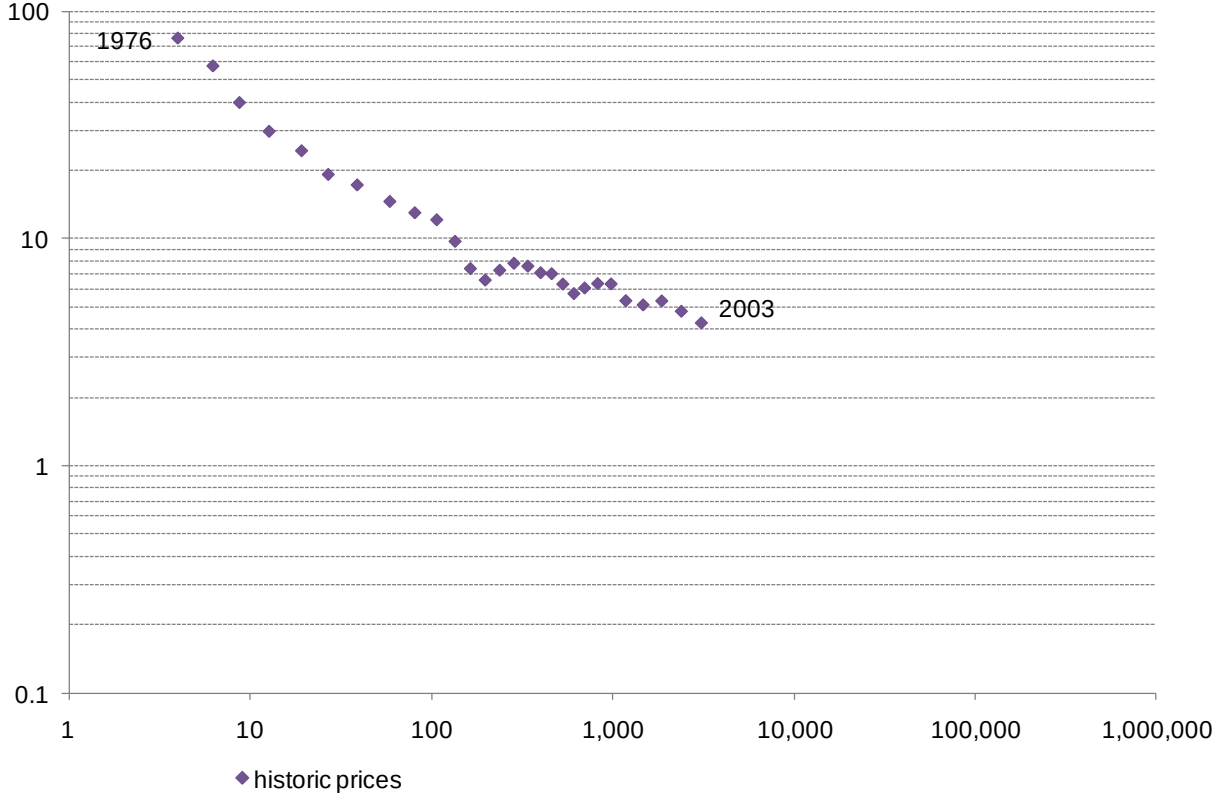
BREAKTHROUGHS IN SOLAR POWER

IT'S NOT JUST ABOUT TECHNOLOGY ANY MORE

JENNY CHASE

Bloomberg
NEW ENERGY FINANCE

THE CRYSTALLINE SILICON PV MODULE EXPERIENCE CURVE, 1976–2004 ($/W)



Note: In 2011 dollars, adjusted for inflation at the US CPI

Source: Paul Maycock, Bloomberg New Energy Finance

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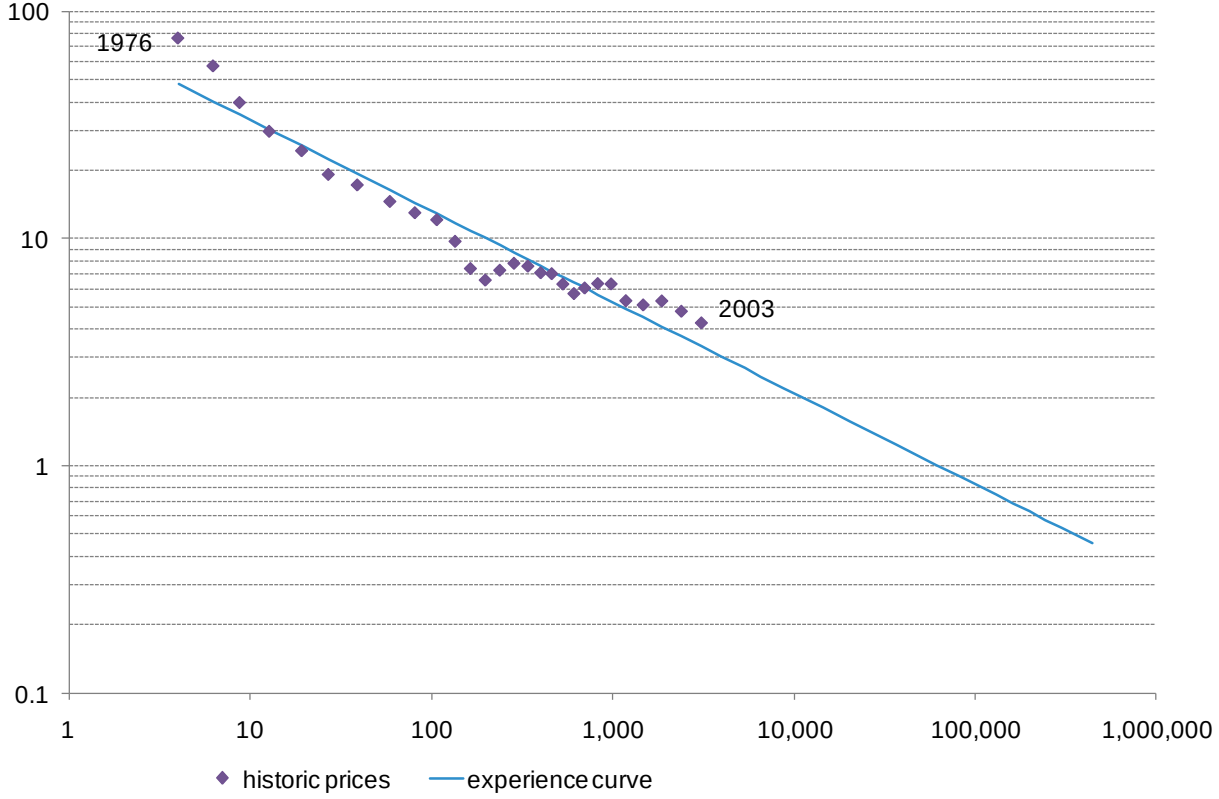

