

Thoughts from the CEO & Founder



Vikram Aggarwal CEO & Founder

As the country's leading online comparison-shopping marketplace for rooftop solar, community solar, and solar financing, we are excited to share with you EnergySage's seventh semiannual Solar Marketplace Intel Report[™] for the twelve month period encapsulating H2 2017 and H1 2018.

Here are some of our top findings:

• Trump's solar tariffs created a \$236.5 million tax on American consumers.

The cost of solar spiked after the U.S. International Trade Commission's finding of injury to American solar panel manufacturers in September 2017. Though prices have since restarted their decline, they are decreasing at a slower rate than before. For the average customer, the solar tariffs increased costs by \$0.16 cents per watt. When this cost increase is applied across all residential installations since late September 2017, it equals \$236.5 million in new costs for consumers.

Impact of Solar Tariff



• Solar costs fell nationally, but rose in many top solar states

Although the cost of solar fell nationally to \$3.12 per watt in H1 2018, the quoted cost of solar increased for many of the top solar states. However, cost increases only occurred in states where the cost of solar was already below the national average price. Florida saw the lowest costs at \$2.71 per watt.

Panasonic and LG are now the two most popular solar panels

The two well-known consumer electronics brands made up 46% of all quotes submitted to shoppers in H1 2018. The Japanese and South Korean manufacturers overcame obstacles created by the solar tariff, and secured greater market share due to their high quality equipment ratings and recognizable brand names.

These are just a few of the many insights contained in this report. We invite you to start a conversation with us about what these findings mean to you, and welcome your ideas for future reports.

Sincerely,

Vikram Aggarwal

Vikram Aggarwal | CEO & Founder EnergySage

National Summary

EnergySage analyzed quotes submitted to shoppers in the Marketplace to provide an overview of trends in the solar industry in H2 2017 and H1 2018. Over twelve months, the average installed price per watt for distributed solar declined, but less so than in previous years.

Despite the tariff on imported panels, quoted prices continued to fall

Quoted prices dropped on the Marketplace between H2 2017 and H1 2018 by -0.3%. Prices decreased at a slower rate than in previous years, possibly as a result of the tariff on imported solar panels enacted in late January 2018.

Lower costs didn't equate to quicker payback periods

Solar payback periods are determined by three things: the size of the system, the percentage of a property owner's electric bill offset by the system, and the total cost of the system. The average system size and offset increased slightly from H2 2017 to H1 2018, while the average quoted price for solar decreased slightly. However, the average payback period for going solar increased by approximately 5%, which could reflect changes to state-specific incentives or regional electricity rates.

-5.9%



National Price Distribution

Payback Period (Years)

\$3.36

\$3.57

-3.3%

-0.3% \$3.17 \$3.13 \$3.00 H2 '14 H1 '15 H2 '15 H1 '16 H2 '16 H1 '17 H2 '17 H1 '18



Gross Cost Per Watt

-1.8%

\$3.79

\$3.86

-2.6%

\$3.69

\$4.00

\$3.75

\$3.50

\$3.25

Size of Quoted System (kW)

8.7



-5.7%

-1.3%

Impact of Solar Tariff

Solar Marketplace Intel Report[™]

The impact of the Trump Administration's tariff on imported solar panels over the last twelve months is twofold. First, it caused the cost of solar quoted to American homeowners to spike. Second, though the cost of solar has since restarted its decline, it is not declining at the same rate we've observed in previous years. The end result is a \$236.5 million tax on American consumers caused by the solar tariffs.

Solar prices spike with finding of injury

The timing of the spike in solar prices corresponds with the US International Trade Commission's (USITC's) finding of injury to US solar manufacturers in late September 2017, and not with the enactment of the tariffs in January 2018.

Following the USITC ruling, solar prices momentarily spiked: from September to November 2017, the cost of solar increased by \$0.07 cents per watt, on average.

The cost of solar restarted its decline following the USITC ruling, but at a slower rate. Solar costs are now declining at a rate of 0.5% per month, only two-thirds the pre-ITC ruling rate of decline.

