

US Renewables Outlook

The Solar Parity Question

Equities

Americas
Utilities

Focusing on the Cost Roadmap for Solar: Gaining Parity

Digging into the cost roadmap provided by FSLR at its latest Analyst Day, we see continued trajectory towards achieving a ~12% per annum reduction in the total cost of solar, translating to an LCOE into the low-to-mid-30's/MWh net of ITCs by ~2020. As such, we see clear risk that merchant solar in high solar penetration jurisdictions could begin to be 'economic' in the same way that wind has been economic in regions like ERCOT net of its PTC benefits (contracted prices here have been as low as the high-teens/MWh). We see 'two levels of relevant utility-scale grid parity: true 'marginal cost' vs. other thermal resources, and vs. traditional resources on a fully levelized basis (higher). While solar would appear to be poised to cross the LCOE threshold (prior to accounting for its very real intermittency issues), we see a trajectory for solar to cross the 'marginal cost' of dispatch parity on peak prices. We see the latest projections for solar as nearly ensuring a wave of merchant solar later in the decade under current forward peak power prices (off long-dated gas and power contango).

Just how low is solar poised to go?

Using the FSLR projections we see total costs declining to ~\$0.60/W, with total sold project costs with margin as low as \$0.80-0.90/W (\$800-900/kW fully developed with returns). While module costs appear to be declining still, FSLR has emphasized it is in fact higher voltage power electronics and reduced steel and cabling around the site that enables much of the reduce cost profile. Its current roadmap would appear to trend towards ~2019/2020 timeline for significant reductions. We note the cost reductions do not come cheaply, with mgmt pointing to total capex of seemingly ~\$2 Bn to install corresponding technology.

Pressure on module prices could bring down costs too

We see the potential for wider industry margins on manufacturing to compress amidst a potential emerging over-supply situation into 2017. We believe this could help bring down prices even further for both internal and externally developed projects. We believe average industry margins could be pressure for both modules and systems as competition mounts to pursue this business. As such we think this could drive expectations under an upside case to below the above range, albeit unsustainably.

Key question remains interest rates – how long will they support growth?

Low prices and new build are supported in large part by constructive monetary policy and cheap financing for new generation sources. In a scenario where interest rates rise and the capital markets remain difficult for further capital raises (particularly in the yieldco and IPP spaces) we see optimistic cost projections offset by rising financing costs and reduced competitiveness.

But the 'parity' will be transient: expect ITCs and PTCs to truly roll-off

We emphasize that our definition of 'utility-scale parity' is still *net* of respective ITCs for solar and PTC for wind, which are largely set to unwind in ~2021, with an ability to safe harbor with the IRS eligible modules and sites for several years thereafter. As such, the PTC is worth ~\$30/MWh on a pre-tax basis and the ITC worth effectively (~\$5-10/MWh as a step-down to the permanent 10% ITC rate). As such, the 'parity' concept will be transient. That said, renewables would appear to remain broadly competitive vs. conventional procurement of *new* units in regions that are not saturated (renewables would *remain* competitive on a levelized cost basis, but *not* vs. marginal costs of fossil fuels). The circularity of power prices could well mean that on-peak remains capped below the mid-30's level needed to support continued investments.

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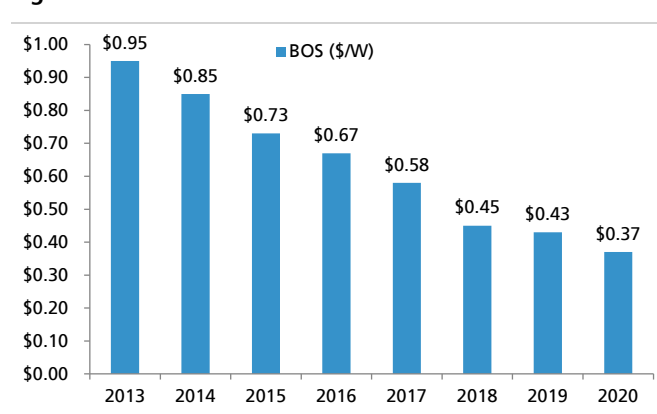
What would a Democratic presidency mean? Not so clear on transient credits

We emphasize with any future Democratic administration likely to push a continued clean energy agenda, there is a potential for a push for yet another tax credit extension. While still requiring congressional action, we note this potential remains little discussed among investors today. We see the election focus as important mostly around the implementation of carbon mandates under the Clean Power Plan (CPP); any future administration would have substantial latitude in not just timeline and enforcement of state-level obligations but potentially targets themselves pending court clarity. Bottom line, while this solar 'parity' would be set 'expire' in the early 2020's a further democratic administration could possibly move to extend implicitly or explicitly such subsidies either through direct action or further IRS latitude on safe harbour definitions.

