Solar overwhelmingly popular in US, says Harvard scientist

05 JANUARY 2015 | APPLICATIONS & INSTALLATIONS, GLOBAL PV MARKETS, INDUSTRY & SUPPLIERS, MARKETS & TRENDS | BY: IAN CLOVER

Professor's 12-year study finds attitudes towards solar and wind energy among Americans largely positive, with natural gas viewed as a 'make-do' fuel until renewables more mainstream.

Despite believing solar to be cheaper than it is, most Americans are clued up on the benefits of solar energy, the study found

A renowned Harvard political scientist has told an audience of climate scientists, physicist, economists and public-policy experts at the University of Chicago that the American public is overwhelmingly supportive of solar and wind energy.

Following a 12-year survey, Stephen Ansolabehere – a Harvard government professor – has concluded that the majority of Americans prefer renewable energy sources over coal, oil and nuclear energy, and see natural gas as a bridge fuel that falls between the two stools of renewables and dirtier fossil fuels.

The scientist's findings were reported at the Energy Policy Institute of Chicago (EPIC). Ansolabehere told the audience how he began surveying Americans in 2001 on their energy preferences in response to scientists at MIT (Massachusetts Institute of Technology) calling on him to gauge public opinion on the U.S.'s climate change initiatives.

In the following 12 years, the scientist discovered that most Americans are instinctively in favor of solar and wind energy, but few grasp the true cost of the technology, and even fewer are generally willing to shoulder that perceived cost. The average American, Ansolabehere found, believes nuclear and oil to be more expensive than solar and wind – an optimism that needs to be handled carefully, said the scientist.

"The average member of the American public has the picture about right," he said. "People have the relative harms about right. People have the relative costs for traditional fuels about right. They're way too optimistic about the cost of solar and wind, and the caution is that if you inform them, you're going to get lower support."

However, despite misunderstanding the costs of solar power (costs that are creeping towards grid parity with every passing day), nearly 90% of Americans want to see more solar and wind energy added to the U.S. landscape.

"Americans want to move away from coal, oil and nuclear power and toward wind and solar. About 80% of Americans want renewables to increase a lot, an another 10% or so want it to increase somewhat," added Ansolabehere. 'This 90% figure will include a lot of natural Republicans, which suggests that even those ostensibly opposed to fighting climate change are inherently supportive of clean energy sources. "This is a non-partisan issue," he said.

Nuclear no-show

According to leading engineers and scientists, the most surprising chapter of Ansolabehere's results was the almost complete lack of support for nuclear power. Even among the Americans who admitted they worried not one jot about climate change, support for nuclear power was notably lacking.

MIT engineers – which in 2001 included current U.S. Energy Secretary Ernest Moniz – who tasked Ansolabehere with conducting the survey have been surprised by the lack of support for solar, having initially commissioned the study to gauge support for a domestic nuclear renaissance.

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"People who were concerned about global warming did not want the technology that they were going to put forward [nuclear]," said Ansolabehere. "For the engineers, this was show-stopper."

And while the survey found that very few Americans are natural conservationists, ie, intent on consuming less energy, there are even fewer supporters of the Obama administration's "all-of-the-above" approach to energy. For the coal, oil and nuclear industries, this could spell bad news: most citizens are mildly in favor of shale (fracked) gas, and back solar and wind because these technologies are non-polluting and pose no health risks, the study found.

"People think of solar and wind as relatively harmless, coal, oil and nuclear as harmful, and natural gas somewhere in between," said Ansolabehere.

Buck stops here

The scientist's findings also concluded that people are willing to pay to stop climate change, but only up to around $5 per year. Ansolabehere stressed that these findings could have implications for policy makers, warning that any climate change measures introduced that will incur high costs will be met with scorn nationwide. "You can't sell a 25% surcharge on your energy bill," he said. "You might be able to sell 5% or 6%."

Americans are not alone in holding this stance. Ansolabehere put the same question to citizens in other developed nations around the globe and received uniformly similar responses. "It's a depressingly small number – 5% - about $5 on your electric bill, and it's the same in the U.S., same in Sweden, same in France, same in Germany, same in Japan, same in Canada, et cetera."

Ansolabehere's findings were published just days before California's governor Jerry Brown called on the state's utilities to boost renewable energy procurement by 50%, but to do so in a way that protects solar-friendly consumer electricity rates.

"Getting the policies right is critical to solar power's continued growth and success," said California Solar Energy Industries Association executive director, Bernadette Del Chiaro.

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Patrick Ducat *from* **Griswold** | http://vizidian.com/patducat
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This is a very exciting time to be involved with solar as it is explosively adopted by homeowners and businesses everywhere!

Solar Energy Facts: Q2 2015

Solar Leading the Way with 40% of All 2015 Electric Capacity

The U.S. solar industry continued on its record-breaking trajectory with 1,393 MW of installed solar capacity in Q2 2015, making this the largest Q2 ever. As has been the case over the last 18 months, the residential and utility-scale markets led the way, installing 473 MW and 729 MW, respectively. Through the first half of the year, the solar industry has supplied 40% of all new 2015 electric generating capacity – more than any other energy technology. With more than 5,000 MW of installed solar capacity projected over the second half of 2015, the U.S. solar industry is expected to reach nearly 8,000 MW for the year, and 28,000 MW in total.[1]

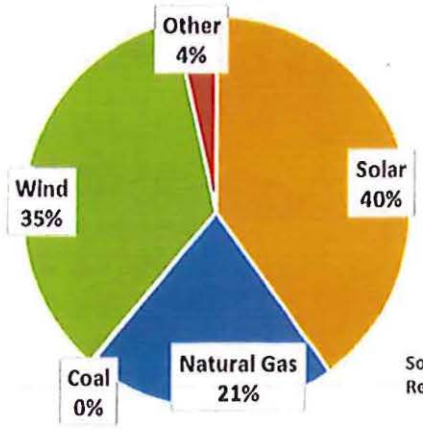
Installations Continue To Boom

- There are now over 22,700 MW of cumulative solar electric capacity operating in the U.S., enough to power more than 4.6 million American homes.
- With over 135,000 installations in the first half of 2015, nearly 784,000 U.S. homes and businesses have now gone solar. Through the first 6 months of 2015, a new solar project was installed every two minutes.
- Growth in Q2 was led by the utility-scale sector, which posted its largest quarter of the year at 729 MW. The residential sector grew 70% over last year to install 473 MW, and will likely surpass its 2014 total in Q3.

Solar More Affordable Than Ever

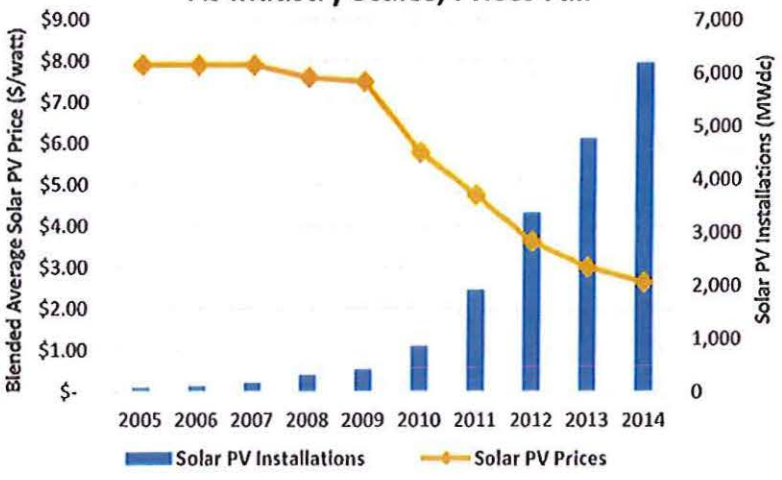
- Since the implementation of the ITC in 2006, the cost to install solar has dropped by more than 73%
- While residential costs have dropped by 45% since 2010, utility-scale costs have dropped more significantly, with recent contracts at prices below $0.05/kWh.