Tariffs on panels cost consumers \$236.5 million in nine months

Customers who installed solar between February and June 2018 were quoted prices that were 5.6% higher, on average, than would have otherwise been expected. This price hike is above the 3% to 4% price increase we estimated in January 2018. For the average consumer, the Trump Administration's solar tariffs have resulted in a price increase of about \$0.16 cents per watt, or \$960 for a standard 6kW system. When we apply this price increase across all residential solar capacity additions after September 2017, we find that Trump's solar tariffs have created a \$236.5 million tax on American consumers.



Impact of Solar Tariff on Residential Prices (in Dollars per Watt)

Price Distribution in Select States

EnergySage reviewed Marketplace quote data from 12 states in four regions across the United States to analyze prices ranges offered to solar shoppers from H2 '17 and H1 '18, compared to the previous 12 months. Price distributions varied significantly from state to state, illustrating the unique characteristics of state markets as determined by local electricity rates, financial incentives, and the level of competition.

California solar prices are more evenly distributed than in other states.

Continuing the trend observed in our previous Intel Report[™], California's prices remained evenly distributed while other states witnessed a tighter distribution of prices. States like Arizona, Texas and Indiana all saw a narrower range of prices offered than in previous reports.











NOTE: Data have been revised to reflect outlier removal in user-provided data. Market average prices made available via Tracking the Sun XI.

Michigan

Price Distribution in Select States (cont.)

Solar Marketplace Intel Report[™]

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Mid-Atlantic/South

Mature solar markets in the Northeast see higher costs

The average quoted cost of solar remained relatively stable in Massachusetts and Rhode Island, and decreased in New York. However, a downward shift in the national distribution of prices meant these three Northeastern states observed higher quoted prices than the national average over the last 12 months.



Northeast **Massachusetts** \$3.28 ا \$3.80 50%

40%

30%

20%

10%

0%













Solar Economics In Select States

Although the average cost of solar fell at a national level between H2 2017 and H1 2018, a number of states witnessed increasing solar costs. EnergySage reviewed changes in solar costs and payback periods in 12 states across four regions. At a high level, it appears that state-level costs moved towards the national average of \$3.12/watt over the last six months, resulting in corresponding adjustments to system payback periods.

State-level cost of solar trended up towards average national price

Across the 12 states EnergySage analyzed, the average quoted solar price increased in seven, remained flat (changed by a cent or less) in three, and decreased in two between H2 2017 and H1 2018. Interestingly, cost declines only occurred in states where solar costs have historically been higher than the national average -- California and New York. Concurrently, all of the cost increases occurred in states where the

quoted cost of solar was below the national average in H2 2017. Of all the states to experience an increase in the quoted cost of solar, only Michigan witnessed an increase in costs to above the national average.

Payback period trends mirrored trends in costs

In general, states that witnessed increases in the quoted cost of solar also experienced increases in the length of system payback periods. The same trend holds true for states where solar costs declined over the previous six months, as payback periods in New York and California shortened. The largest declines in average payback period occurred in Rhode Island and North Carolina, two states with recent adjustments to solar incentive programs.

Gross Cost Per Watt

States	Region	H2 '17	H1 '18	% Change
Arizona	West/ Southwest	\$2.68	\$2.89	7.8%
California	West/ Southwest	\$3.22	\$3.17	-1.6%
Florida	Mid-Atlantic/ South	\$2.53	\$2.71	7.1%
Indiana	Central	\$2.71	\$2.84	4.6%
Maryland	Mid-Atlantic/ South	\$2.74	\$3.04	10.9%
Massachusetts	Northeast	\$3.28	\$3.29	0.3%
Michigan	Central	\$3.02	\$3.14	4.1%
New York	Northeast	\$3.38	\$3.23	-4.4%
North Carolina	Mid-Atlantic/ South	\$2.97	\$3.06	3.0%
Ohio	Central	\$2.79	\$2.88	3.2%
Rhode Island	Northeast	\$3.44	\$3.45	0.2%
Texas	West/ Southwest	\$2.94	\$2.93	-0.3%

Payback Period (Years)

