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Bifacial HJT SCWT GG modules

Bifi Konstanz, October 2017, Thomas Söderström, Head of Module Technology and Innovation & R&D MB Teams



Meyer Burger



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Wafer
Ingot to Wafer

Cell
Wafer to Cell

Module
Cell to Module



Diamond Wire Saw



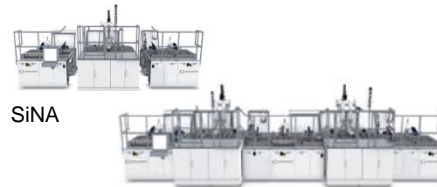
DW 288 Series 3

Wafer Inspection



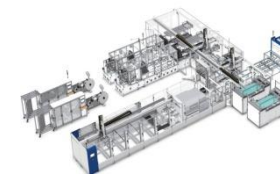
WIS-06

Cell coating



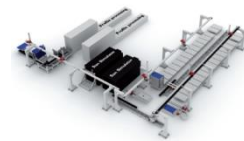
SiNA

Module Line



SWCT

Module Testing



HighLIGHT by Pasan

MAiA

Industrie Standard:

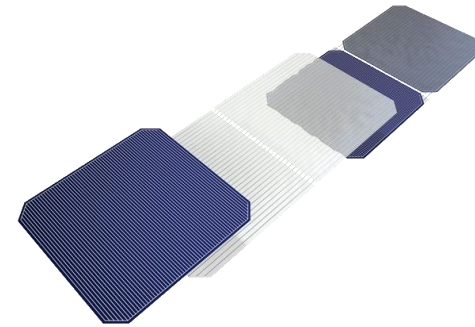
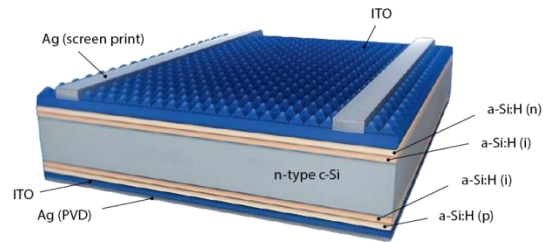
	«DW288»	«Hennecke»	«MB PERC»	MB SWCT	«PASAN»
# tools	> 150	> 142	> 500	> 5	> 100
Installed Capacity	>7GW	>23GW	> 30 GW	> 320 MW	> 20 GW
Market Share:	~35%	~80%	> 30 %	Increasing	> 80%

