

FIRST SOLAR PLANT PERFORMANCE IN SOUTHEAST ASIA



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With more than 1000MW of First Solar's photovoltaic (PV) thin-film module technology installed world wide, First Solar continues to set performance records in both research and real-world environments. Collectively, solar plants using First Solar thin-film PV modules are performing above expectations, validating the modeling guidance and demonstrating the performance and reliability advantages inherent to First Solar's technology.

It is well understood that PV module semiconductors perform differently depending on the environmental conditions in which they are installed. The large-scale solar plants in operation across Southeast Asia and Asia Pacific importantly provide local validation of the spectral, temperature and shading response of First Solar's semiconductor.

The anticipated energy yield advantage of First Solar's modules is up to 10% compared to equivalent crystalline silicon (c-Si) modules at the same locations. This advantage is of particular importance in hot and humid climates such as Southeast Asia, where First Solar's high efficiency thin-film modules have an increased energy yield advantage due to a superior temperature coefficient, better shading response and better spectral response.

When evaluating return on investment for a solar power plant, energy yield has one of the biggest impacts on the overall Levelized Cost of Electricity (LCOE).

First Solar's high efficiency modules are proven to deliver significantly more usable energy per nameplate watt than conventional silicon-based modules. For an equivalently designed and installed power plant priced at the same \$/watt, a First Solar plant will produce more energy, resulting in a lower LCOE (\$/MWh).

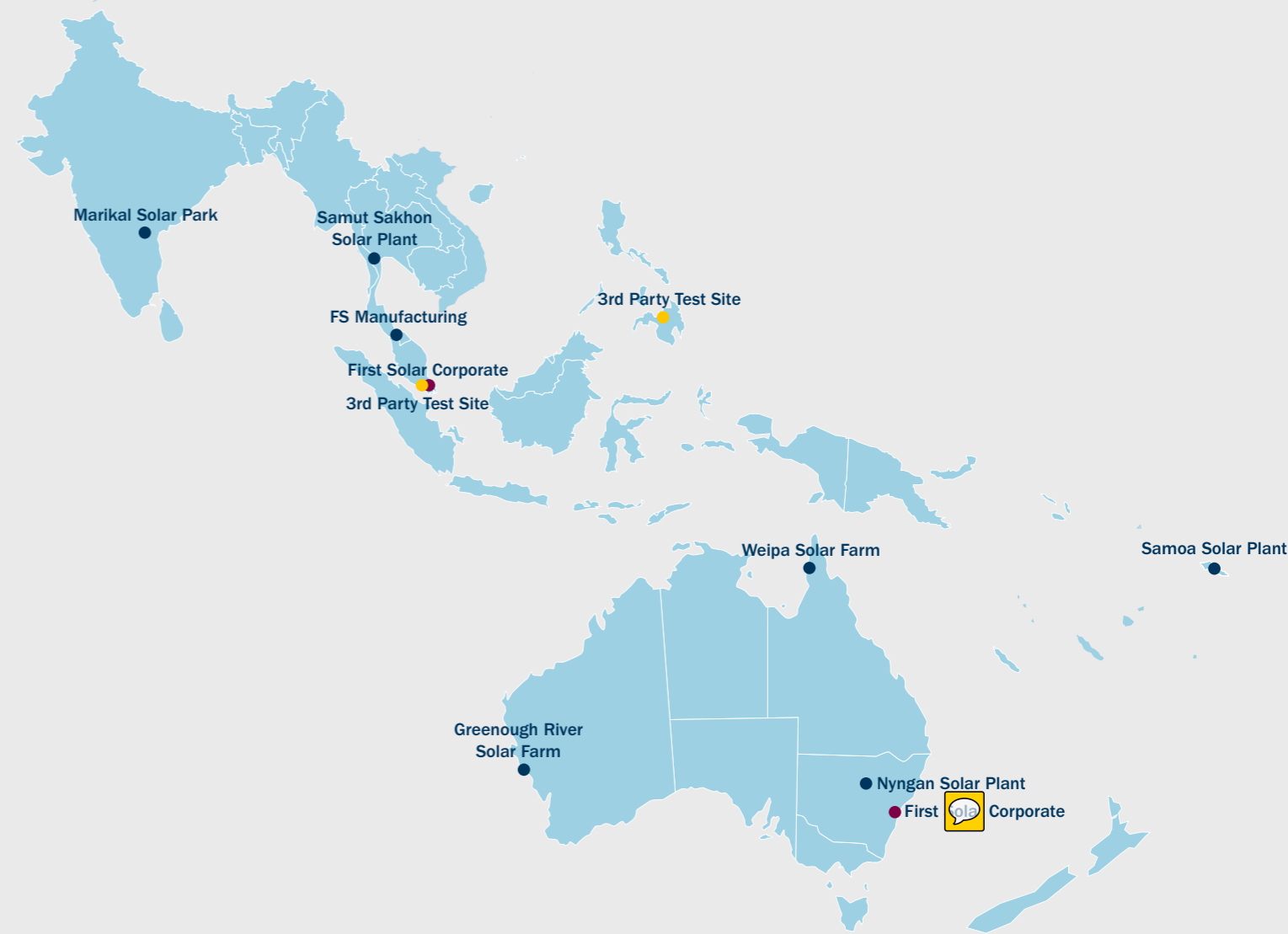
The real world data from these plants validates the expected yield benefits and confirms the stability of the technology during initial years of operation. Coupled with long-term international performance data, including a 21+ year independently maintained NREL study, this further bolsters confidence in First Solar's degradation guidance and product reliability.