Illustrating the Cost Declines

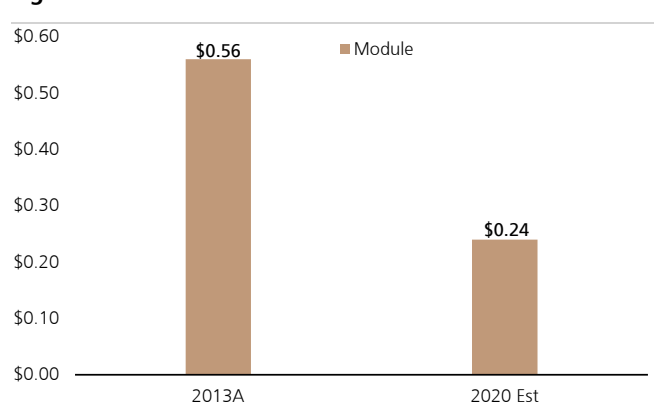
We emphasize the latest cost curves for fully-installed FirstSolar projects bode well for continued deflation in total system costs. We include our best approximation of the charts reflected at the time of the Analyst Day last week. Although the company suggested their charts are not perfectly to scale, our checks coupled with previous disclosure from FSLR (projecting 99cents all in system cost for 2017 deliver in 2013 analyst day) suggest that if costs continue on their current trajectory, all in cost plus 20-30% margin baked in could plausibly reach the \$0.80-0.90 range for delivered systems in that timeframe.

Figure 1: BOS Costs Contain Most Potential for Reduction



Source: UBSe, Company Filings

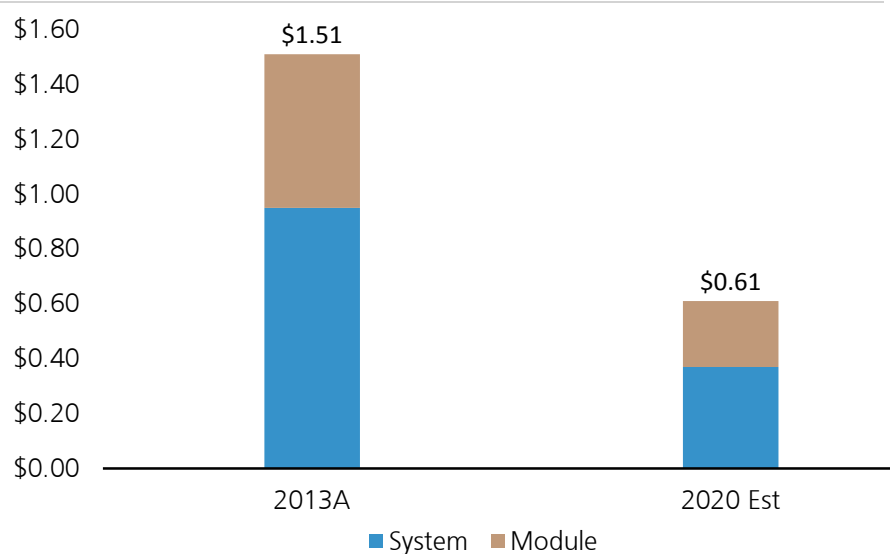
Figure 2: Module Costs Still have Room



Source: UBSe, Company Filings

Taken together, total system+module cost of ~61 cents exiting 2020 seems entirely possible on a 4-5 year trajectory.