Complex vs Complicated



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Complicated



Complex

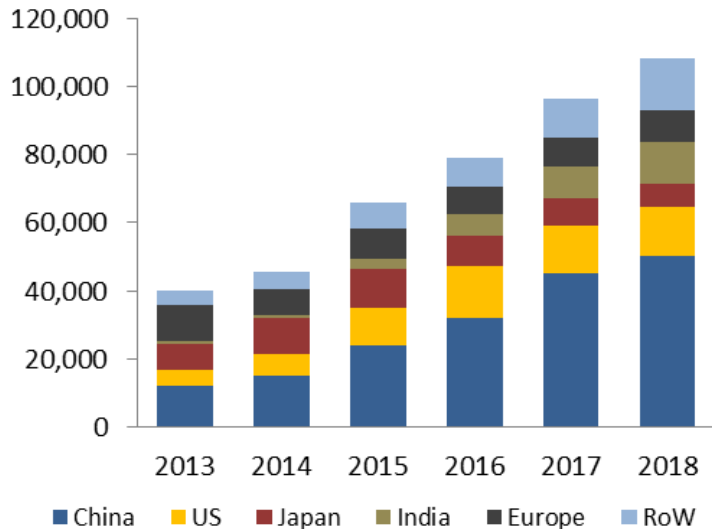


Market PV Tech Research

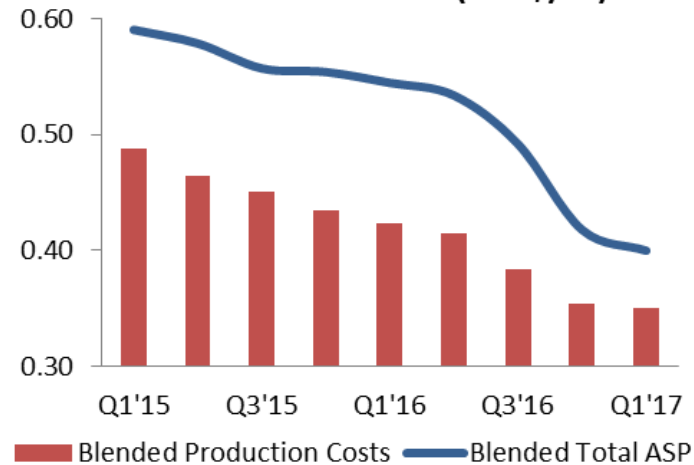


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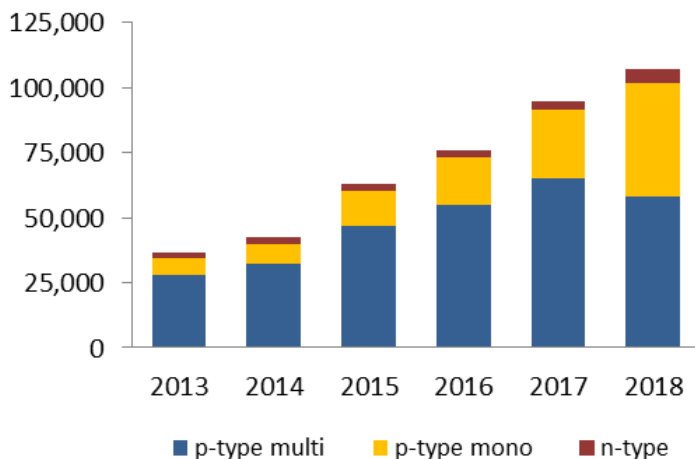
Global PV Demand (MW)



SMSL: Blended Module ASPs & Production Costs (USD\$/W)



c-Si Production (MW)



- Market is expanding to >100GW in 2018
- PERC is the Hype and MB is committed
- N type Mono is still marginal but growing
- Bifacial module about 70 MW (0.1% of market)

PV Market today and tomorrow

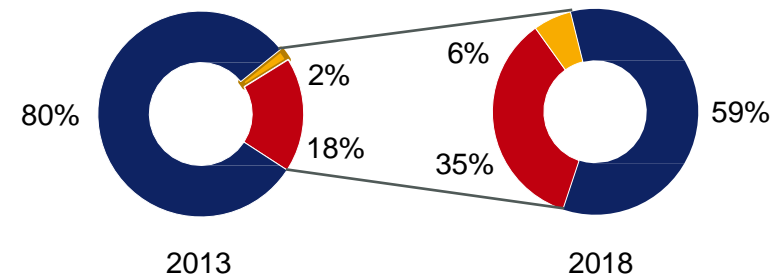
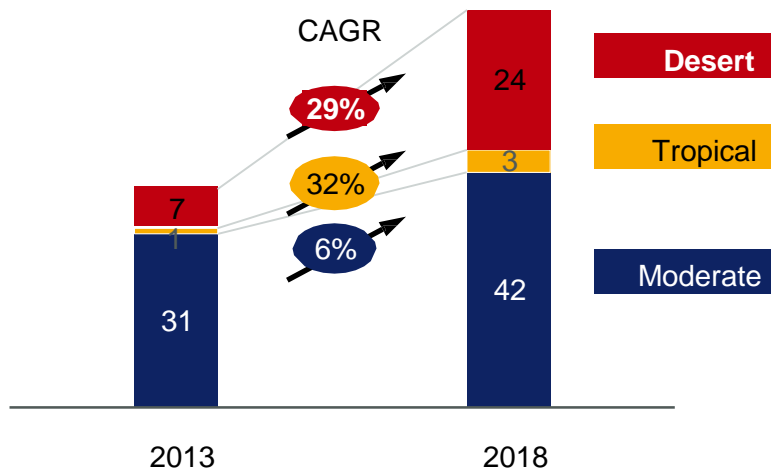
strongest CAGR in Desert & Tropical Zones



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Annual global installations [GW] by climatezone

Installations by climate zones [%]



- LCoE decrease enables PV being competitive even in gas/oil countries, known as high temperature climate zones, projected with highest CAGR
- Markets with desert climate (Saudi Arabia, Morocco)
- Markets with tropical weather (Taiwan, Indonesia, Brazil, Thailand)