As the best source of credible long-term solar energy performance data in the region, the performance of these plants demonstrates that large-scale solar is a proven, reliable and bankable source of power generation.

UP TO **10%**
PERFORMANCE
ADVANTAGE
OVER C-SI



The performance of these plants demonstrates that First Solar's technology advantage is proven, reliable and bankable in real-world applications.



PROJECT OVERVIEW

KEY STATISTICS

Capacity/Generation	Samut Sakhon Solar Plant	Samoa Solar Plant	Weipa Solar Farm	Greenough River Solar Farm	Marikal Solar Park	Nyngan Solar Plant
MW	10MW DC	3.5MW AC	1.2MW AC	10.2MW AC	10MW AC	102.1MW AC
Period MWh (expected) ¹	12,067	1,822	1,972	22,803	19,047	196,709
Period MWh (actual) ²	12,463	1,850	2,136	23,256	19,421	202,086
Performance						
Actual in Excess of Expected ³	3.06%	1.57%	0.78%	1.22%	1.96%	2.91%
Spectral Shift Advantage ⁴	3.83%	3.70%	3.60%	1.08%	1.83%	0.43%
Yield Advantage vs. c-Si ⁵	8.22%	7.12%	8.15%	6.67%	6.93%	4.55%

References: 1. Expected energy yield adjusted for measured site weather conditions and according to First Solar energy prediction methods. Excludes availability. 2. Measured energy yield at the interconnection. 3. Excess energy of Annual GWh (expected) versus Annual GWh (actual). 4. Calculated spectral shift based on measured site weather data. 5. Calculated yield advantage based on actual weather excluding inverter clipping.

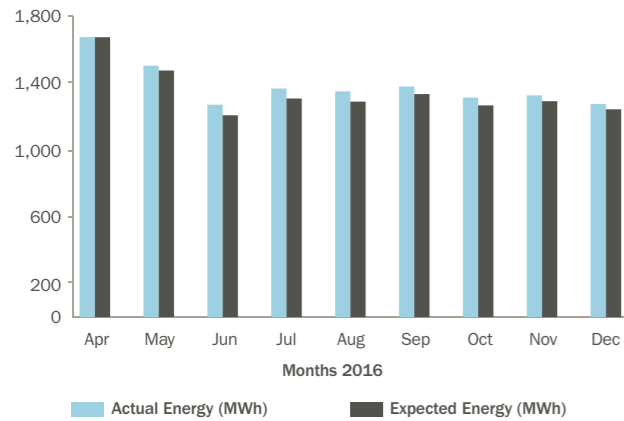
SAMUT SAKHON SOLAR PLANT

Commencement Date: December 2015
Capacity: 10.2MW DC
Number of Modules: 91,450
Module Type: Series 4 V2
Mounting Structure: Fixed
Latitude: 13°28'48"N
Longitude: 100°4'11.99"E
Owner: Symbior

