

Smarter Solar from the leader in Interactive Distributed Generation



The background of the slide features a photograph of a large array of solar panels installed on a flat roof. The panels are arranged in neat, parallel rows that recede into the distance. The sky is a clear, bright blue, and the overall scene is well-lit, suggesting a sunny day. The solar panels themselves are a dark blue color with visible grid lines.

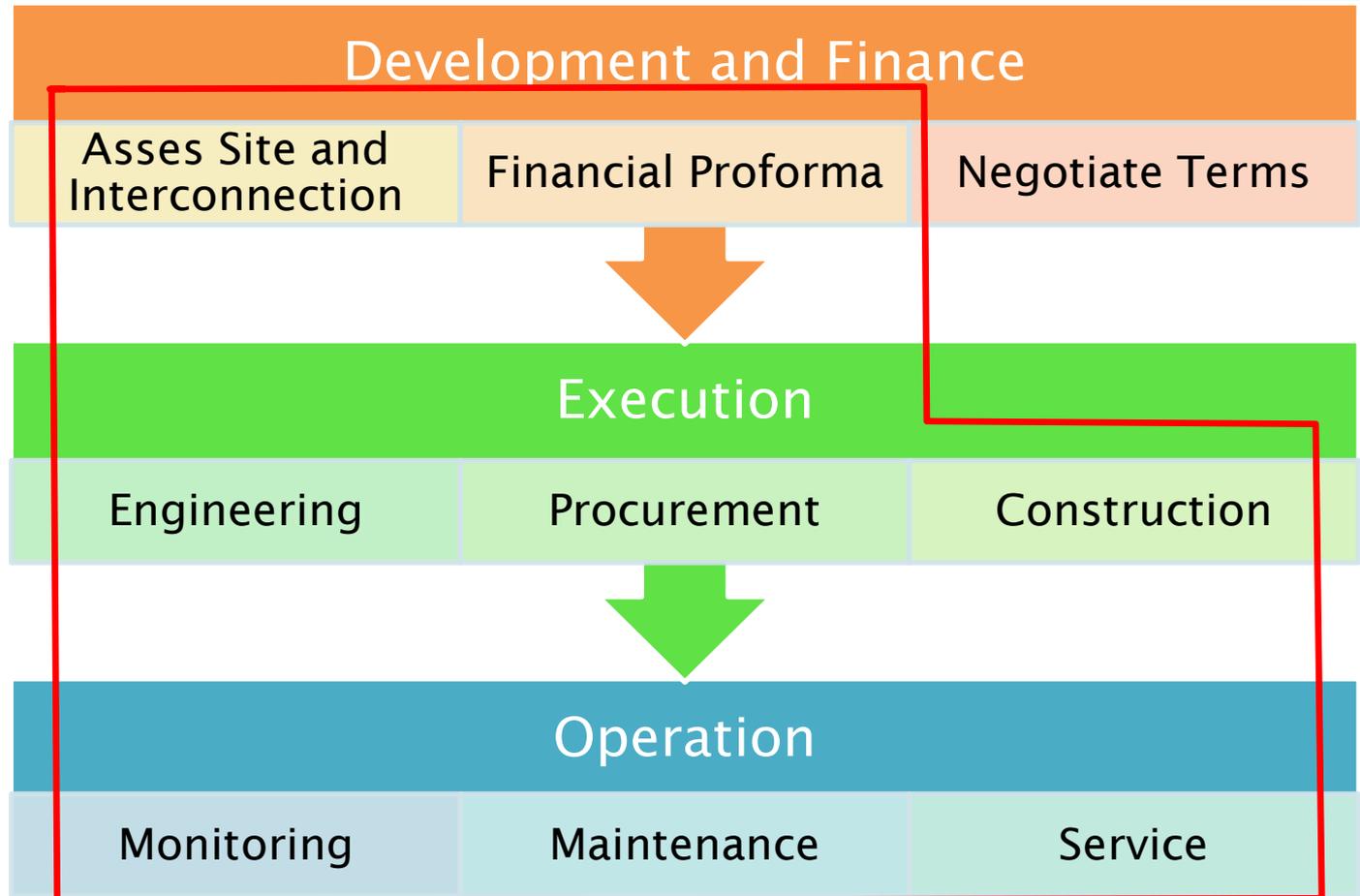
Shameless Propaganda

Engineering, Procurement, Construction (EPC)

- 2,000 MW Engineered
- 1,500 MW Constructed
 - 26 states
 - 225+ utilities
- Fuel Neutral
 - Diesel and Bi-fuel
 - Natural Gas
 - CHP and Tri-gen
 - Solar
 - Small Wind
 - Storage
 - Landfill gas-to-energy
- Reliability- 98.5%