$R^2 = 0.94$

Note: In 2011 dollars, adjusted for inflation at the US CPI

Source: Paul Maycock, Bloomberg New Energy Finance

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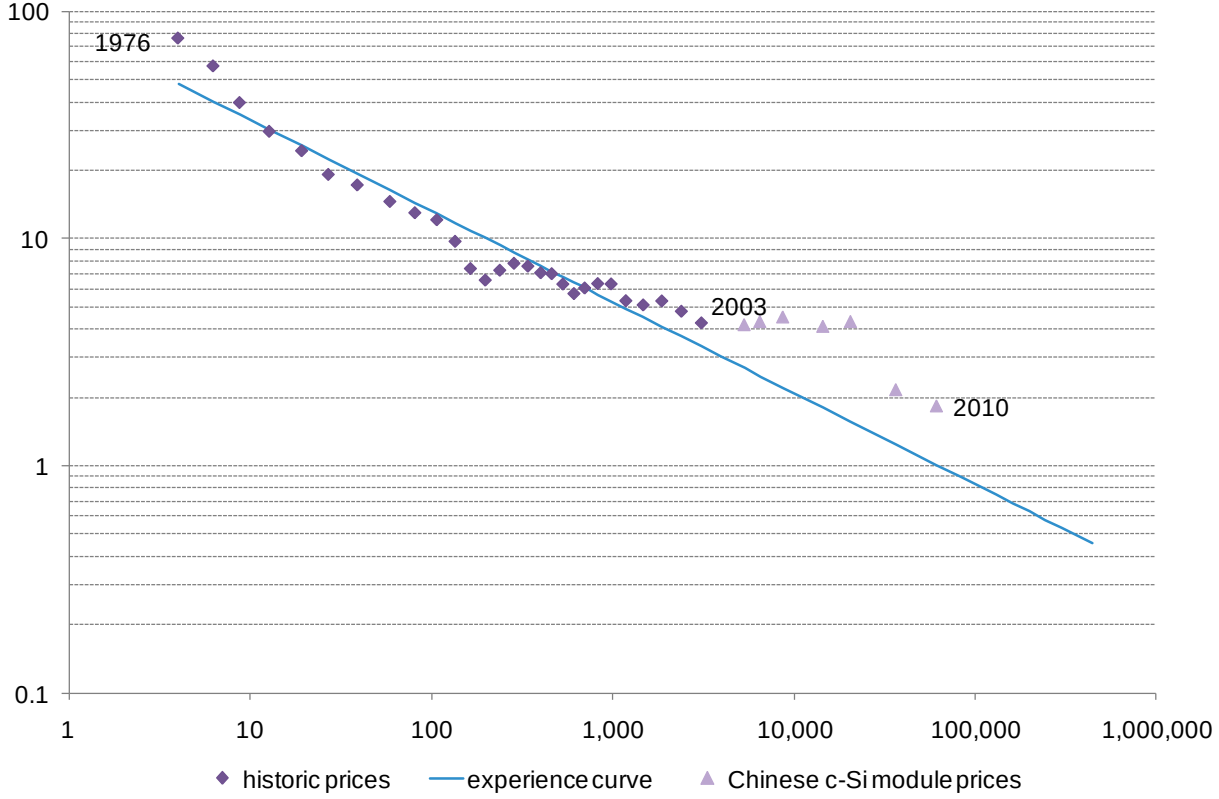

