

First Solar – A Partner for Egypt Solar Program



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First Solar Overview

Capabilities

Experience Record

Module Technology



First Solar in the Middle East

2014

First Solar at a Glance



Over 8GW installed worldwide and over 3GW contracted pipeline



Cost competitive with conventional energy sources today



Partner of choice for leading utilities and global power buyers



Driving innovation across entire value chain and plant solution



Strongest financial stability & bankability in the industry



Founded in 1999 and publicly traded on Nasdaq (FSLR)

History of Leadership Across Entire Solar Value Chain



1st global module recycling program



1st to break \$1/watt cost barrier
1st to produce 1GW in single year



World record 20.5% cell
World record 17.0% module

1999 ... 2005 ... 2007 2008 2009 2010 2011 2012 2013 2014



Acquired EPC & project DEV



Financed ~9B solar plants



World's largest PV plants



Industry leading tracker technology



Proprietary plant controller



State-of-the-art Operations Center



Acquired disruptive x-Si technology



Integrating into the global energy mix

Global Offices & Manufacturing

~4,600

Associates

~40,000

Global Supply
Chain Jobs



Experience in the Middle East



Abu Dhabi, UAE, 5MW

Type: Utility-Scale

Customer: Masdar

Status: Operational



Dubai, UAE, 13MW

Type: Utility-Scale

Customer: DEWA

Status: Operational



Ma'an, Jordan, 52.5MW

Type: Utility-Scale (IPP)

Customer: Shams Ma'an Consortium

Status: Project to begin construction



Al Jouf, Saudi Arabia, 0.8MW

Type: Agricultural water pumping application

Customer: Al Wataniya Agriculture Company

Status: Project to begin construction





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Capabilities Across the Entire Solar Value Chain



**GRID INTEGRATION
& PLANT CONTROL
SYSTEMS**



**ENGINEERING &
PLANT OPTIMIZATION**



PROJECT DEVELOPMENT



PROJECT FINANCE



**OPERATIONS
&
MAINTENANCE**



**PROCUREMENT &
CONSTRUCTION**



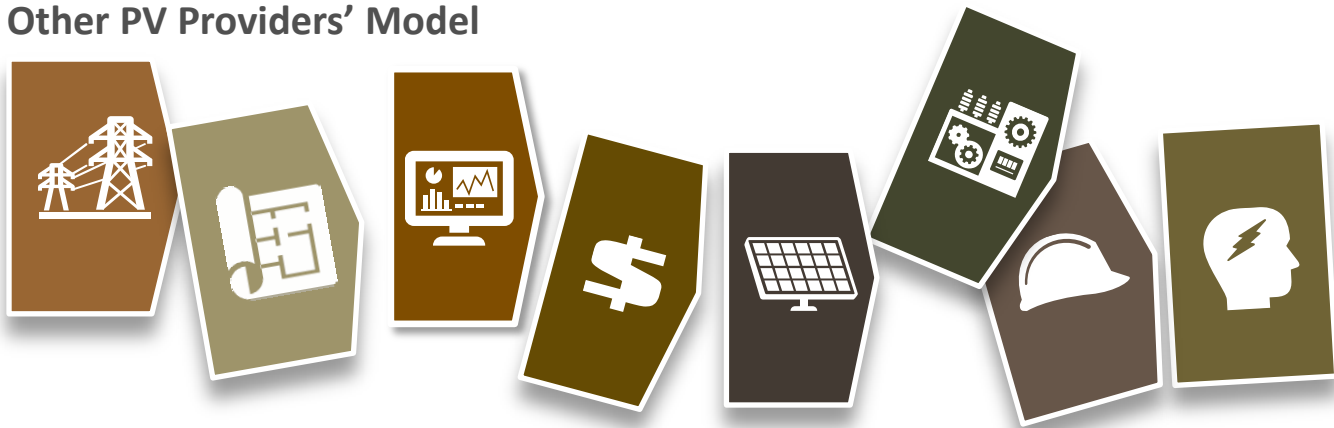
**BALANCE OF
SYSTEMS
TECHNOLOGIES**



**ADVANCED PV
MODULES**

The First Solar Advantage

Other PV Providers' Model



== More Cost
== & More Risk

First Solar's Model



== More Value
== & Less Risk

PV energy solutions with superior value and less risk

First Solar Grid Integration and Plant Control Systems



Grid Integration

- Actively stabilize the electricity grid and enhance its reliability
- Manage variability with existing infrastructure
- Offer significant value to plant owners and grid operators



ADVANCED PLANT FEATURES

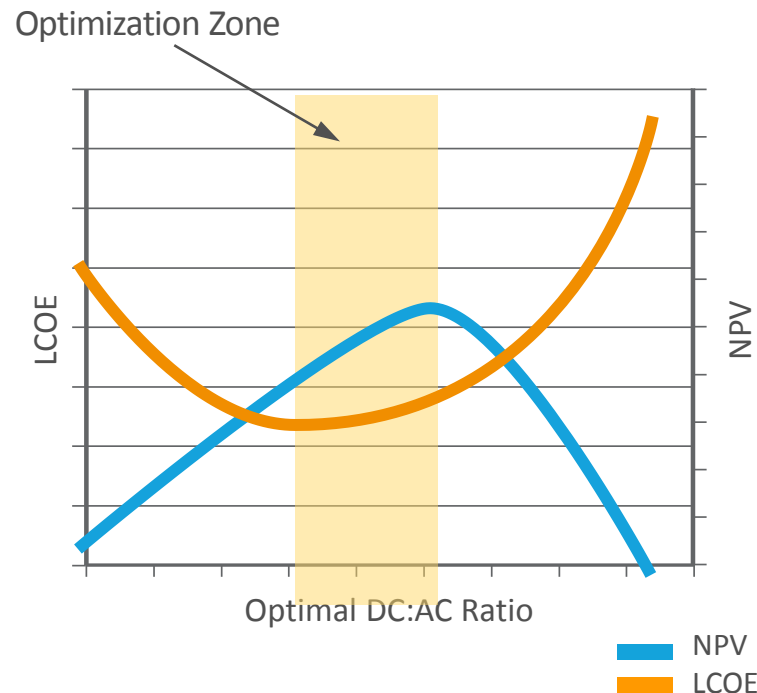
- ✓ Regulate voltage and power factor
- ✓ Control active and reactive power
- ✓ Control ramp rates
- ✓ Regulate frequency
- ✓ Fault ride through
- ✓ Curtailment impact mitigation