Solar Project Stages



PowerSecure self-performs all of these functions

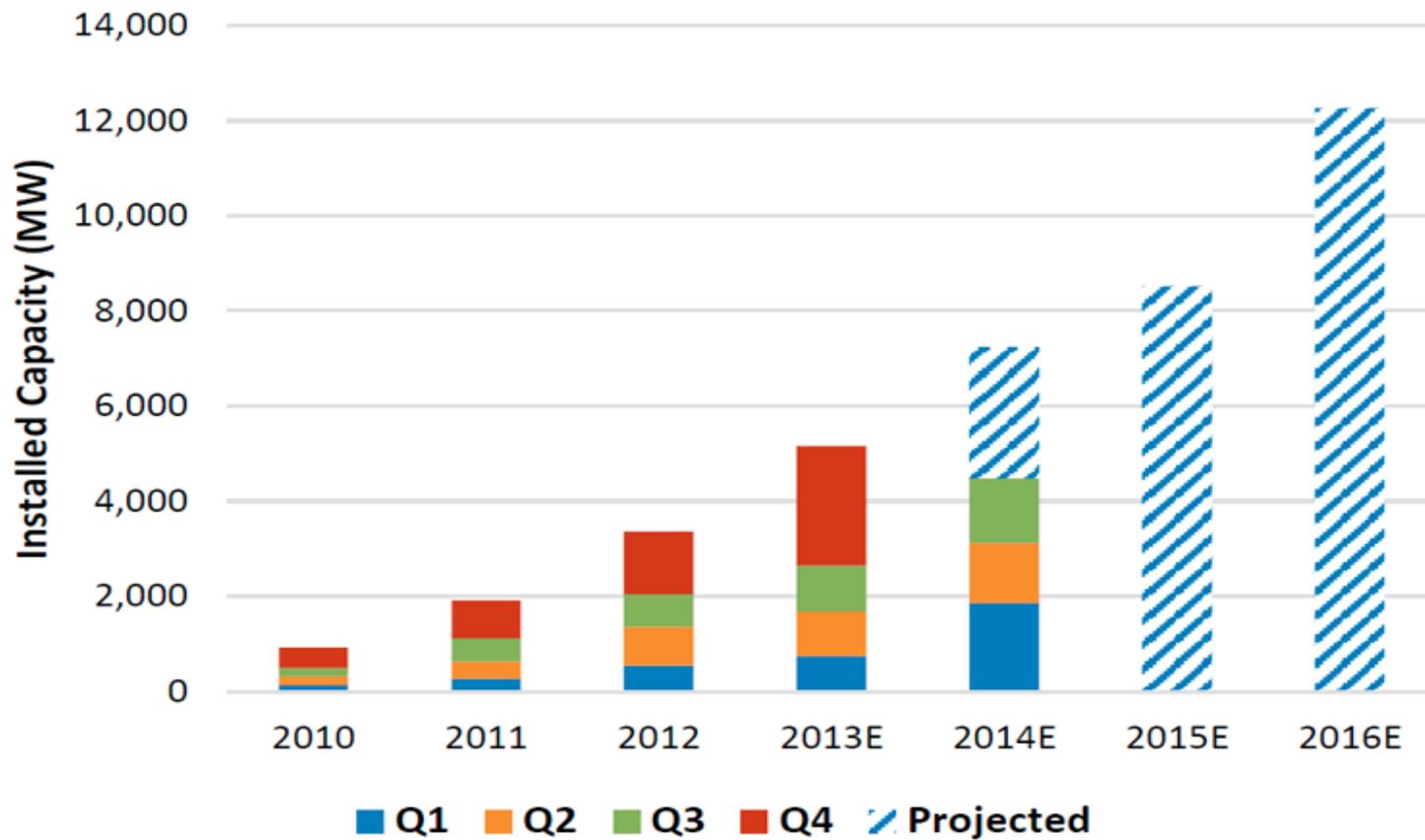


Let's Talk Solar

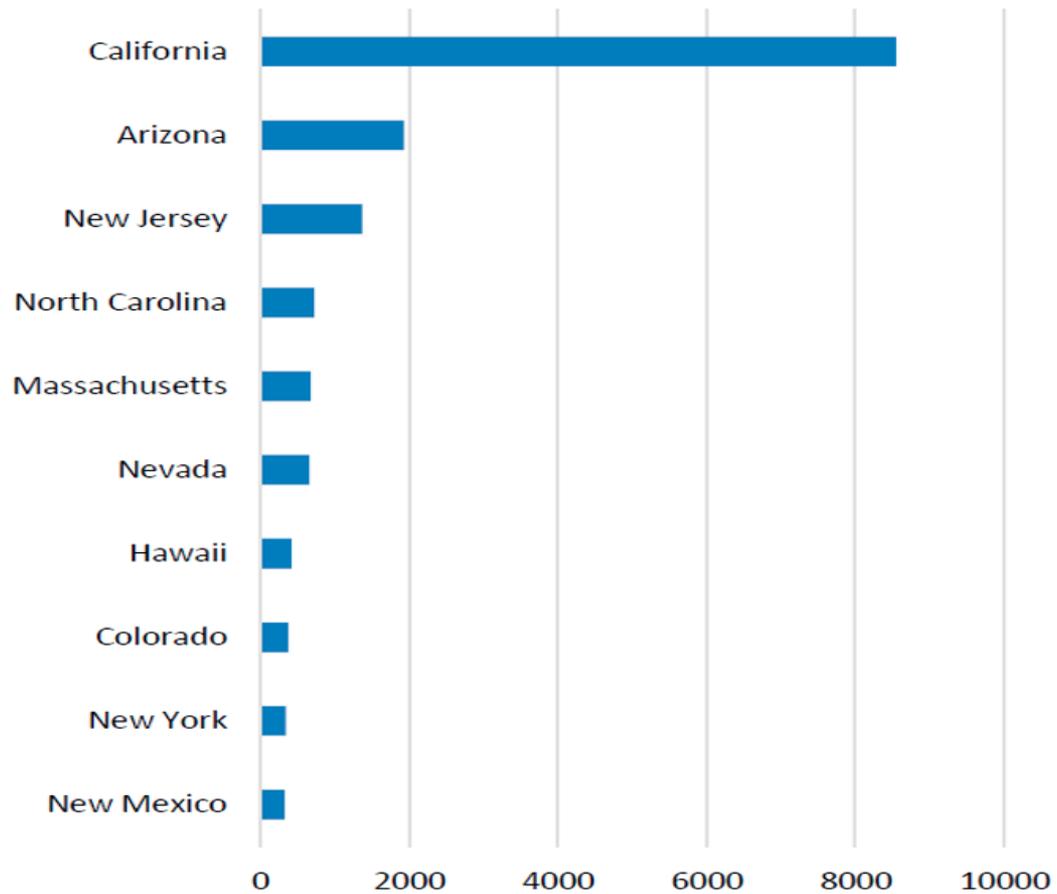
US Solar Market Overview

- 36% of all new capacity in 2014
- ~25% Sector growth (year)
- 17.5 GW installed
 - 49,000 installations
 - 600,000 homes
- 0.4 % of US Consumption
- Market Drivers
 - Trade War
 - Investment Tax Credit (ITC)
 - Accelerated Depreciation
 - RPS (State Level)