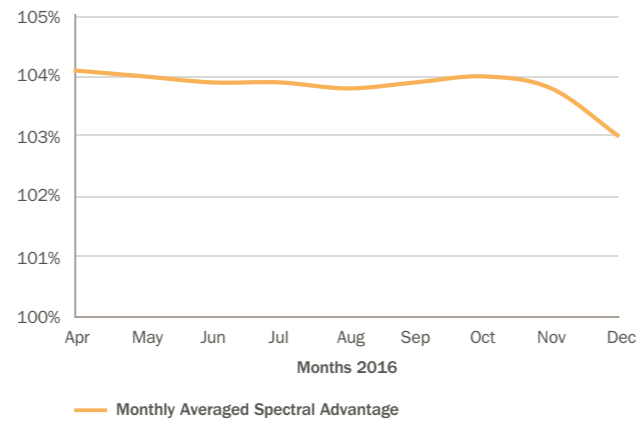
The Samut Sakhon Solar Plant is situated on approximately 13.5 hectares of land in Samut Sakhon, Thailand in a hot and humid climate. Since completion of the project in December 2015 the plant has demonstrated superior performance.

- **Actual vs. Expected:** On average, the plant is exceeding expected energy by 3.06%.
- **Spectral Shift:** The plant demonstrates a monthly spectral shift of 3.0% to 4.1% (3.83% average).

Actual vs. Expected Performance



Spectral Advantage



+8.2%
PERFORMANCE ADVANTAGE
OVER C-SI

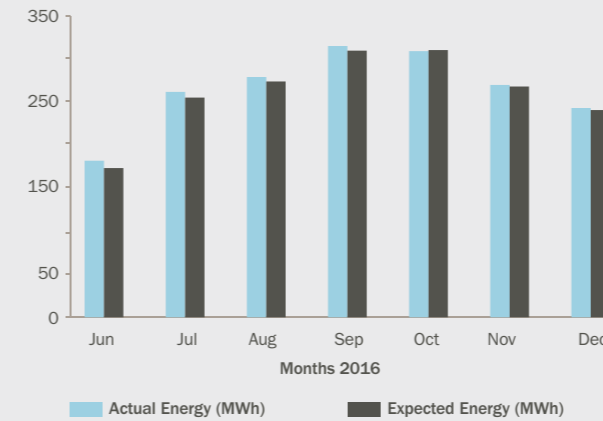
SAMOA SOLAR PLANT

Commencement Date: May 2016 (stage one)
Capacity: 3.5MW AC
Number of Modules: 47,000
Module Type: Series 4 V2
Mounting Structure: Fixed E-W
Latitude: 13°50'25.65"S
Longitude: 171°48'30.39"W
Owner: Solar for Samoa

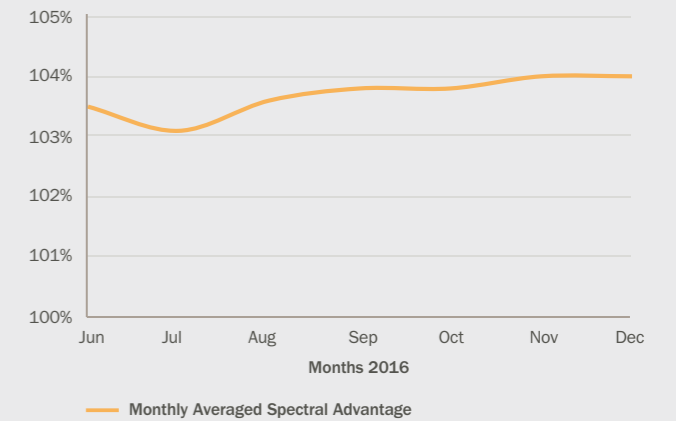
The Samoa Solar Plant is located in two sites in Samoa at 1.4MW and 2.1MW. Stage one of the plant near the Faleata Racecourse has been operational since May 2016 and is demonstration of our spectral response in hot and humid climates.

- **Actual vs. Expected:** On average, the plant is exceeding expected energy by 1.57%.
- **Spectral Shift:** The plant demonstrates a monthly spectral shift of 3.1% to 4.0% (3.7% average).