First Solar Plant Design & Engineering Services



Plant Design &
Engineering

- Configure power plants to respond to customer requirements
- Results are “by design” and based on continuous efforts (over 1000’s of iterations) to improve plant design
- Reduce LCOE and deliver stronger plant performance
- Optimize the right combination of design features (e.g. AC:DC ratio) with project financing
- Deliver project specific economics with stronger financial results
- Provide greater visibility and control over project cash flows



First Solar Project Development



Project Development

- Creates asset value by securing PPA, site control, permitting and financing
- Optimizes technology selection and engineering design for each project
- Developed the world's largest solar project pipeline
- Assumes project development risk for our customers prior to project financing
- Converted more PPA's to energy than anyone else in industry



Product Offerings

“ Together, **with our global partners**, we are enabling a world powered by clean, affordable solar electricity. ”

—Jim Hughes, First Solar CEO

ENERGY PRODUCTS
& Co Development
with Key Track
Record of
Bankability



SYSTEM
SOLUTIONS



COMPONENTS



First Solar Project Finance 1/2



Project Finance

- Strongest balance sheet and cash position amongst all solar competitors
- Unparalleled use of First Solar modules in debt financed projects around the world
- Financial institutions worldwide support First Solar technology

Bank of America

Bank of Tokyo-Mitsubishi UFJ

Bayern LB

BBVA Compass

CIMB BANK

citibank

COMMERZBANK

CRÉDIT AGRICOLE

CREDIT SUISSE

Deutsche Bank

DNB

DZ BANK
Bank on Germany



Goldman Sachs

Helaba
Landesbank
Hessen-Thüringen

HSBC

HSB NORDBANK

IFC

INTESA

SANPAOLO

J.P.Morgan

KeyCorp



LB BW

Maybank

MetLife

Morgan Stanley

NATIXIS

NORD/LB



RHB

Sabadell



SOCIETE GENERALE

SMBC
SUMITOMO MITSUI
BANKING CORPORATION

Sumitomo Corporation
of America

UnionBank

UniCredit

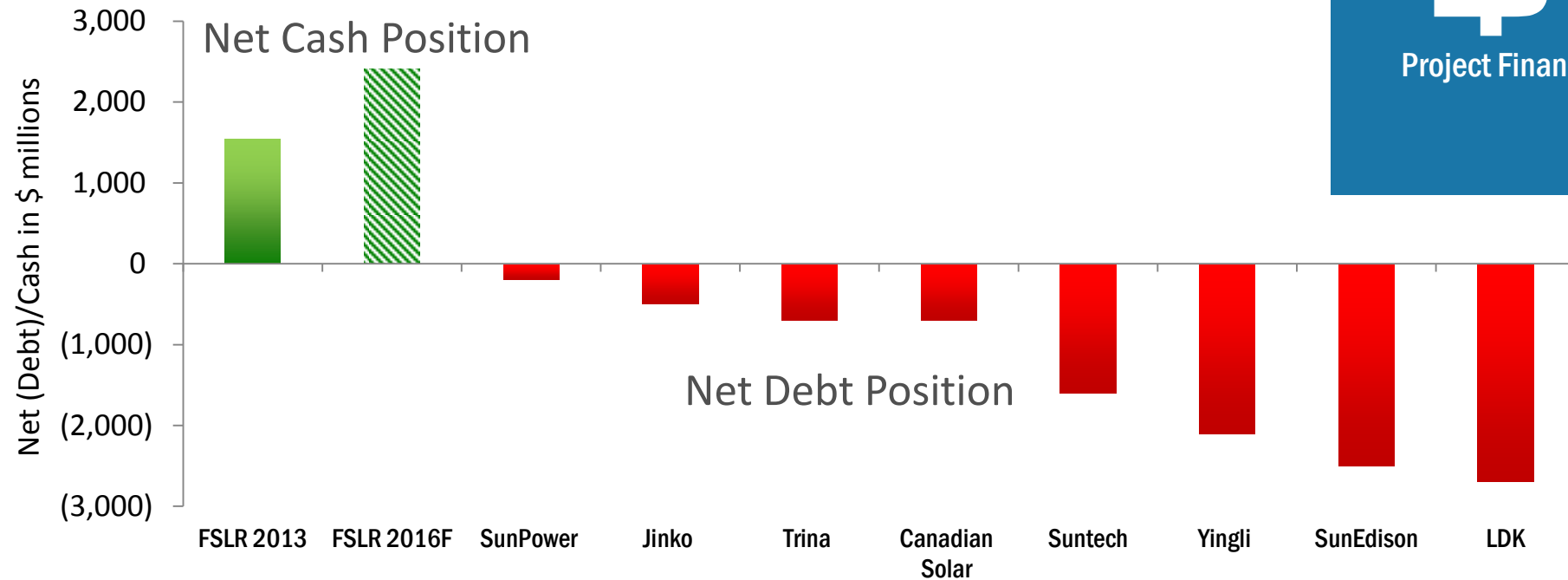


First Solar is BANKABLE

First Solar Project Finance 2/2



Project Finance



Net Debt as % of Revenue

N/A

8%

43%

39%

42%

default

103%

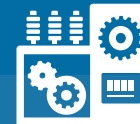
125%

default

Note: FSLR 2013 as of 4Q 13 actuals. FSLR 2016F per management guidance.