2014 New Electric Capacity Installed



Source: SEIA/GTM Research and FERC

As Industry Scales, Prices Fall



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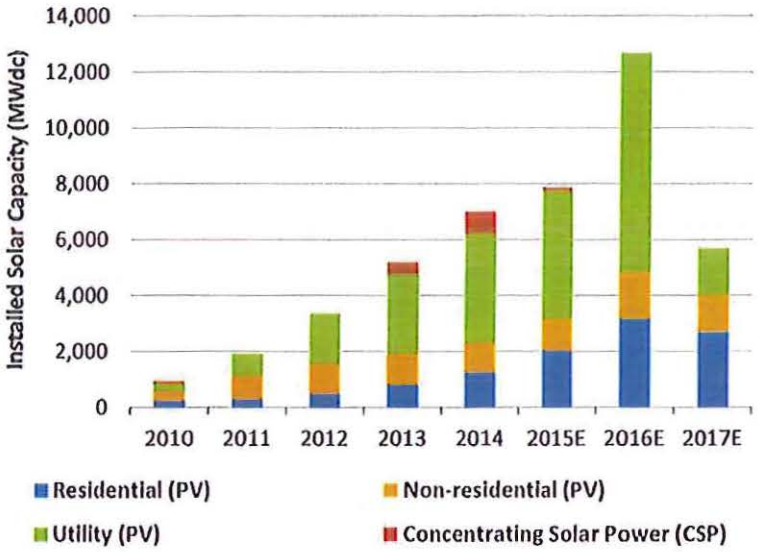
Growth to Continue Through 2016

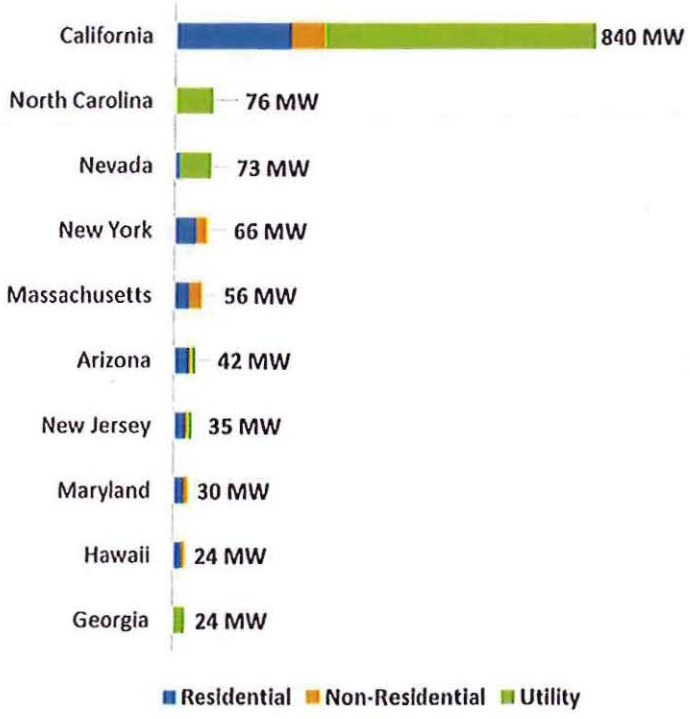
- Roughly 20,000 MW of solar capacity is forecasted to come online from 2015-16, doubling the country's existing solar capacity.
- Growth is expected to be broad based, with more than 16 states expected to top the 100 MW mark in 2016, up from 9 in 2014.
- However, without congressional action, the upcoming expiration and reduction of the Investment Tax Credit is expected to lead to a 55% decline in installed solar capacity in 2017.

