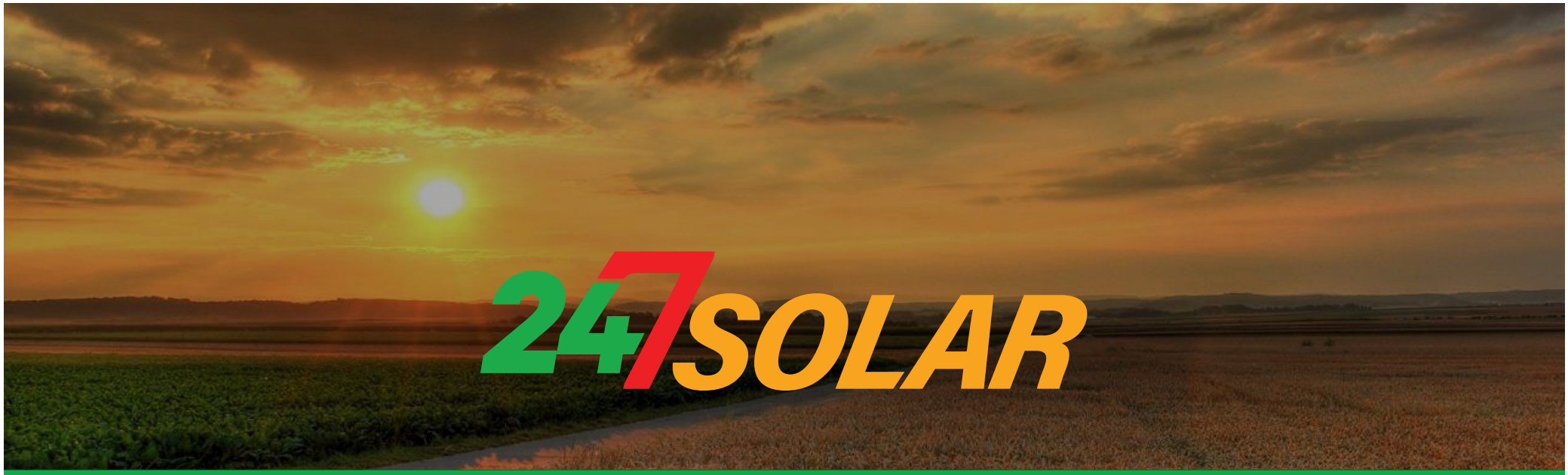

OPTIMIZING RENEWABLES FOR MINES

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

THE PROBLEM

We're all under pressure to reduce greenhouse emissions

THE LONG TERM TARGET

No emissions

THE CHALLENGE

It's hard, especially for mines, and especially for off-grid mines

247SOLAR Bruce.Anderson@247Solar.com

THIS PRESENTATION

We show how to

1. Maximize renewables penetration and fuel savings economically
2. Achieve 80-90% renewable energy with a clear path to 100% and no need for gensets
3. Compare the economics with other technology options for decarbonizing mine power

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THE PRODUCT - - 247SOLAR PLANTS™

3 advanced technologies integrated into a single proprietary 24/7 baseload solution

247Solar Hot-air Turbine™

Off-the-shelf turbine – World's most versatile, reliable power generator

- Modified to generate electricity using hot air at atmospheric pressure, without combustion.
- Initially 400 kWe
- Low maintenance, high reliability

247Solar Receiver™

World's highest temperature solar air heater

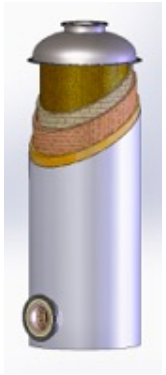
- Heats ambient-pressure air to almost 2000°F (970°C)
- Super-high temperature air powers the turbine and charges the thermal storage
- No moving parts