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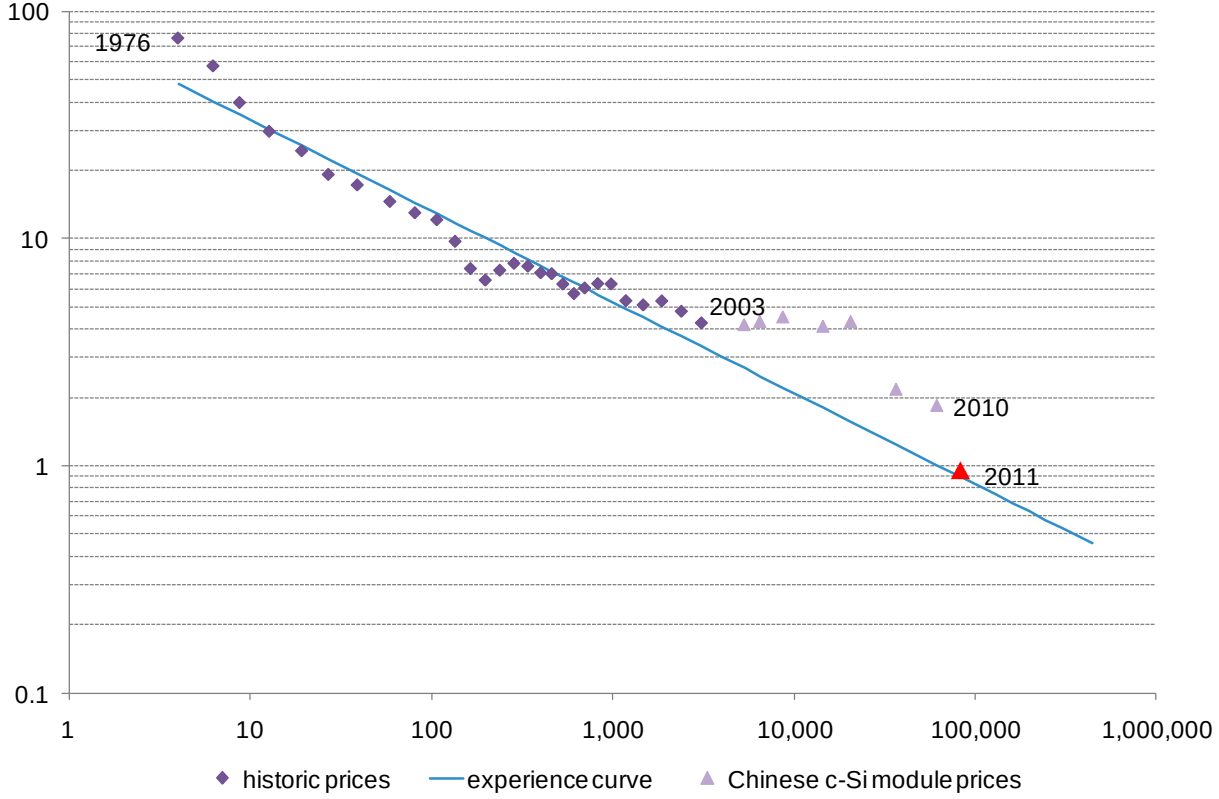

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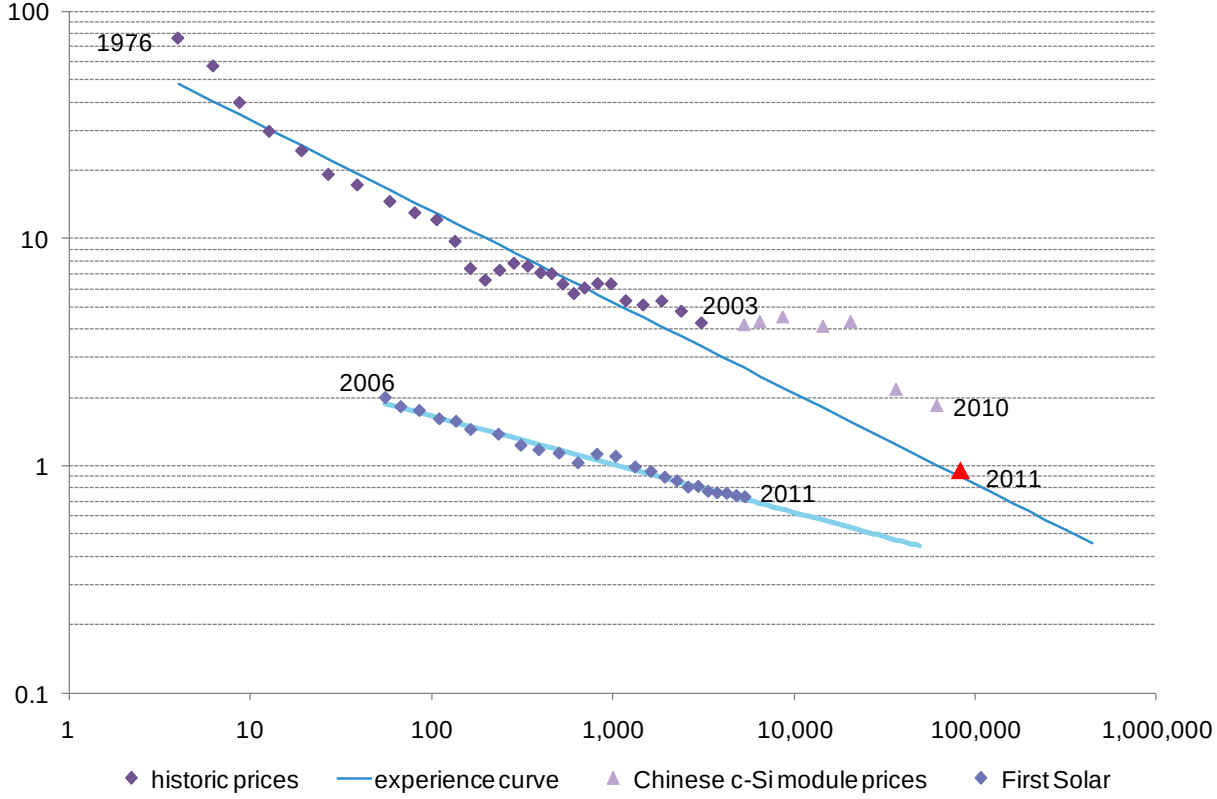
THE PV MODULE EXPERIENCE CURVE, 1976–2011 ($/W)