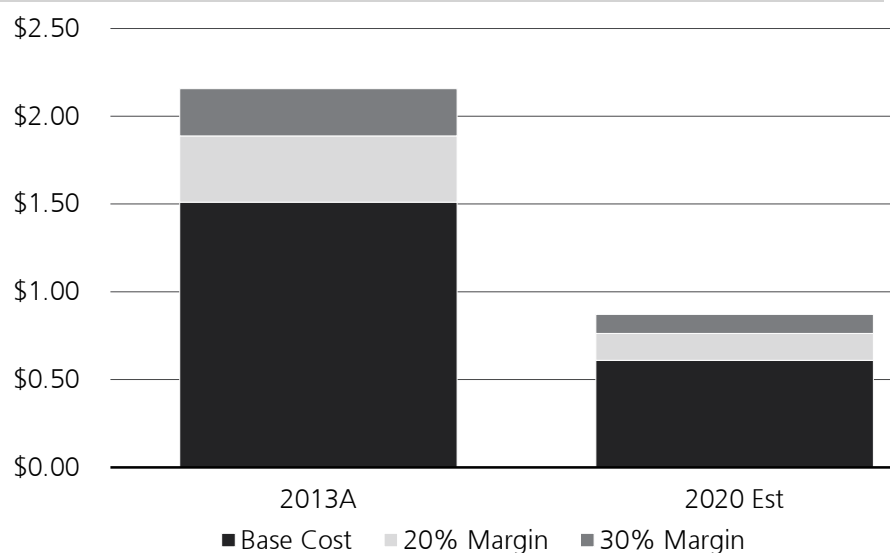
Figure 3: Total System Costs Could Reach Well Under \$1/W in the US



Source: UBSe, Company Filings

Assuming 20-30% systems margins, all in system costs could remain under \$0.90/w exiting 2020. Whether that means FSLR and other top tier solar developers remain project owners or simply deliver MW for a margin (in a speciality E&C capacity) remains to be seen and is likely largely dependent on marginal cost of electricity in specific regional markets.

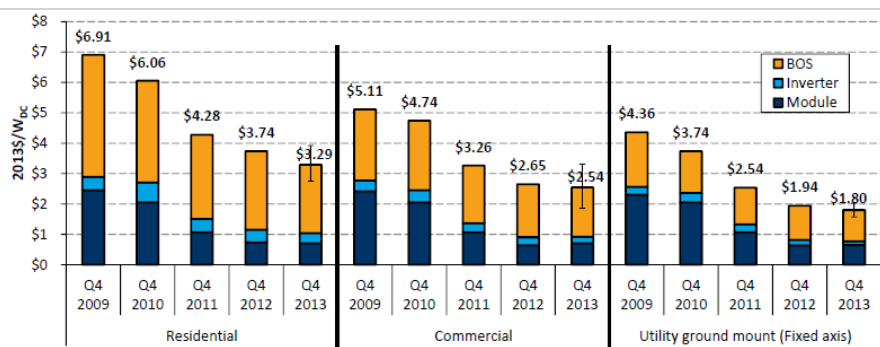
Figure 4: Total System Costs with 20-30% Margin are Still Under \$1/W in 4-5 yrs



Source: UBSe, Company Filings

Furthermore, NREL's estimates suggest system prices have typically fallen 16-19% annually, supportive of our implied decline of ~12% annually to achieve costs in the ~60c/W or \$600/kW range (pre-developer margin).

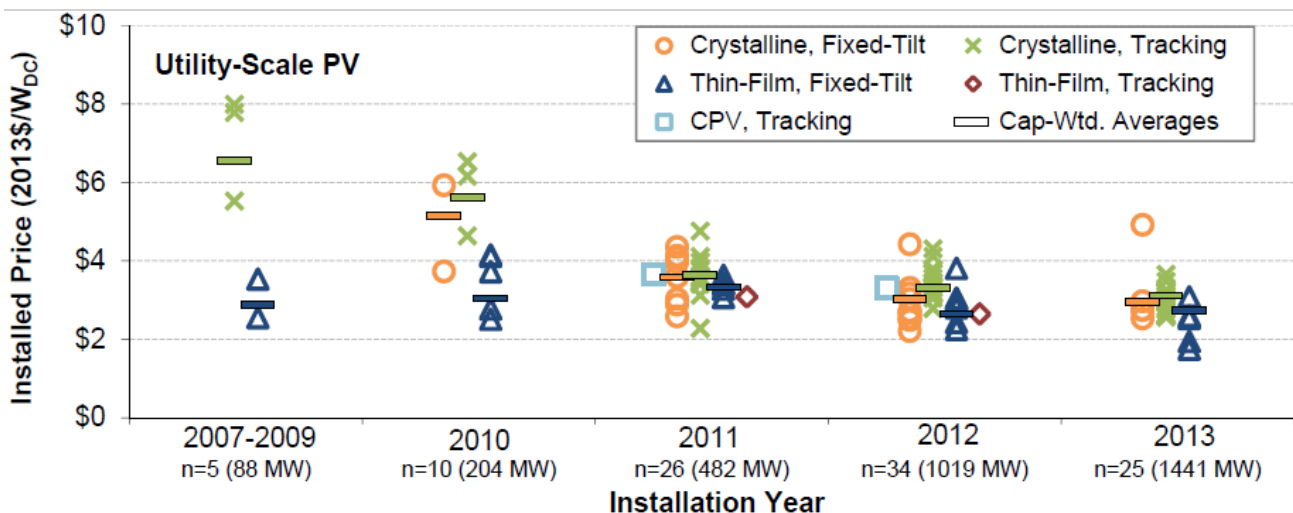
Figure 5: Historic NREL Cost Basis Ests Show ~16-19% Cost Declines



