

TECHNOLOGY BEHIND THE WORLD'S LARGEST BIFACIAL PV POWER PLANT

Ashok Sinha, Chairman & CEO
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Miyazaki, Japan



- 12.8MW
- Cost-competitive
- Eco-friendly

Empowering the Sun from
all Directions

Our detailed Value Proposition includes putting Bifacial HCT PV on the map and changing the status quo for sophisticated urban settings

- ~50 MW deployed in 24 countries
- Utilitarian PV → Artistic Design
- Functional → Beauty + Function



Changing the Status Quo

I. The most powerful panels around

- I. 310 to 510W STC
- II. 350 to 585W BFB 15%
- III. Integrated Optimizer option

II. Designed for adverse environments

- I. Partial shade, Low & Diffuse lighting
- II. Heat, Dust & Storms
- III. Corrosive marine conditions

III. Leapfrog Design

- I. Double glass
- II. Frameless
- III. World-class aesthetics

IV. Innovative HCT Platform

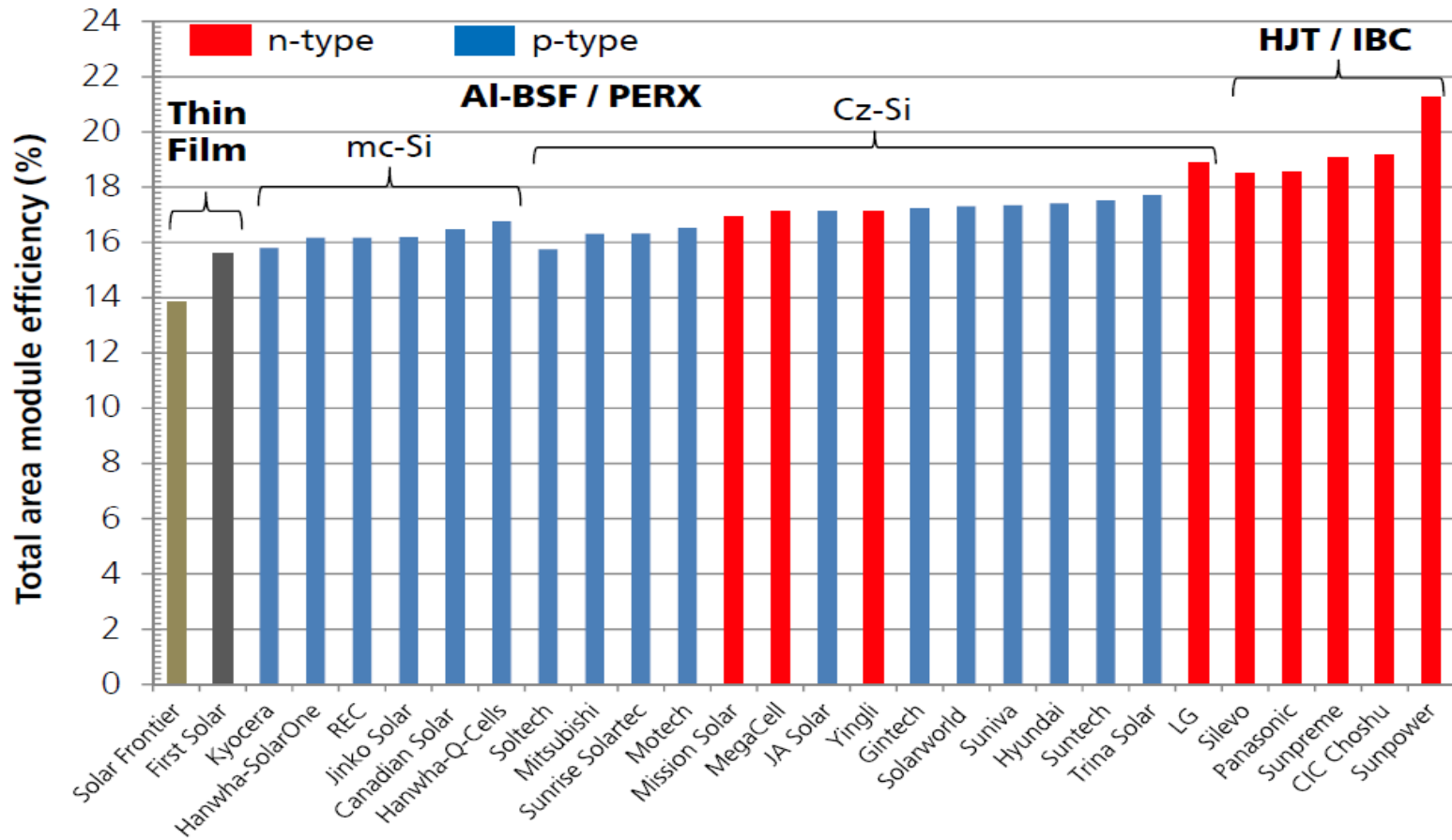
- I. Cell efficiency to 23.5%
- II. Module efficiency to 22.5% with BFB
- III. Hi Voc (720 – 750 mV), Lo TCE (-0.27%/C)