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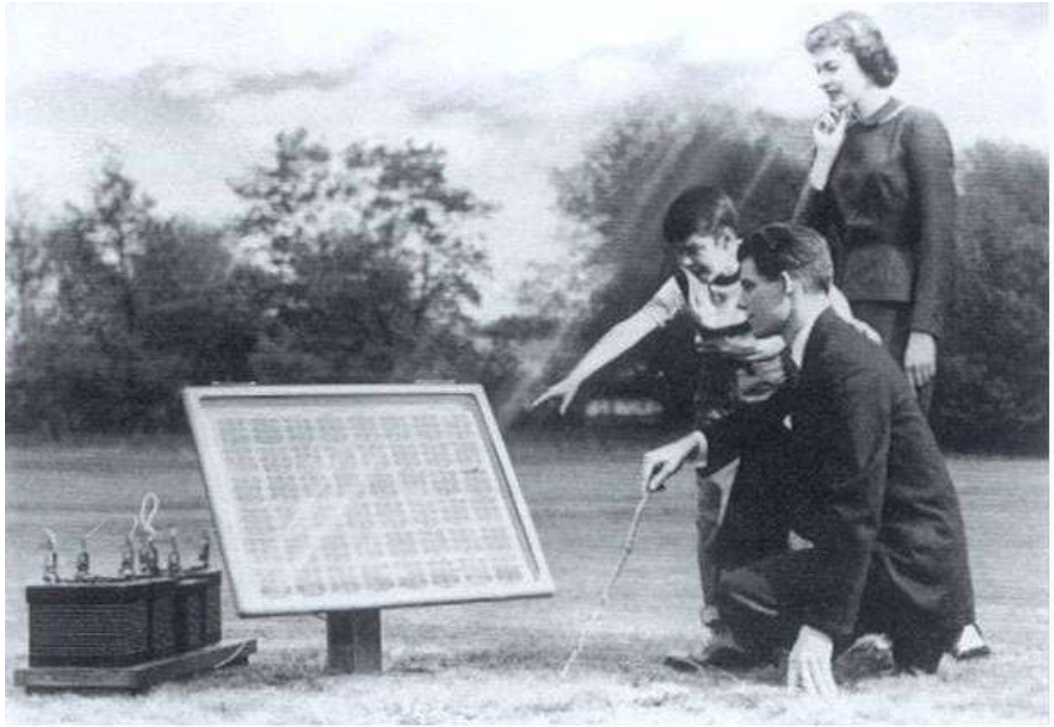
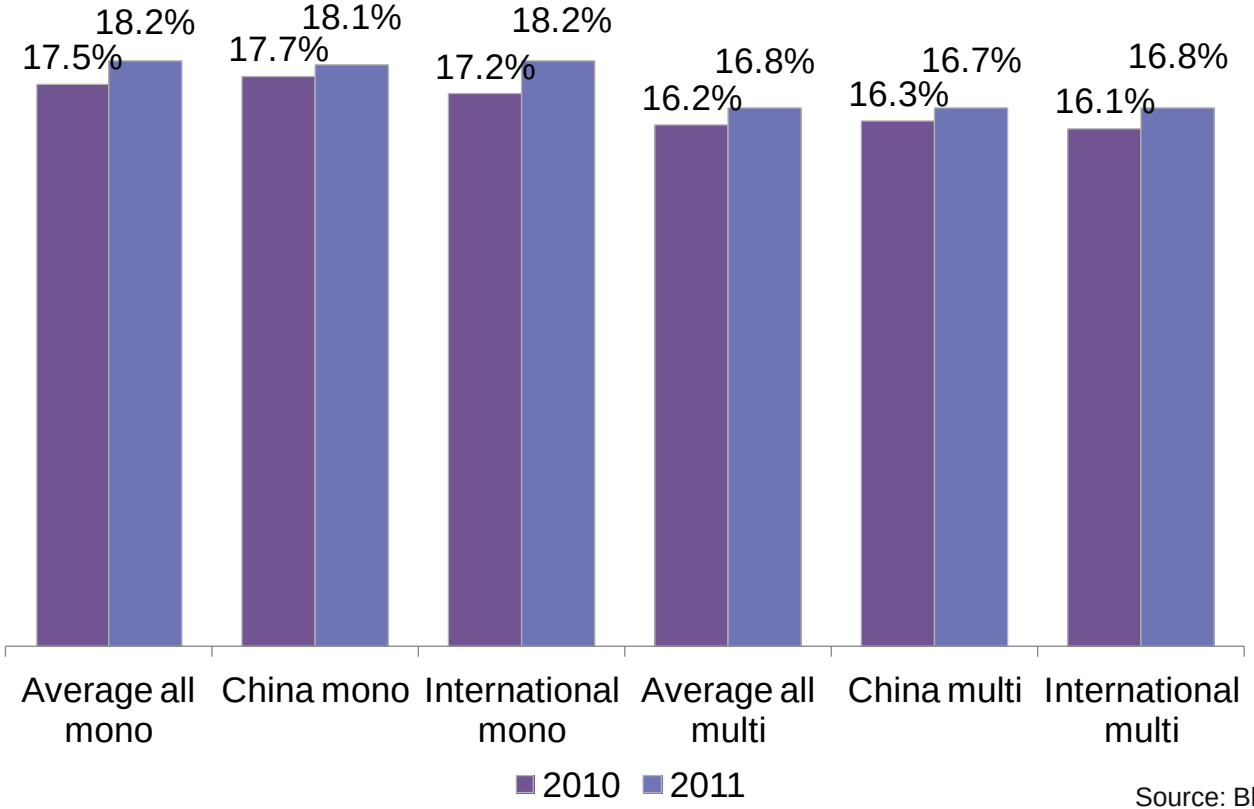
NEW JERSEY, US
1954



AVERAGE EFFICIENCY OF PV CELLS BY TYPE OF MANUFACTURER AND TECHNOLOGY (%)