Yearly U.S. Solar Installations



State Rankings

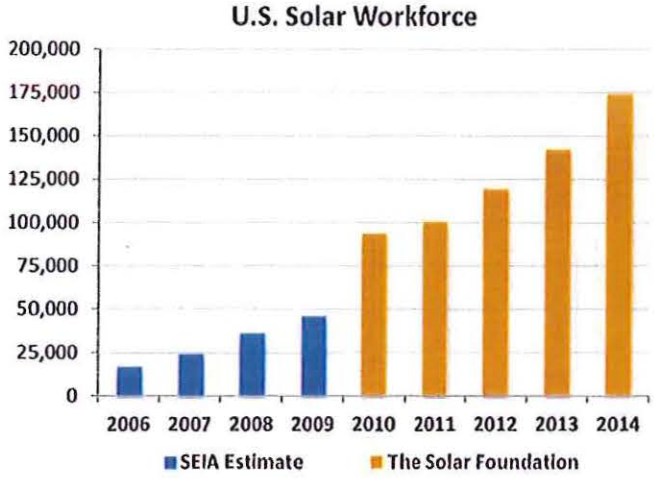
2015 Q2 Solar PV Installed Capacity

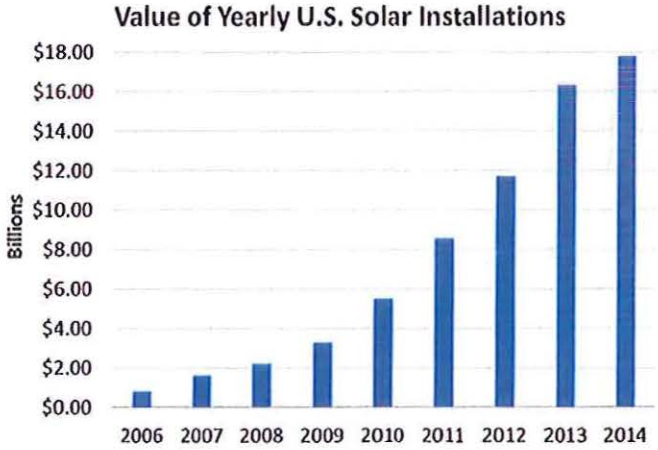


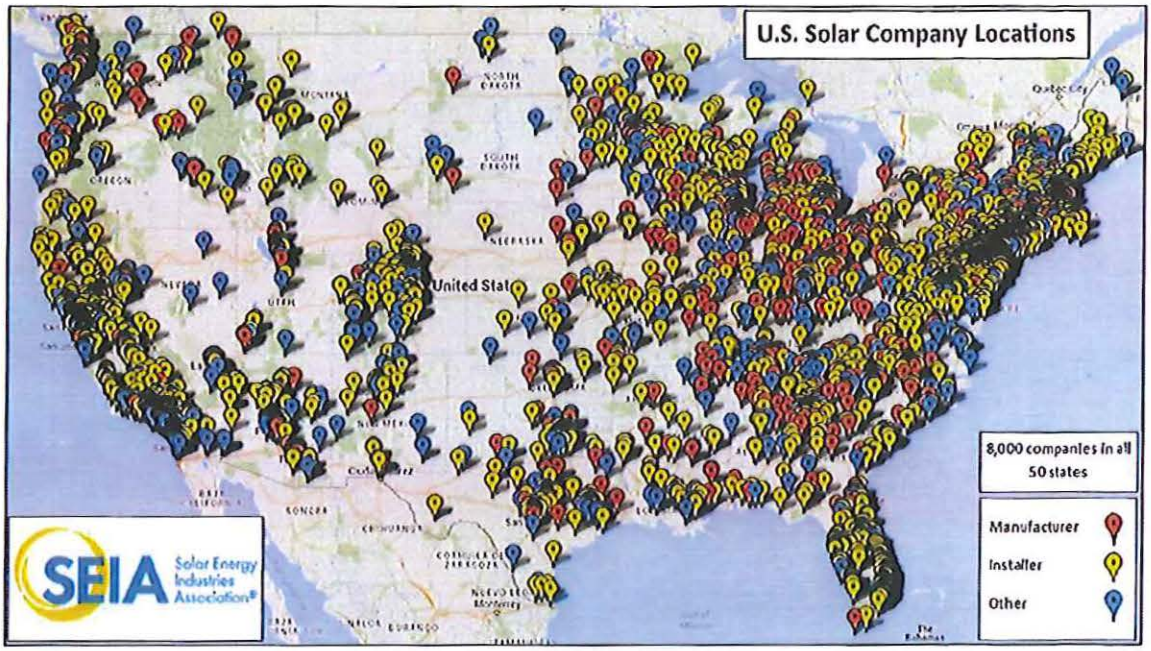
Cumulative Solar Electric Capacity

Solar Is an Economic Engine

As the solar industry grows, so does its benefit to the economy. There are now nearly174,000 solar workers in the U.S., a 22% increase over 2013.[2] These workers are employed at over 8,000 businesses across all 50 states, ranging from large manufactures to local rooftop installers. The growth of the solar industry has led to an investment of more than $17.8 billion in to the U.S. economy in 2014, up 9% over 2013 despite falling prices.







[1]All data from SEIA/GTM Research *U.S. Solar Market Insight 2014 Year in Review* unless otherwise noted
[2]The Solar Foundation "National Solar Jobs Census 2014"

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Solar Market Insight 2015 Q3

Report

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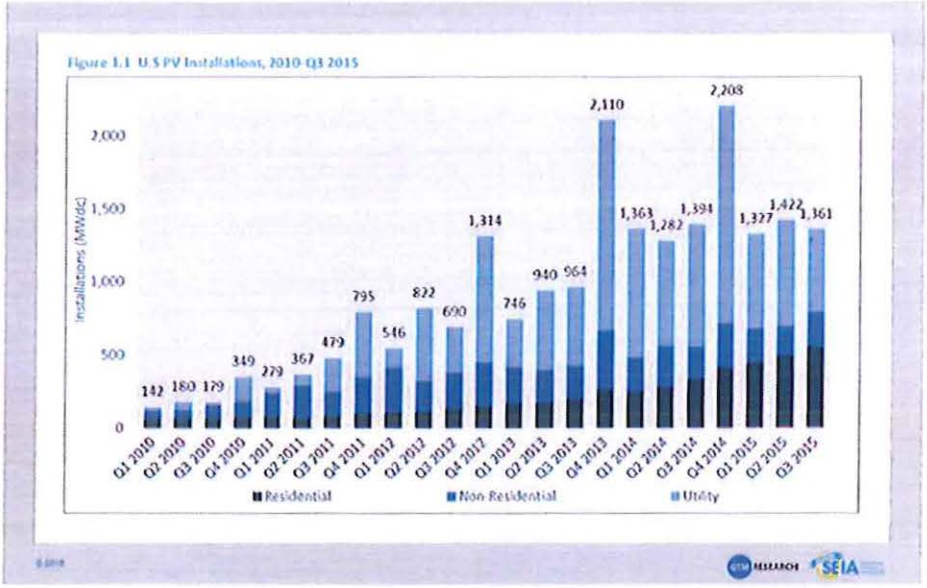
Key Figures

- The U.S. installed 1,361 MW_{dc} of solar PV in Q3 2015, marking the eighth consecutive quarter in which the U.S. added more than 1 GW_{dc} of PV installations.
- Throughout the first three quarters of 2015, 30% of all new electric generating capacity brought on-line in the U.S. came from solar.
- As of Q3 2015, more than 50% of all states in the U.S. have more than 50 MW_{dc} of cumulative solar PV installed.
- Totaling 18.7 GW_{dc}, the current utility PV development pipeline is greater than all U.S. PV installations brought on-line through the end of 2014.
- GTM Research forecasts that 7.4 GW_{dc} of new PV installations will come on-line in 2015, up 19% over 2014. Growth will occur in the residential and utility PV segments, while for the second straight year, non-residential solar will dip 5%.
- 2014 was the largest year ever for concentrating solar power, with 767 MW_{ac} brought on-line. The next notable CSP project slated for completion is SolarReserve's 110 MW_{ac} Crescent Dunes project, which is expected to become fully operational by early 2016.

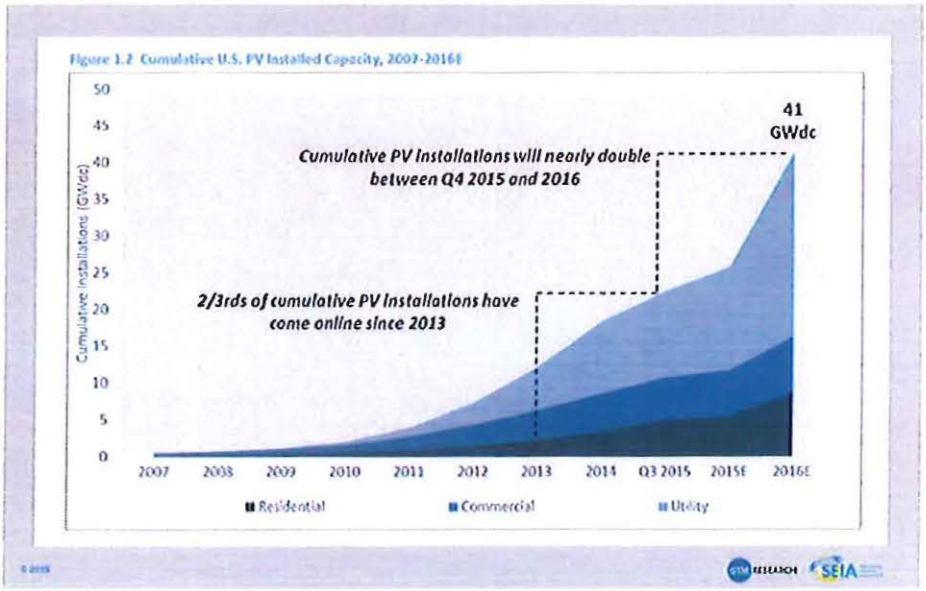
1. Introduction

The U.S. solar market remains on track for a record-breaking year, with 1,361 MW_{dc} installed during Q3 2015, bringing the market up to 4.1 GW_{dc} through the first three quarters of 2015. Thanks to a booming residential PV market and continued realization of the utility sector's double-digit gigawatt project pipeline, Q3 2015 marks the eighth consecutive quarter in which the U.S. added more than 1 GW_{dc} of solar PV.



(http://www.seia.org/sites/default/files/1-1-USPVInstallations2010-Q32015.jpg)

Over the next 12 months, however, 1 GW_{dc} will serve as a distant floor for quarterly U.S. PV installation volumes. Headlined by the utility PV segment, we expect the U.S. solar market to experience a record-breaking Q4 2015, with more than 3 GW_{dc} of solar installations. In 2016, developers will have a laser-like focus on project build-out in order to qualify for the 30% federal Investment Tax Credit, which is scheduled to step down to 10% for utility, commercial, and third-party-owned residential PV, and to expire altogether for direct-owned residential PV on January 1, 2017. This focus on project build-out and pipeline pull-in has increased dramatically to the point where GTM Research is now forecasting more than 15 GW_{dc} to come on-line in 2016 alone, and between Q4 2015 and Q4 2016, cumulative U.S. PV installations are poised to nearly double, eclipsing the 40 GW_{dc} mark for operating solar PV capacity.