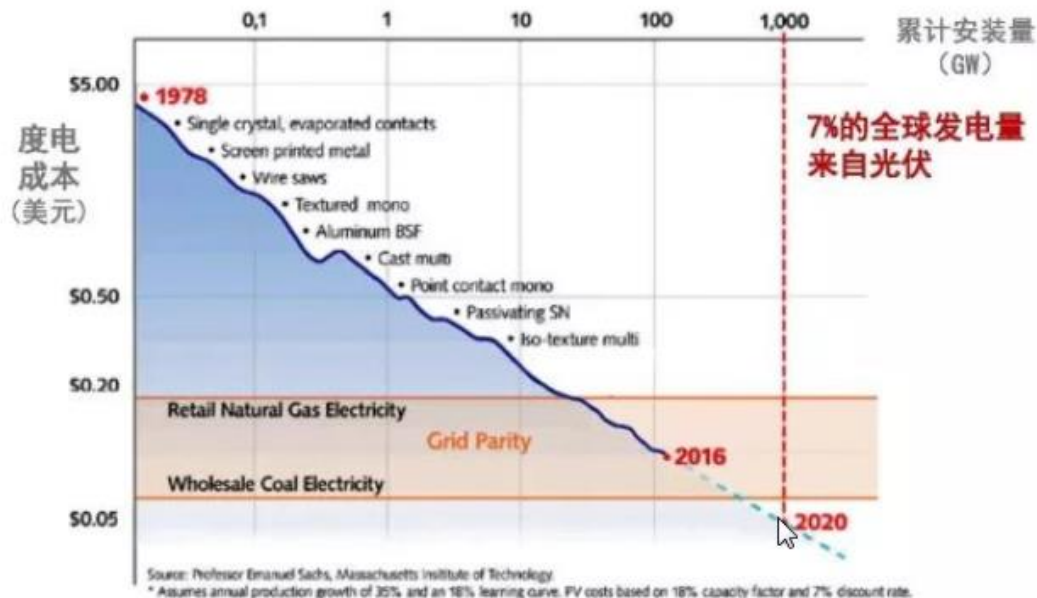
Source: Apricum consulting

LCOE View from China



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光伏摩尔定律



2

晋能清洁能源科技有限公司

2017/10/19

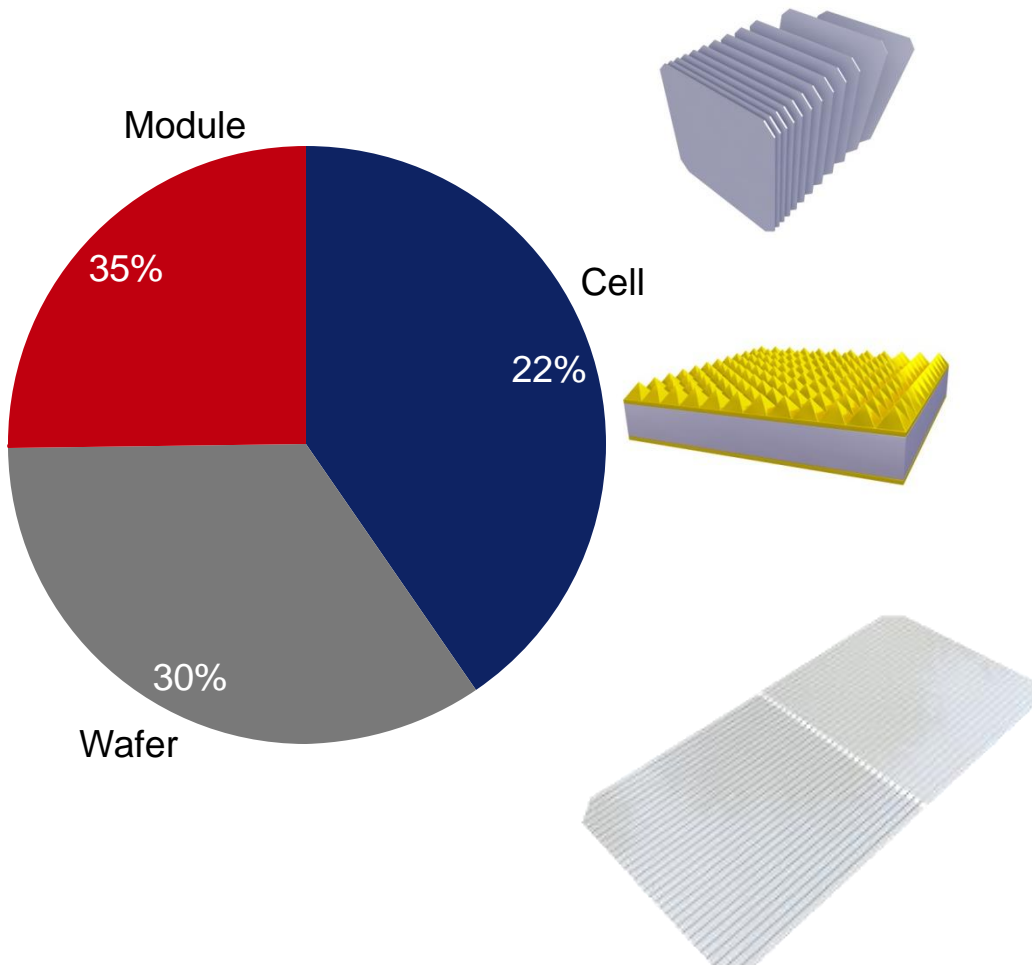
摩尔定律的核心