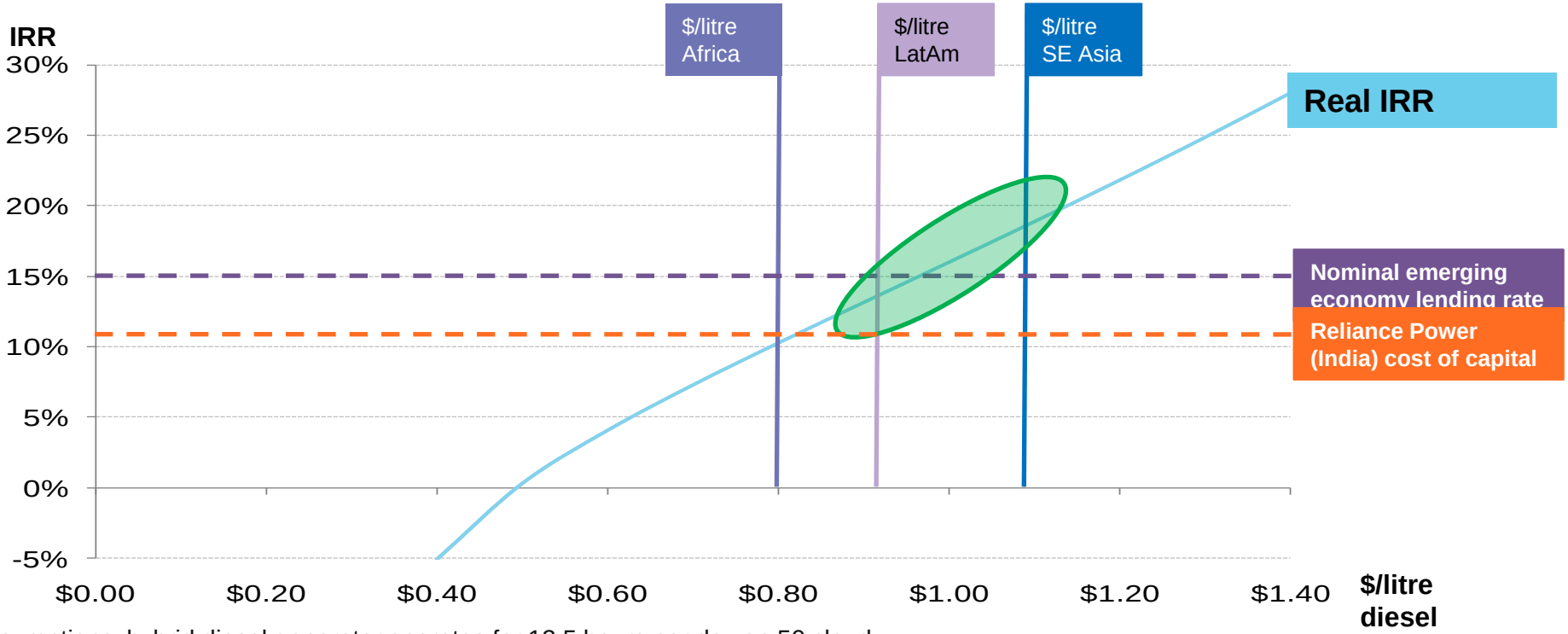
Source: Bloomberg New Energy Finance

DIESEL AND PV GENERATION FACTS AND FIGURES

700m	People who pay $1/litre+ for diesel fuel
$0.40/kWh	Fuel cost of diesel electricity at $1/litre
150GW	Size of off-grid diesel generation market
660GW	PV capacity to replace that diesel market
860GWh	Of batteries to make PV storage systems
80%	% of lead acid battery manufacturing capacity 860GWh represents

Source: Bloomberg New Energy Finance
Picture: Caterpillar

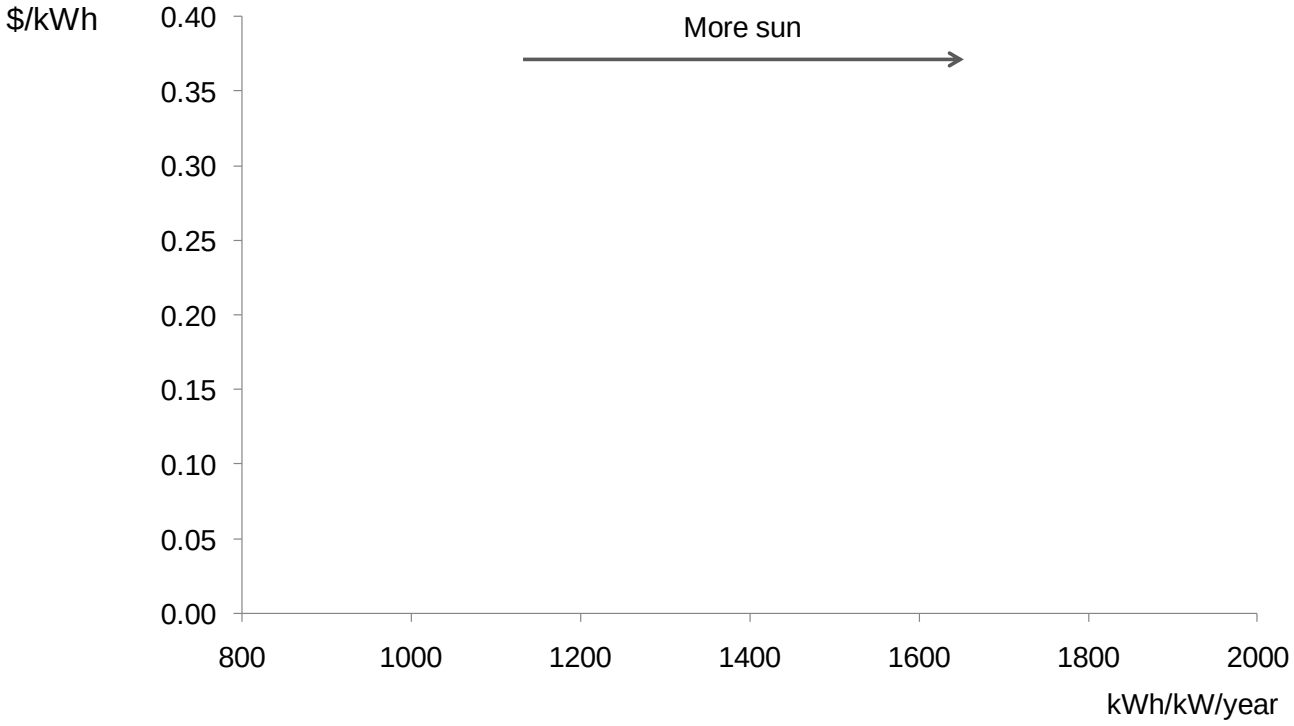
INCREMENTAL IRR ON HYBRID SYSTEM REPLACING DIESEL GENERATION AND REGIONAL DIESEL PRICES