States	Region	H2 '17	H1 '18	% Change
Arizona	West/ Southwest	6.9	7.4	7.2%
California	West/ Southwest	6.2		-1.0%
Florida	Mid-Atlantic/ South	9.3		4.3%
Indiana	Central	10.8		1.8%
Maryland	Mid-Atlantic/ South	7.9		12.7%
Massachusetts	Northeast	4.8		-2.9%
Michigan	Central	8.3		9.2%
New York	Northeast	8.6		-3.0%
North Carolina	Mid-Atlantic/ South	11.5		-5.0%
Ohio	Central	10.9		2.8%
Rhode Island	Northeast	8.4		-13.4%
Texas	West/ Southwest	11.8		-0.8%

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Solar System Characteristics in Select States

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EnergySage evaluated the average system size quoted across 12 states, as well as the average portion of a homeowner's monthly electric bill those quotes would offset. The 12 states were split evenly between increasing and decreasing average system sizes, and nearly evenly split on directional differences in the percent of electricity use offset.

Changes to system sizes tended to correlate with changes to quoted costs

For the most part, states where the quoted cost per watt increased were subject to a decrease in the average system size. States where solar costs either flattened or declined were more likely to experience growth in average system size, including in all three of the Northeastern states included in the analysis. The most notable outlier, however, is Maryland, which experienced both the highest increase in costs and the largest growth in average system size on a percentage basis.

Size of Quoted System (kW)

States	H2 '17	H1 '18	% Change
Arizona	10.4	9.6	-7.2%
California	7.4	7.4	-0.8%
Florida	11.5	10.8	-6.3%
Indiana	10.2	11.0	7.5%
Massachusetts	8.3	8.6	4.5%
Maryland	9.9	10.8	8.3%
Michigan	8.8	8.7	-0.7%
New York	9.3	9.8	5.3%
North Carolina	9.5	9.4	-1.0%
Ohio	10.2	9.6	-6.2%
Rhode Island	8.1	8.2	2.0%
Texas	11.2	11.6	3.6%

Differences in offset percentages didn't align with other factors

The percentage of a homeowner's electric bill offset by a quoted solar array affords a useful metric for comparison across states where average system sizes differ. Interestingly, trends in the percent offset metric did not track directionally with changes to the average system size between H2 2017 and H1 2018. One possible explanation may be variation in the average monthly electric consumption of new solar customers. Overall, changes to the offset percentage were relatively minor, with two-thirds of states studied seeing less than a 3% change.

Importantly, the average electricity use offset by solar in California reached 102% in H1 2018, a first for the Intel Report. Sizing solar systems above a homeowner's current electric usage may be indicative of Californians preparing for increased household electrification in the near future.

Percentage of Usage Offset (%)

States	H2 '17	H1 '18	% Change
Arizona	92.5		2.6%
California	99.4	102.0	2.6%
Florida	82.1		4.7%
Indiana	74.4		2.6%
Massachusetts	94.0		-2.6%
Maryland	80.1	90.2	12.6%
Michigan	85.2		-0.6%
New York	89.7	90.0	0.4%
North Carolina	76.8		-2.7%
Ohio	75.3		-10.4%
Rhode Island	90.6		-0.8%
Texas	83.7	88.4	5.7%

NOTE: Data have been revised to reflect outlier removal in user-provided data

Market Share: Equipment

Installers submit quotes to shoppers that include a variety of panel modules and inverter brands in the EnergySage Marketplace. From H2 2017 to H1 2018, the two most popular panel brands remained the same, though Panasonic overtook LG as the most quoted brand. Meanwhile, the solar inverter market consolidated even further in H1 2018 compared to the previous six months.

Panasonic and Silfab gained in popularity

The five most quoted solar panel brands now account for over 70% of all quotes on the EnergySage Marketplace. Two potential factors contributing to the popularity of these panels are the name recognition of the two most widely quoted brands – Panasonic and LG – as well as the success of high-efficiency panel brands on the Marketplace more broadly. Only two brands in the top five increased market share: Panasonic and Silfab. The popularity gains for Silfab may be due to its loyal following among some solar installers. Meanwhile, Panasonic was the only brand to offer a manufacturer rebate to consumers* on the EnergySage Marketplace during this time period.