Other companies based on Photon Consulting estimates as of Jan 2014, except for Suntech which is based on estimate before default and filing for bankruptcy

First Solar Balance of Systems Technologies



**BOS & First Solar
Tracker**

- Optimize non-module components for total plant results
- Roadmaps aligned to create synergies and competitive advantage
- Proprietary First Solar Tracker

POWER CONVERSION COMPONENTS



PLANT CONTROL SYSTEM



PLANT SCADA



MOUNTING SYSTEMS



First Solar O&M – World's Largest Solar O&M Provider



MOST Experience & BEST Performance

- ✓ >2,500 MW_{dc} under operation + multi GW pipeline
- ✓ 2013 Fleet availability average 99.5% and 100% of expected energy

SUPERIOR Technology

- ✓ State-of-the-art First Solar operations center
- ✓ Proprietary solutions create high barriers to entry

BANKABLE Solutions

- ✓ >3.5 GW of projects financed
- ✓ Multiple O&M products to meet varying customer needs





First Solar Overview

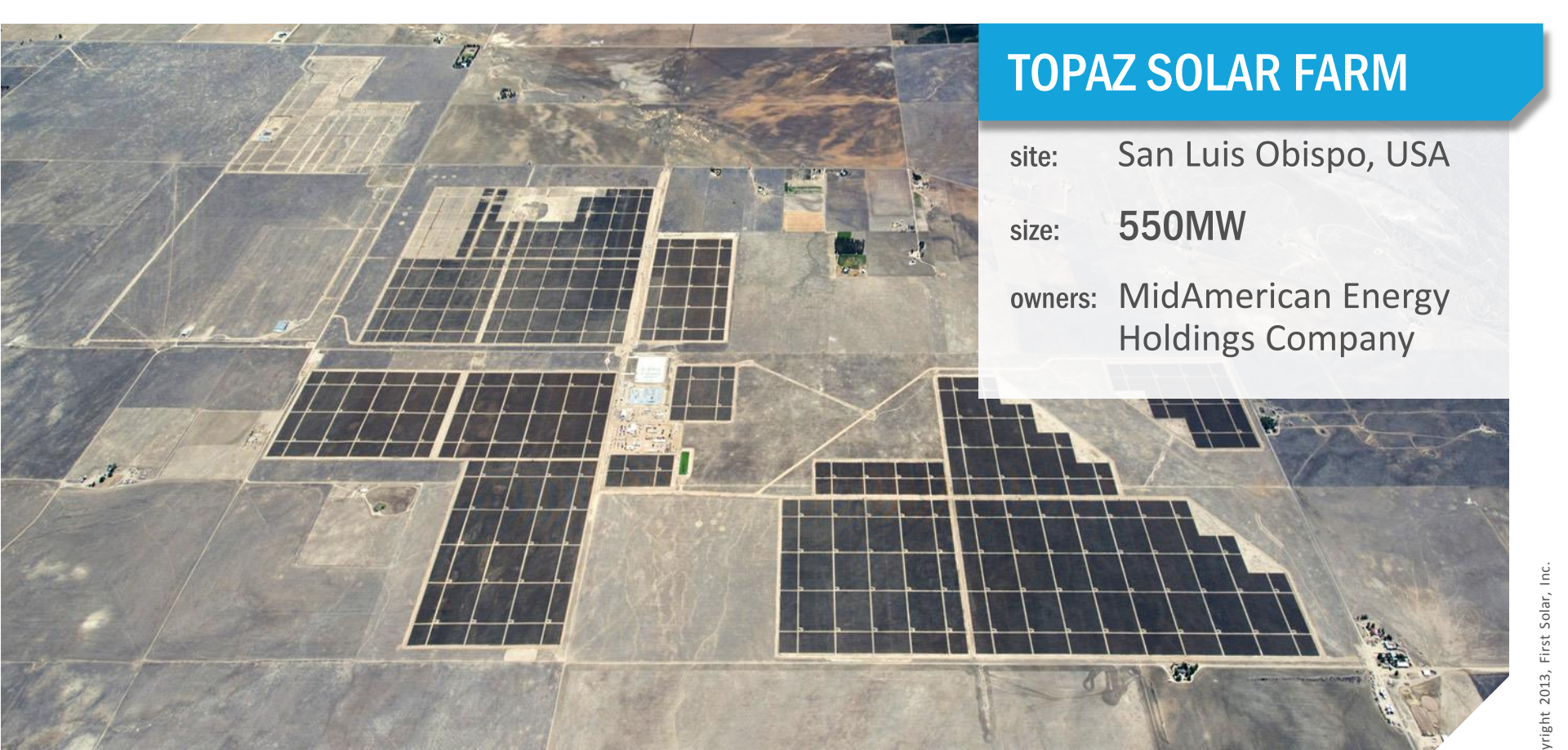
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8GW+ Global Installations





TOPAZ SOLAR FARM

site: San Luis Obispo, USA

size: **550MW**

owners: MidAmerican Energy
Holdings Company

First Solar Arranged for the Largest investment grade renewable bond in history = **US\$ 1 B**