U.S. Solar Installation Forecast



Cumulative Solar Electric Capacity



How is Solar Bought and Sold?

➤ You build a *power plant*

- Capital Project (cash and/or debt)
 - Design/Bid/Build
 - Design/Build
 - CM with GMP
- Main advantage– simplicity, control (ex– Ogdensburg, Los Angeles)

➤ You buy *energy* from a third–party

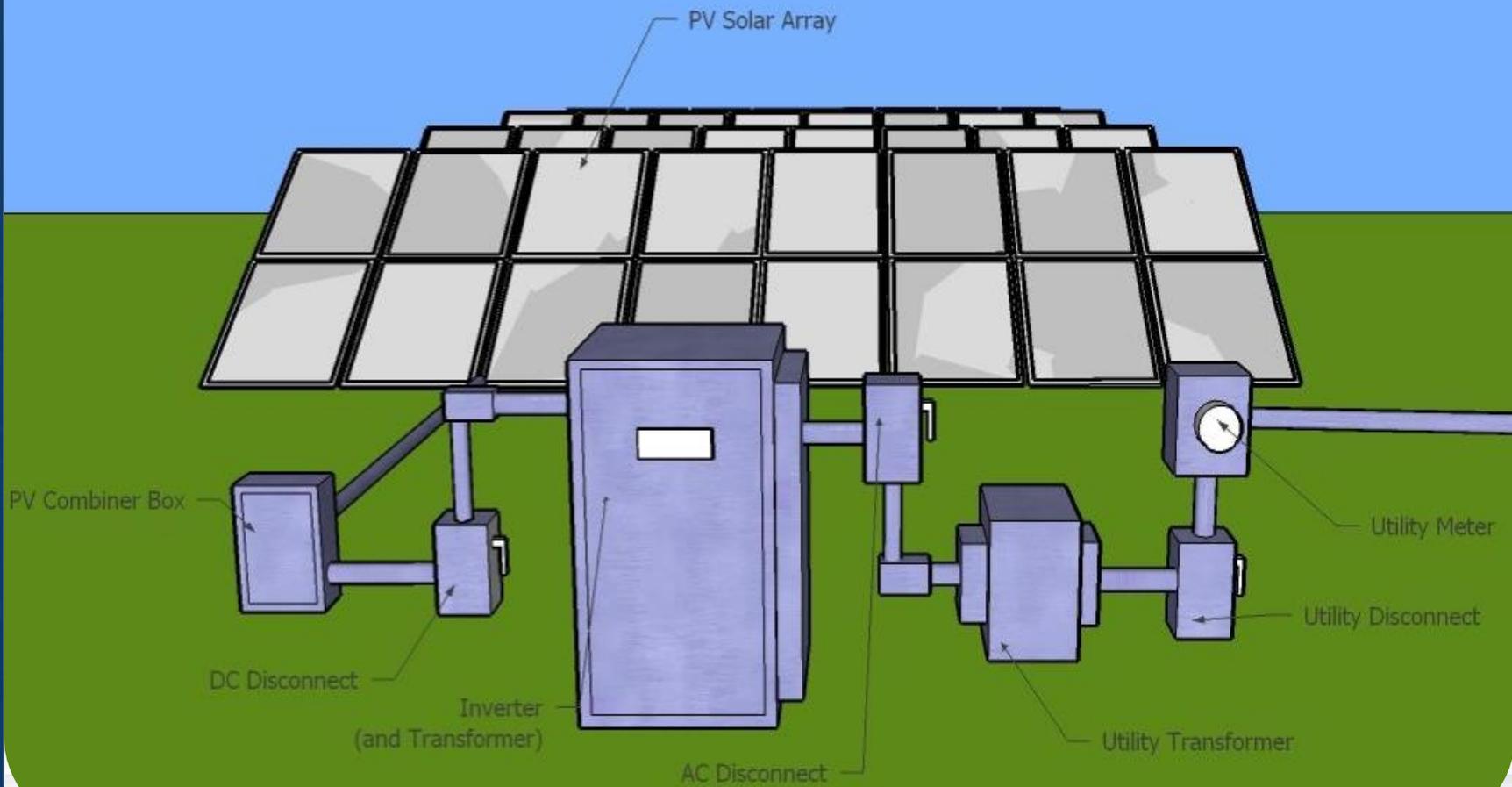
- Power Purchase Agreement (PPA) with Independent Power Producer (IPP)
- Can utilize a developer
 - Site
 - Interconnection
 - PPA
- Optional arrangements (Pre–pay, scheduled FMVbuy–out, VNM)
- Main advantages– leverage ITC, no operational risk (ex– West Sacramento)