Roadmap HJT SWCT GG



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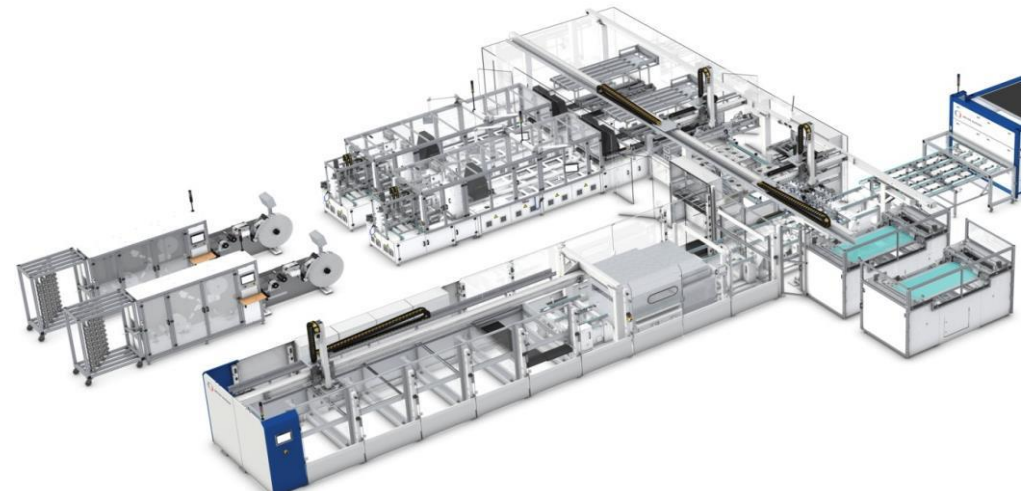
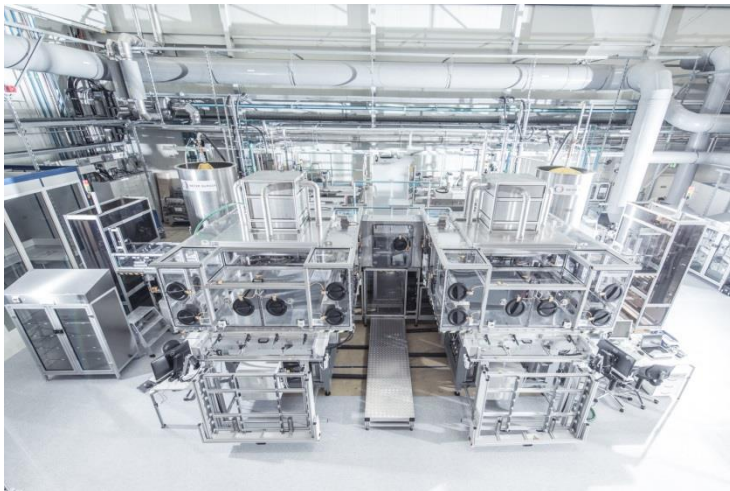
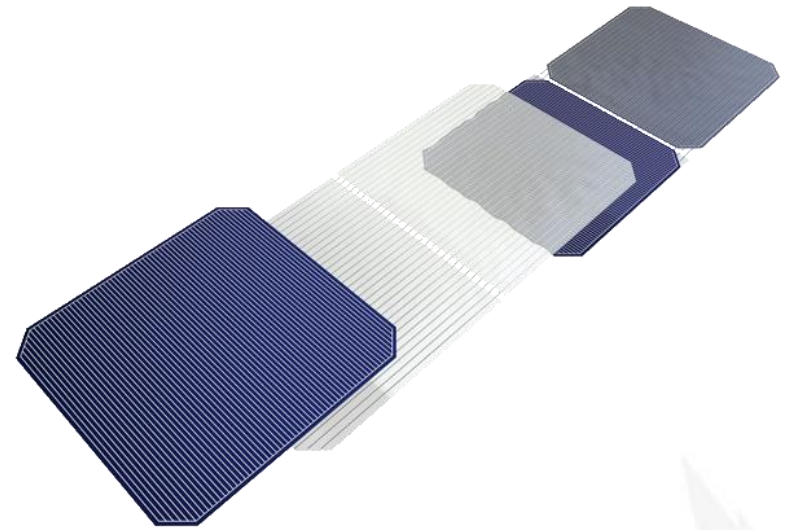
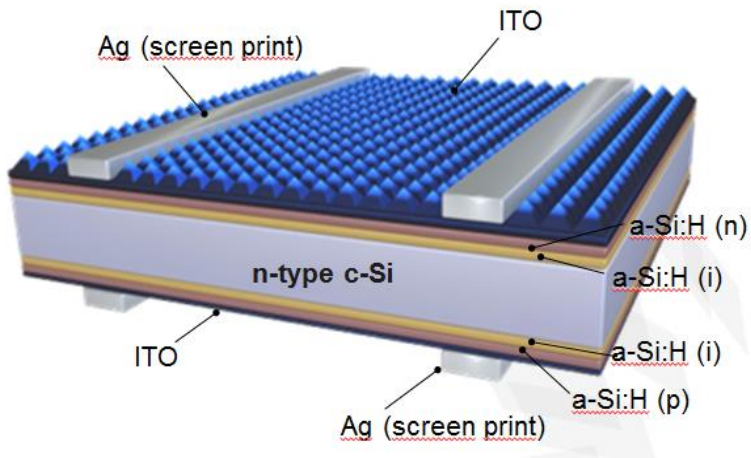