V. Low Cost with Quality that lasts

- I. Intelligent Lean Manufacturing
- II. Top Fire Class A rating, wind rating to 300 km/h
- III. Easy Installation at 15° tilt for low O&M

Sunprime is independently ranked among top 3 global providers

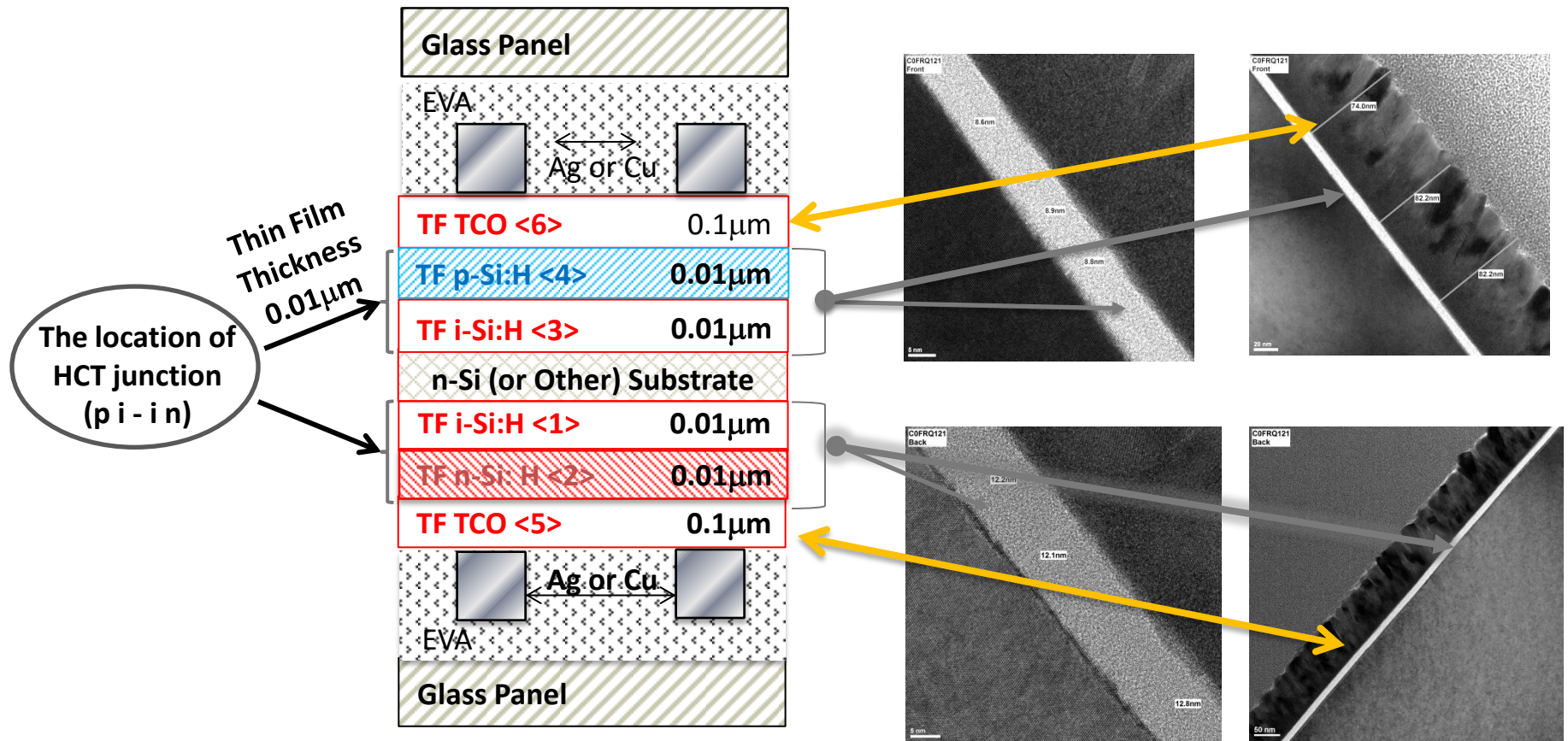
Current Efficiencies of Selected Commercial PV Modules Sorted by Bulk Material, Cell Concept and Efficiency



Note: Exemplary overview without claim to completeness; Selection is primarily based on modules with highest efficiency of their class and proprietary cell concepts produced by vertically integrated PV cell and module manufacturers; Graph: Jochen Rentsch, Fraunhofer ISE. Source: Company product data sheets. Last update: Nov. 2015.