247Solar Thermal Battery™

World's lowest cost heat storage

4-20+ hours

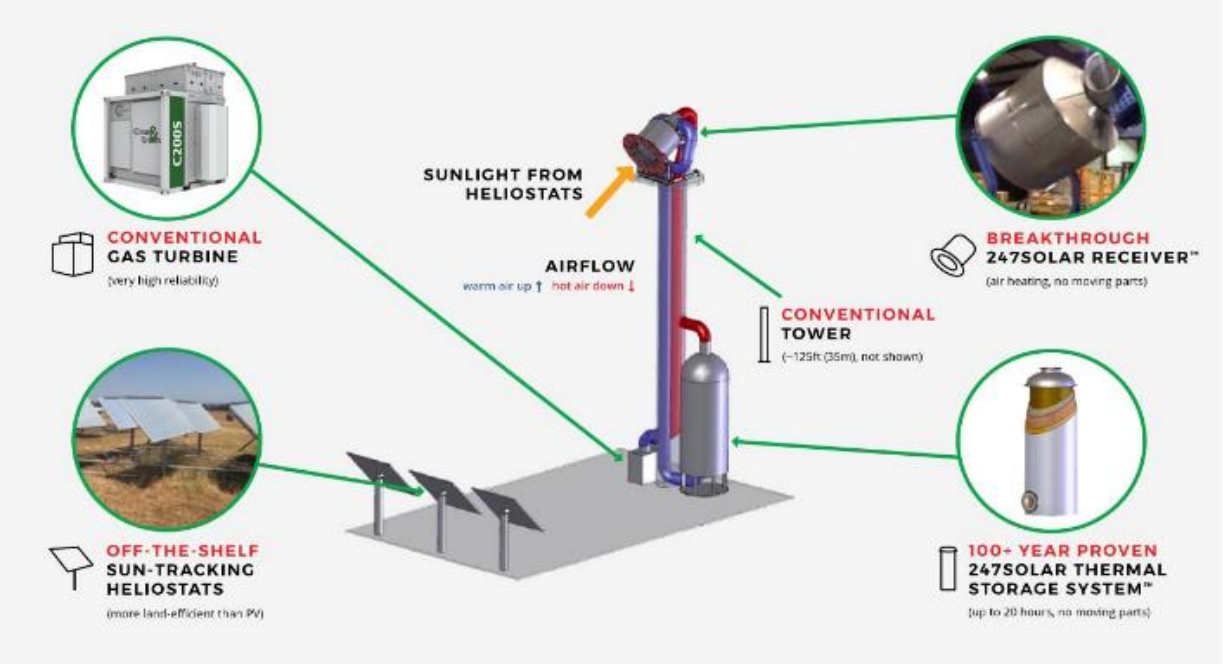
<10% the cost of batteries



- Solar-heated air from the receiver passes through the storage during the day to heat small ceramic pellets.
- Air passes through in the opposite direction at night to power the turbine.
- Simple, proven technology
- No moving parts, long life

HOW IT WORKS

1. **Daytime**: converts sunlight to electricity and/or stores solar energy as heat
2. **Nighttime**: converts stored heat energy to electricity for up to 20 hours of operation
3. **Standby**: burns any clean fuel as back-up power to guarantee 24/7 operation

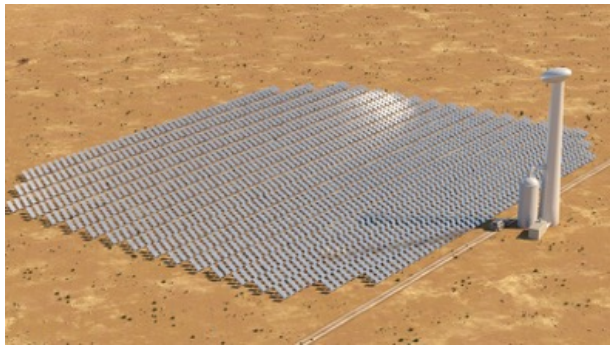


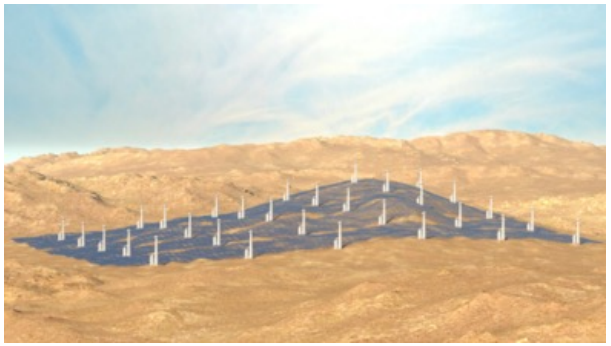
Each 247Solar Plant: 400 kWe + 600 kWth

ONE PLANT OR MANY

247Solar Plants™ are modular and scalable to any capacity

- Standardized, identical modules of 400 kWe capacity, ~5 acres (~2 hectares, 20,000m^2).
- Multiple 247Solar Plants combine to provide 24/7 power & heat at any capacity.
- Multiple modules ensure continuous delivery when one or more are offline.
- Provides added flexibility, reliability, and resilience to any power project.