Source: NREL

Utility scale solar in particular has shown significant cost improvement in recent years, and further cost reductions are likely particularly on the balance of systems cost. Other developers like SPWR have suggested 20-30% cost reduction through 2018 is achievable, which is consistent with our projections.

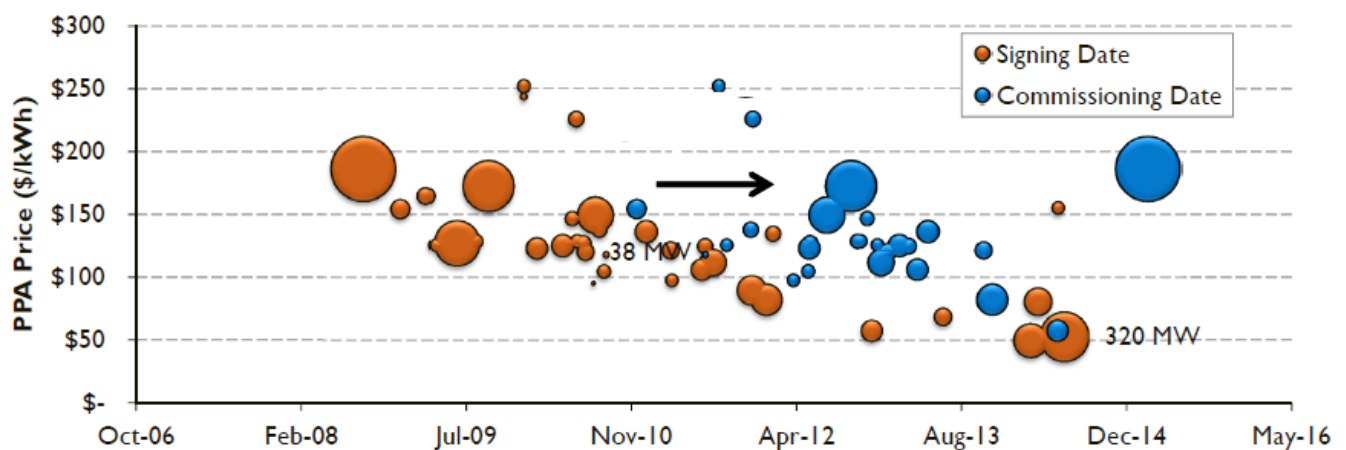
Figure 6: Historic Cost Declines for Utility Scale Solar Have Been Substantial



Source: Lawrence Berkeley National Lab, NREL

We also note the historic 2-3 year lag between PPA bids and actual construction, which implies **developers could be bidding based on sub \$1/w all in cost in the 2018-2019 timeframe (for 2020-2021 delivery).**

Figure 7: Lag Between Bids and COD



Source: BNEF, NREL; do not cite as is Preliminary data from NREL's presentation to UBS

Further, marginal improvements outside of factors within company's control (lower weight building codes, for example) could compound effects from efficiency gains, pre-assembly, standardization, and other company-specific BOS reductions.

How Cheap Can Solar Get? NREL's Take on Trends [Click here for the full report.](#)

Where's the Cost of Solar, eventually?