(http://www.seia.org/sites/default/files/1-2-CumulativeUSPVInstalledCapacity2007-2016.jpg)

But in a world where the 30% federal ITC does ultimately drop to 10% for commercial, utility and third-party-owned systems and 0% for direct-owned residential PV, the road to market recovery across distributed and utility PV will be shaped by numerous upside drivers and downside risks that extend beyond the next 12 months of heated legislative battles in Washington, D.C. Without an extension of the ITC, it will take four years for the industry to recover to being a 10 GW_{dc}+ annual market after first achieving this feat in 2016.

Between now and 2020, as the U.S. solar market navigates the uncertainty of the 30% federal ITC's future, it is worth considering the next order of magnitude for solar in the U.S. What does that really mean and how can the industry bring it closer?

1.1 In Focus: From 25 GW $_{dc}$ to 250 GW_{dc} - Exploring the Next Order of Magnitude for U.S. Solar

Over the next few months, the U.S. solar market will reach two symbolic milestones. First, early next year, the millionth solar installation will begin operation. Second, around the end of this year, solar will begin generating over 1% of all electricity in the country. That 1% compromises more power than the state of Nevada consumes in an entire year.

Yet solar still has a way to go to fundamentally change the generation mix or to significantly impact U.S. greenhouse gas emissions.

So what does the next order of magnitude look like for U.S. solar?

Let's use 250 GW_{dc} as a rough benchmark, since cumulative capacity at the end of this year will just exceed 25 GW_{dc}. Assuming incremental increases in solar performance, this should equate to around 10% of all electricity generation in the U.S. And if average system sizes hold steady, this means nearly 10 million individual installations. But what drivers could fuel a tenfold increase in solar deployment over the next decade? The four major upside drivers are outlined below.

1. Electricity Prices Will Probably Continue to Rise

Every time retail electricity prices increase, distributed solar becomes more attractive for two reasons. First, solar looks better to the customer in an immediate sense – solar providers can offer greater savings, shorter payback periods, and better returns. Second, solar's value proposition as a hedge against continually rising electricity prices becomes more apparent with each electricity price hike.

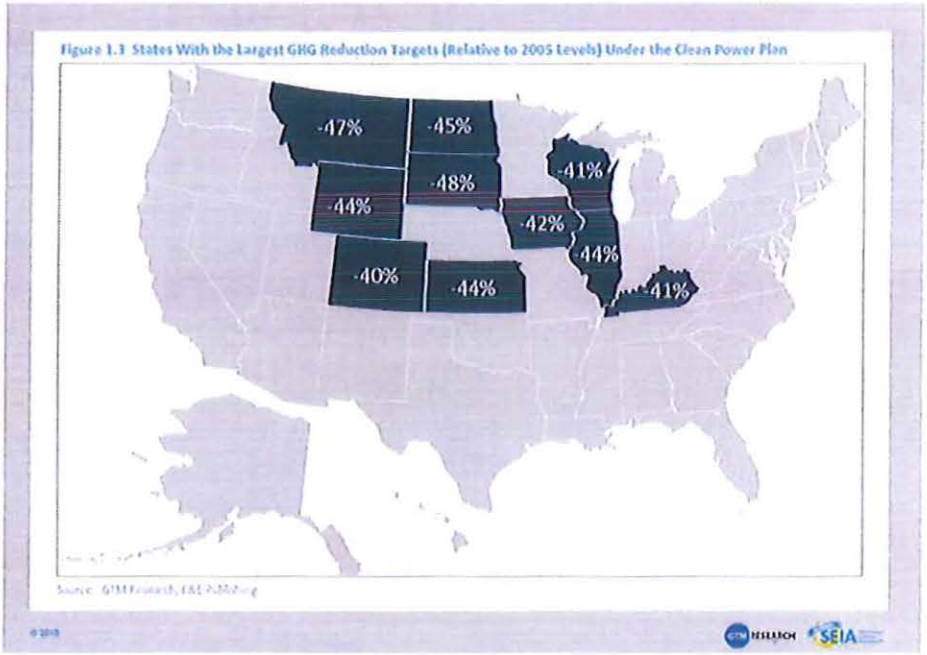
2. Solar Prices Will Probably Continue to Fall

While electricity prices are likely to keep rising over the coming decades, solar prices will continue to fall. To be clear, it would be unrealistic to expect the cost of solar to decline over the next decade at the same rate that it has over the previous decade. But there is still plenty of headroom in system prices – hardware can still be optimized and made more efficient, while a variety of soft-cost reductions remain unrealized.

3. The Clean Power Plan Could Open Up New Markets

In the short term, the Clean Power Plan may unintentionally dampen solar demand through 2019 (given compliance plan timelines, unless the pre-compliance Clean Energy Incentive Program is revised), but in the long term, the CPP provides enormous potential to support the expansion of solar in the U.S. The

10 states with the largest GHG reduction requirements by 2030 under the CPP account for less than 2% of operating solar in the U.S. In other words, these states (with the exception of Colorado) have virtually no solar market today, and solar may be an attractive component of their aggressive GHG reduction compliance requirements. Moreover, the EPA and other analyses of the CPP have shown a significant increase in solar deployment under the plan. ERCOT's analysis of the CPP had the capacity expansion model routinely running into a hard cap on annual solar builds coded into the model.



(http://www.seia.org/sites/default/files/1-3-StatesWithLargestGHGReductionUnderCPP.jpg)

4. Market Reinvention dia DER Aggregation May Open Up New Revenue Streams

A final tailwind for solar could come in the form of new sources of revenue, particularly for behind-the-meter (distributed) projects. Today, these projects essentially receive a single value stream: the reduction of a customer's bill via a combination of self-consumption of solar power and net energy metering for power fed back into the grid. But solar ultimately has greater value – specifically, value to the grid. Especially when paired with energy storage, load control and other distributed energy resources (DERs), solar can be a valuable component of tomorrow's grid-responsive building.

This additional revenue could be used to open up otherwise-unattractive markets, or it could be passed on to the customer. Regardless, DER aggregation for grid services may present the most significant new opportunity for distributed solar in years with the right regulatory environment.

But this vision of dramatic solar growth throughout the country for the next 10 to 15 years is no foregone conclusion. While the solar market does have momentum and the factors mentioned above on its side, there are a number of meaningful roadblocks threatening to derail growth.

- **Recovery from 30% ITC expiration could be slow:** While GTM Research's base-case forecast calls for each market segment to grow year-over-year in 2018 after a crash in 2017, downside drivers including abrupt elimination of major state incentive programs, delayed procurement plans trigged by the CPP, and stark reforms to rate design and distributed PV net-metering policies could mean slower-than-expected recovery timelines if the 30% federal ITC ultimately steps down.

- **Rate design and net energy metering reforms could still erode distributed solar economics:** The distributed solar market is expected to remain a geographically consolidated market. As such, major decisions on the future of NEM in a handful of state markets, such as one scheduled to be announced this month (December 2015) n California, will play a leading role in supporting the near-term growth trajectory of national distributed PV installations.
- **As solar penetration grows, its value to the grid shrinks:** In the long run, however, as solar becomes a mainstream power source, regulators and utilities are more likely to align solar compensation closer to wholesale market pricing. Just as importantly, solar on its own will deliver less value to the grid as its penetration increases by providing power during times of over-generation rather than times of particular need. As solar adoption takes off, if compensation tracks solar's value, then solar owners could experience declining revenues. Energy storage and load-shifting both present opportunities to mitigate this effect, and both will be vital to solar's future.