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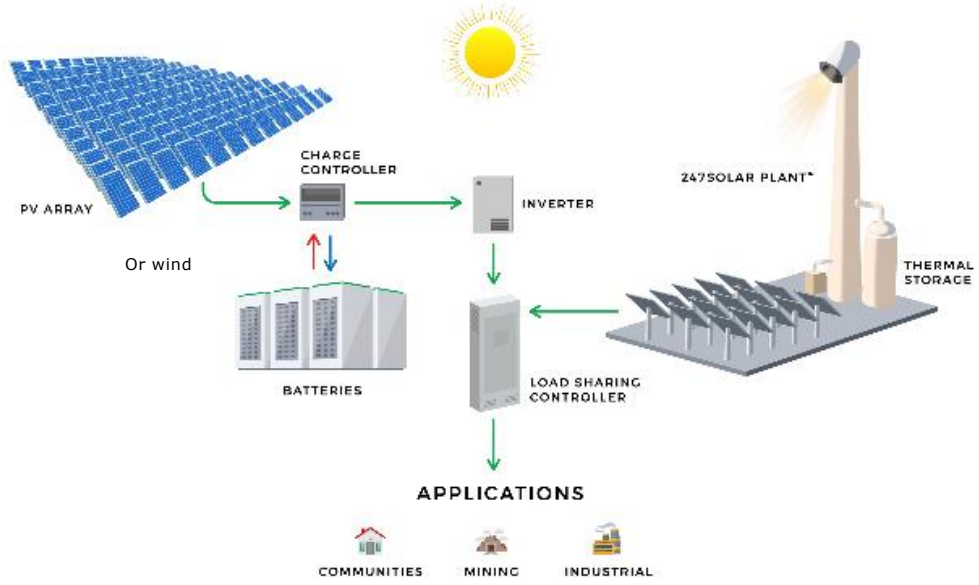
247SOLAR MICROGRIDS™

Adding 247Solar Plants™ for 24/7 operation, up to 90% fuel cost savings

- PV, batteries, wind, etc., provide variable power
- Add 247Solar Plants™
  - Readily integrate with other power generation and management technologies
  - Highly responsive, reliable *baseload* 24/7 power
  - Eliminate gensets
  - Can also supply industrial-grade heat
- 100% renewable energy via combustion of biofuels or hydrogen in 247Solar Plants.

247Solar Microgrid™



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COMPARATIVE ADVANTAGES

247Solar vs. diesel when added to PV and batteries to form microgrids

	247Solar Plants™	247Solar Microgrid™ 247Solar + PV + batteries	Conventional Microgrid Diesel + PV + batteries
Fuel cost reduction	✓ 70-90%. Inflation free and predictable	✓ 75-95%. Inflation free and predictable	X 18-38%. Highly variable
Dispatchable power on demand?	✓ Highly reliable	✓ Highly reliable	● Gensets have more frequent down times
System Complexity	✓ Few moving parts with high MTBFs	✓ Few moving parts with high MTBFs	X Gensets have low MTBFs, high maintenance costs
Deployment schedule	✓ Limited	● Longer	● Longer
Storage	✓ Low cost, long-lasting thermal storage	✓ Low cost, long-lasting thermal storage	X Batteries are very expensive and short-lived
Environmental	✓ Minimal environmental impact	✓ Minimal environmental impact	X Diesel combustion
Combined heat & power (CHP)	✓ Generates 24/7 electricity plus heat	✓ Generates 24/7 electricity plus heat	X Does not provide usable heat

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USE CASE

247Solar Microgrid™ at a 24/7 off-grid mine in Western Australia

A pathway to 100% renewables

Steps:

1.	18-23% renewables:	PV
2.	25-40%	More PV plus Li-ion
3.	Up to 90%	247Solar Plants™
4.	100%	Biofuels, hydrogen, etc. by 247Solar Plants