Wafer Thickness => <100 μ m

Cell efficiency => 24%

Module eff. => 23%W
reliability => 40 years

Bifacial HJT SWCT module





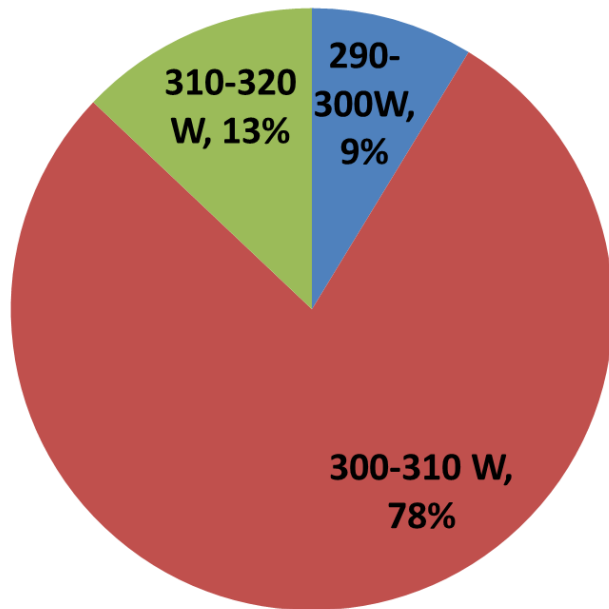
Module Line Performance



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Power distribution

1000 modules



	Pmax [W]	Voc [V]	Isc [A]	FF [%]
White Backsheet	330	44.5	9.5	78.5%
Black Backsheet	320	44.4	9.1	79.5%



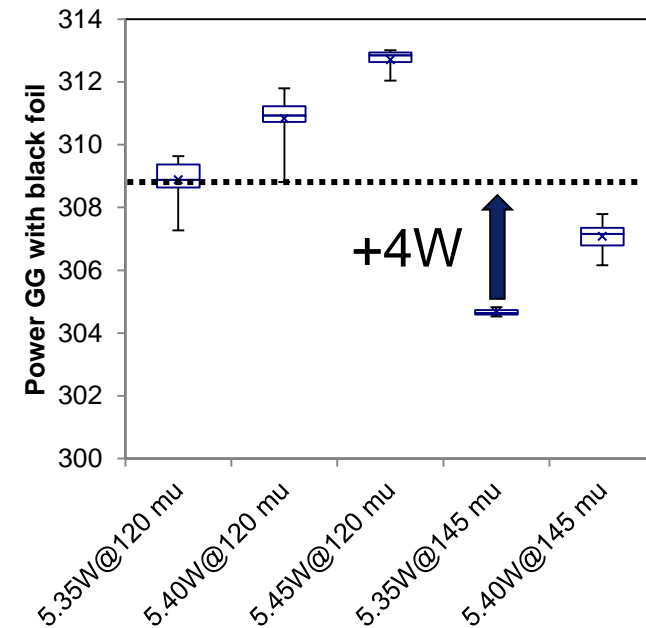
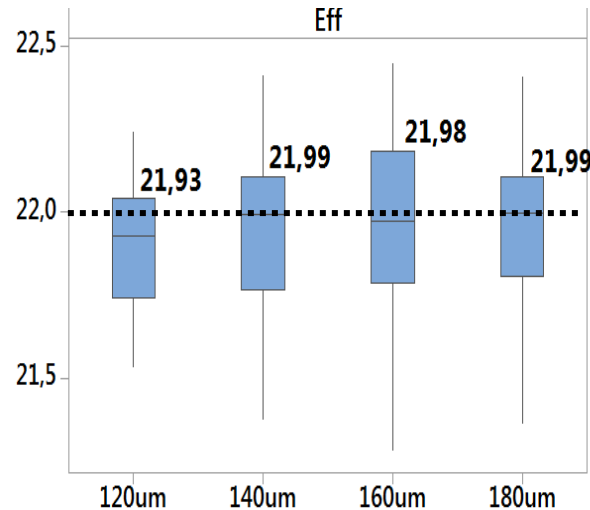
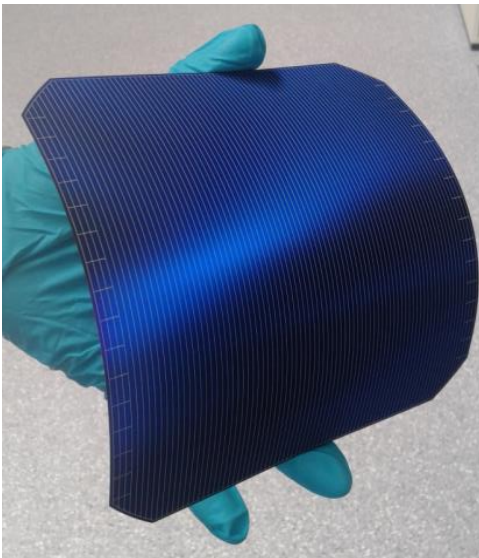
1000 module produced power between 300-320W measured with black backsheet