The factors mentioned above, both positive and negative, likely will not come as news to the solar industry. But many of them likely seem like distant concerns, to be dealt with after the next quarter, the next year, or the next business cycle. We believe these are relevant considerations to monitor today, both in established markets like California, where proceedings are deciding the long-term future of net metering and rate design, to more nascent markets like Texas, where efforts are underway to promote DER aggregation. With that in mind, GTM Research and SEIA are keeping tabs on these trends that can accelerate the tailwinds and counter the barriers to enable solar's growth through 2020 and beyond.

2. Photovoltaics

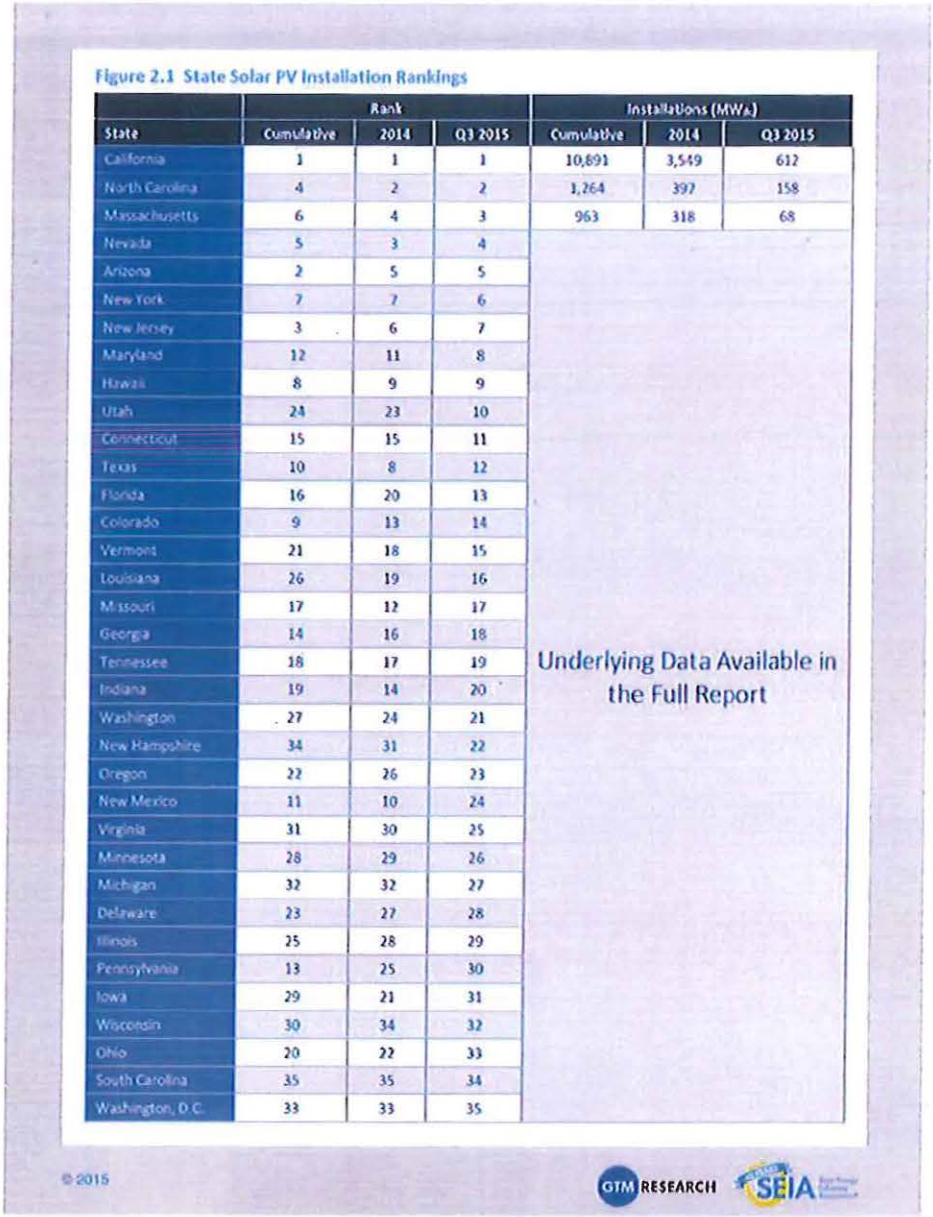


Figure 2.1 State Solar PV Installation Rankings

	Rank			Installations (MWs)		
State	Cumulative	2014	Q3 2015	Cumulative	2014	Q3 2015
California	1	1	1	10,891	3,549	612
North Carolina	4	2	2	1,264	397	158
Massachusetts	6	4	3	963	318	68
Nevada	5	3	4			
Arizona	2	5	5			
New York	7	7	6			
New Jersey	3	6	7			
Maryland	12	11	8			
Hawaii	8	9	9			
Utah	24	23	10			
Connecticut	15	15	11			
Texas	10	8	12			
Florida	16	20	13			
Colorado	9	13	14			
Vermont	21	18	15			
Louisiana	26	19	16			
Missouri	17	12	17			
Georgia	14	16	18			
Tennessee	18	17	19			
Indiana	19	14	20			
Washington	27	24	21			
New Hampshire	34	31	22			
Oregon	22	26	23			
New Mexico	11	10	24			
Virginia	31	30	25			
Minnesota	28	29	26			
Michigan	32	32	27			
Delaware	23	27	28			
Illinois	25	28	29			
Pennsylvania	13	25	30			
Iowa	29	21	31			
Wisconsin	30	34	32			
Ohio	20	22	33			
South Carolina	35	35	34			
Washington, D.C.	33	33	35			

Underlying Data Available in the Full Report

(http://www.seia.org/sites/default/files/2-1-StateSolarPVInstallationRankings.jpg)

2.1 Market Segment Trends

Residential PV

Key Figures

- Up 12% over Q2 2015
- Up 69% over Q3 2014

Continuing a well-established trend, residential PV once again posted a new record quarterly total in Q3 2015, growing 12% quarter-over-quarter and 69% year-over-year. California's share of the national market once again fell slightly, but still accounted for 48% of Q3 installations. Most major state markets

saw quarterly growth as well – including Massachusetts, New Jersey and Maryland – while New York saw a decline in quarterly installations. Notably, Nevada's market nearly quadrupled its installations over Q2 2015, marking the state's ascension to the top five in total installed capacity for 2015.

Non-Residential PV

Key Figures

- Up 19% over Q2 2015
- Up 4% over Q3 2014

Despite non-residential PV experiencing a strong rebound from the preceding quarter, which saw the lowest installation volumes in the past several years, Q3 2015 installations barely grew year-over-year. California primarily drove the non-residential market in an otherwise weak quarter, adding more than 100 MW_{dc} – a feat achieved only twice before (once by California and once by New Jersey). Meanwhile, most other major non-residential markets faltered, with Hawaii and New Jersey being the only other top 10 states to post positive growth on the quarter.