AGUA CALIENTE

site: Yuma County, AZ, USA

size: **290MW**

owners: NRG Energy and
MidAmerican Solar

Reliable bulk power generation utilizing advanced plant controls and forecasting



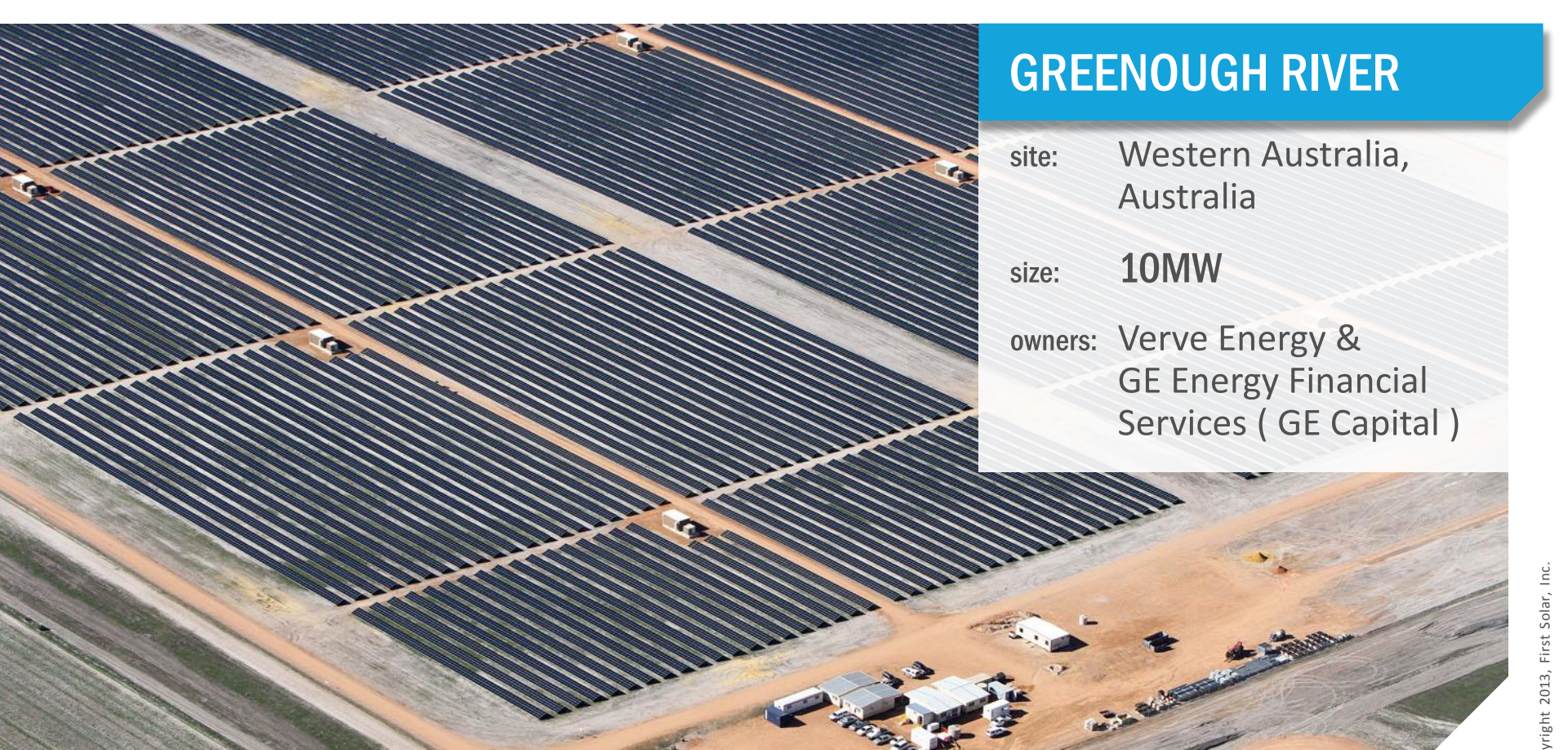
COPPER MOUNTAIN 1

site: Boulder City, NV, USA

size: **48MW**

owner: Sempra Generation

Co-located with existing gas combined cycle power plant



GREENOUGH RIVER

site: Western Australia,
Australia

size: **10MW**

owners: Verve Energy &
GE Energy Financial
Services (GE Capital)

Displacing the energy requirements of a desalination plant

Quick Deployment to Meet Immediate Needs



Phase I, Mohammed bin Rashid Al Maktoum Solar Park, Dubai (13MW)

30

Weeks from ground-breaking to grid-connection

1,280

Number of personnel onsite at the peak of construction activity

1,500,000

Incident-free man hours to complete the plant

Recognitions/Awards in the Middle East



Solar Project of the Year – Middle East



Power Project of the Year – UAE

Power Project of the Year – GCC



Finalist, 2015





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PROVEN ENERGY YIELD ADVANTAGE

- Superior temperature coefficient ($-0.29\%/^{\circ}\text{C}$) resulting in greater energy yield in typical field operating temperatures
- Superior spectral response yields proven energy yield advantage in humid environments



ADVANCED PERFORMANCE & RELIABILITY

- Improved long-term power-output and extended reliability test performance warranted for 25 years
- Independently tested to pass accelerated life and stress tests beyond industry standards
- Highly predictable energy in all climates and applications
- Independently certified for reliable performance in high temperature, high humidity, extreme desert and coastal environments