As-cut Si wafer thickness



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90 μm thickness HJT cell



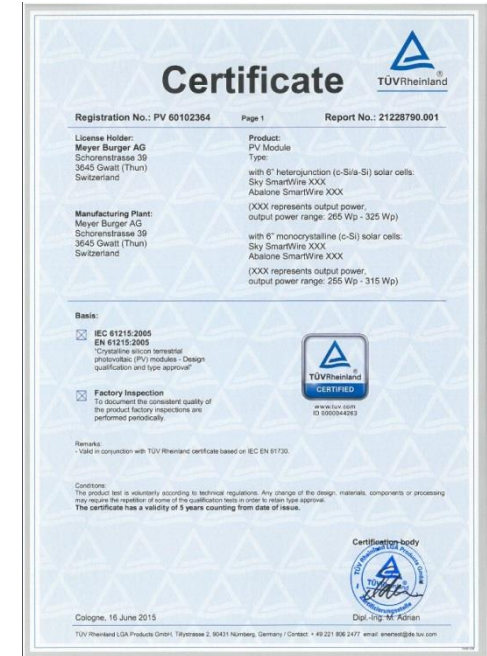
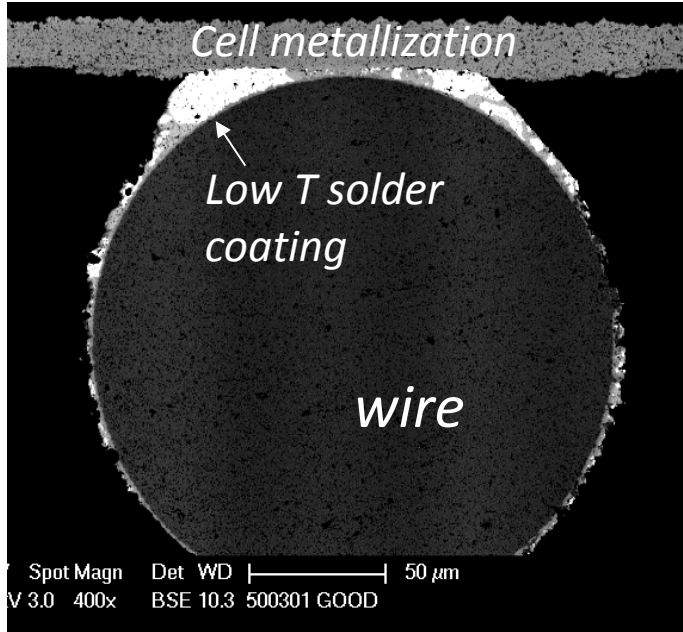
- Cell: Thin wafer \Rightarrow same efficiency
- Module: thin cell \Rightarrow + 4 W

«The thinner the better»