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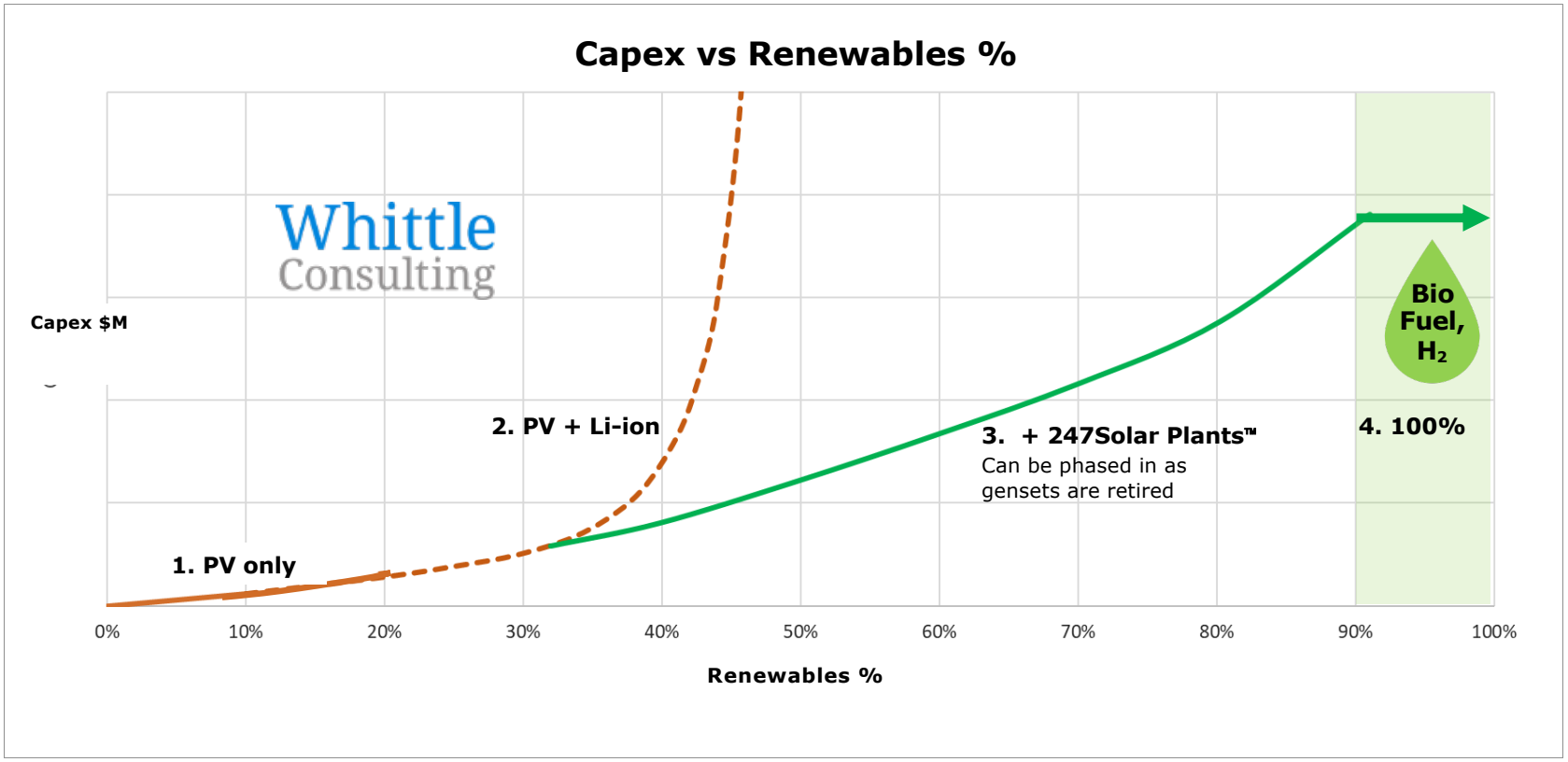
PATHWAY TO 100% RENEWABLES



DIESEL COST COMPARISON (indicative numbers)

