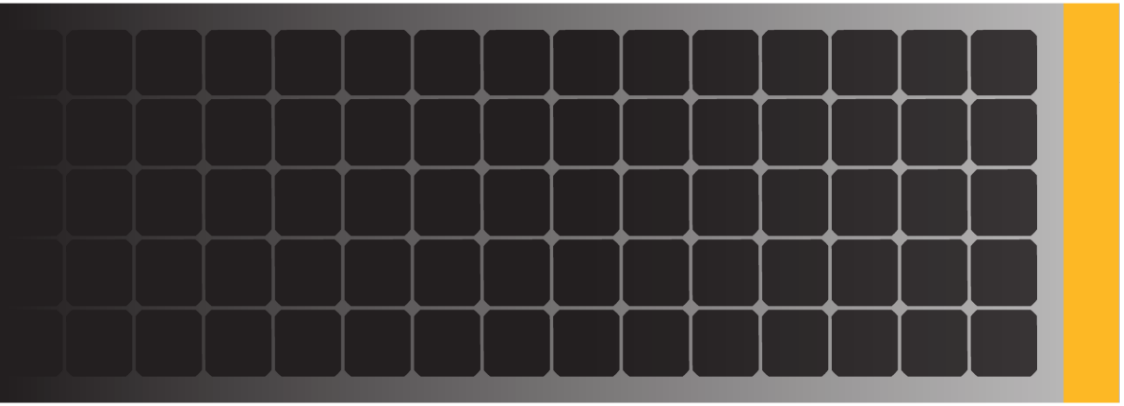
SUNPOWER®

MORE ENERGY. FOR LIFE.™



Telecom Solar Solution

Bringing Energy to Mission-Critical Applications

Thomas Thillou – Sales Director Off-Grid - SunPower

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SunPower: a strategic asset of Total

- World's fifth-largest publicly-traded oil & gas company
- 2012 revenue: €200B
- First largest capitalisation on the Euronext Paris and the Euro zone

- $1.5B investment, 66% majority share in SunPower + $1.6B of support
- $24M, 4-year R&D support

TOTAL

Oil & Gas	Refining & Chemicals	Marketing & Services	New Energies
			 SUNPOWER



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Highest efficiency[1]	Highest production[2]	Highest reliability[3]

- World-leading solar conversion efficiency[1]
- >2.5 GW solar PV deployed
- Diversified portfolio: roofs to power plants, on-grid and off-grid applications
- Publicly listed on NASDAQ
- 2012 revenue: $2.4B
- 1 GWp total production capacity at end of 2012
- 5,000+ employees
- We only do solar, more than 200 patents
- Majority owned by Total Group

[1] SunPower holds the world-record large silicon panel efficiency (21.4%). Green, M. A., et. al. "Solar Cell Efficiency Tables (version 39)," Progress in Photovoltaics, 2013, vol. 21, p1-11
[2] BEW Engineering, part of DNV KEMA, SunPower Yield Report, Jan 2013. Compared to Conventional 15% efficient silicon panels.
[3] Romero, Ralph, et al. "Review of SunPower Fleet-Wide System Degradation Study using Year-over-Year Performance Index Analysis," Black & Veatch Eng., Nov. 2012.
[4] Source: 2012 Fortune 500 Global Ranking

Off-Grid At a Glance

- **25 years+** Off-Grid expertise
- **Focused**: Telecoms and O&G
- **World leader:** 5'000 Sites in telecoms with 20MWp Installed
- **150+ Staff (30% temps) in 7 sites supported by Lyon COE**
- 50 Concurrent Projects: from $100k to $10m. Weeks to years