Value of a Site

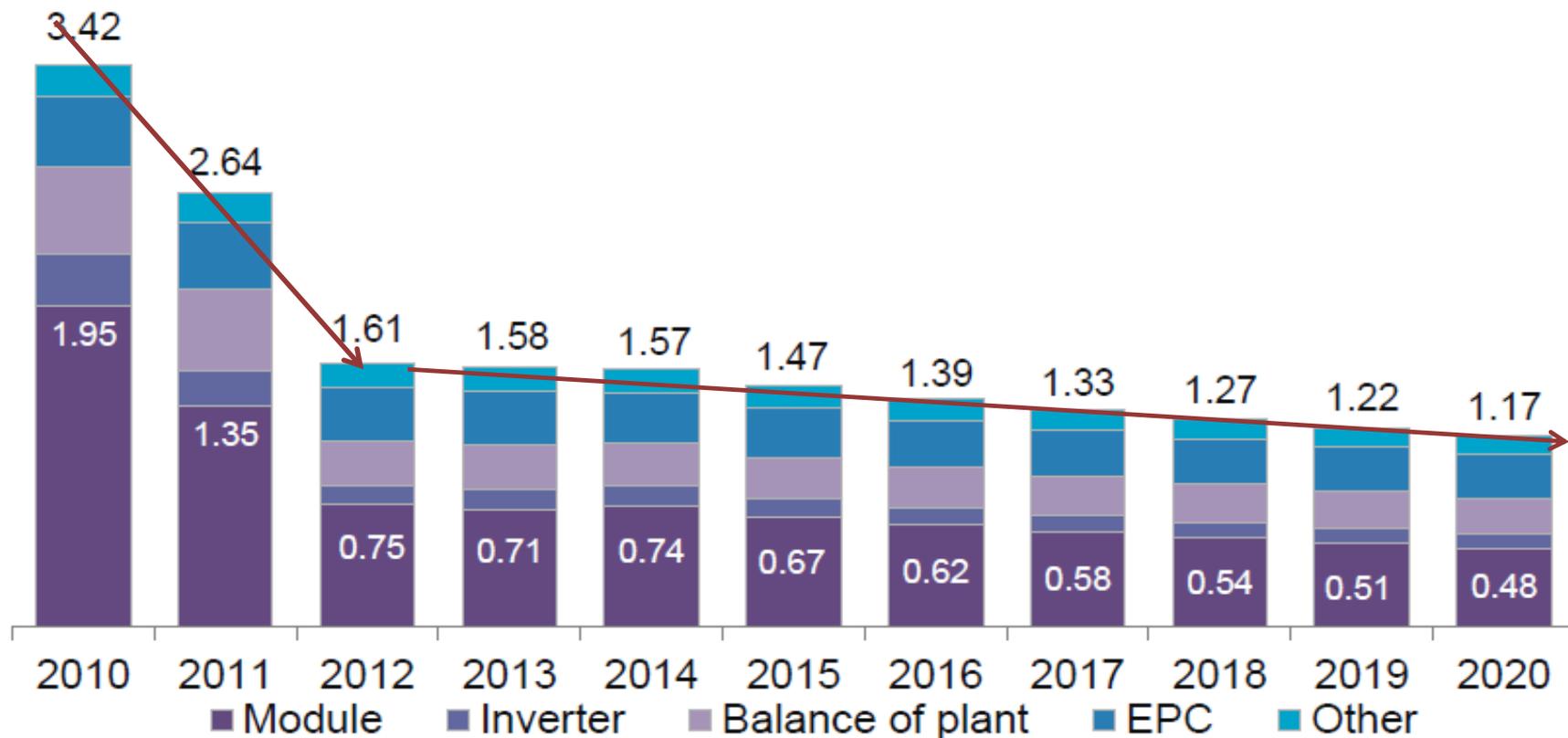
- Project feasibility driven site costs
 - 1 MW AC/5–6 acres
 - Good “coverage ratio” driven by
 - Topography/grade
 - Existing trees (shading, clearing)
 - Site shape
 - latitude (drives module tilt)
 - Low cost interconnection
 - Site partnerships can be formed
 - Option for future purchase at FMV
 - Host does not have to off-take
 - Behind RTO/ISO, off-taker does not have to host







FORECAST FIXED-AXIS UTILITY-SCALE PV CAPEX, 2010-2020 (2013 \$/W)