We show the illustrative example of Southeast solar on an LCOE basis below. We emphasize our estimate of \$32/MWh and a ~25% capacity factor yields a reasonable 9% levered return. We believe the ability to hedge out future prices at these levels will remain relatively attractive to regulated entities able to sign long-term PPAs. We emphasize without cheap wind available, we see the Southeast as an ideal market for future penetration.

Figure 8: Illustrative Southeast Economics – making it work in the future

Inputs					
General		Operational		Financing	
Mega Watts	100	PPA / kWh	\$0.032	Debt	52%
Annual GWH Produced	219	OpEx / Year	\$ 1 MM	Total \$	\$ 61 MM
Effective Tax	35%	OpEx / kWh	\$0.005	Cost of debt	5.0%
Investor IRR	8.3%	Cap Factor	25%	Tenor	25
System Price/W	\$0.90	Degradation factor	1%	Equity	48%
Cash Grant (~27%)	\$31.59			Total \$	\$56.05
Total Sale Price (w/ FMV Step-up)	\$ 117 MM			Debt Service Coverage Ratio	1.30
		Unlevered IRR	6%		
		Levered IRR	9%		

Source: Company reports and UBS estimates

Then what about merchant solar in Texas?

Using the same assumptions above with a higher (merchant) cost of borrowing and higher capacity factor (given high irradiance) in West Texas, the lower cost roadmap for solar would suggest merchant prices work for on-peak in the mid-30's/MWh. This would appear to be *near* to where ERCOT forwards trade already, suggesting risk to development activities. We see increasing direct competition between natural gas and solar given direct generation competition emerging across the key markets in California, Texas, and the Southeast

Figure 9: Merchant Solar in Texas: Getting Close to Parity ... out in 2020

Inputs					
General		Operational		Financing	
Mega Watts	100	PPA / kWh	\$0.350	Debt	58%
Annual GWH Produced	245	OpEx / Year	\$ 1 MM	Total \$	\$ 67 MM
Effective Tax	35%	OpEx / kWh	\$0.005	Cost of debt	7.0%
Investor IRR	19.1%	Cap Factor	28%	Tenor	25
System Price/W	\$0.90	Degradation factor	1%	Equity	42%
Cash Grant (~27%)	\$31.59			Total \$	\$49.68
Total Sale Price (w/ FMV Step-up)	\$ 117 MM			Debt Service Coverage Ratio	1.30
		Unlevered IRR	10%		
		Levered IRR	19%		

Source: Company reports and UBS estimates

Using Wind as a Case Study for Solar: How to Frame the Upside Case?

With Wind having already 'achieved' this parity status below the marginal cost of coal, we see utility-scale deployments for wind as having previously achieved years with 10GW+ of deployments with clarity of the Production Tax Credit. While not a direct analogue to solar, we see potential for utility-scale solar deployments to achieve substantial levels in the 2019/2020 period should the current trends materialize. We emphasize this utility-scale build at this magnitude would be in addition to the 3-4GW/yr of current residential deployment.

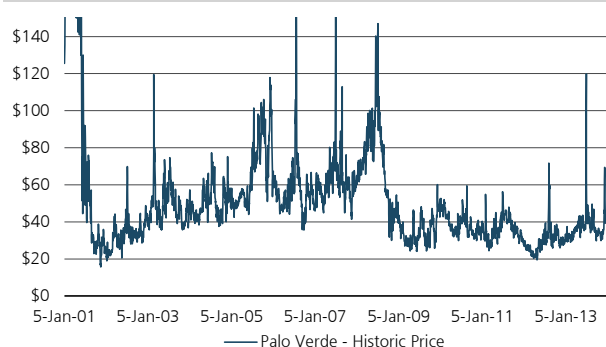
What are the limits to this comparison?

- Solar will *not* be below the marginal cost of coal; rather, it will simply be close to meeting project on-peak power prices across several regions. We emphasize peak prices would well be pressured quickly by additions of solar, bringing down prices to below their marginal costs. We note this phenomenon has occurred in West/North Texas already where off-peak power prices are below levels necessary to incentivize continued 'merchant' build.
- While the wind build was largely limited to areas with sufficient capacity factors across a large swath of the Midwest, higher solar capacity factors exist across much of the Southern band of the US. This expands the eligible pie to a wider region in the US.
- Coincidence with peak retail needs and solar insulation suggest that retailers could well pursue renewables to hedge their peak generation risks. We see the SUNE-TXU Energy deal as seemingly driven by these considerations.