Powering Off-Grid Mission-Critical Assets on 24/7

With Commitment to OPEX Reduction



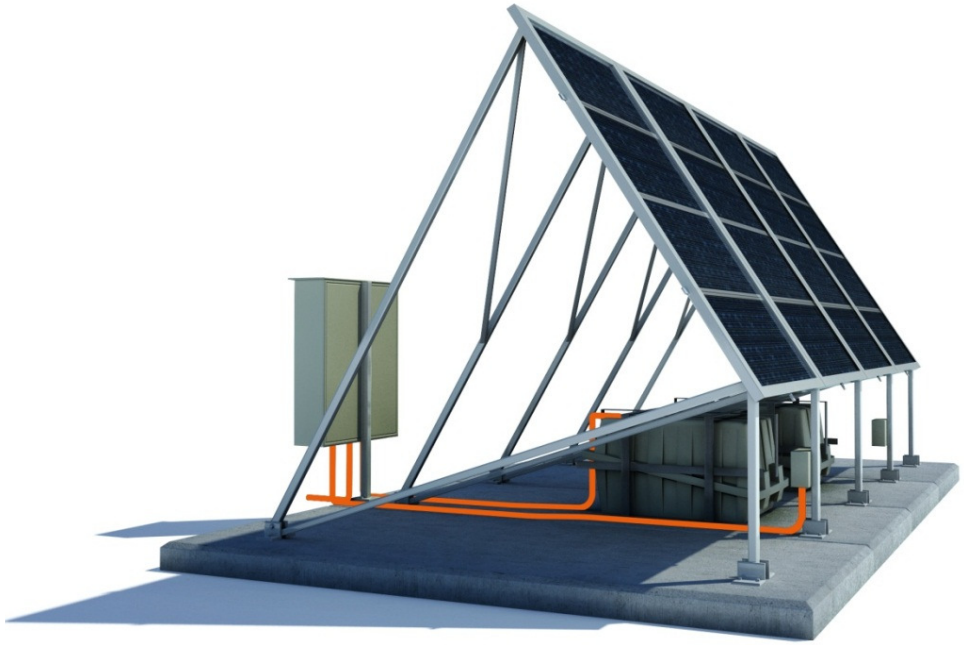
Telecom

- Global leader since more than **20 years**: first installation in Togo,1989
- More than **5,000 installations** worldwide – **80% in Africa**
- Chosen by leading operators worldwide - In Africa mainly by **Orange**, **Maroc Telecom**, **MTN, Atlantique Telecom…**
- **Applications**: fixed mobile, radio operated networks, transmitting base stations, peripheral infrastructures

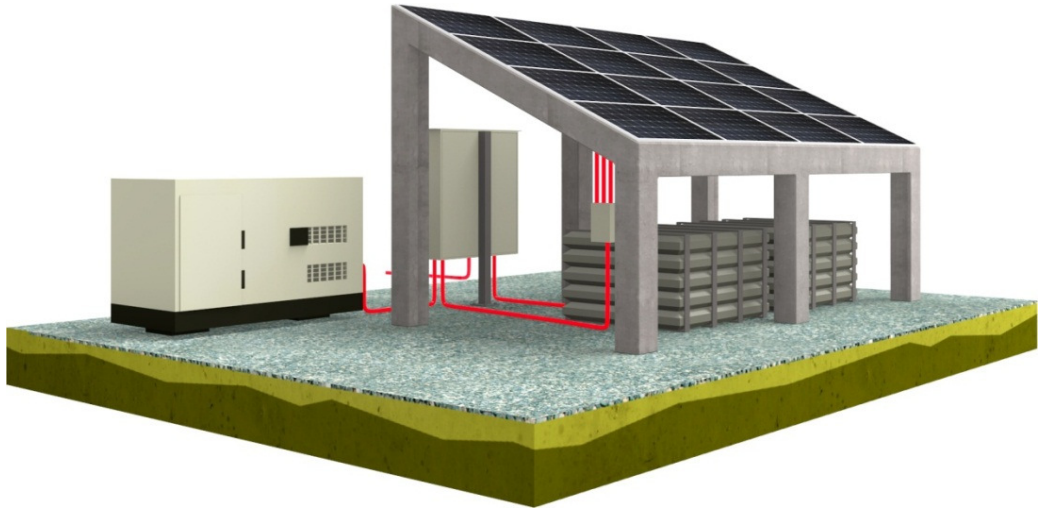


Reduce energy OPEX & carbon footprint.
Green branding advantage

Sunpower Solution overview



PV solution



Diesel Hybrid solution

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SunPower MaxeonTM Technology

SunPower patented back contact cell technology

With the highest efficiency of:

24.2%



World record full-scale champion cell efficiency verified by NREL

The Heart of the SunPower Panel is the Maxeon® Solar Cell

- The Maxeon cell has a Fundamentally Different design from a conventional solar sell: it's built on a solid Copper foundation
- Copper plated cells cost more to manufacture than conventional solar cells, but the investment pays of with a much more durable and high-performing solar cell.
- SunPower is the only manufacturer offering a copper-plated cell – all the conventional cells are made by baking a metal paste onto the silicon wafer – just like screen-printing a logo onto a T-shirt

