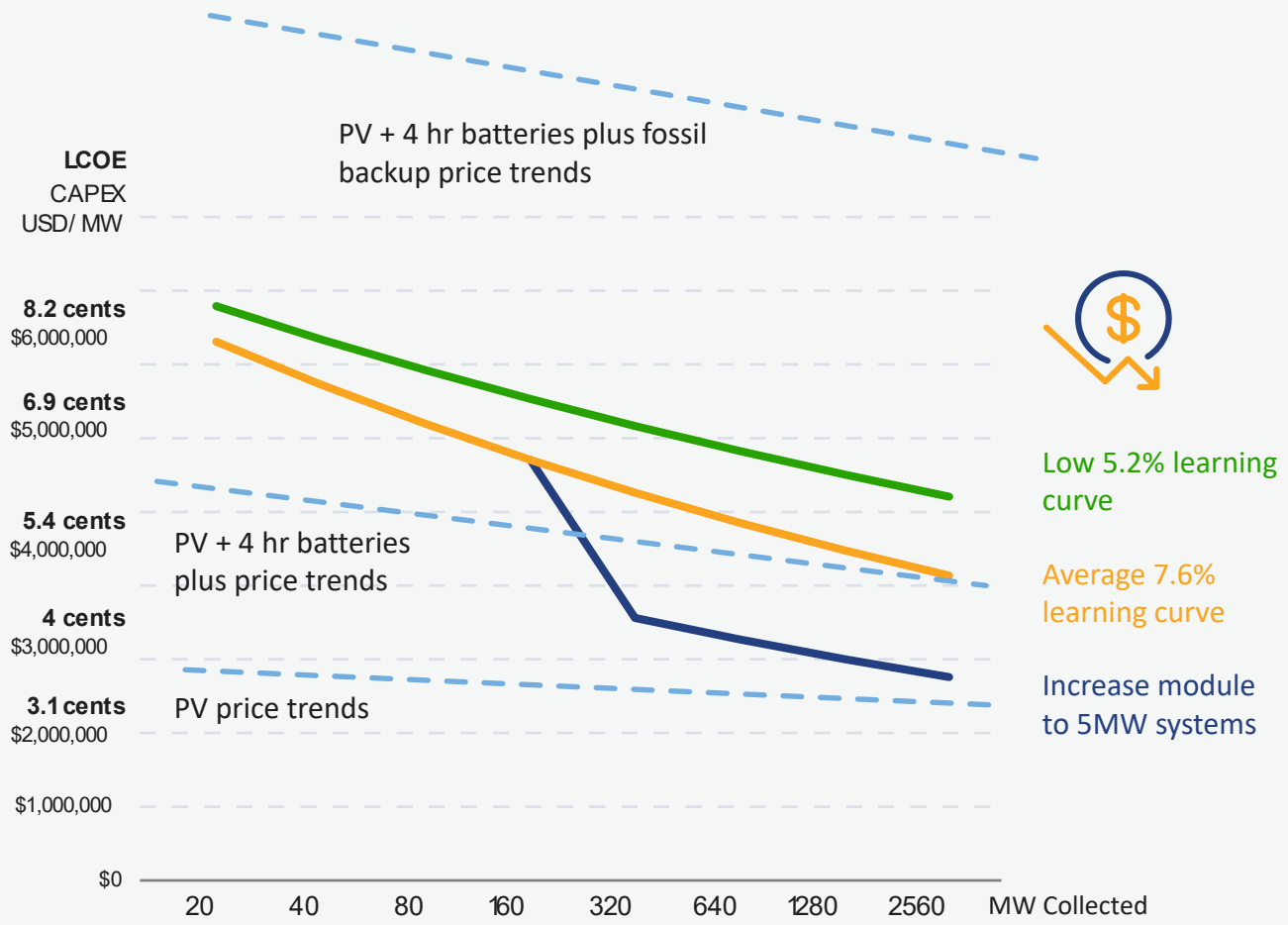
247SOLAR PLANT™

- USD5.9 million/MW compares with USD5.4 million/MW for 700 MW Dubai CSP project; LCOE <8 US cents/kWh
- USD2.9 million/MW projected after 2+ GW of production and deployment; LCOE <4 US cents/kWh

HEATSTORE™ - 247SOLAR'S THERMAL BATTERY

- USD30-100/kWh of storage compares with >USD300/kWh for other batteries
- 50-75% cost reductions after 100 MWH of deployment
- Market potential >USD100s billion

Cost Reductions of 247Solar Plants™ based on Cumulative Cost Learning Curves



247Solar around the world

Leadership Team

Spinoff from MIT, owned partly by MIT; US Department of Energy development funding

Management, technical team

Bruce N. Anderson

Chairman, CEO

- 40-year career CEO and co-inventor of 247Solar technology
- Began solar career in 1973 with Masters thesis at MIT

Douglas A. Hamrin

VP Systems Engineering

- Partner, URSA Energy Solutions
- 25 years as systems engineer of advanced, low-emissions power & electricity systems
- MS Mech E, MIT; BS Mech E, Illinois Institute of Technology

Natalie Givans

Board Director & VP Operations

- 30+ year Business Operations and Market Growth (Booz Allen Partner in Energy, Cyber, Risk, Defense)
- Experienced Board Director (Embr Labs, AFCEA, GS)
- MS EE, Johns Hopkins University; BS EE, MIT

Rod Lancaster

Director Biz Dev

- Dubai based
- 25 years strategic business development, market entry sales
- Former Country Manager in Saudi Arabia, China, Eastern Europe for various companies

Board of Advisors

Dave Rank

Former Acting US Ambassador to China

David M. Walker

Senior Vice President of Bechtel Group (retired)

Robert Hemphill

Former CEO of AES Solar and Executive Vice President of AES Corp (retired)

Global development partners

Fraunhofer DLR	Germany; World's largest, most experienced centers of excellence for Brayton solar power towers
Worley (energy | chemicals | resources)	Australia; Global utility engineering firm
SAINT-GOBAIN	France; Global construction products manufacturer
OAK RIDGE National Laboratory	US government's premier materials-testing lab

247SOLAR

The next big leap in clean power

Bruce Norman Anderson | CEO |

Bruce.Anderson@247Solar.com

+1-617-290-9913

www.247Solar.com

> The 247Solar Plant™ is a dream come true for the 21st century – a solar power plant with built in storage so it can generate electricity economically any time day or night when needed.

S. David Freeman

Former head, Sacramento Municipal Utility District, Tennessee Valley Authority, New York Power Authority, and Los Angeles Department of Water and Power

> 247Solar's CSP concept has enormous potential – a home run.

Dr. Fred Morse ("Mr. CSP")

Directed DOE's solar program under both Presidents Carter and Reagan