Assumptions: hybrid diesel generator operates for 12.5 hours per day on 50 cloudy days per year, battery bank sized to night time energy consumption, all prices are assumed constant in real terms

Sources: Bloomberg New Energy Finance, market player interviews, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

RESIDENTIAL PV PRICE PARITY – RESIDENTIAL POWER PRICE VERSUS LCOE



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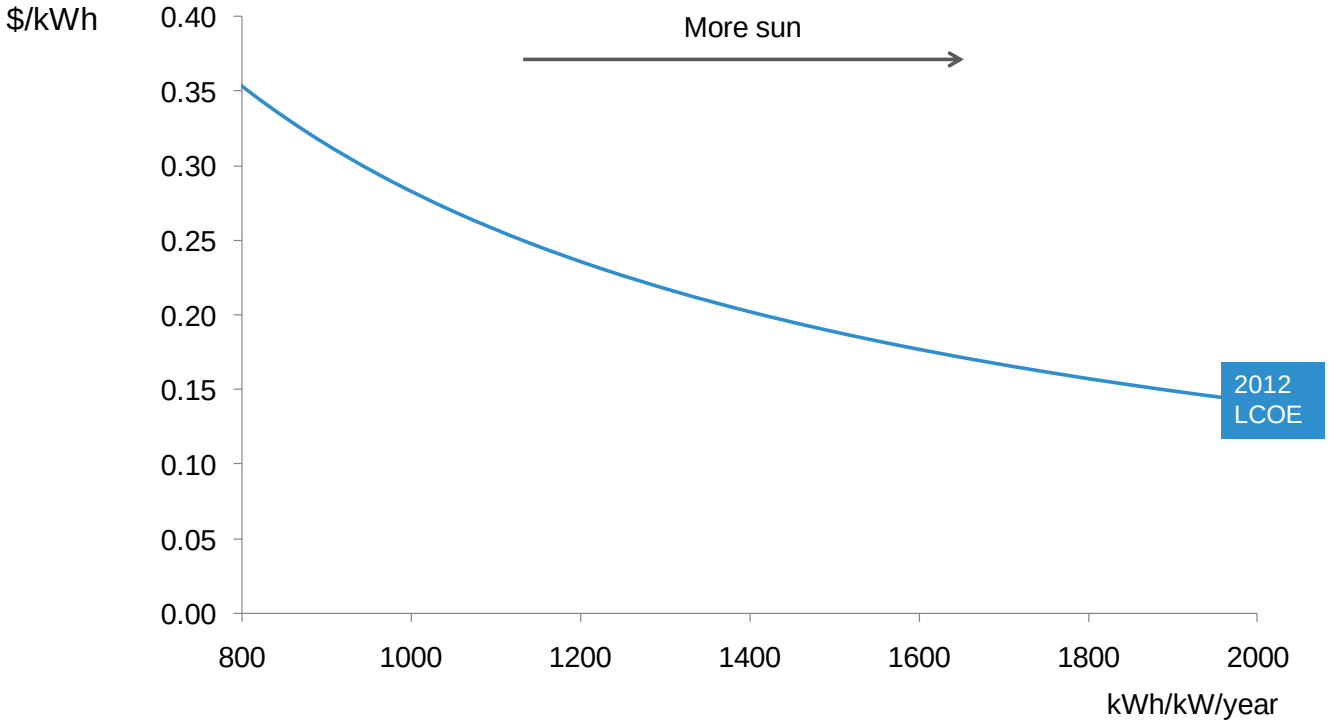

Note: LCOE based on 6% weighted average cost of capital, 0.7%/year module degradation, 1% capex as O&M annually. $3.01/W capex assumed for 2012, $2/W for 2015.

Source: Bloomberg New Energy Finance

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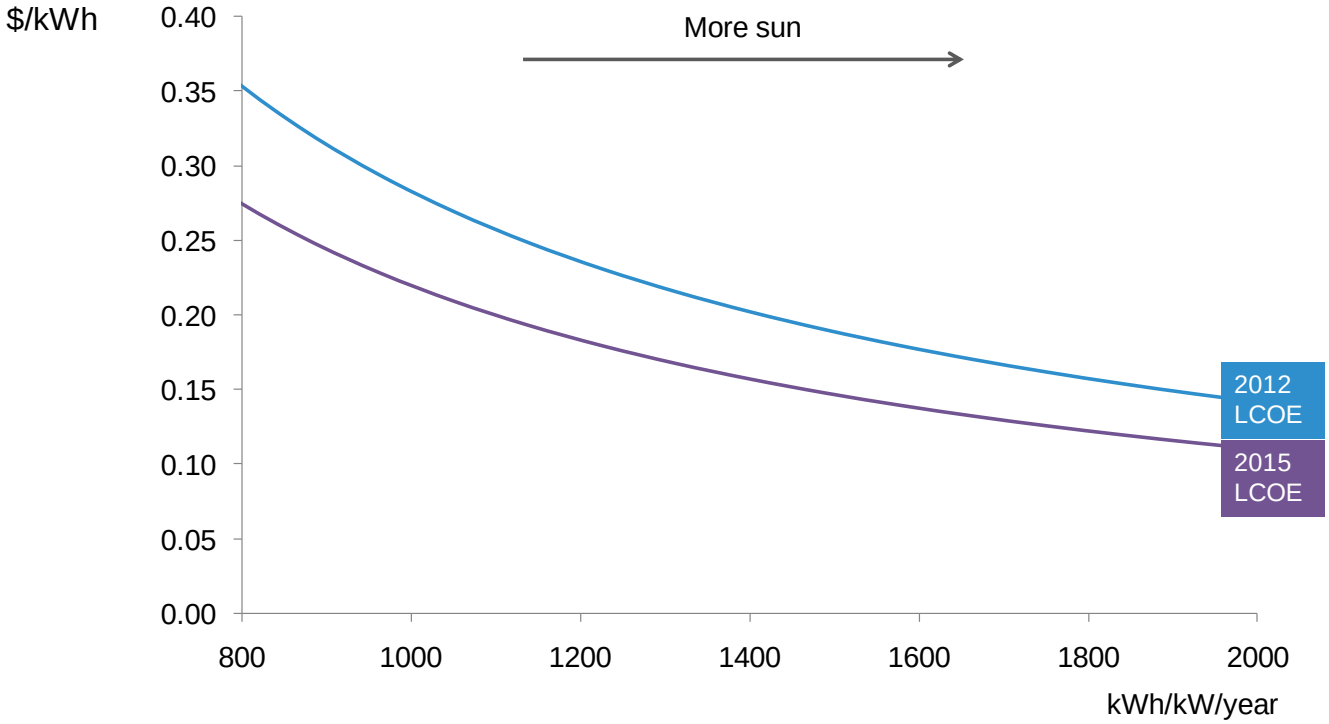