SolarEdge continued to dominate a consolidating inverter market

Despite a slight decrease in market share in H1 2018, SolarEdge continues to dominate the inverter market on the EnergySage Marketplace, accounting for two-thirds of all quoted inverters. Enphase rebounded from a slight decrease in market share in H2 2017 to reach nearly one quarter of all quoted inverters. The remaining 12% of the market continued to consolidate, as the number of inverter brands quoted dropped from 30 brands quoted in H2 2017 to just 21 brands quoted in H1 2018.

Top Inverter Brands

H2 2017 = 30 brands, H1 2018 = 21 brands



H2 2017 = 48 brands, H1 2018 = 44 brands

Top Panel Brands

*Rebate offered. All solar panel manufacturers are eligible to offer a rebate to consumers via the EnergySage Marketplace. NOTE: Data have been revised to reflect outlier removal in user-provided data. energysage (4) Solar M

Installer Equipment Offerings

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EnergySage reviewed installer equipment offerings in quotes to shoppers on the Marketplace. More than half of installers quoted three or more panel brands during H1 2018. When it came to inverters, the number of installers quoting three or more brands grew from 16% in H2 2017 to 18% in H1 2018.

Brand loyalty declined in H1 2018

From H2 2017 to H1 2018, the percentage of installers that offered only one brand decreased for both panels and inverters. Over this time period, the number of installers that quoted three or more panel brands increased from 51% to 54%. Similarly, the number of installers that quoted three or more inverter brands increased from 16% to 18%.

Installers rarely quoted more than five brands in an increasingly consolidated inverter market

The number of installers offering five or more inverter brands has been trending downward since H1 2015. In H1 2018, the percentage of installers offering more than five brands of inverters in their quotes to shoppers reached a new low of 1%. Comparatively, the number of installers that quoted more than five panel brands was 17% during this time frame, revealing more competition in the more fragmented panel market.

Number of Panel Brands Offered



Number of Inverter Brands Offered



Installer Equipment Pairings & Price

For this review, EnergySage determined the 10 panel and inverter pairings quoted most frequently to Marketplace shoppers from H2 2017 to H1 2018, calculating the comparative cost differences between these equipment packages. The packages varied significantly in price, with both the panel and inverter choice playing a role in overall cost differences.

Microinverter options tended to be more expensive

Of the 10 panel-inverter packages analyzed, those that included microinverters from Enphase and SunPower were the most expensive overall, ranging from about 11% to 20% above the baseline pairing price for SolarWorld-SolarEdge. Interestingly, Silfab panels paired with Enphase microinverters were quoted at a 13% price premium above pairing the same panels with SolarEdge power optimizers.

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Premium panel brands increased prices

Equipment packages including premium panel options – either from Panasonic, LG or SunPower – were 8% more expensive than the least expensive baseline package of SolarWorld-SolarEdge. When quoted together, SunPower panels with SunPower inverters was the most expensive equipment package offered, quoted at a 20% premium above the baseline. Of these premium equipment options, Panasonic panels paired with SolarEdge inverters were offered at the least expensive price, at just 8% above the baseline price.



Changing Landscape of Panel Modules

During H1 2018, EnergySage began tracking the changing landscape of panel modules within the Marketplace, focusing in particular on the most quoted monocrystalline and polycrystalline panel modules. Overall, polycrystalline panels accounted for less than 4% of total quoted panels in the first half of 2018. The top panel brands across the entire Marketplace also appear in the top five most quoted panel by module type, though smaller panel manufacturers maintain a share of the polycrystalline market.

Installers in the Marketplace heavily favored monocrystalline panels

Over the course of the first six months that EnergySage tracked this data, monocrystalline modules represented over 96% of all panels quoted in the Marketplace. The higher efficiency of monocrystalline panels can offset their higher costs, and keep their payback period competitive with polycrystalline systems. EnergySage will continue to track if and how this trend changes moving forward.