SunPower Panel with Maxeon



FRONT



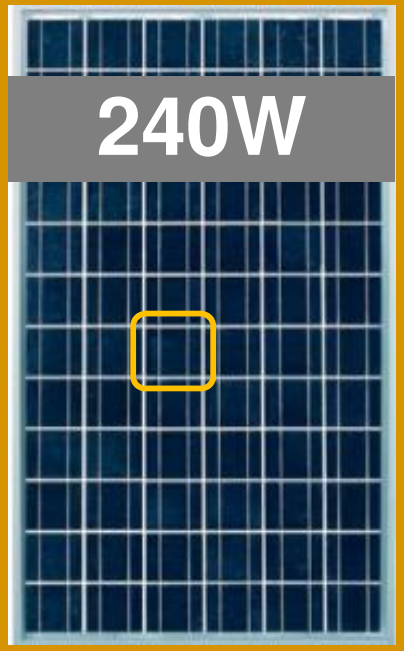
No metal

BACK



Copper-plated

Conventional Panel (same size)



FRONT



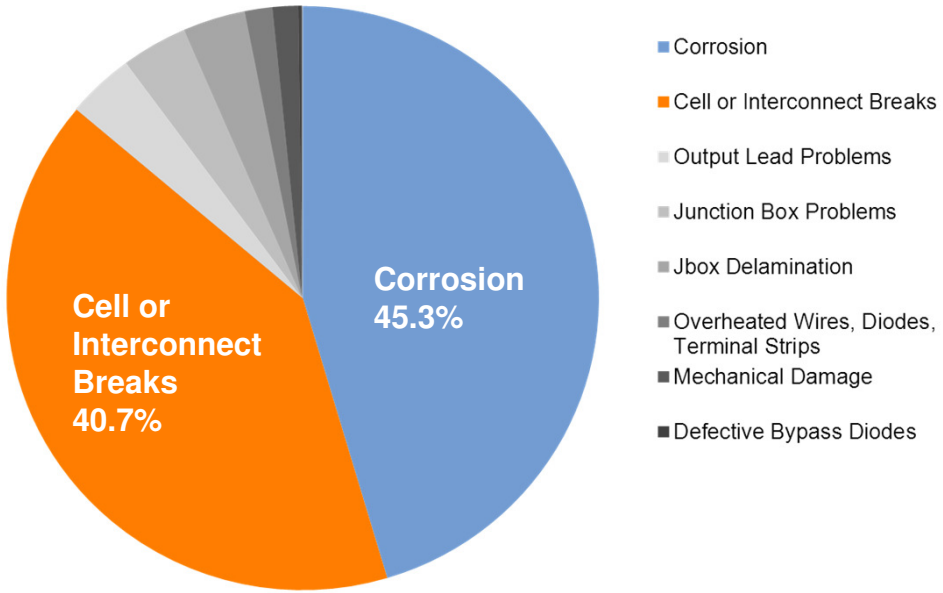
Thin lines of metal paste

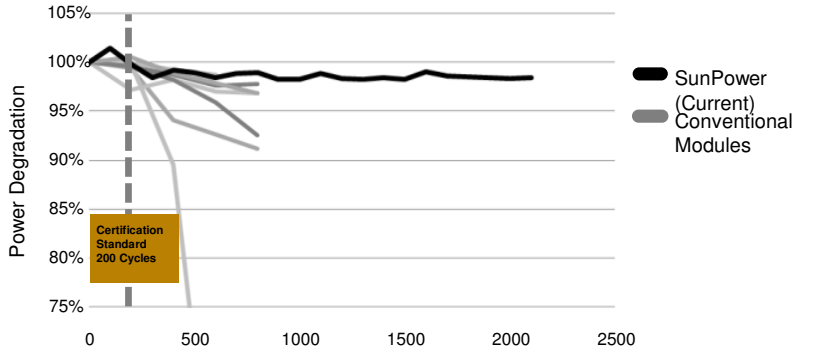
BACK



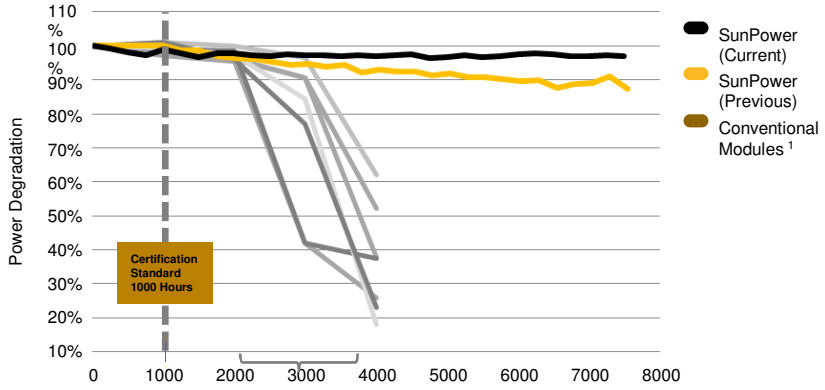
Full-coverage metal paste

SunPower Maxeon cells: unparallel long-time performances and reliability





Number of Cycles: -40 to 85C (-40 to 185F), 5 cycles per day



Number of Hours at 85C (185F) and 85% Humidity

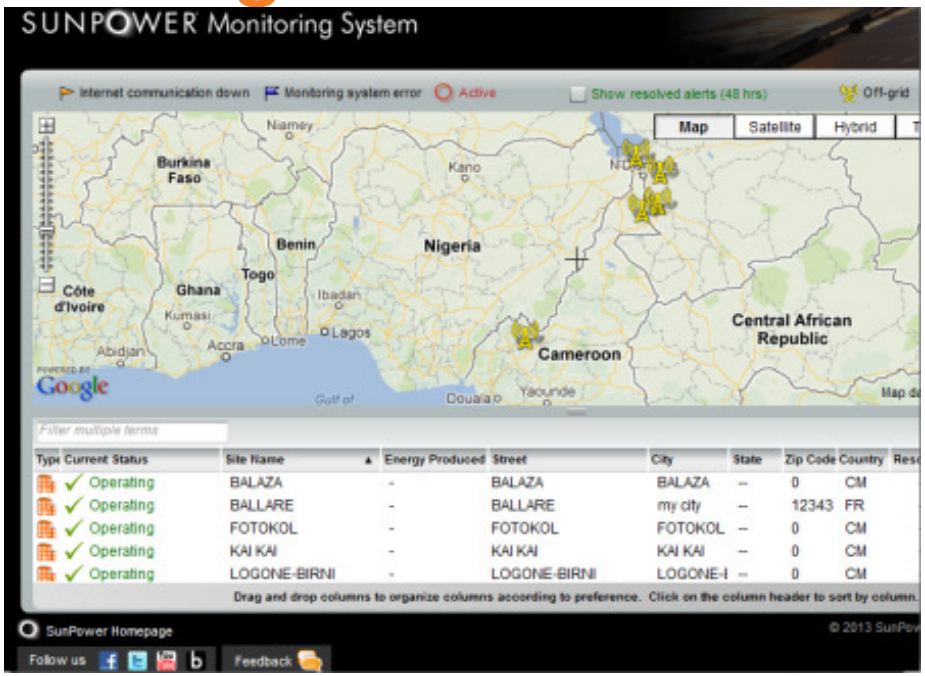
7x IEC **12x** ISO **5x** UL

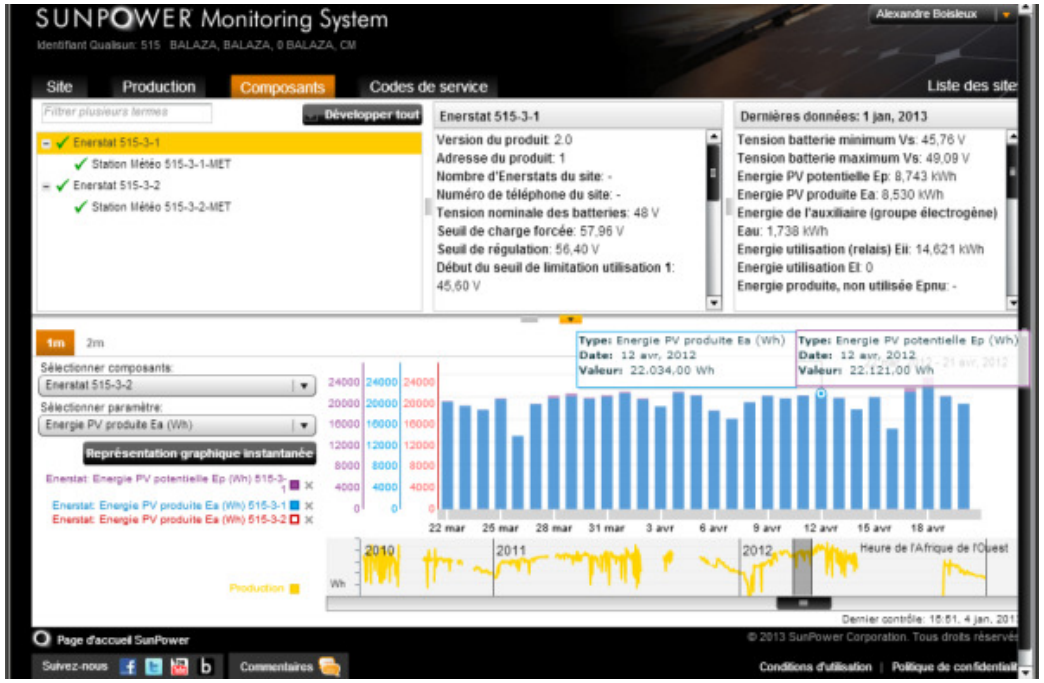
Wohlgemuth, J. "Reliability of PV Systems." Proceedings of SPIE, Aug, 2008.