Wholesale Power: Pushing against Marginal Costs

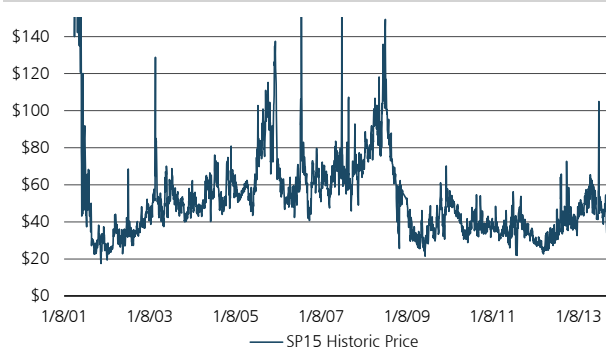
Long term secular decline in wholesale power markets despite some increases in the price of gas causing drastic short term shifts in the 2005-2008 timeframe suggest structural factors in place in western markets.

Figure 10: Palo Verde Wholesale Power Prices



Source: EIA Historic Data

Figure 11: SP15 Wholesale Power Prices

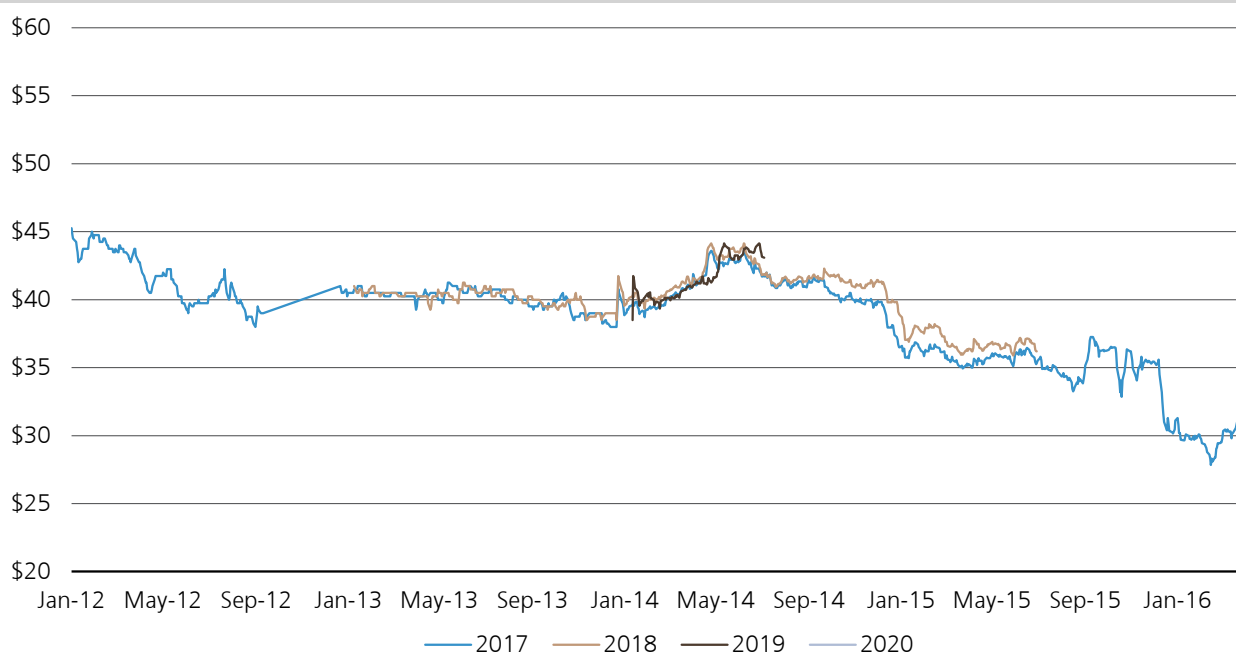


Source: EIA Historic Data

And Price decline in West has been much more pronounced than in Southeast...

Southeast forward power prices have declined much slower than California, which we expect can be attributed in part to the extensive build out of renewables in the region.