Utility PV

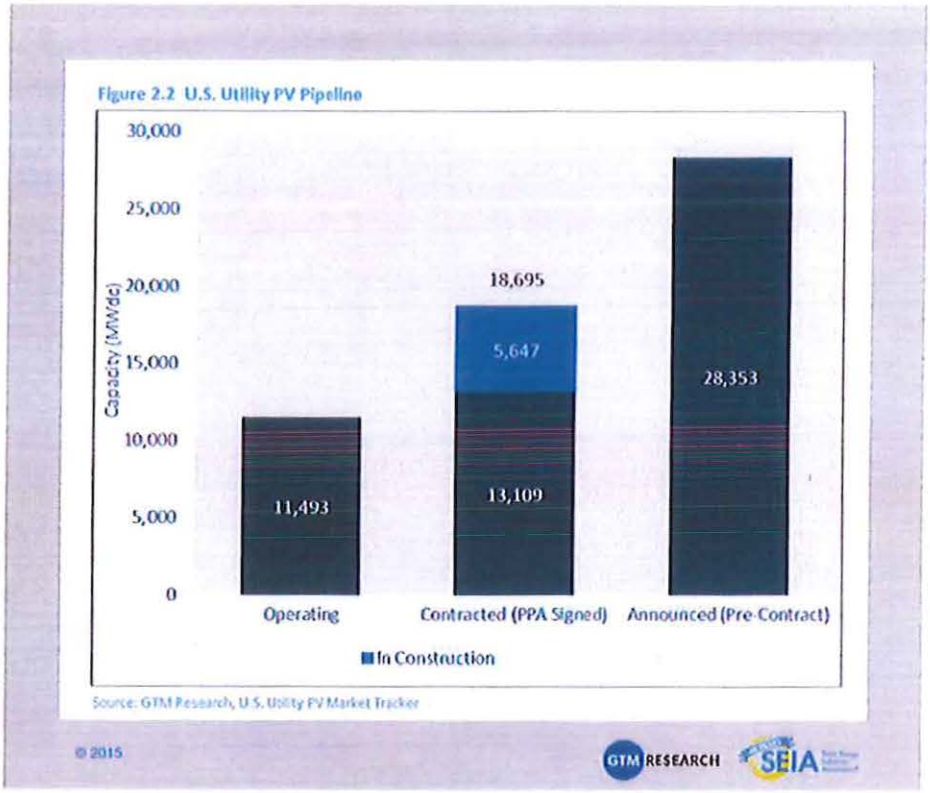
Key Figures

- 10^{th} consecutive quarter in which utility PV added at least 500 MW_{dc}
- Contracted utility PV pipeline currently totals 18.7 GW_{dc}

The utility PV market continues to serve as the bedrock driver of installation growth in the U.S. solar market, accounting for 42% of capacity installed in Q3 2015. And the market is on the precipice of unprecedented growth through 2016, with more than 10 GW_{dc} expected to come on-line in 2016 alone. This growth is partly pegged to the recent wave of centralized PV procurement by utilities and other buyers of power without a renewable portfolio standard (RPS).

With PPA prices for utility-scale solar now ranging between $40/MWh and $60/MWh, utility PV's value proposition is evolving beyond simply meeting an RPS obligation. On top of RPS-driven demand, centralized PV is proving to be an economically competitive resource to meet utilities' peak power needs. This is especially true in regions like Texas and the Southeast, where utilities are retiring their aging coal fleets and replacing them with utility PV alongside combined-cycle natural gas plants.

Corporations and other large institutions have played a larger role in the procurement of offsite, centralized solar projects as well. Such retail customers' ability to procure large-scale projects stems from a few creative solutions, including direct access legislation, partnerships with utilities to launch green tariffs for one project and one customer, and financial hedge contracts for projects that sell power directly into a real-time, wholesale energy market.

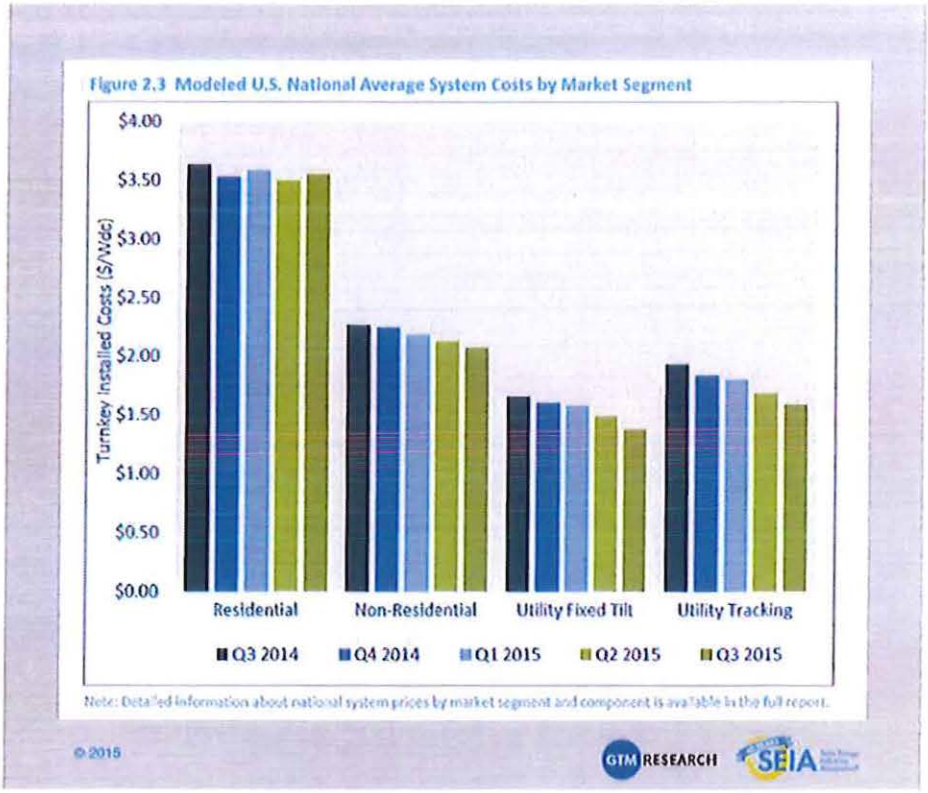


(http://www.seia.org/sites/default/files/2-2-USUtilityPVPipeline.jpg)

2.2 National Solar PV System Pricing

We utilize a bottom-up modeling methodology to track and report national average PV system pricing for the major market segments. Though we continue to solicit weighted-average system pricing directly from utility and state incentive programs, we believe that this data no longer accurately reflects the current state of system pricing, as more systems forego local incentives and data from these sources often represent pricing quoted well prior to the installation and connection date.

Our bottom-up methodology is based on tracked wholesale pricing of major solar components and data collected from interviews with major installers, supplemented by data collected from utility and state programs.