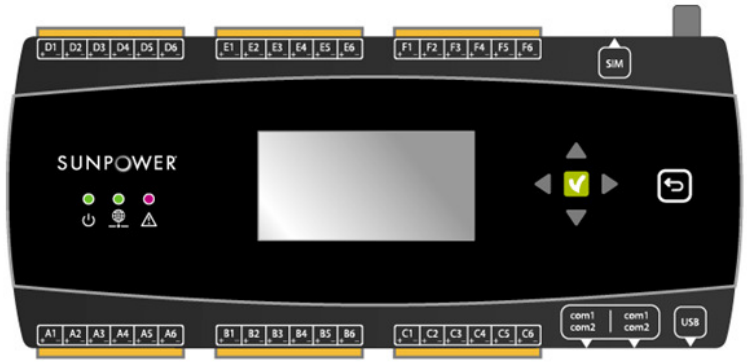
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Comprehensive Remote Monitoring Solution

- Local and remote monitoring
- Detailed and Consolidated Fleet supervision
- Remote site management







➔Maximises savings from Solar input and batteries lifetime

Less material, less space, quicker installation

Example of a 1200W BTS in Africa, 5 days autonomy

	Standard offer, PWM charge control	Sunpower high efficiency combination	% gap
Needed Wp power	10 200	8 502	-20%
Nb of PV Modules	34	26	-25%
PV field area	70	42	-40%
Installation time (estimation)	Remoteness-tied	Remoteness-tied	-15%
Transport cost (estimation)	Remoteness-tied	Remoteness-tied	-10%

➔ Maximised PV input on revamped sites with existing space constraint

➔ Lower expense for land lease or land aquisition

➔ Shorter time to network comissioning

SUNPOWER

Economics of Solutions for Nigeria

Load	South Nigeria	North Nigeria
1kW 100% Solar	8.5kWp / 2600Ah	6.6kWp / 2600Ah
	42m²	33m²
	50k$ EPC	38k$ EPC
1kW Diesel Hybrid 50% (existing genset)	3.9kWp / 1300Ah	3.2kWp / 1300Ah
	20m²	16m²
	20k$ EPC	16k$ EPC
2kW 100% Solar	17kWp / 5200Aj	13kWp
	85m²	65m²
	98k$ EPC	76k$ EPC
2kW Diesel Hybrid 50% (existing genset)	7.8kWp / 2600Ah	5.9kWp / 2600Ah
	40m²	30m²
	38k$ EPC	29k$ EPC

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TCO approach, or the importance of Sunpower 360° analysis before making a decision