Life time and cost



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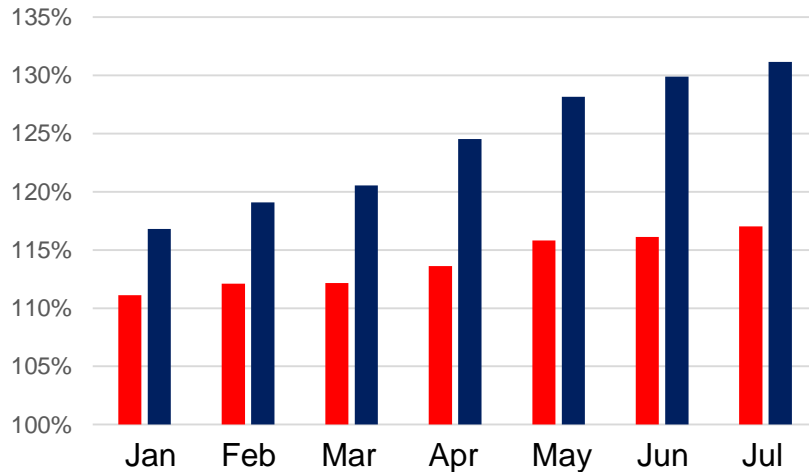


Bifacial MB test module



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UAE: normalized monthly yields
01/2017 to 07/2017



- Bifacial \Rightarrow 30% more yield vs Mono
- Bifacial \Rightarrow 14% more yield vs PERT Bifi
- Glass-Glass \Rightarrow 20 years more life time

<https://www.meyerburger.com/ch/de/login>

MB Measurement sites



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China, Yinchuan $\approx 16\%$ Albedo