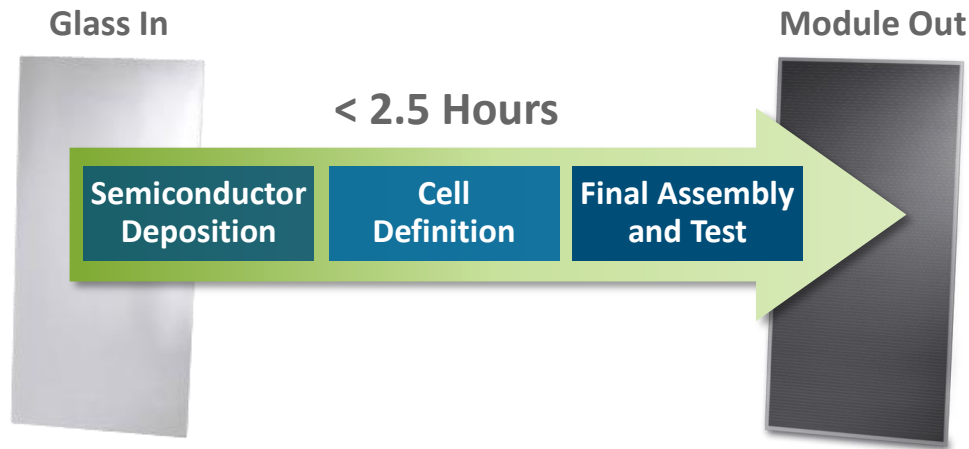


CERTIFICATIONS & TESTS

- Thresher Test, **Long-Term Sequential Test, and PID-Free¹ CERTIFIED BY TUV**
- IEC 61646, IEC 61730, CE, Safety Class II @1000 V
- IEC 61701 Salt Mist Corrosion, IEC 60068-2-68 Dust and Sand Resistance
- ISO 9001:2008 and ISO 14001:2004
- UL 1703 and ULC 1703 Listed Class B Fire Rating (Class A Spread of Flame)
- CSI Eligible (CA-USA), FSEC (FL-USA), MCS (UK), CEC Listed (Australia)



PV Module and Manufacturing Technology



- 98-99% reduction in semiconductor material
- Fully integrated, continuous process vs. batch processing
- Large 60x120cm (2'x 4') substrate vs. 6" wafers

Conventional Crystalline Silicon Batch Technology

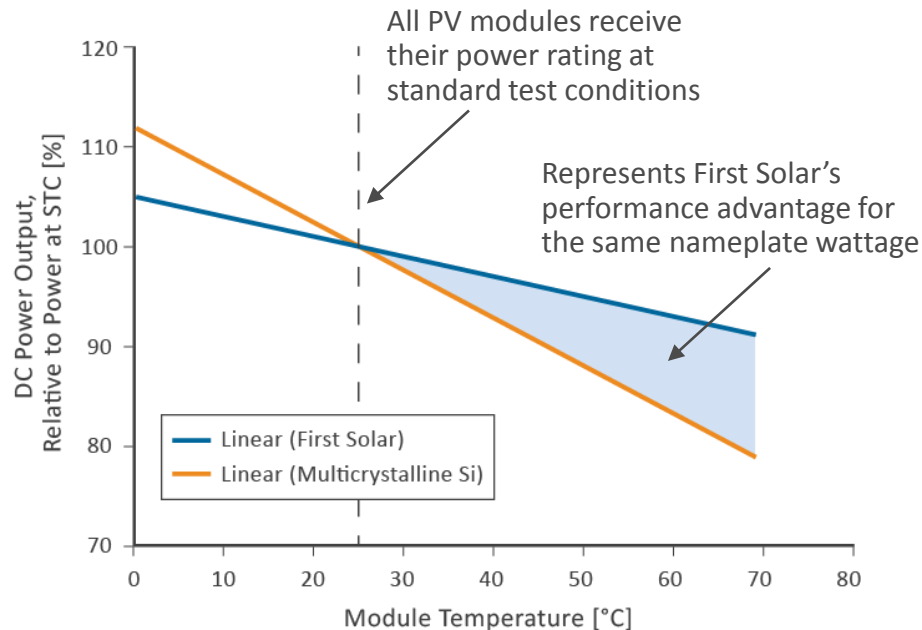


First Solar Fully Integrated, Automated and Continuous Thin Film Process



Real World Performance Analysis

Proven Real World Performance Advantage vs. c-Si



Temperature Dependence of First Solar and Multicrystalline Silicon DC Power Output

Superior temperature coefficient of FS yields more energy on annual basis on hot and humid weather

Temperate climate example:

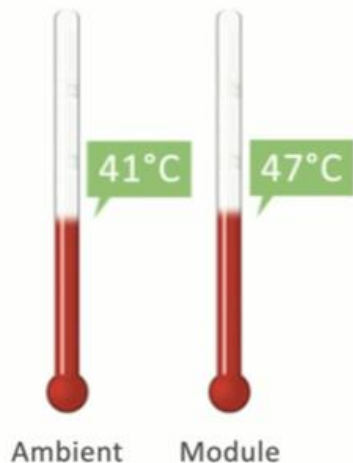
- Module temperatures often reach 65°C (40°C above the STC rating)
- Silicon module power output will be reduced by up to 20% at this temperature
- FS output will be reduced by only 10%

Hot Climates:

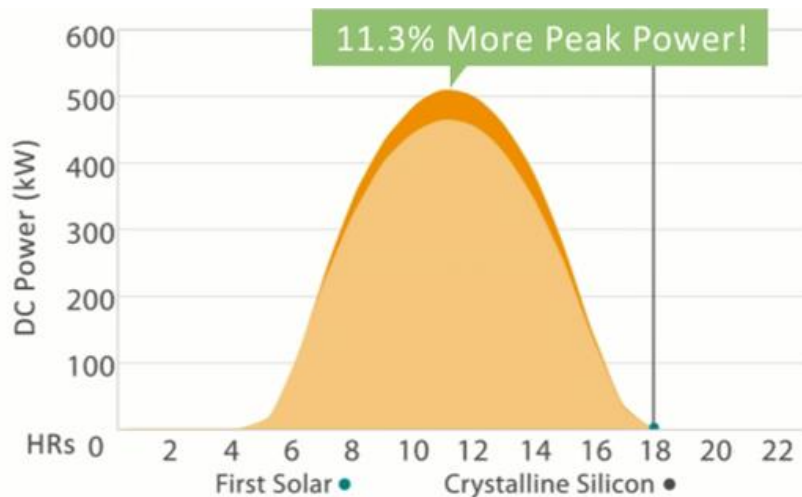
- More hours at higher temperatures (Module temps can reach 85°C)
- FS advantage grows more pronounced

First Solar Energy Yield Advantage

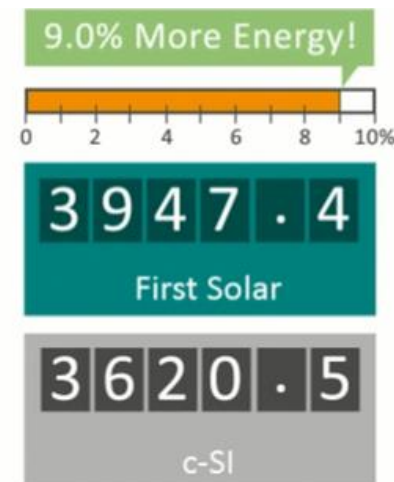
Temperature (°C)



Instantaneous Power (kW)

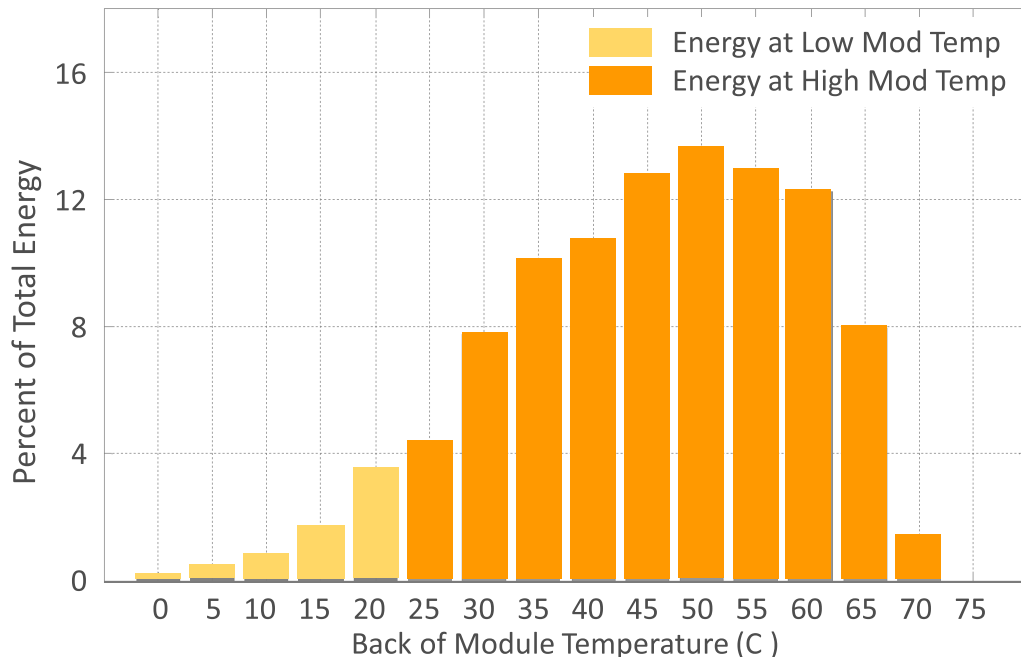


Accumulated Energy (kWh)



Performance vs. c-Si in Hot Climates

Frequency of Module Temperatures in Desert Climate



$T > 25^{\circ}\text{C}$



>90% of Generation when
First Solar has yield advantage

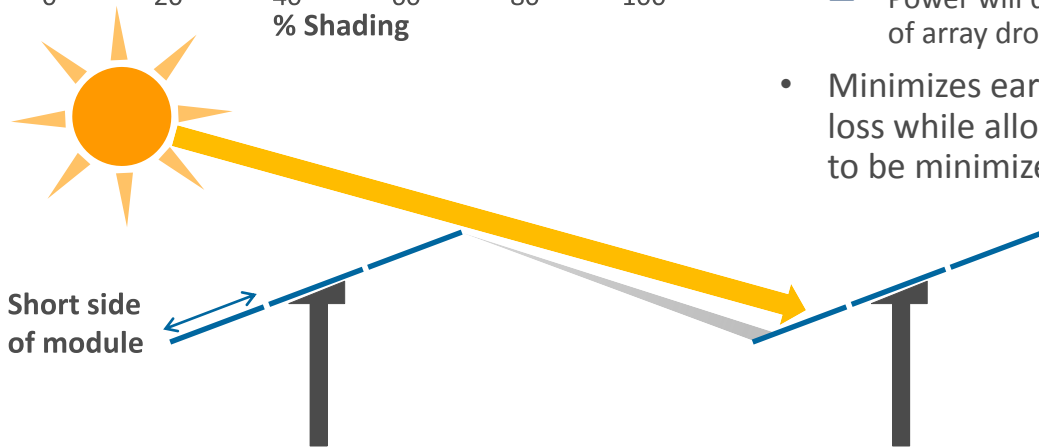
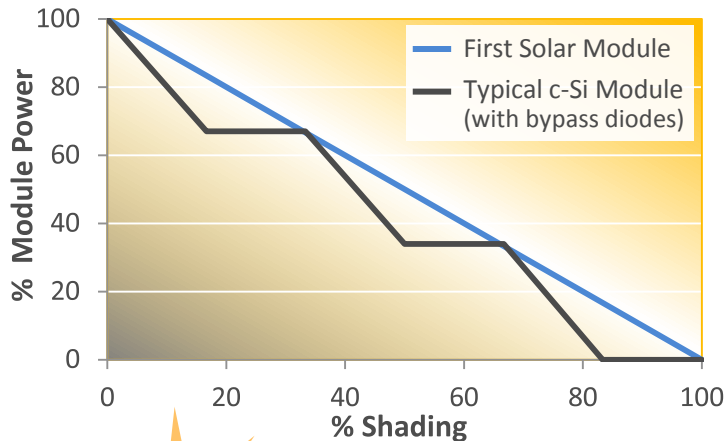
$T > 45^{\circ}\text{C}$



