

India's Transition from Daytime-Only Solar To Round-the-Clock Clean Power

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

Does this sound familiar? "India wants to reduce carbon emissions, but..."



- "PV and wind are intermittent and only get India so far."
- "Batteries help but they're expensive."
- "Are there emerging solutions to this tough problem?"

"I still don't see how we're going to reach zero carbon at low cost."



Imagine instead...

A Make in India approach to zero-carbon energy 24x7

Imagine:

- India without brownouts
- India without coal plants
- All of India's citizens with 24x7 clean power
- India with clean skies
- Huge manufacturing and export opportunities





Make in India Achieving zero carbon energy 24x7

India needs now:

- Low cost solar 24x7, eg, Concentrated Solar Power (CSP)
- 2. Low cost long duration batteries
- 3. Low cost 24x7 clean power to make green hydrogen



1. Low cost 24x7 CSP India tried CSP a number of years ago with little success

So what's different this time?

MODULARITY

- 1. A la PV, wind, & batteries
- 2. All factory production = rapid cost reduction with volume
- 3. Rapid deployment
- 4. Simple operation





247Solar's CSP Solution: The 247Solar Plant™

Highly reliable clean power every hour of the year

Cost competitive with PV but 24x7

247Solar technology is a perfect fit for India

How It Works

247Solar Plants power 247Solar Heat2Power™ turbines with solar heated air

- Sun-tracking mirrors reflect light to 247Solar's Collector
- The Collector heats air to 970°C/1800°F
- Solar-heated air drives 247Solar's Heat2Power Turbine to produce electricity
- Some of the solar-heated air heats 247Solar's Thermal Storage System for later use





247Solar: Lowest Cost

24x7 Zero-Carbon Power

24x7 power at low daytime-only PV prices <3 US cents/kWh





247Solar: Lowest Cost 24x7 Zero Carbon Power 24x7 power at low daytime only PV prices, <3 US cents/kWh

2022

USD5.9 million/MW compares with USD5.4 million/MW for 700 MW Dubai CSP project; LCOE <8 US cents/kWh

2025

USD2.9 million/MW projected after 2+ GW of production and deployment; LCOE <3 US cents/kWh



2. HeatStorE[™] Low Cost Long Duration Batteries A second approach to lowest cost 24x7 zero carbon power

Enables 24x7 wind and PV systems

- Stores their excess energy for nights and calm weather
- Operates 4-20+ hours on one charge
- Capacity from 200 kWe to 100s MW
- Provides power 24x7 even when fully discharged



Standard HeatStorE[™] configuration

Larger scale HeatStorE[™]

How It Works

The core of our revolutionary battery is our Heat2Power™ turbine

The first-ever turbine that converts ambient pressure hot air to electricity without combustion

- Produces electricity without burning fuel in normal operation
- Low maintenance, 4-8 hr/yr
- Long life, >40,000 hr MTBF

For super-reliable 24/7 continuous operation when fully discharged,

 Can also burn diesel, natural gas, biofuels, even 100% hydrogen





How does a 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.



Breakthrough Thermal Battery Technology HeatStorE = Heat2Power turbine + lowest cost thermal storage

Hot air for the turbine comes from sand

- Excess electricity from PV and wind heats resistance coils
- This in turn heats sand in the thermal storage system
- When you require power, the hot sand heats air to power the turbines
- When fully discharged, the turbine can burn 100% hydrogen, most other fuels



Standard HeatStorE[™] configuration

Larger scale HeatStorE[™]

3. Green Hydrogen

India can be a green hydrogen powerhouse

Requires

low cost 24x7 electrolysis



low cost 24x7 zero-carbon power

India is ideal

- Low-cost industrial manufacturing
- Good solar resource
- Huge markets





247Solar Inc. in India

Ready to provide 24x7 clean power

- Ready to partner with India to deploy mega projects
 - 1. 24x7 solar
 - 2. Long duration storage
 - 3. Green hydrogen
 - 4. Green desalination
- Also smaller projects
 - Remote communities, mines, islands, factories
 - Industrial heat and power
 - 1000°C heat to cement, steel, glass, etc.



Imagine! A vision for India

TODAY

• Now 350 - 400 GW of power generation

2050

- 100 GW of CSP for green hydrogen at \$1/kg
- 500 GW of CSP for everyday use
- 5000 GWH of long duration batteries
- India a global powerhouse of 24x7 clean power manufacturing





The Company – 247Solar, Inc.



MIT origins. Owned in part by MIT and the state of Massachusetts



\$6 million U.S. Department of Energy funding

Technology Development Partners



German, World's largest, most experienced center of excellence for Brayton power towers



Australian Global utility engineering firm



US government's premier materials-testing lab



French Global construction products manufacturer

Let's Work Together

Make this zero-carbon vision for India a reality

247Solar respectfully requests:

Your enthusiasm | Contact us | Introductions to potential partners





24/SOLAR

"The most transformative energy technology I found in searching the solar and broader renewable energy industry, energy, storage, smart grid industries."

- Jeff Wolfe - CEO, HelioFire & PV veteran

CONTACT US

Bruce Norman Anderson, CEO 247Solar Inc. Bruce.Anderson@247Solar.com +1-617-290-9913 www.247Solar.com