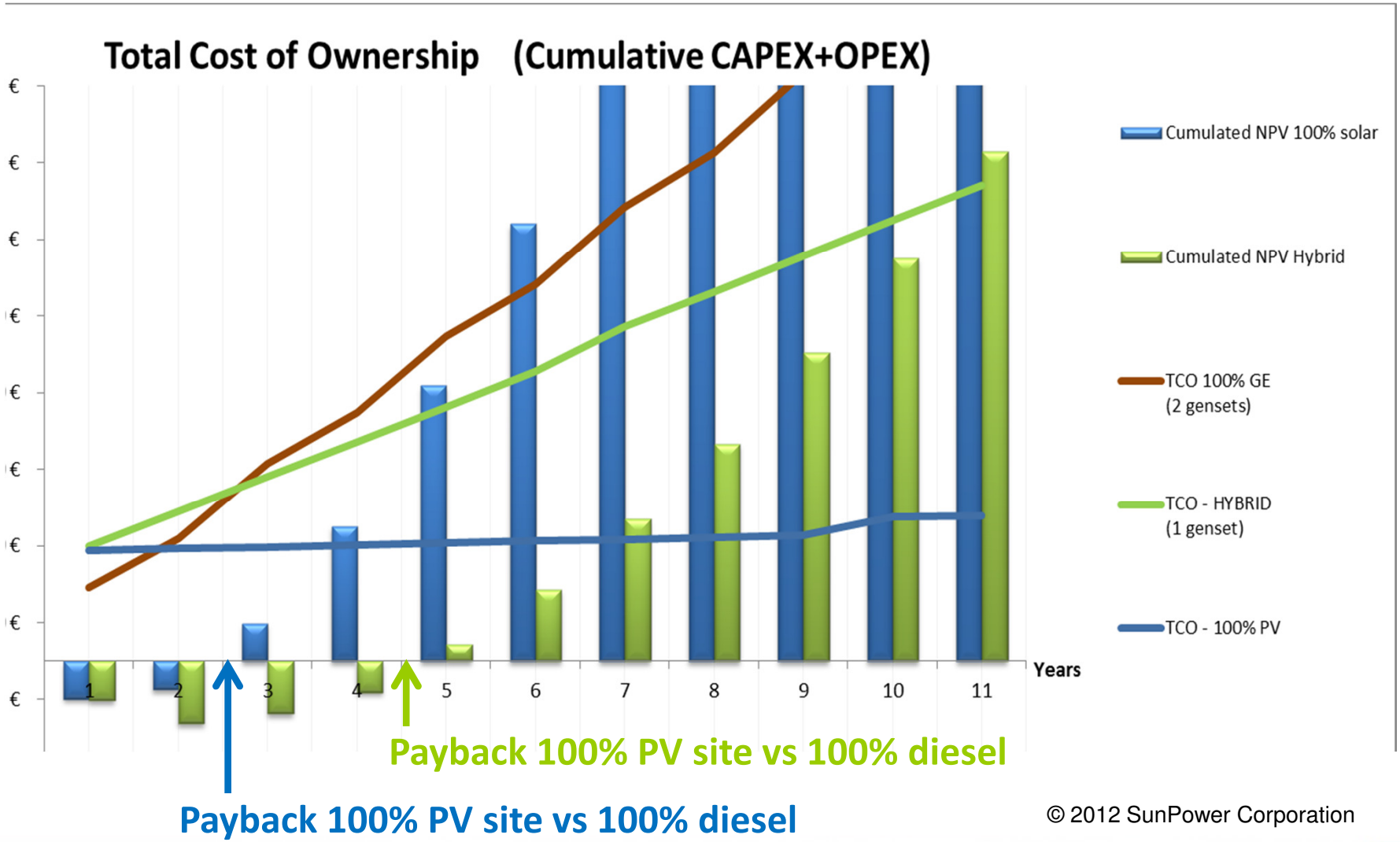
Basic fuel retail price: $0,9/l

Remoteness: 1h fuel transport

24/7 BTS operation

BTS power 1000W

Sun power 4kW/m²



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Wall-to-wall change management: we take care of everything

Project Kick-Off



- Sites analysis (eligibility)
- Financial analysis

Technical Engineering



- Energy sources choices
- Site surveys
- On-demand innovative solutions

Systems Design



- Sizing of systems
- Pricing

Production & Procurement



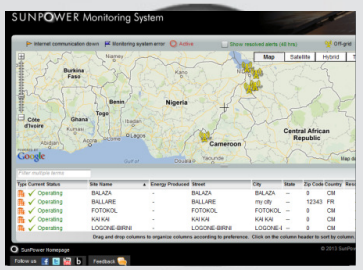
- Project management
- Supply chain management