Sunpreme HCT cells in Bifacial double glass modules

Showing the location of deposited junctions of p-i// i-n a-Si:H ultra thin films on Si substrate

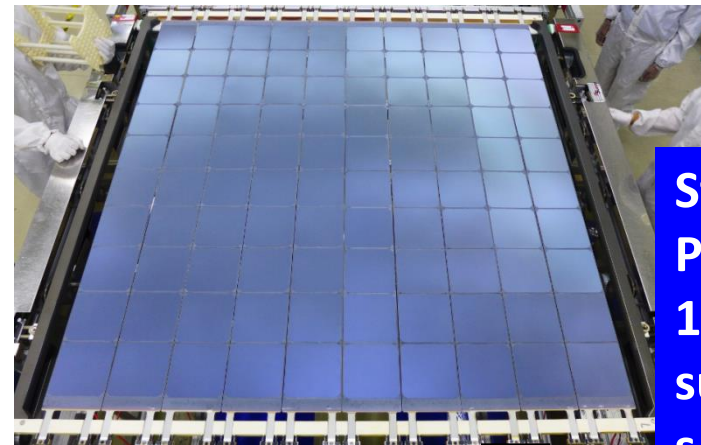


SUNPREME LEAN MANUFACTURING PROCESS (<250C, 5 STEPS, 6 HR CYCLE)