Figure 12: Southern (Southeast) Wholesale Forward Prices – On-Peak (\$/MWh)

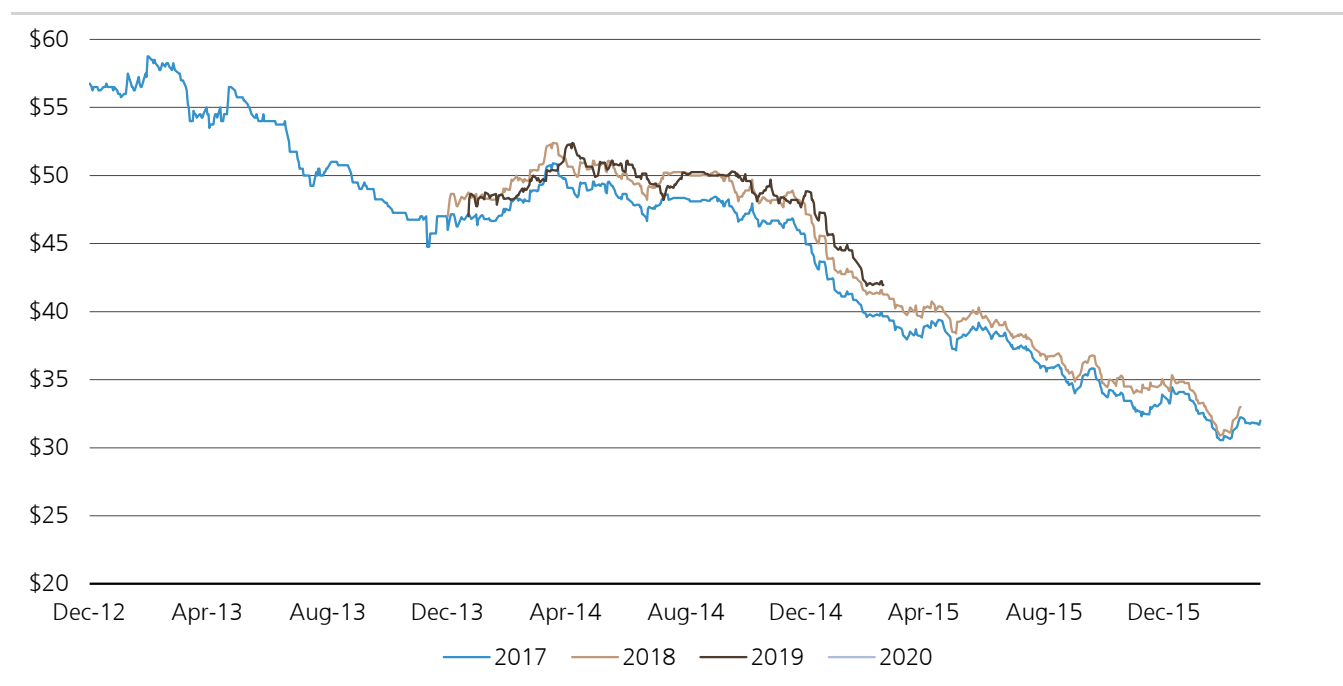


Source: Platts

California – declining due to gas and renewables.

California wholesale prices have declined the same dollar amount in the last 2 years that Southern power prices have declined in the last 4 years. As large scale renewables came online in the state, we expect power prices were largely capped over the last few years.

Figure 13: SP15 (California) On-Peak Forward Power Prices (\$/MWh)