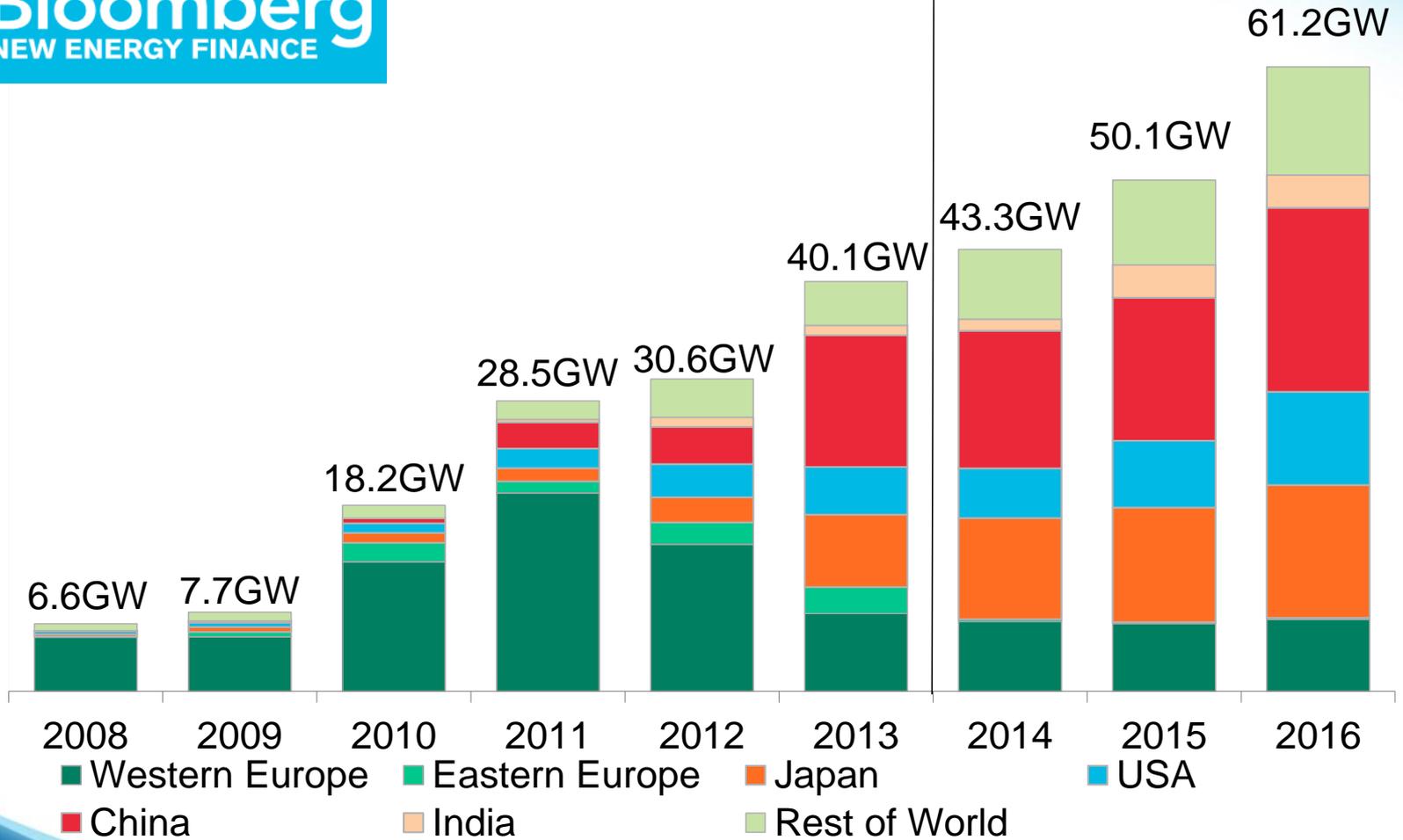


Note: Collected, triangulated from project developer and installer documents in medium-priced markets

Source: Bloomberg New Energy Finance

Historical

Forecast



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Analysis and news on trade and environment

Overview

News archive

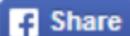
Issue archive

About

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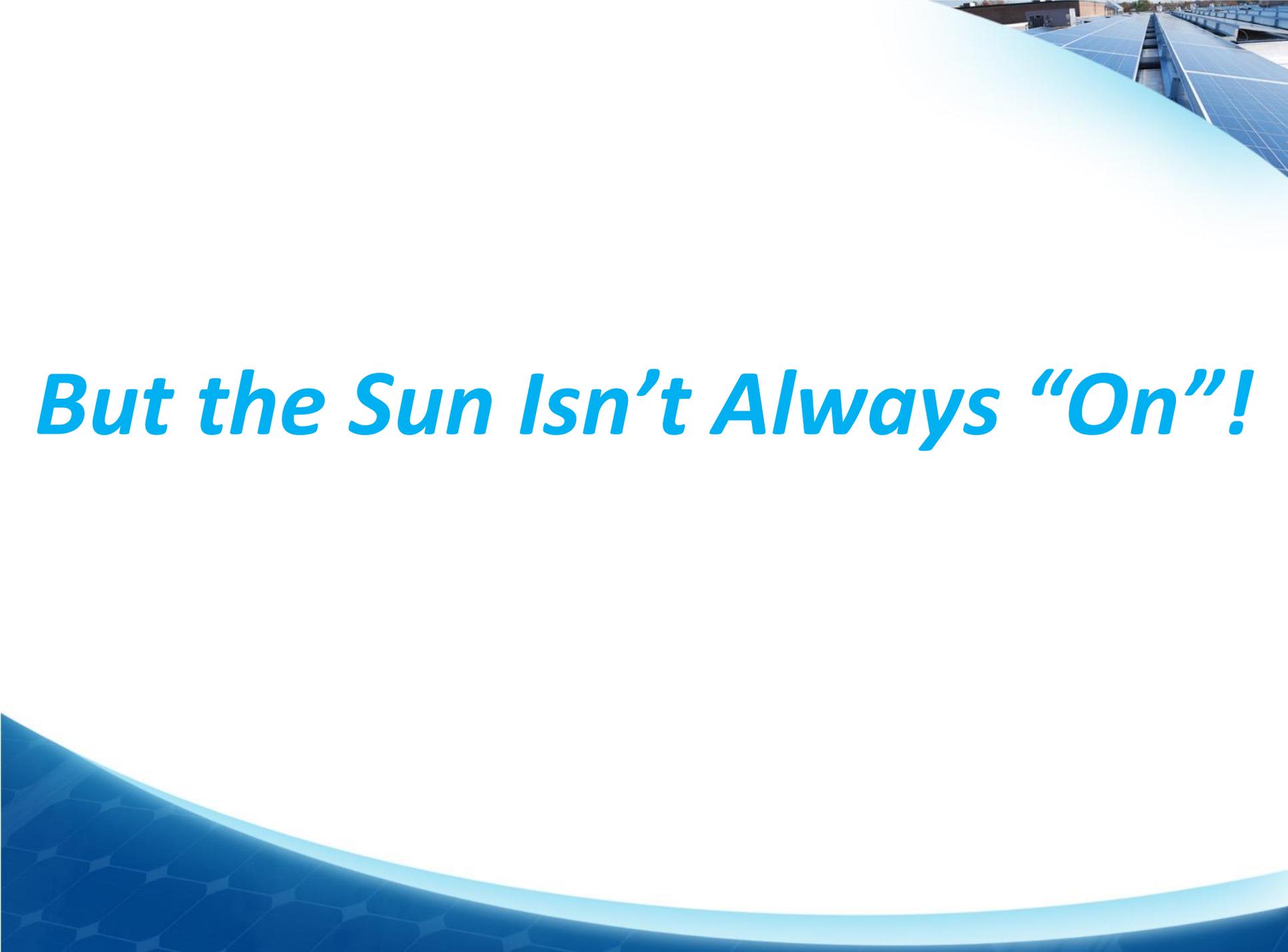
Washington Announces Final Duties on Chinese Solar Cells