TFT FPD TOOLS FOR CRITICAL DEPOSITION STEPS 2 & 3



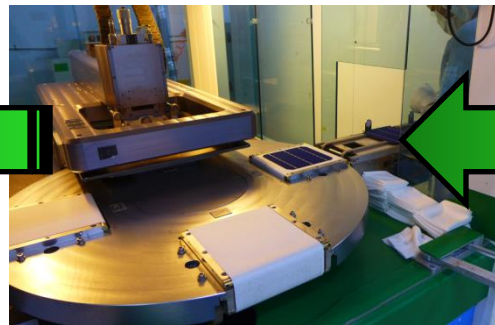
Stage#1: Wet Bench, 50*4



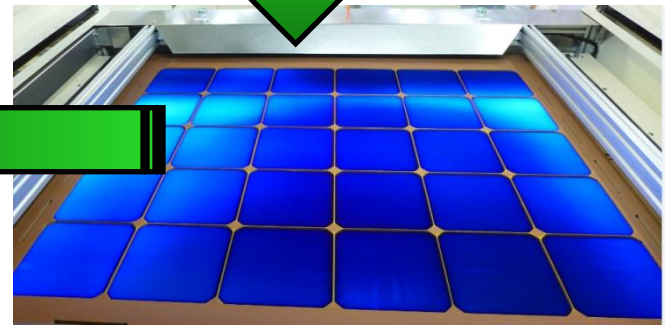
Stage#2:
PECVD,
10*10 Si
substrate
S



Stage#5: Anneal

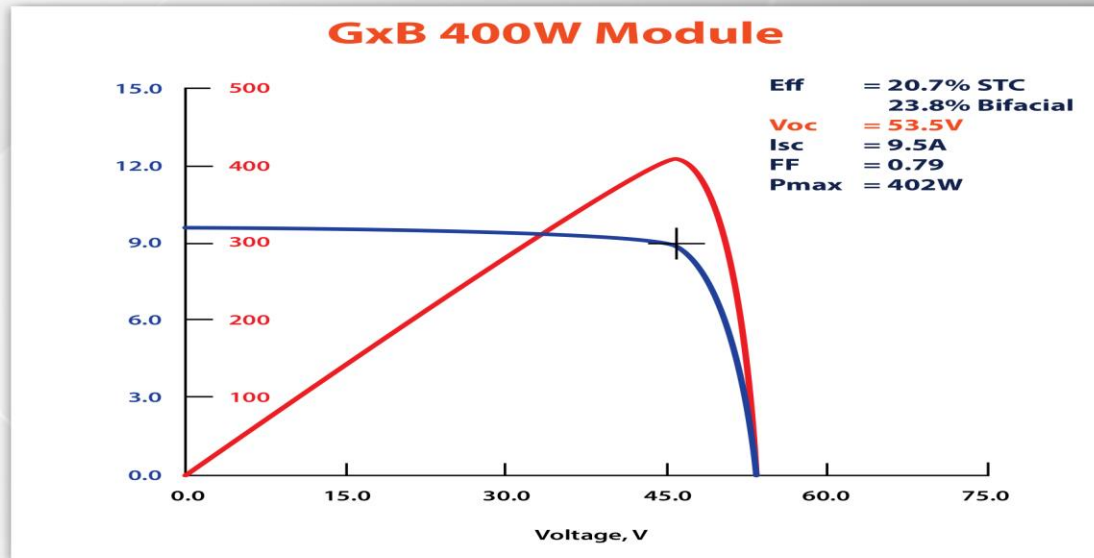
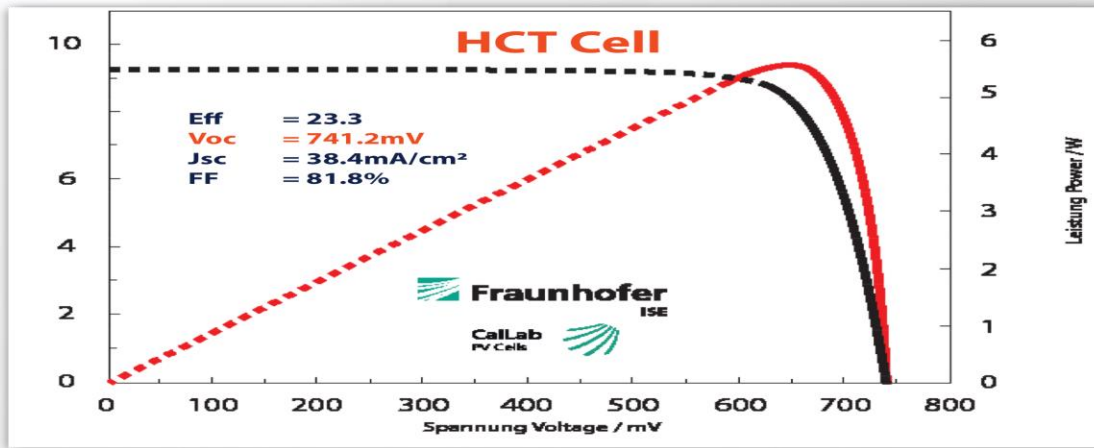


Stage#4: Printing



Stage#3: PVD,
5*6

Cu Metalized Sunpreme HTC Cell & 400W Module



- Hi Voc > 740 mV
- Lo Thermal coefficient (-0.27 %/C)
- Hi sensitivity to low, diffuse light

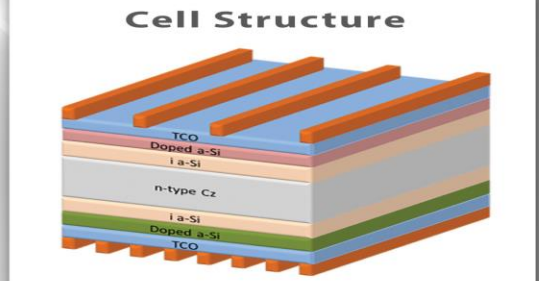
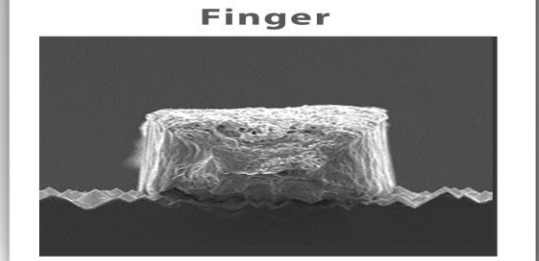
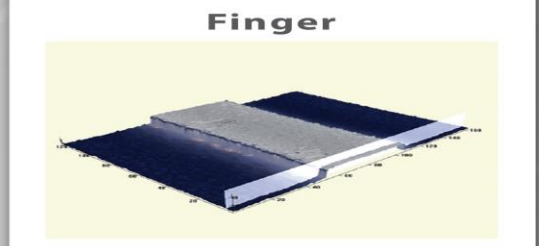
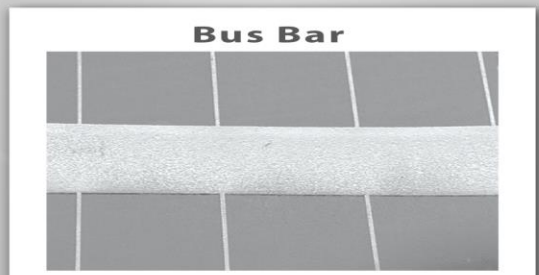