	247Solar	Diesel
CAPEX	$6,000,000	$3,000,000
CAPEX/year over 20 years	$300,000/year	$150,000/year
Annual Fuel Costs	$380,000/year	$1,900,000/year
Annual Non-fuel Costs	$130,000/year	$220,000/year
Total Annual Costs	**$810,000/year**	**$2,270,000/year**

ASSUMPTIONS:

SYSTEM: 1 MW genset OR 1MW 247Solar. Same PV + batteries for both

CAPEX:

a) Constant genset prices for the next 20 years: $1 mil/MW
b) 10-year life of gensets with overhaul, $1.5 mil, $3.0 mil over 20 years
c) $6 mil/MW for 247Solar
d) 20+ year life of 247Solar (actual life is longer)
e) Up time: gensets 90%; 247Solar 96%

LOCATION: Clear skies ~300 days/yr, 2000-2500 DNI

FUEL COST:

a) Constant diesel costs for 20 years: $0.80/litre, delivered
b) Fuel use hours/yr: gensets 100%, 8760 hr; 247 20%, 1750 hr
c) Fuel consumption, both: 270 litres/hr-MWH (~37,000 Btu/l)

O&M:

Non-fuel O&M: gensets 2.5UScents/kWh; 247 1.5UScents/kWh

247SOLAR *Bruce.Anderson@247Solar.com*

247SOLAR MICROGRIDS™

The optimal mining power solution

- ✓ 24/7 operation, up to 100% renewables
- ✓ Eliminate need for gensets
- ✓ Interoperable with all power technologies: gensets, PV, wind, batteries, etc
- ✓ Handles surge loads
- ✓ Ease of operation, high reliability compared to gensets
- ✓ Scalable to any required capacity

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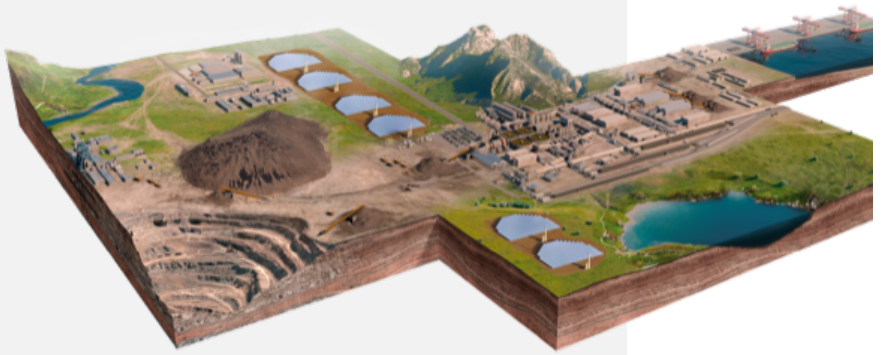
ADDITIONAL BENEFITS

Combined heat and power (CHP)

✓ Industrial-grade heat up to 970°C (1800°F)

✓ 1.3+ MWth per 1 MWe, 250+°C



Examples

- Heating water, steam boilers
- Wastewater treatment
- Product drying
- Product finishing
- HVAC Climate Control (offices and rooms via absorption chiller)

IN SUMMARY

247Solar Microgrids™ optimize renewable power generation for mines

- ✓ Up to 100% renewables
- ✓ Adds flexibility and versatility to plant operations
- ✓ Highly reliable engine: 4-8 hr/yr routine maintenance; MTBF of 80,000–120,000 hours
- ✓ Can be deployed gradually or quickly on a modular basis, replacing gensets in an orderly way
- ✓ Delivered as a fully operational turnkey system
- ✓ Movable to other locations in the future

247SOLAR

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THE COMPANY – 247SOLAR, INC.

- MIT origins; partly owned by MIT and the state of Massachusetts
- $6 million U.S. Department of Energy funding

Global development partners

- Germany; World's largest, most experienced centers of excellence for Brayton power towers
- Australia; Global utility engineering firm
- France; Global construction products manufacturer
- US government's premier materials-testing lab

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THE 247SOLAR MICROGRID™

The ideal clean off-grid solution

"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

"The most transformative energy technology I found in searching the solar and broader renewable energy industry / energy /storage /smart grid industries for 18 months."

Jeff Wolfe - CEO, HelioFire and PV veteran

247SOLAR

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