Actual vs. Expected Performance



Spectral Advantage



+7.1%
PERFORMANCE ADVANTAGE
OVER C-SI

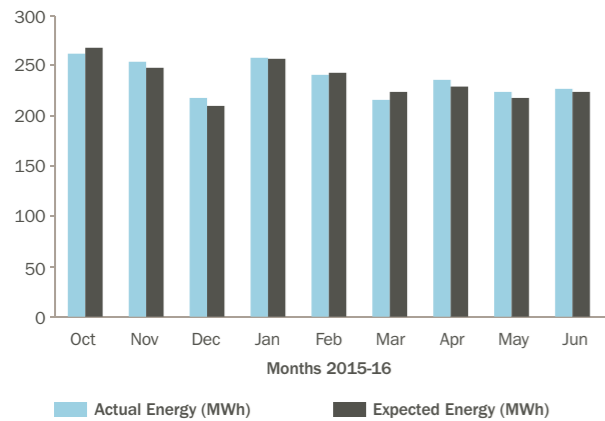
WEIPA SOLAR FARM

Commencement Date: September 2015
Capacity: 1.2MW AC
Number of Modules: 18,000
Module Type: Series 3 Black Plus
Mounting Structure: Fixed
Latitude: 12°38'53.1 S
Longitude: 141°51'33.3 E
Owner: Weipa Solar Farm Pty Ltd

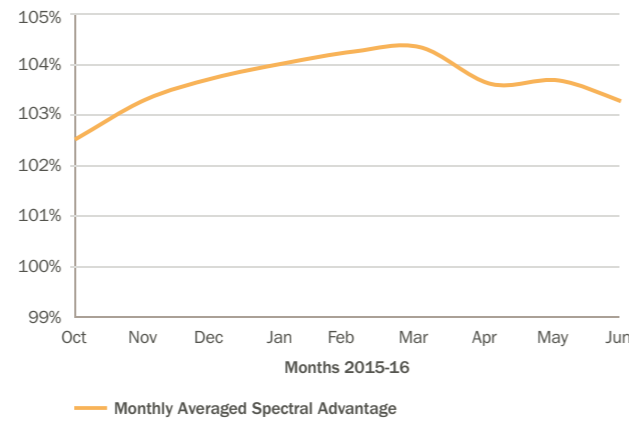
The Weipa Solar Farm is the first commercial diesel displacement solar plant in Australia and demonstrates the technical and economic potential of using solar PV to power remote mine operations, as well as the performance advantage of First Solar modules in a high-humidity environment.

- **Actual vs. Expected:** On average, the plant is exceeding expected energy by 0.78%.
- **Spectral Shift:** The plant demonstrates a monthly spectral shift of 2.3% to 4.4% (3.6% average).

Actual vs. Expected Performance



Spectral Advantage



+8.2%
**PERFORMANCE
 ADVANTAGE**
 OVER C-SI

Image courtesy of AGL Energy Limited

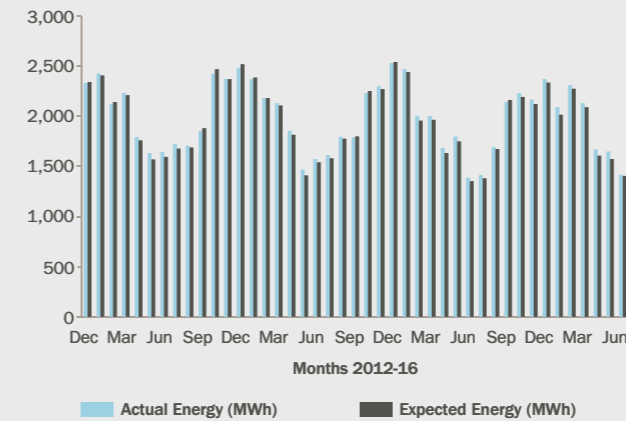
GREENOUGH RIVER SOLAR FARM

Commencement Date: October 2012
Capacity: 10.2MW AC
Number of Modules: 152,880
Module Type: Series 3
Mounting Structure: Fixed
Latitude: 28°54'14.3 S
Longitude: 115°6'41.6 E
Owner: Synergy & GE Energy Financial Services

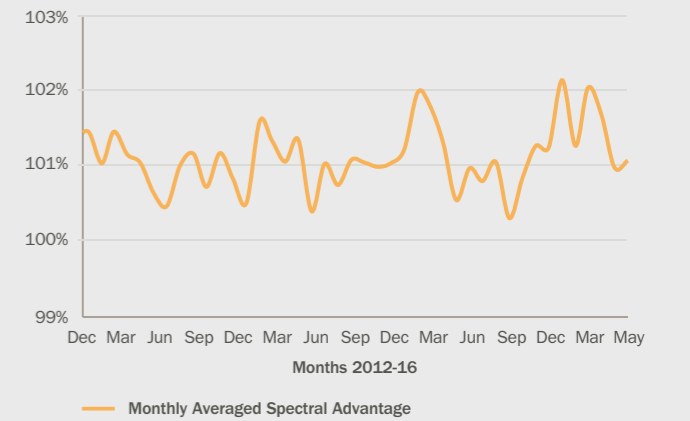
The Greenough River Solar Farm is Australia's first commissioned and operational large-scale solar plant. The plant is approaching its fourth year of operation and provides the longest credible data source for large-scale solar in Australia.