15 October 2012

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The US Commerce Department has determined final anti-dumping and anti-subsidy - also known as countervailing - duties on imports of Chinese solar cells, the government agency said last Wednesday. The highly-anticipated announcement comes a year after a coalition of US solar panel manufacturers first filed the case, which ramped up tensions between Beijing and Washington over their respective renewable energy policies.

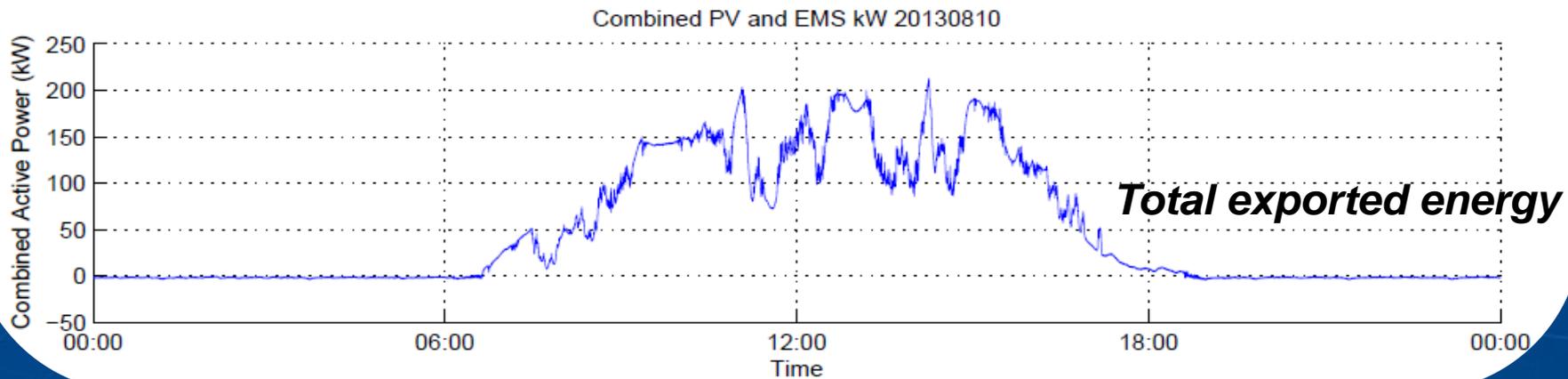
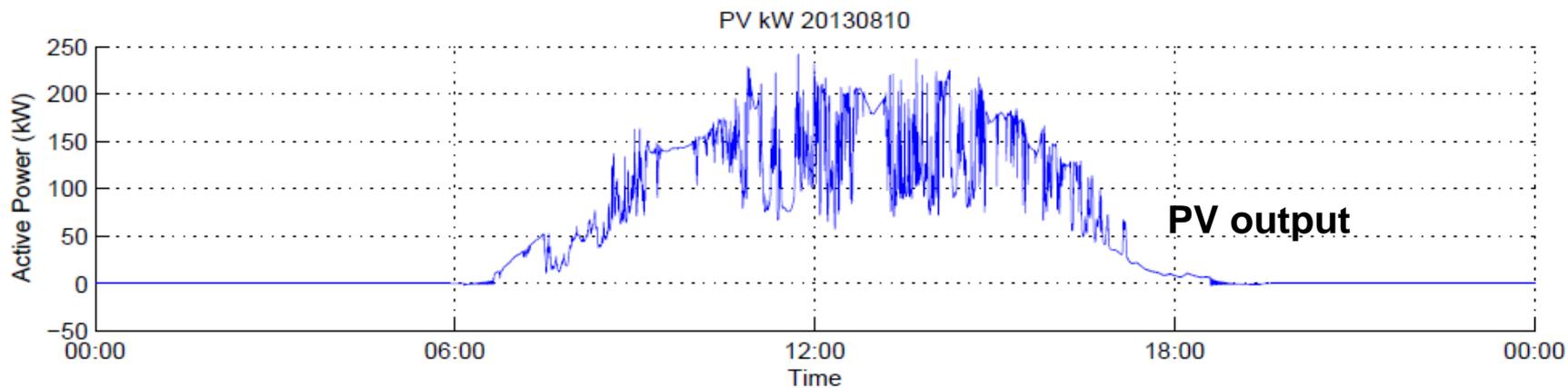
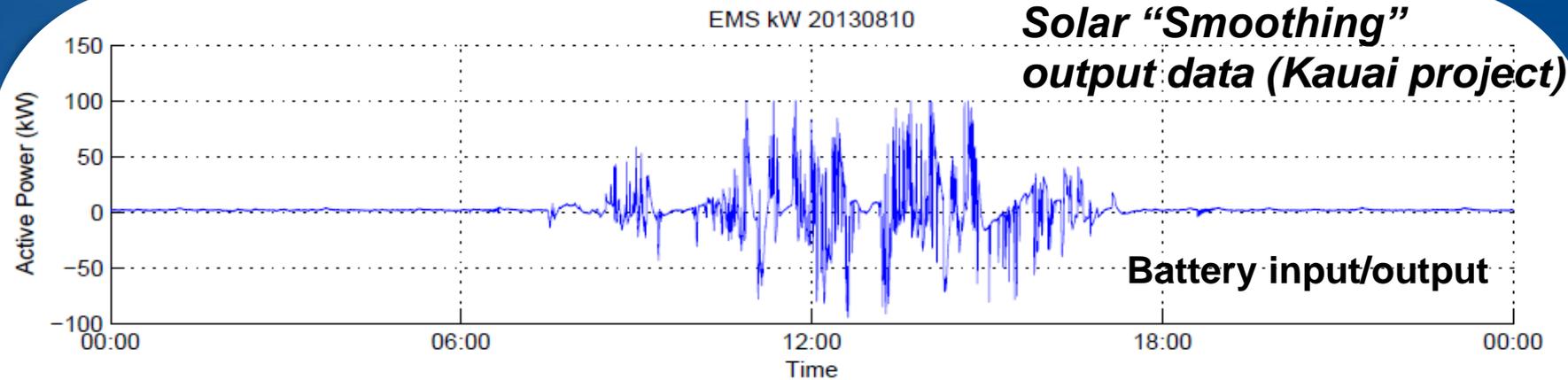
The US Commerce Department, in its final determinations today, found that Chinese producers/exporters have dumped solar cells in the United States at prices between 18.32 to 249.96 percent lower than their fair value. The practice of dumping involves companies selling their products abroad at prices below normal market values, causing harm to the domestic industry of the importing country.