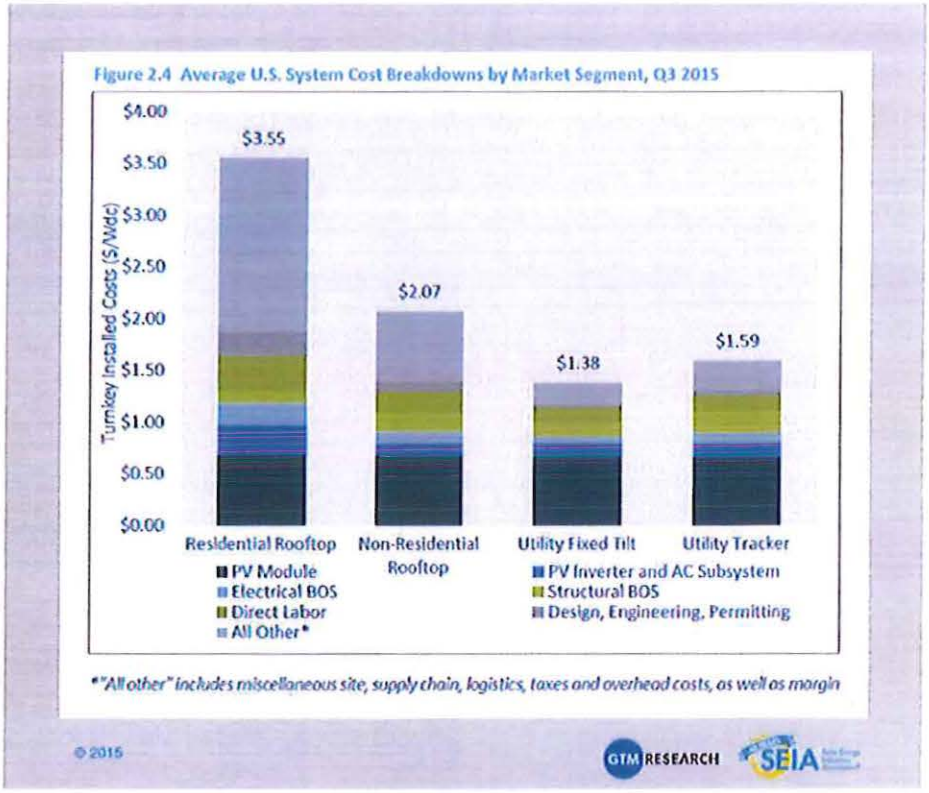


(http://www.seia.org/sites/default/files/2-3-ModeledUSNationalAverageSystemCostsbyMarketSegment.jpg)

Year-over-year, overall system pricing has fallen by 2% to 18%, depending on the market segment, with the largest declines in ground mount PV. On a quarterly basis, pricing continues to trend downward with some leveling-off in the residential sector due in particular to strong investment in customer acquisition ahead of 2016. In the non-residential and utility sectors, we see declines of 3% to 7%, reflecting continued aggressive cost reductions in national system pricing on an aggregate basis. Markets with a large footprint, such as California, continue to have a disproportionate effect on overall national average pricing, which can vary by as much as 20% from state to state. Variations in utility system costs are much smaller than variations in residential and non-residential costs.

Average pricing for residential rooftop systems landed just above $\$3.50/W_{dc}$, with nearly 60% of costs coming from on-site labor, engineering, permitting and other soft costs. While residential hardware costs have fallen by over 14% in the past year, soft costs have actually risen on an industry average basis by 6%. The trend is indicative of persistent challenges in lowering permitting costs and rising expenditures in customer acquisition that have not yet yielded additional installed capacity. As the industry continues to consider market expansion, these soft costs remain under intense scrutiny by large and small installers alike.

While utility system pricing is more tightly clustered than residential and non-residential system prices, state-by-state variation is prevalent, with states in the Southeast U.S. leading on lowest system costs. In Q3 2015, a high proportion of projects located in North Carolina with lower costs (especially in regards to labor) played a significant role in bringing national pricing downward for utility fixed-tilt systems. However, utility EPCs and developers continue to leverage a heavily competitive supply chain and maturing system installation practices to reduce costs across the board.



(http://www.seia.org/sites/default/files/2-4-AverageUSSystemCostBreakdownsbyMarketSegment.jpg)

2.3 Component Pricing

Compared to the first half of the year, the price trend for polysilicon and PV components was relatively stable in Q3 2015.

- For polysilicon, prices fell a 3% sequentially to $15.06/kg in Q3 2015. This is compared to the 18% drop in Q2 2015. The moderate decline was in part due to a drop in inventory levels for polysilicon producers and buyers (wafer producers).
- Wafer prices were also driven by healthier inventory levels, allowing quarterly prices to remain static at $0.20/W in Q3 2015.
- Cells were the only component to see a price uptick. Driven by stronger end-market demand, cell prices grew 2% to $0.30/W in Q3 2015.

U.S. module prices are largely driven by antidumping and countervailing duties on Chinese suppliers. In July 2015, the U.S. Department of Commerce filed its final review of the import tariffs on Chinese cells into the U.S. market. The final ruling set the cumulative duty at 30.61% for most major suppliers (21.70% for Yingli). During the third quarter, the average delivered priced for Chinese modules ranged from $0.65/W on the low side (corresponding to order volumes greater than 10 MW for less established firms) to $0.67/W on the high side (established, bankable firms, order volumes of less than 1 MW).

2.5 U.S. Polysilicon, Wafer, Cell, and Module Prices, Q3 2014-Q3 2015

	Q3 2014	Q4 2014	Q1 2015	Q2 2015	Q3 2015
Polysilicon ($/kg)	$21.69	$21.04	$18.94	$15.53	$15.06
Wafer ($/W)	$0.22	$0.22	$0.21	$0.20	$0.20
Cell ($/W)	$0.32	$0.32	$0.31	$0.29	$0.30
Module ($/W)	$0.75	$0.73	$0.72	$0.68	$0.67

Source: GTM Research

(http://www.seia.org/sites/default/files/2-5-USPolysiliconWaferCellModulePricesQ32014-Q32015.jpg)

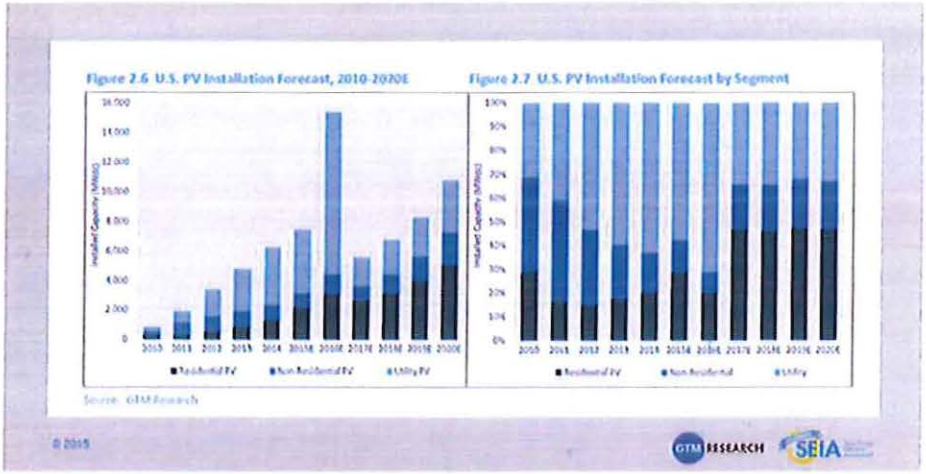
2.4 Market Outlook

We expect another record year for the U.S. PV market in 2015, with installations reaching 7.4 GW_{dc}, a 19% increase over 2014. The fastest growth will come from the residential segment, which is on pace to add more than 2 GW_{dc} for the first time ever, following a year in which the segment installed more than 1 GW_{dc} for the first time. Meanwhile, the non-residential PV market continues to struggle to scale as state incentive funding declines, and for the second straight year the segment is expected to fall slightly (5% downturn). Lastly, utility PV is forecasted to grow by 9% and should fuel more than 50% of all installations brought on-line for the fourth consecutive year.

As mentioned, on January 1, 2017, the 30% federal Investment Tax Credit (ITC) is scheduled to drop to 10% for third-party-owned residential, non-residential, and utility PV projects under Section 48 of the tax code, while the credit for direct purchases of residential PV under Section 25d is scheduled to expire entirely. Given that, solar installers and developers will aim to bring as much capacity on-line as possible before the scheduled stepdown. Solar development will continue, but some markets will fare better than others, and resumption of growth after 2017 will look different from the growth seen over the past eight years. For all market segments, the total addressable market will shrink post-2016, some states will fall off the solar map entirely, and resumption of growth at a national level will be due to several states with strong economics.