Silfab and Trina Solar rank in top five for both the mono and poly panels

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All five of the top quoted monocrystalline panels in H1 2018 are manufactured by brands in the top five of national quoted brands, with the Panasonic VBHN330SA16 panel included in the most installer quotes. Interestingly, both Silfab and Trina Solar have a panel ranked in the top five for both the monoand polycrystalline categories.

While larger brands dominate the monocrystalline market, two smaller brands rank high for the polycrystalline market. For instance, REC Solar had less than 2% of the nationally quoted panel market in H1 2018, yet produced two of the top five most quoted polycrystalline modules.



EnergySage User Interests

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To better understand the future direction of the home energy market, EnergySage asks Marketplace shoppers to voluntarily describe the other non-solar energy products and services they are interested in. At 73%, energy storage easily received the most interest of any category, as was the case in the previous Intel Report. In fact, two-thirds or more of all customers expressed interest in energy storage in all states except for the District of Columbia. On the other end of the spectrum, only 12% of customers surveyed were interested in a new electricity provider.

Case Studies



Vermont Highest energy storage interest

Customers in the Green Mountain State expressed the highest interest in energy storage, at 85% of all survey respondents. Two potential drivers of interest are the state's resiliency needs during winter months and the visibility of Green Mountain Power's new Tesla Powerwall program.

% of Customers Interested



Connecticut, New Hampshire and Rhode Island Highest interest in energy assessments

The highest interest (34%) in participating in home energy assessments exists in three New England states – Connecticut, New Hampshire and Rhode Island. As a region, New England has long been a leader in utility-backed and third-party energy efficiency programs, which often include home energy assessments, possibly contributing to the high levels of interest seen in the region.



California

Highest interest in electric vehicle charging options

Given the Golden State's outsized influence on the national electric vehicle market, California is an expected leader for customer interest in electric vehicle charging options at 35%. Of note, the State of Washington is in second place with 27% of EnergySage customers expressing interest. According to Department of Energy data, Washington has the third highest number of plug-in electric vehicles per 1,000 people in the country, only behind California and Hawaii.

Financing Products

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During H1 2018, offering a single solar loan financing option once again became the most popular approach among installers in the Marketplace. The last time that a single loan option was the most popular quoted offer was H2 2016. Nevertheless, the total number of solar loan options quoted in the Marketplace continued to rise.

Majority of installers worked with one or two financing partners, but that number is decreasing

Although the percentage of quotes offering one or two financing options dropped by 7% between H2 2017 and H1 2018, the number of quotes offering a single financing option grew by a third over the same timeframe. Meanwhile, installers offering three or more financing options grew from 33% to 41% during the same time period.

Top solar loan financiers took back market share

The top ten solar loan financiers quoted on the Marketplace remained the same from H2 2017 to H1 2018, as their cumulative market share increased. Only one solar loan financier – Dividend Solar – boasts a market share above 10%, as both Sungage Financial and Service Finance Company saw their share reduced in the Marketplace in H1 2018. Notably, both Energy Loan Network and Sunlight Financial increased share at a rate over 50%.

Loan Products Per Installer



Financing Provider Market Share



Changes in Financing Products

In H1 2018, over 80 different financing products were offered to shoppers within the EnergySage Marketplace. Across different types of financiers, from solar companies to credit unions to traditional banks, two key metrics remained relatively consistent: the median loan term has been 15-years or 20-years in all but one of the previous reporting periods, and the median loan rate been steady at 4.99% since H1 2016. However, the average loan down payment has steadily decreased over time.

More installers are offering zero-down loans

The average loan down payment quoted has steadily decreased in every six month reporting period since H2 2014. In H2 2014 it was nearly \$700, while in H1 2018 it has decreased to just over \$100. This downward adjustment of the mean indicates that more installers than ever are offering zero-down loan options to customers on the EnergySage Marketplace.



Solar Loan Changes Over Time

Growth in Solar Interest by State

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Given that EnergySage receives the most organic traffic of any website in the solar industry, increasing web traffic is a good indicator of growth in solar interest in a given state. According to this metric, between H2 2017 and H1 2018, every state in the country experienced growth in solar interest. Though a small market to begin with, solar interest doubled in North Dakota during the time period assessed. Utah experienced the slowest growth in solar interest, though still increased interest by more than a third over H2 2017.