But the Sun Isn't Always "On"!

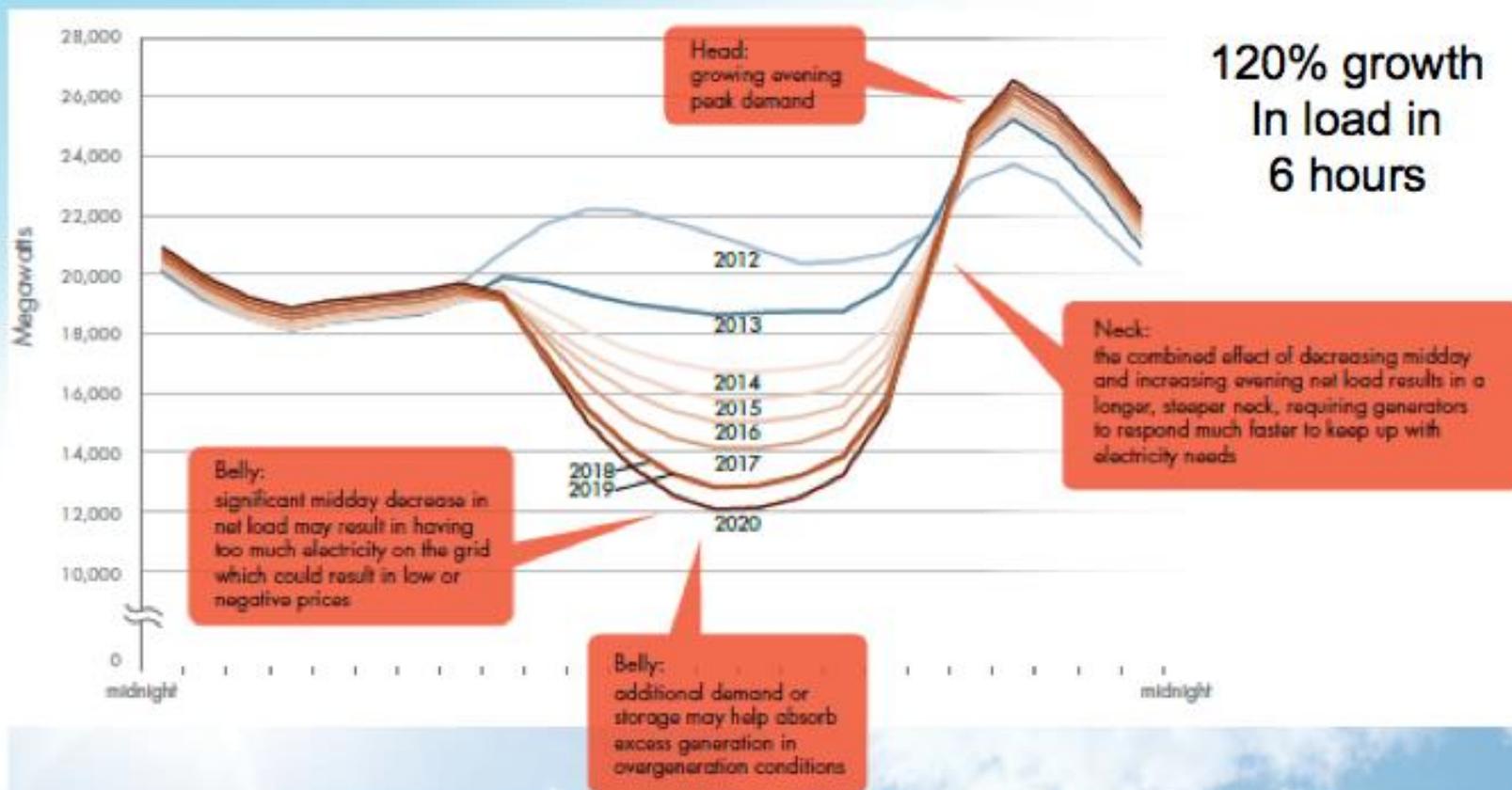
Energy Storage Systems (ESS)