>60% of Generation when
First Solar has >5% Yield Advantage

First Solar Has Energy Yield Advantage vs. c-Si Majority of Time

Effects of Shading vs. c-Si



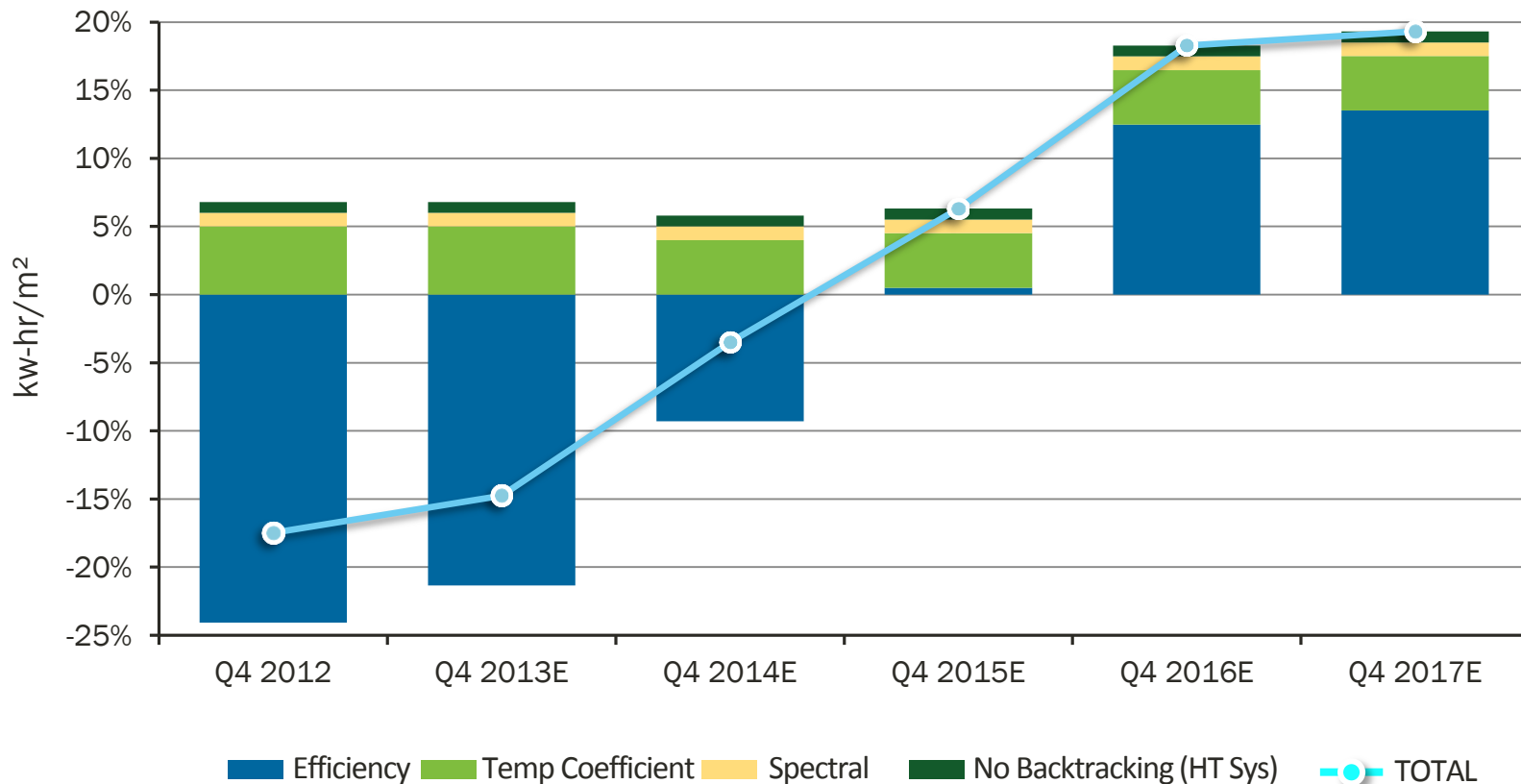
- Robust against shading in landscape orientation (perpendicular to cells)
- FSLR power loss is ~proportional to shading
 - 10% shading = ~10% power loss
- Typical c-Si power loss is not proportional
 - 10% shading = ~30% power loss¹
- This result extends to array-level performance
 - Power will drop to zero when voltage of array drops below inverter limit
- Minimizes early morning and late evening energy loss while allowing row spacing (array footprint) to be minimized

¹ Partially Shaded Operation of a Grid-Tied PV System, Chris Deline, National Renewable Energy Laboratory (@ >800W/m²)



Module Roadmap

FS will have a significant energy density **advantage** relative to c-Si



c-Si efficiency roadmap based on 3rd party analyst consensus



Module Reliability

PV Module Reliability – Raising the Bar

Traditional IEC Tests



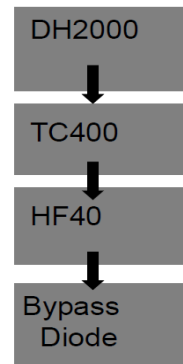
2X-4X

Leading Edge Reliability

Comparative Testing: Types

Long-Term Sequential Testing

Conventional Extended Testing



vs.