The utility-scale market shows the most dramatic drop in 2017, not only because of the challenges posed by the lower ITC, but also because project developers have largely turned their attention to bringing their contracted projects on-line before the end of 2016 in order to capture the full 30% credit. Many of these projects have long-term PPAs that begin in 2017 or later but will sell electricity either through short-term PPAs or on the spot market to bridge the gap between their commercial operation date and the beginning of their long-term PPAs. This pull-in of the utility solar pipeline will render the ITC cliff dramatic. Overall, installations are expected to drop 64% in 2017.

Forecast details by state (34 states plus Washington, D.C.) and market segment through 2020 are available in the full report (http://www.greentechmedia.com/research/ussmi) .



(http://www.seia.org/sites/default/files/2-6-2-7-USPVInstallationForecast2010-2020E-bySegment.jpg)

3. Concentrating Solar Power

The final quarter of 2013 kicked off the first wave of mega-scale CSP projects to be completed over the next few years, and Q1 2014 built on that momentum with 517 MW_{ac} brought on-line. This included BrightSource Energy's 392 MW_{ac} Ivanpah project and the second and final 125 MW_{ac} phase of NextEra's Genesis solar project. While Q2 2014 and Q3 2014 were dormant for CSP, Abengoa finished commissioning its 250 MW_{ac} Mojave Solar project in December 2014. As a result, 2014 ranked as the largest year ever for CSP, with 767 MW_{ac} brought on-line. The next notable project slated for completion is SolarReserve's 110 MW_{ac} Crescent Dunes project, which entered the commissioning phase in February 2014, then entered the testing phase in October 2015, and is now expected to become fully operational by early 2016.

After Crescent Dunes comes on-line, growth prospects for the CSP market in the U.S. are bleak. On one hand, CSP paired with storage represents an attractive generation resource for utilities, offering a number of ancillary and resource-adequacy benefits. However, due to extensive permitting hurdles that have confronted CSP projects, developers are putting their CSP pipelines on hold given the short window to bring projects on-line before the federal ITC is scheduled to drop at the end of 2016. Most notably, Abengoa's Palen Solar project, BrightSource's Hidden Hills project, and SolarReserve's Rice Solar project are all delayed indefinitely.

Beyond 2016, the outlook for the CSP market will depend on further progress made toward mitigating early-stage development hurdles, lowering hardware costs, and strengthening the ancillary and capacity benefits provided by CSP paired with storage.

Acknowledgments

U.S. Solar Market Insight® is a quarterly publication of GTM Research and the Solar Energy Industries Association (SEIA)®. Each quarter, we collect granular data on the U.S. solar market from nearly 200 utilities, state agencies, installers and manufacturers. This data provides the backbone of this U.S. Solar Market Insight® report, in which we identify and analyze trends in U.S. solar demand, manufacturing and pricing by state and market segment. We also use this analysis to look forward and forecast demand over the next five years. All forecasts are from GTM Research; SEIA does not predict future pricing, bid terms, costs, deployment or supply.

- References, data, charts and analysis from this executive summary should be attributed to "GTM Research/SEIA U.S. Solar Market Insight®."
- Media inquiries should be directed to Mike Munsell (munsell@gtmresearch.com (mailto:munsell@gtmresearch.com)) at GTM Research and Alexandra Hobson (ahobson@seia.org (mailto:ahobson@seia.org)) at SEIA.
- All figures are sourced from GTM Research. For more detail on methodology and sources, visit www.gtmresearch.com/solarinsight (http://www.gtmresearch.com/solarinsight) .

Our coverage in the U.S. Solar Market Insight reports includes 34 individual states and Washington, D.C. However, the national totals reported include all 50 states, Washington, D.C., and Puerto Rico.

Detailed data and forecasts for 34 states and Washington, D.C. are contained within the full version of this report, available at www.greentechmedia.com/research/ussmi (http://www.greentechmedia.com/research/ussmi)

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Tags Concentrating solar power (CSP), Residential Solar, Solar Market Insight (SMI) market development, Investment Tax Credit (ITC), Photovoltaics (PV), Residential Solar Rate, Solar Data, Solar Market Insight (SMI)

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People Will Pay To Stop Climate Change -- But Only $5

People who worry about human-caused climate change are willing to pay higher energy bills to help stop it, but only up to 5 percent higher, or about $5 on the average American energy bill, according to a Harvard political scientist who has conducted a comprehensive survey of attitudes toward energy and climate for the last 12 years.

Global warming is a huge problem for humanity that is foreseeable and possibly preventable, which makes it an excellent public policy problem to work on, "and a depressing one at the same time," Harvard Government Professor Stephen Ansolabehere said during a December appearance at the University of Chicago.

"People are not willing to really put their dollars—even people who say they are concerned about global warming—are not willing to put their dollars where their hearts are," Ansolabehere told a gathering of climate scientists, physicists, economists and public-policy experts at The Energy Policy Institute of Chicago (EPIC). The Institute's director, economist Michael Greenstone, introduced Ansolabehere as "the leading energy political scientist in the world."

The finding has implications for policy makers, Ansolabehere said, because it shows they do not have political support for measures that would incur higher costs, at least when climate change is offered as the benefit.

"You can't sell a 25 percent surcharge on your energy bill," he said. "You might be able to sell 6 percent or 5 percent."

The EPA estimates its proposed Clean Power Plan will raise energy bills slightly at first—up to 2 percent—but result in lower costs over time because of increased efficiency and reduced demand (pdf).

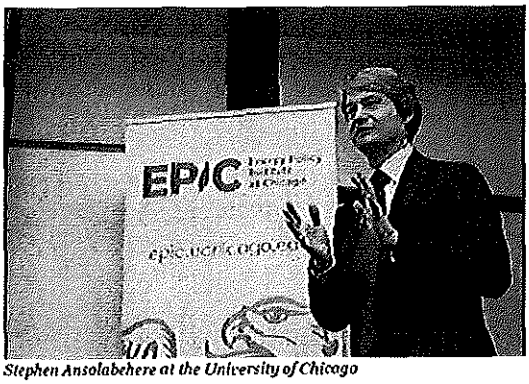
However, Americans support EPA regulation even if it results in higher costs, Ansolabehere found, because they associate EPA regulation with local benefits, such as cleaner air and improved health, and not merely with global climate change.

After surveying Americans, Ansolabehere posed the same question to energy consumers in other developed countries, asking how much more they would be willing to pay on electricity bills if it reduced greenhouse gas emissions by various percentages.

"And we took that on the road, asked that survey in a lot of different countries around the world. It's a depressingly small number—5 percent—about $5 on your electric bill, and it's the same in the U.S., same in Sweden, same in France, same in Germany, same in Japan, same in Canada, et cetera."

Ansolabehere and Georgetown public policy professor David M. Konisky detail these findings and more in a recent book, "Cheap and Clean: How Americans Think About Energy in the Age of Global Warming" published by MIT Press. Among their other findings:

- **Americans Want America To Run On Solar and Wind**
- **Americans Favor EPA Regulation Over Carbon Tax, Cap And Trade**



Stephen Ansolabehere at the University of Chicago

By Jeff McMahon, based in Chicago. Follow Jeff McMahon on Facebook, Google Plus, Twitter, or email him here.

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Americans Favor EPA Regulation Over Carbon Tax Or Cap And Trade

Americans Want America To Run On Solar and Wind

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Zenefits CEO Parker Conrad Resigns Amid Scandal