Project Delivery



- EPC
- Commissionning
- Trainings

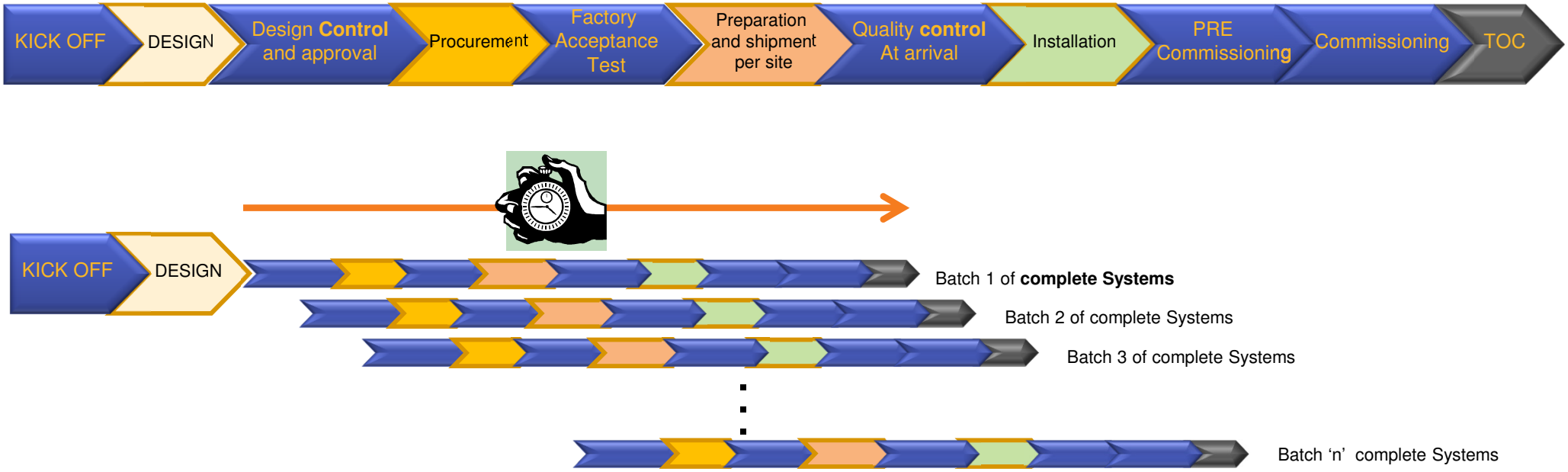
Operation & maintenance



- Extended warranty
- Performance commitment

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Typical rollout for a hundred-sites project turnkey





Continuous supply of batch composed of complete systems.



Quality control at each step of the project



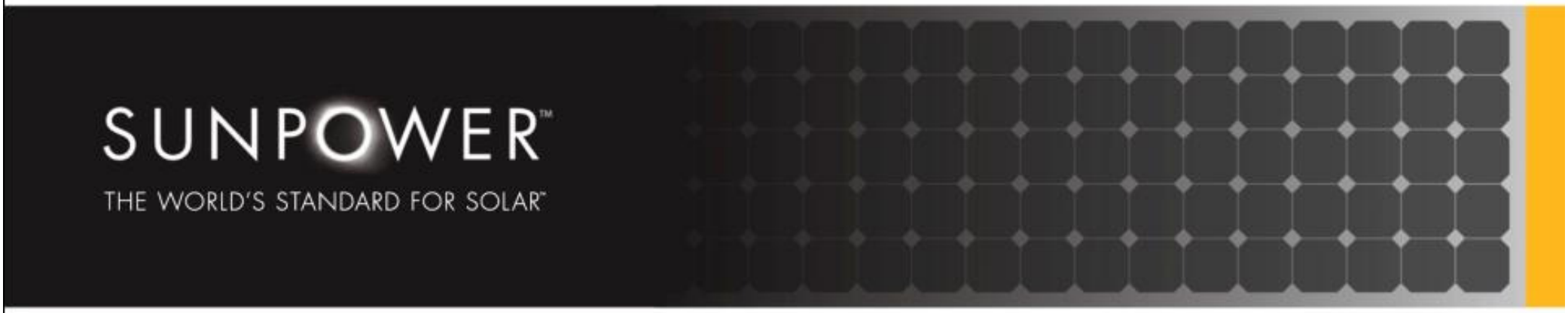
Continuous check up of the time delivery



Continuous sharing of the progress with the customer to accelerate if necessary, by Weekly report and Monthly meeting.

SunPower Confidential

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