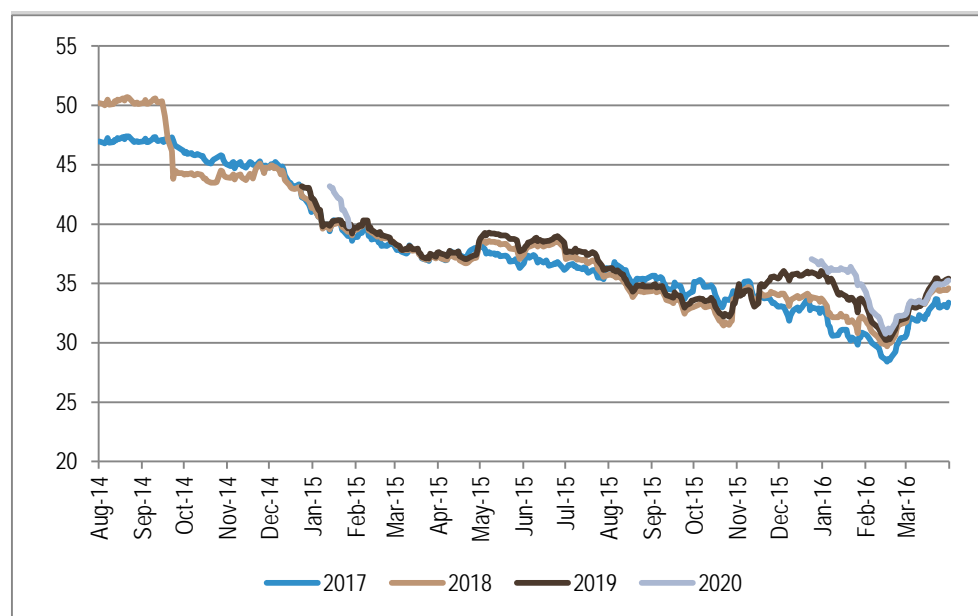


Source: Platts

What about ERCOT?

We reflect ERCOT West On-Peak prices, illustrating long-dated forwards appear to be near 'in the money' for solar, prior to adjusting for liquidity premiums to do long-dated deals.

Figure 14: ERCOT West On-Peak price (\$/MWh)



Source: Platts

Valuation Method and Risk Statement

Risks for Utilities and Independent Power Producers (IPPs) primarily relate to volatile commodity prices for power, natural gas, and coal. Risks to IPPs also stem from load variability, and operational risk in running these facilities. Rising coal and, to a certain extent, uranium prices could pressure margins as the fuel hedges roll off Competitive Integrations. Further, IPPs face declining revenues as in the money power and gas hedges roll off. Other non-regulated risks include weather and for some, foreign currency risk, which again must be diligently accounted in the company's risk management operations. Major external factors, which affect our valuation, are environmental risks. Environmental capex could escalate if stricter emission standards are implemented. We believe a nuclear accident or a change in the Nuclear Regulatory Commission/Environment Protection Agency regulations could have a negative impact on our estimates.

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Buy	FSR is > 6% above the MRA.	49%	32%
Neutral	FSR is between -6% and 6% of the MRA.	38%	26%
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Short-Term Rating	Definition	Coverage ³	IB Services ⁴
Buy	Stock price expected to rise within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%
Sell	Stock price expected to fall within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%

Source: UBS. Rating allocations are as of 31 March 2016.

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Company Name	Reuters	12-month rating	Short-term rating	Price	Price date
First Solar Inc ¹⁶	FSLR.O	Neutral	N/A	US\$59.96	11 Apr 2016

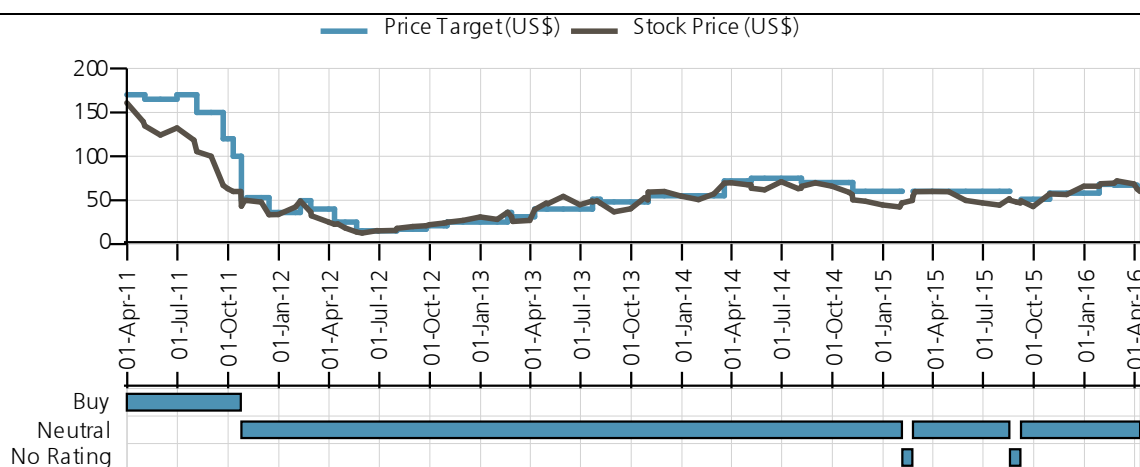
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First Solar Inc (US\$)



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