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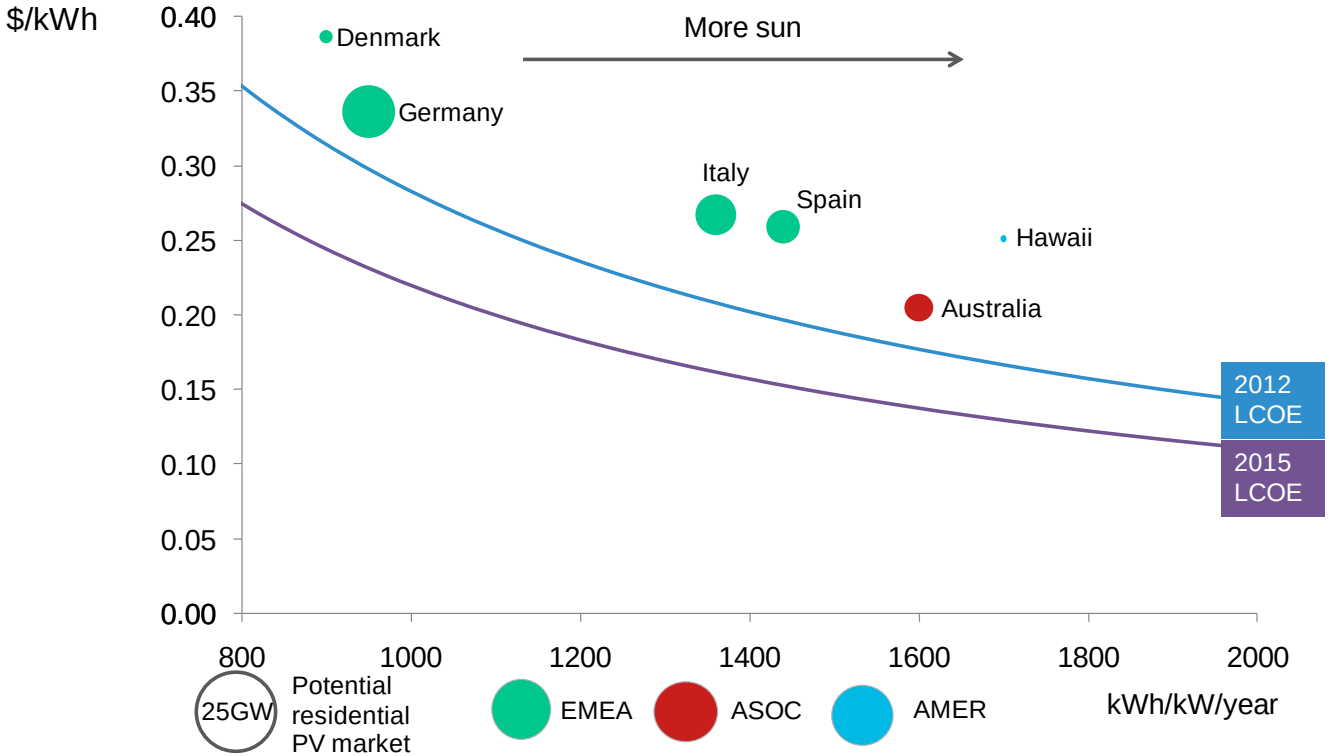