UAE, Abu Dhabi $\approx 24\%$ Albedo

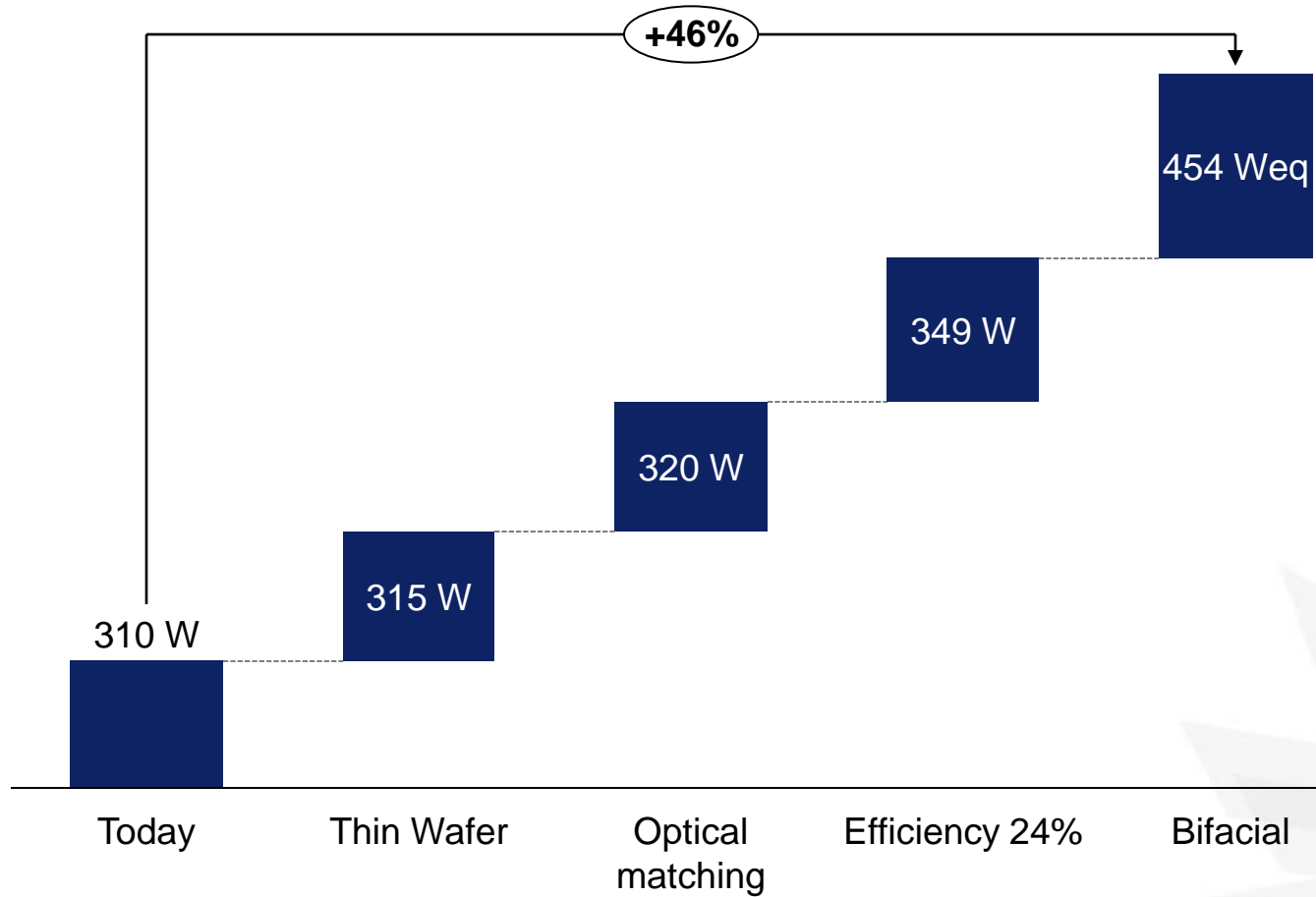


USA, Kalifornia $\approx 10\%$ Albedo

Module Power Roadmap



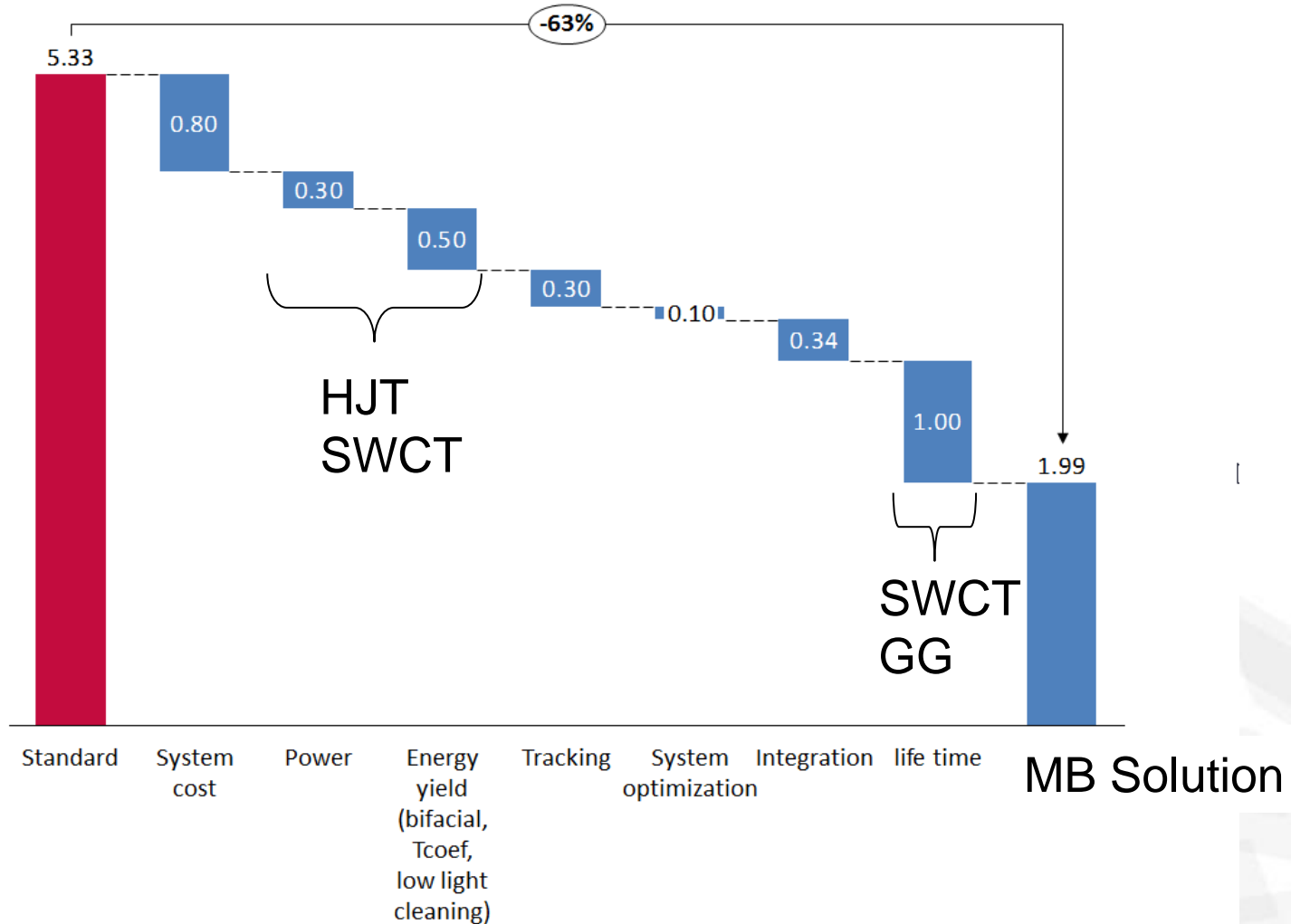
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LCOE \$/kwh driven by technologies



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Thank you!