www.sunpreme.com

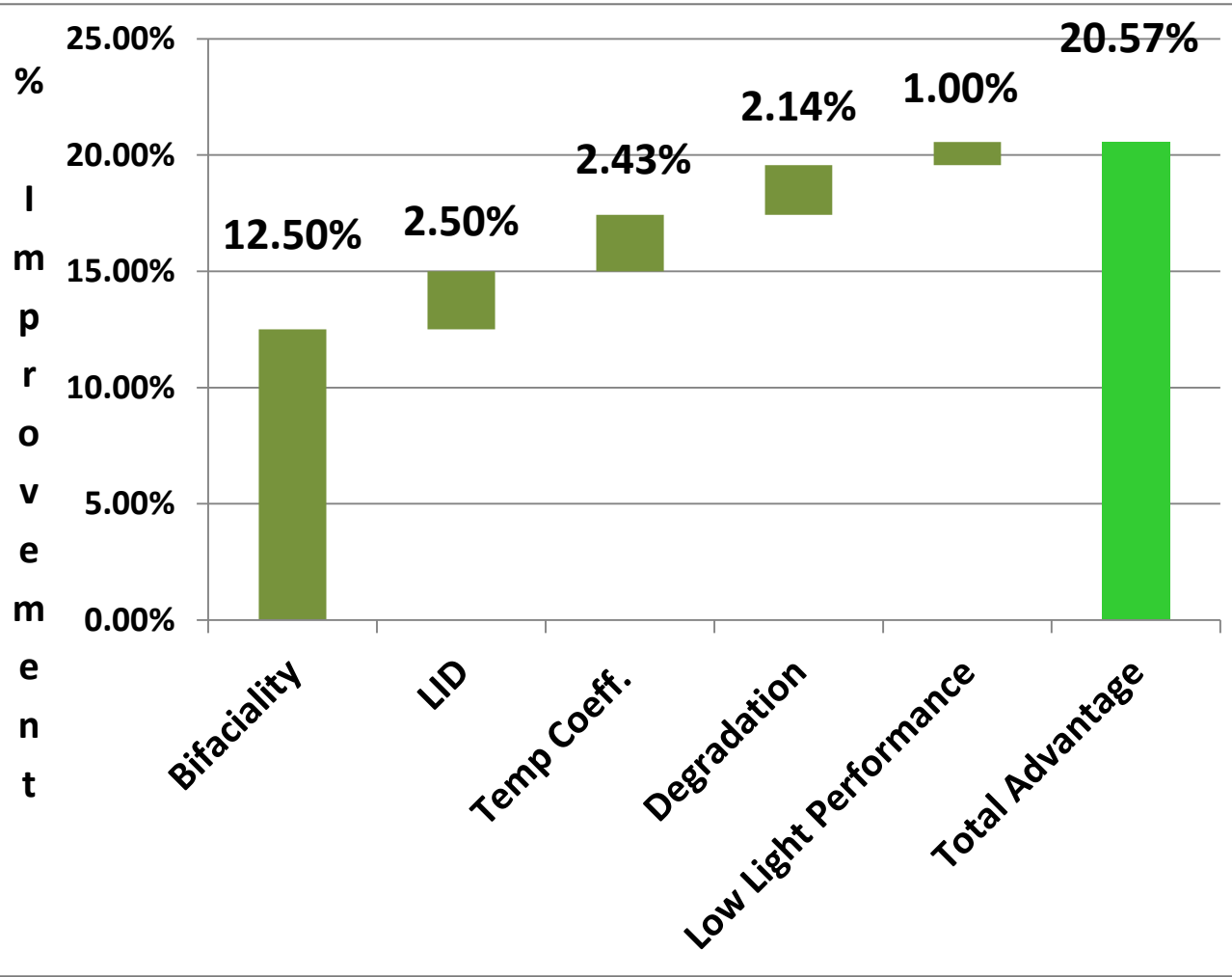
MAXIMA GxB 400W

Designed in California, USA

Model Number: SNPM-GxB-400
Peak Power (Pmax): 402W STC
 460W Bifacial



Electricity generation by Sunprime module is 20.6% higher than same name plate p-mono-Si module