- **Actual vs. Expected:** On average, the plant is exceeding expected energy by 1.22%.
- **Spectral Shift:** The plant demonstrates a monthly spectral shift of 0.3% to 2.0% (1.08% average).

Actual vs. Expected Performance



Spectral Advantage



+6.7%
**PERFORMANCE
 ADVANTAGE**
 OVER C-SI

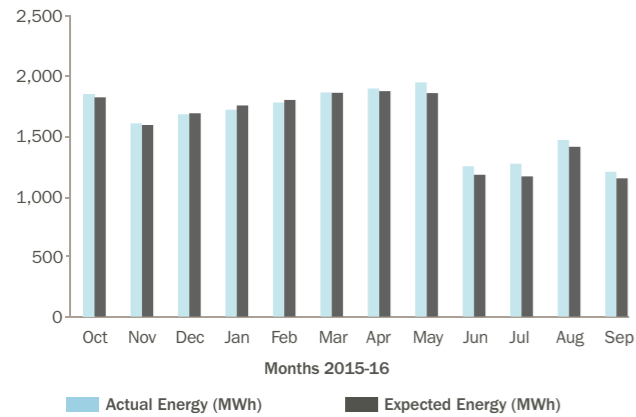
MARIKAL SOLAR PARK

Commencement Date: June 2015
Capacity: 10MW AC
Number of Modules: 126,270
Module Type: Series 3 Black Plus
Mounting Structure: Fixed
Latitude: 16°37'35.0 N
Longitude: 77°39'56.3 E
Owner: Marikal Solar Parks

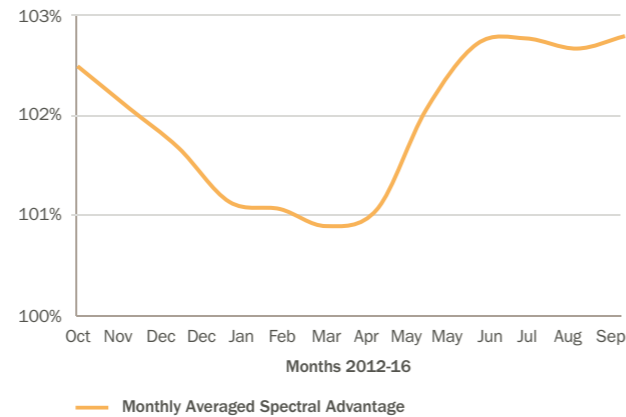
The Marikal Solar Plant is situated at the Dhanwada village of Mahabubnagar, which is approximately 150 kilometers from Hyderabad in Telangana. The plant has been operational since June 2015 and is demonstration of strong performance in a variable climate.

- **Actual vs. Expected:** On average, the plant is exceeding expected energy by 1.96%.
- **Spectral Shift:** The plant demonstrates a monthly spectral shift of 0.9% to 2.8% (1.8% average).

Actual vs. Expected Performance



Spectral Advantage



+6.9%
PERFORMANCE ADVANTAGE
 OVER C-SI

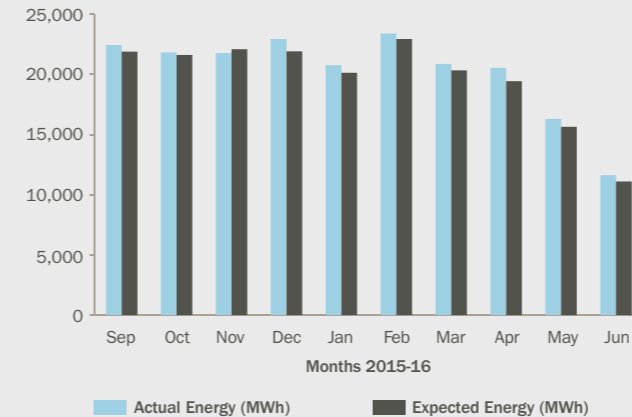
NYNGAN SOLAR PLANT

Commencement Date: June 2015
Capacity: 102.1MW AC
Number of Modules: 1,385,190
Module Type: Series 3 Black Plus
Mounting Structure: Fixed
Latitude: 31°33'32.9 S
Longitude: 147°5'3.1 E
Owner: AGL Energy Limited