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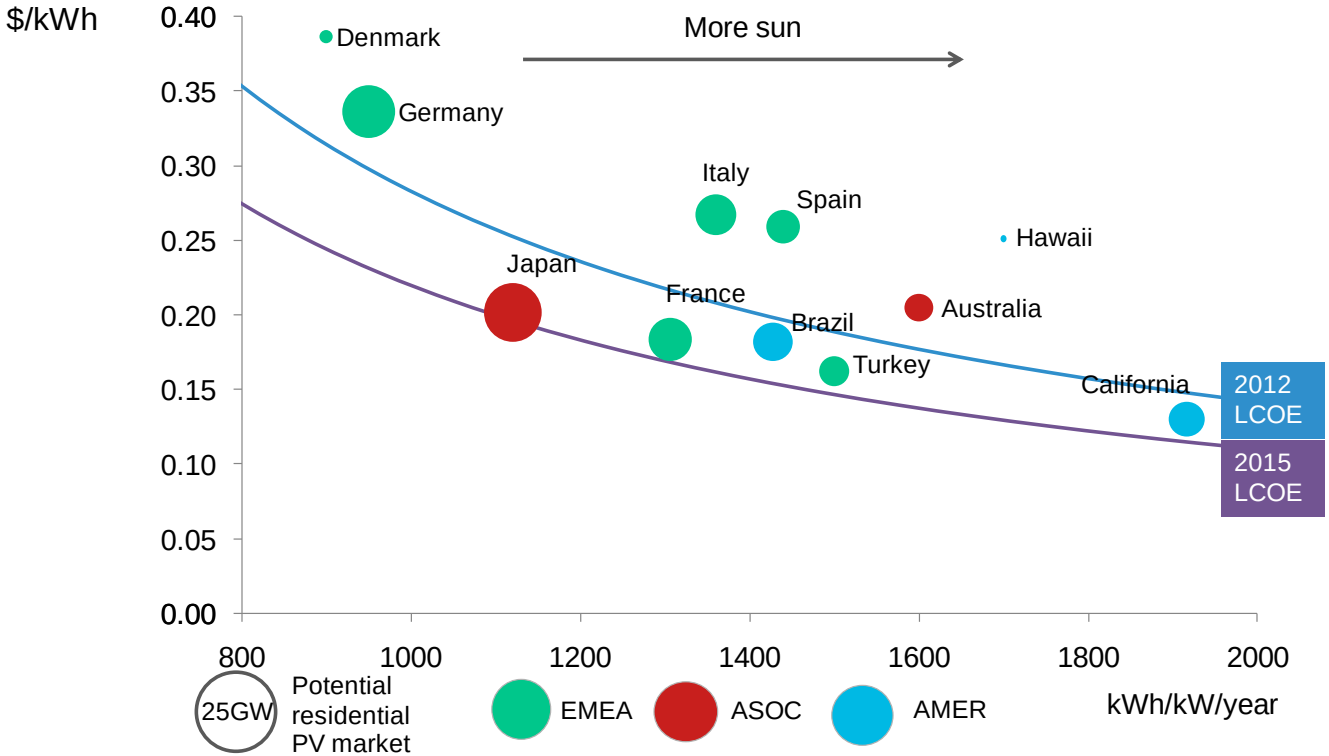

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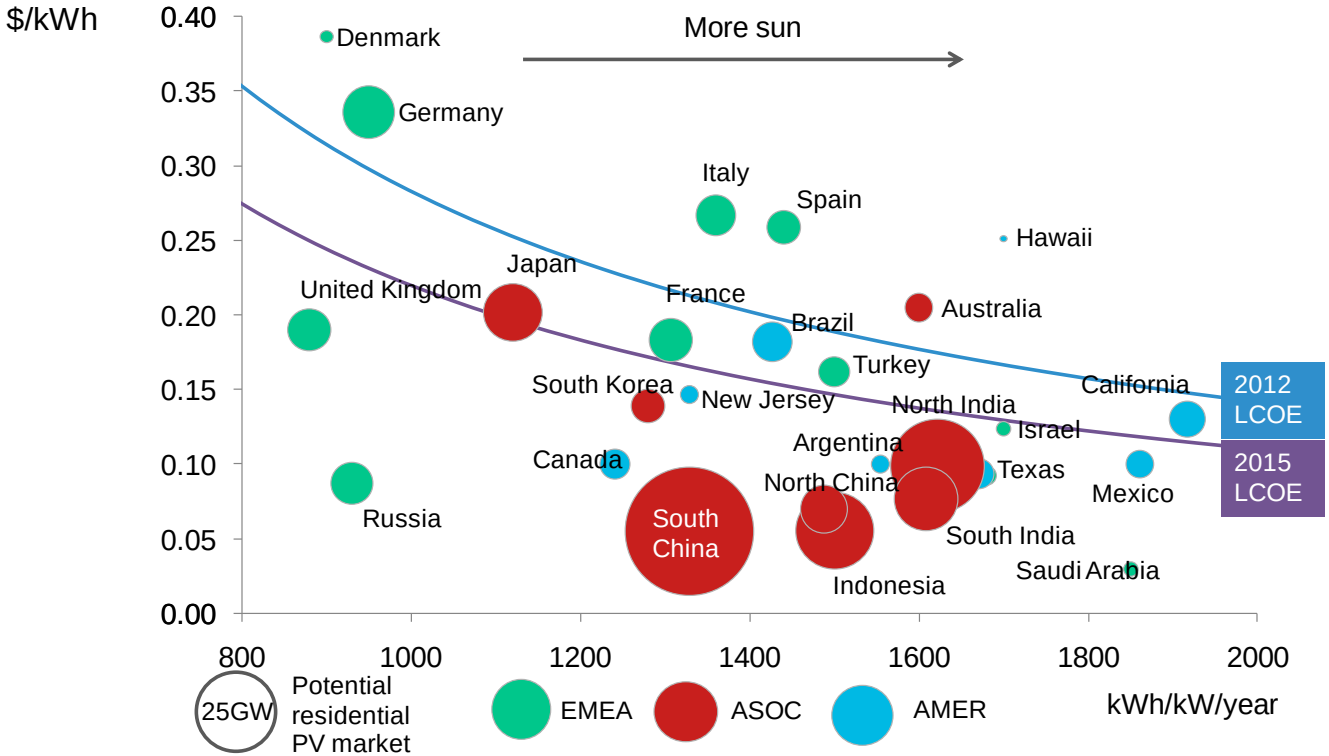

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SUMMARY

- The past six years have seen tremendous progress in solar power
- This has been mainly by a 30-year-old technology, crystalline silicon
- Crystalline silicon continues to make incremental improvements to all aspects of the technology
- The breakthroughs are probably elsewhere
- Improving economics of solar will open up new opportunities

INNOVATING AROUND CHEAP SOLAR MODULES

- Inverters
- Balance of system components
- Racking and mounting structures
- Better installation team management
- Home energy management systems
- Financing innovations
- Innovations in distribution, particularly in the developing world
- Monitoring and security software to prevent theft or allow mobile payments
- Cheaper operation and maintenance contracts
- Customer sourcing and qualifying

Source: Bloomberg New Energy Finance
Pictures: TerraSmart, SolarEdge, Conergy

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