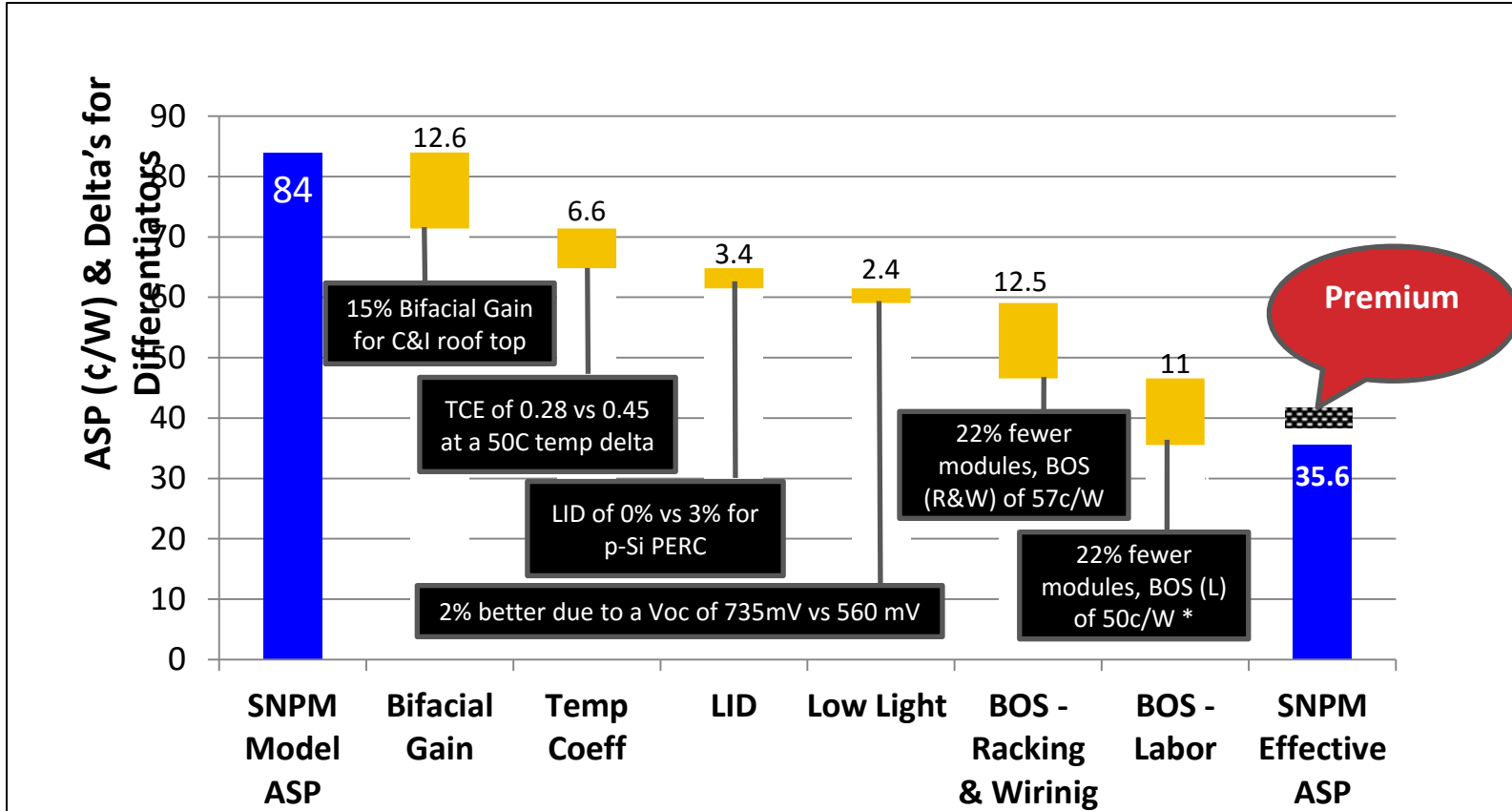


1. Bifaciality: 12.5% (conservative);
2. LID: 2.5% (compare with AIBSF mono);
3. Temp coeff: 2.43% (based on Sunprime -0.28% vs. mono -0.41%);
4. Regular degradation: 2.14% (based on Sunprime 0.6% vs. mono 0.7%, for 25 years).
5. Better low light performance, higher Voc

Think all premium panels are the same?