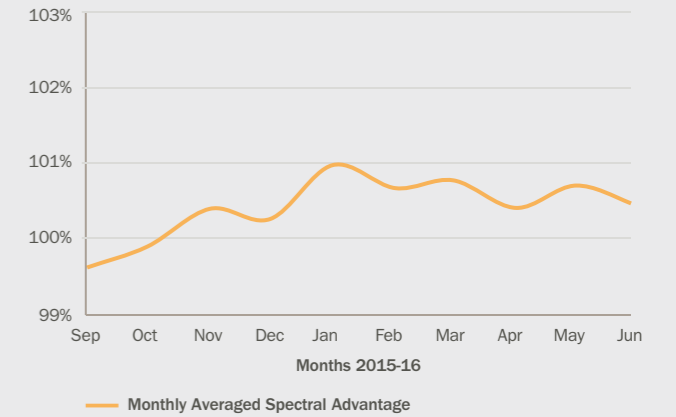
The Nyngan Solar Plant is Australia's largest PV installation and was the first NEM connected plant above 30MW at its completion in mid-2015, a significant milestone for the industry.

- **Actual vs. Expected:** On average, the plant is exceeding expected energy by 2.91%.
- **Spectral Shift:** The plant demonstrates a monthly spectral shift of -0.4% to 1.0% (0.43% average).

Actual vs. Expected Performance



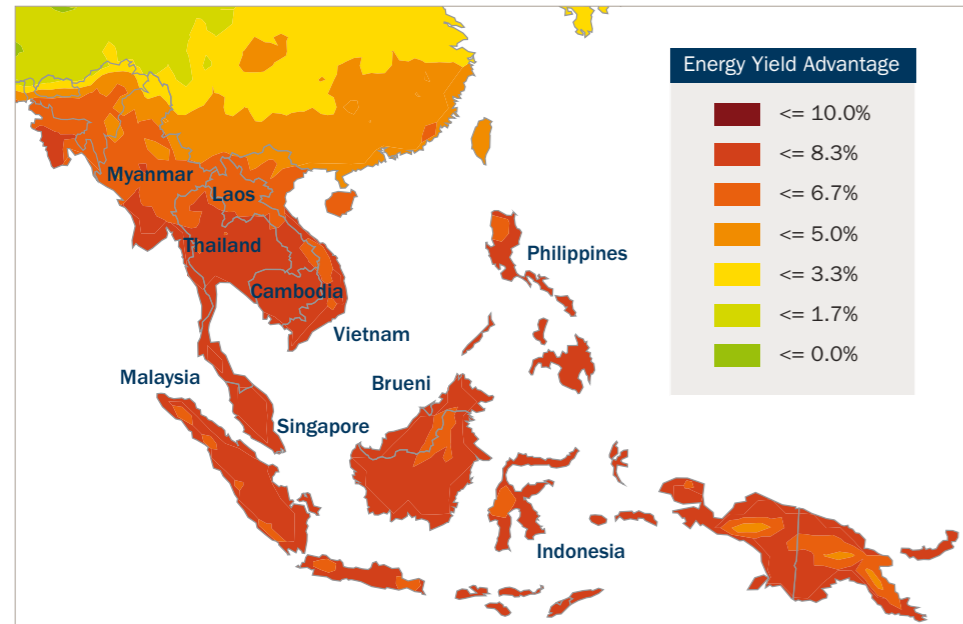
Spectral Advantage



+4.6%
PERFORMANCE ADVANTAGE
 OVER C-SI

Image courtesy of AGL Energy Limited

ENERGY YIELD ADVANTAGE IN SOUTHEAST ASIA



First Solar's high efficiency modules have a proven annual specific energy yield advantage, delivering more usable energy per nameplate watt than conventional c-Si modules.

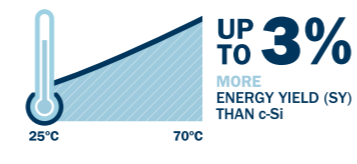
Annual specific energy yield captures operating data over a year of module performance during varying real-world conditions where temperature, sunlight intensity and solar spectrum all change throughout the days and seasons.