"Thresher Test"

TC400

DH2000

HF40

Sequential	Extended
Multi-variable & variable preconditioning	Single-variable & No variable preconditioning



- Traditional IEC tests form basic foundation of PV module durability and reliability testing...no longer 'gold standard'
- Thresher and Long Term Sequential are leading edge extended lifetime tests that truly differentiate long term field performance

1st Thin-Film PV Module to pass Thresher & TUV Long Term Sequential Test ! - TUV Rheinland July 2013

http://www1.eere.energy.gov/solar/pdfs/pvmrw12_wedsam_tuv_tamizhmani.pdf

http://www1.eere.energy.gov/solar/pdfs/pvmrw2011_csi_thresher.pdf

First Solar Long-Term Module Stability Data



- Longest-Available Data Since (NREL) 1995
- Improving Characterize Degradation Rates
 - Outdoor field testing of climate impact
 - Reliability test arrays
 - Commercial arrays starting 2002
 - Germany, Spain, Desert SW US
 - Accelerated Life Testing (ALT)
 - Randomized module selection
 - Chamber testing on site to measure total performance delta and distribution
- Continuing efforts to improve/
correlate ALT with field data

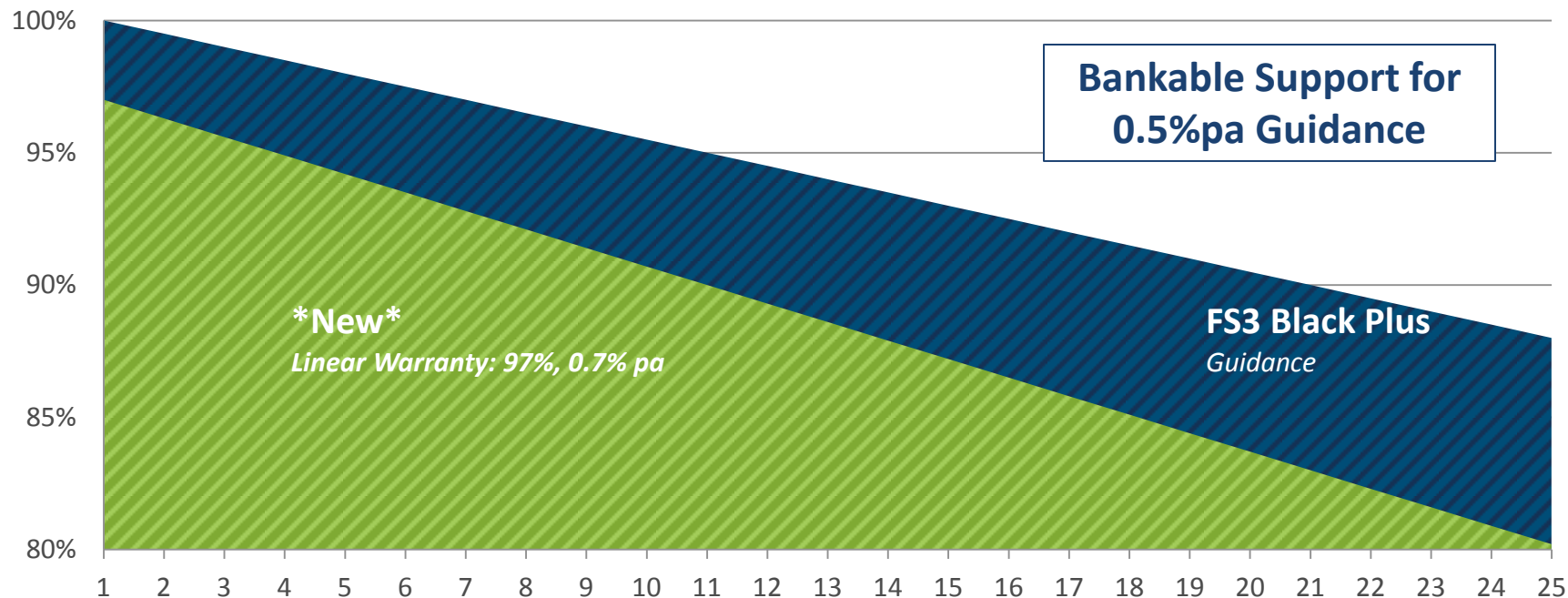


FS3 Black Plus: New Standard Warranty Shape



Improved Warranty Shape: Linear Power Output

100% represents Nameplate Watts



Environmental Benefits of First Solar Modules



CdTe PV carbon footprint is a fraction of conventional sources

Fastest Energy Payback Time of Current PV Technologies

$$\text{EPBT} = E_{\text{input}} / (E_{\text{output}} / \text{yr})$$



Collection & Recycling available if required at competitive price



Creating enduring value by enabling a world
powered by clean, affordable solar electricity.