Think again! Sunprime 420W (385 + 15% BFB) vs 350W top-of-the line p-mono PERC, ASP 40 ¢/W

- . Sunprime's effective apple-to-apple ASP is only 35.6 ¢/W even for an assumed list of 84 ¢/W
- . ~25% more energy (KWhr = Revenue for the Developer) in C&I (Commercial & Industrial) applications



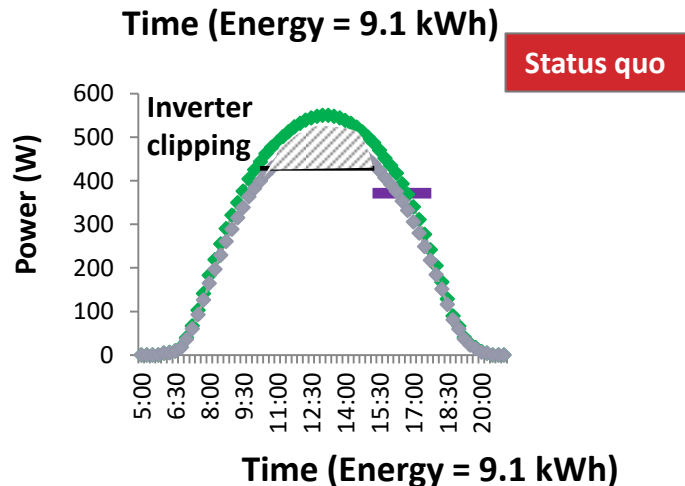
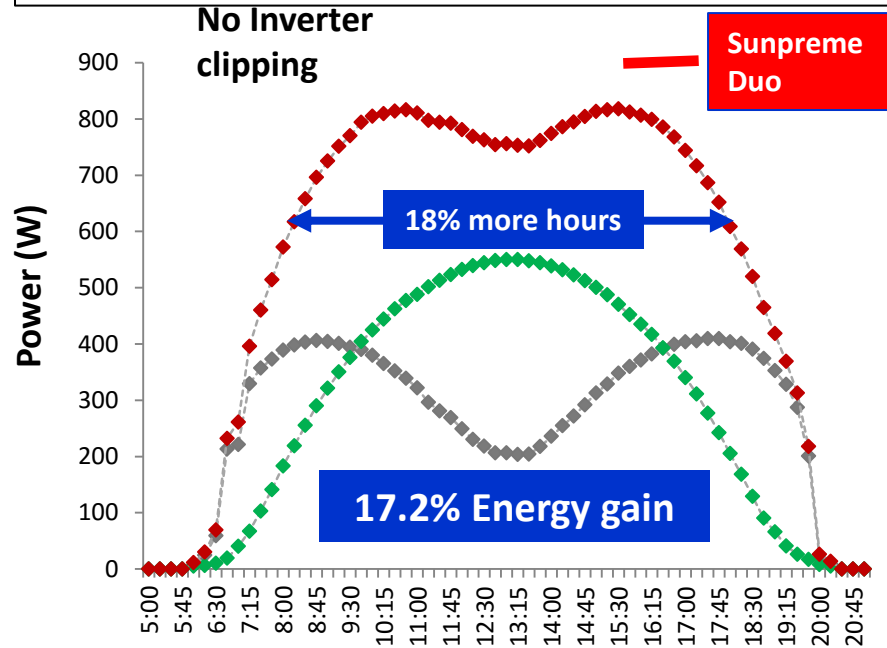
Differentiators (not monetizing Class A fire & 300 kmh typhoon rating, nor 0.1% less degradation/yr over 25 yrs)

* Not including inverter portion of the BOS at 18 ¢/W for a total BOS of \$1.25/W



Empowering the Sun from all Directions™

Our 500W Duo panels produce a nearly flat, 3-peak power profile with 17% greater energy and 18% more energy hours and no inverter clipping