This energy yield advantage relative to silicon-based modules is especially profound in hot and humid climates such as Southeast Asia, delivering up to 10% more usable energy per nameplate watt than competing technologies.

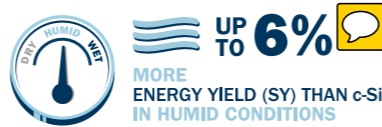
First Solar technology delivers more energy, more consistently, over the lifetime of the power plant.

ENERGY YIELD

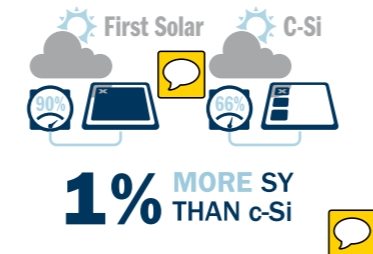
Superior Temperature Coefficient



Better Spectral Response



Better Shading Response



INDUSTRY LEADING RELIABILITY

Predictable lifetime energy is critical to confidently project the expected value of the sellable energy from a PV plant designed for long-term operation.

First Solar's modules are the first and only thin-film modules, and one of five PV modules in the world, to pass the Thresher reliability and Long-term Sequential tests, indicating best in class long-term performance, degradation, and durability in the harshest operating conditions.

First Solar modules have been verified by independent engineers and certified to international performance and safety standards by third party laboratories around the world. Independently monitored by NREL, First Solar modules have a documented median power degradation of just 0.26% per year.

This low degradation rate positively impacts the long-term reliability and LCOE over the life of the entire power plant by maximising value and minimising risk.

Furthermore, First Solar has one of the largest databases of PV installations and with supporting data from over a decade of monitoring can provide highly predictable estimates of future module degradation.

0.26%
14+ YEAR NREL DEGRADATION STUDY

Extended 3rd Party Reliability Tests

- Independent Thresher Test
- TUV Long-term Sequential Test
- Fraunhofer - PVDI Rating
- Atlas 25+

Product Reliability Monitoring

- Temp Cycle -40° to +85°C 600 Cycles
- Damp Heat 85°C/85%RH 2000 hrs
- Humidity Freeze 40 cycles

Environmental Resistance

- PID Free
- IEC 601701 Salt Mist Corrosion
- IEC 60068 Desert Sand Resistance
- Ammonia Resistance



MANUFACTURING KULIM, MALAYSIA

First Solar has a proud history of manufacturing in South-East Asia as well as the United States.

First Solar runs its leading global manufacturing facility from a 160-acre site at the Kulim Hi-Tech Park in Kedah, Malaysia.

The facility has undergone astronomical growth over the past eight years and is the top exporter from the port of Penang, with a total annual manufacturing capacity in 2016 in excess of 2,500MW.

The Kulim facility employs local associates from the region, providing the Malaysian community with reliable high-tech jobs that span the entire manufacturing spectrum.

First Solar is committed to manufacturing the industry's best thin film PV modules while providing superior safety and security to employees.



First Solar modules have the smallest carbon footprint of any available PV technology



This facility is certified in Quality, Environmental Management and Occupational Health and Safety. To ensure optimum working conditions for employees, comprehensive environmental health and safety protocols and procedures are conducted regularly.

This landmark facility is also paving the way in environmental innovation and solutions by operating a full recycling facility to minimize the potential for modules to be disposed of as municipal waste.

The program increases resource efficiency by recovering over 90% of glass and semiconductor materials for use in new modules and other products.

First Solar's Kulim site is a model facility for the manufacturing of safe and sustainable solar technology.

The PV modules produced here help First Solar to maximize value and minimize risk for our customers and partners around the world.

13.5GW+
SOLD WORLDWIDE

ISO9001:2008
ISO14001:2004
OHSAS
18001:2007
CERTIFIED



First Solar.

FIRST SOLAR PTY LTD

First Solar is a leading global provider of comprehensive photovoltaic (PV) solar systems using advanced module and system technology. Through determined innovation, we have achieved a significant milestone by delivering solar energy that is an economically attractive alternative to fossil-fuel sourced electricity.

From module sales through turnkey power plant development, First Solar is a reliable, world-class partner for clean, renewable energy generation. With over 13.5GW of modules sold today, First Solar has a demonstrated history of financial stability and manufacturing success. As a project partner, we bring extensive expertise into how today's PV power plants are developed, financed, designed, constructed and operated to maximize profitability for our customers and strategic partners.

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