Changing solar policies may contribute to growing customer research and interest

Three of the five states experiencing the greatest increase in customer solar interest either recently revised or announced plans to update their solar policies. New Jersey adjusted their Solar Renewable Energy Credit (SREC) program, Connecticut increased the state's renewable portfolio standard while simultaneously ending net metering, and Illinois announced plans for a new SREC program. These revisions and updates to existing policies may have contributed to increased consumer interest levels and web traffic.



Price Dispersion for EnergySage Customers

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The EnergySage Marketplace affords customers the ability to compare multiple competitive solar quotes across a variety of metrics including price, system size, monthly bill offset, financing options and quality of panel and inverter components. Given the variety and pricing of options available for installers to quote on the Marketplace, the average solar-interested customer could expect a range of quoted total costs.

Price dispersion decreased for the second straight half year

Although price dispersion for the average EnergySage customer has historically been 15% or more between the lowest- and highest-cost quotes offered, the magnitude of this range has decreased over the past twelve months. By H1 2018, price dispersion was down to 12.6%. Overall, this trend may represent an increasing maturation in the solar market, and greater similarity in the makeup and pricing of quotes offered by solar companies.





What can EnergySage data do for you?

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EnergySage used aggregated quote and	Report Title	Details	Scope & Pricing
installation data from the EnergySage Solar Marketplace to conduct the market analyses featured in this report. EnergySage marketplace data can be used to better inform installers, utilities, equipment manufacturers, policymakers and solar businesses across the country.	Solar Market Trends	 Market data and trends for a market territory. Sample data points included: Quoted prices Payback periods Panel and inverter brands quoted Financing options System sizes Consumer demographics 	 Basic Package (\$1,000): Quarterly roll-up, trend over 4 quarters Up to 4 counties Up to 2 states Custom Package: Available upon request
EnergySage is also excited to collaborate with universities and research organizations and provides data on a cost neutral basis. Contact Luke Tarbi VP Marketing data@energysage.com	Solar Equipment Trends	 Market data and trends for solar panel or inverter brands. Sample data points included: Market share of equipment Quote prices by equipment Likelihood of purchase by equipment Panel-inverter pairing frequency Production ratio Electricity bill offset Monitoring systems System sizes Mount location Property types Financing options Consumer demographics 	 Basic Package (\$1,500): Quarterly roll-up, trend over 4 quarters Up to 12 counties Up to 3 states Benchmarking Package (\$4,000): Includes Basic Package, plus benchmark comparisons to 2 other equipment manufacturers Custom Package: Available upon request
	Solar Market Trends, by Utility Territory	 Market data & trends for solar activity within a utility territory. Sample data points included: Customer interest in solar Comparison to solar interest in other utility territories Solar prices Solar installers Solar business climate (survey data) Panel and inverter brands System sizes Financing options Solar loan providers, terms, rates Consumer demographics 	 Basic Package (\$4,000): Quarterly roll-up, trend over 4 quarters One utility territory Up to 3 states One written report and advisory call Custom Package: Available upon request
	Custom Reports	Any combination of above-mentioned data and more. Contact us for details.	Custom Package: Available upon request



About EnergySage, Inc.

EnergySage is the leading online comparison-shopping marketplace for rooftop solar, community solar, and financing. Supported by the U.S. Department of Energy, EnergySage is the trusted source of information for over 6 million consumers across 35+ states. As of early 2018, the company has sent over \$3 billion in solar installation requests to its network of more than 500 pre-screened solar installation companies, and serves as a high-quality lead source for solar financing companies and powerful distribution channel for solar equipment manufacturers.

EnergySage is unique in that it allows consumers to request and compare competing quotes online, unlike traditional lead-generation websites. For this reason, leading organizations like Environment America, Connecticut Green Bank, Duke University, National Grid, and Staples refer their audiences to EnergySage to empower them as they consider solar. The EnergySage formula of unbiased information, transparency and choice helps consumers go solar with confidence—at a higher rate of adoption, and lower cost. For more information, please visit EnergySage and follow us on Facebook, Twitter and LinkedIn.