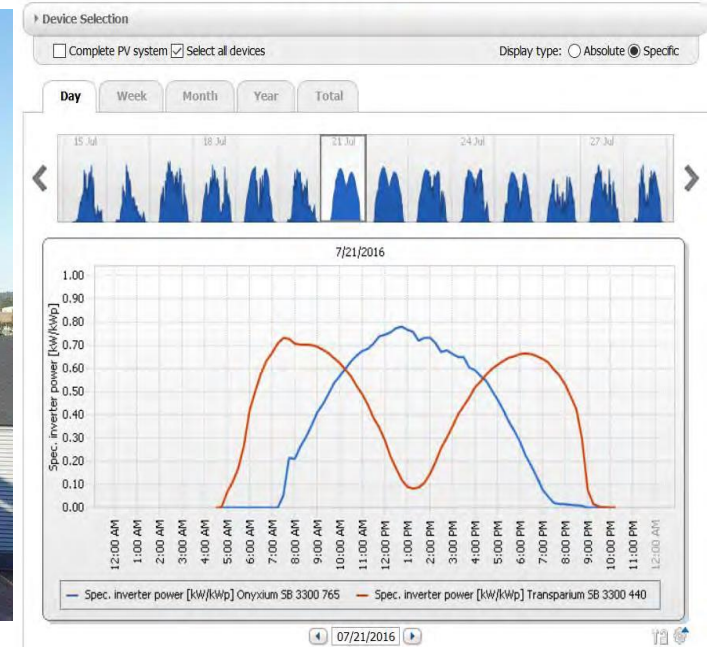


- In Duo configuration (red) the composite produced a broad, nearly flat top plateau, with extended width on the time scale
- No need for power clipping at mid-day
- The Duo power profile yields 17% greater energy and extends the daily production hours by ~18%
- A significant improvement over an equivalent number of “status quo” panels
- The Duo may compare favorably with 500W panels on single or dual axis trackers

Then, Sunpreme Bifacial Modules can do Applications which others simply cannot, e.g. [Highway Smart Noise Barriers in Sweden](#)



Analysis - Byggesta - Sunny Portal | Byggesta



Customer Energy Production Data

Byggesta

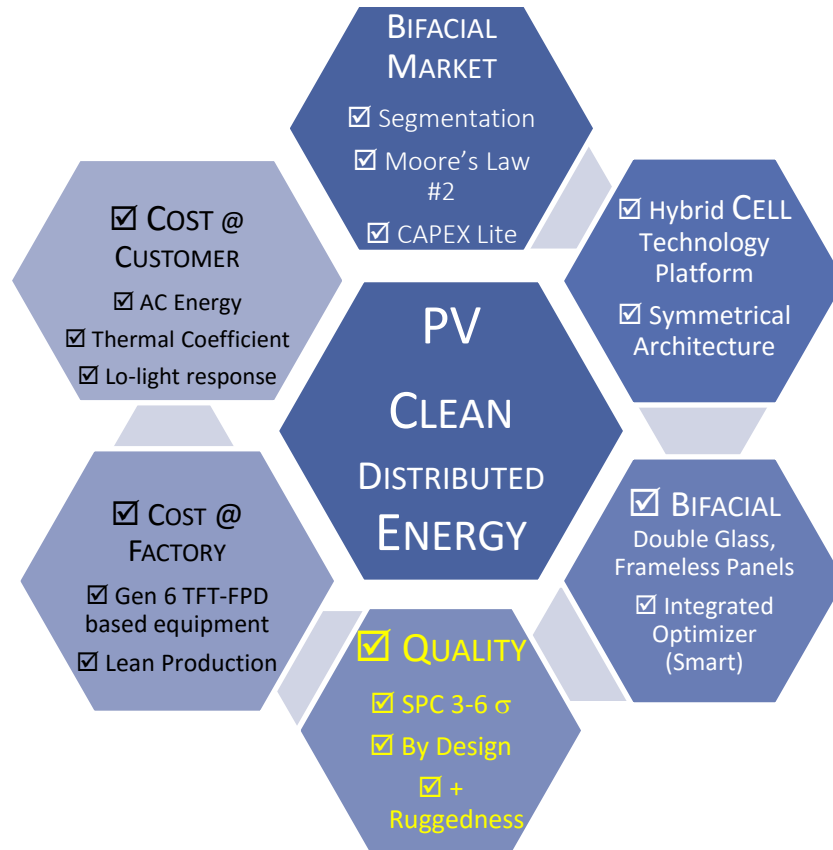
7 pcs 300/270 Wp.

Test location from April 2016.

Shows yields clearly without self-shading effect.

Our core competencies cover all aspects of the Business

animation



- 1) Distributed Commercial Roofs
- 2) Islands
- 3) Cells on Gen 6 → Gen 8 TFT trays
- 4) CAPEX \$300m/GW, 50% less than Benchmark
- 5) TF Junction ON, not IN the Si
- 6) Larger, thinner wafers
- 7) 15% Bifacial Boost
- 8) Self-cleaning
- 9) Adverse environments OK
- 10) Utilitarian → Aesthetic
- 11) Superlative wind & fire ratings
- 12) Lean 6-step process
- 13) 10 hr. cycle time 50% of benchmark, 80% less energy
- 14) 17% higher AC energy
- 15) 33% lower thermal coefficient
- 16) 10% greater low-light response
- 17) Proven out on 50MW Bifacial installed base in 24 countries

Thank You!