- Load *Shifting*
 - The “Holy Grail”
 - Make intermittent resources available anytime
- Load *Shaping*
 - Building- and grid-level solutions
 - Need increases as DG penetration increases
- Disruptive Technologies???
 - Depends on use (depth of discharge)
 - \$250/kWh

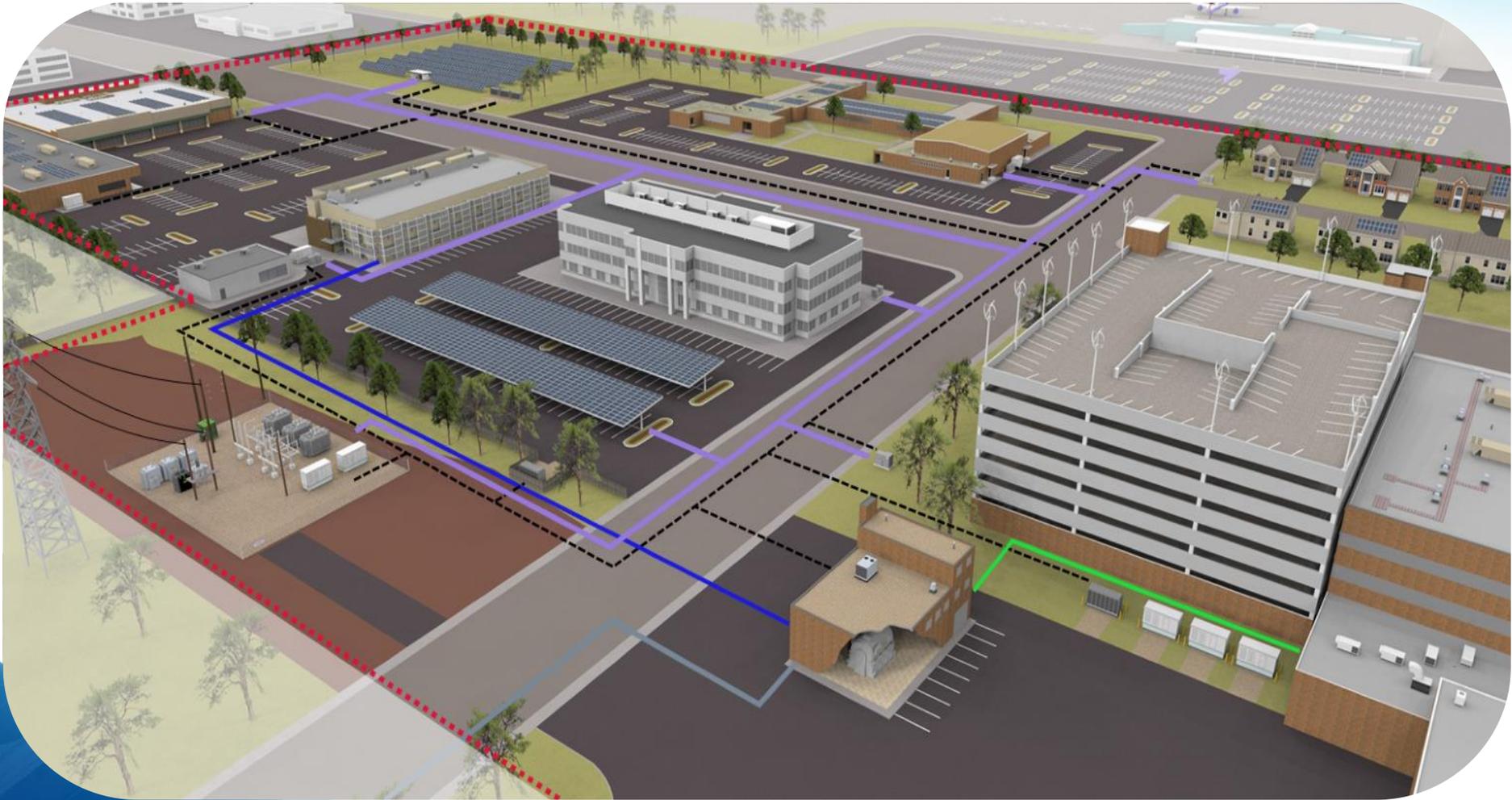


New Resource Need to Have Operating Characteristics To Integrate Renewables

California “Duck Curve” For March



Microgrids – Dynamic Islanding



Honeywell

Power Secure



The Future Grid is Distributed

- Parallel DG has benefits when grid connected
 - *Utility Programs*
 - Renewable Portfolio Standards
 - Net-metering
 - *RICE for peak load management*
 - Also benefit in an outage
 - integrated with renewables (save fuel, capacity “firming”)
- Unstable grids –**OR**– Ancillary Markets
 - *Frequency Response*
 - *Voltage Regulation (reactive power)*
- Interconnection challenges
 - *Pairing solar with energy storage for ramp control*
 - *Load following solutions (zero net export of energy)*



Utility



Grid Interconnect



Fixed Solar



Diesel Generators



Mobile Solar Generator



DC Module 200kW



AC Module 250kW



SCMG Human Machine Interface (HMI) PC



Smart Distribution Panels



Plug In Electric Vehicles



Mobile Smart Panel



Thank You!

Sterling Bowen

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