THE QUEST FOR CHEAPER SOLAR

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Innovation for a Better Life

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On the cover: Five acres of sun-baked parking lot on the campus of Arizona State University, a SunShot Initiative awardee, are transformed with four PowerParsols that cover more than 800 parking spaces and drive aisles. Photo courtesy of Michael Nothum
Interest in module level power electronics (MLPE) technologies is exploding. In fact, MLPE products like AC and smart modules are expected to grow to 23 percent of the solar panel market by 2020, up from 8 percent in 2016, according to GTM’s first-half 2017 research report on the global PV inverter and MLPE landscape.

MLPE products are growing in popularity in large part because they can help the solar industry reduce installation labor and supply chain costs. MLPE products also are attractive from a safety standpoint. Rapid shutdown features, for instance, enable the ability to switch the DC output of individual panels off, rapidly and automatically. Experts also note that the energy created by MLPE components such as DC optimizers and micro-inverters is safer than conventional DC modules.

To bring these benefits to the growing worldwide solar market, a number of manufacturers offer MLPE products. One of the leading companies driving this trend, LG Electronics, just introduced its NeON®2 ACe high-power AC module, which combines LG’s best-selling DC module with Enphase’s IQ6 + inverter. The result is a high-output solar panel with a DC output of 330W and an AC output of 290W, and the industry’s highest DC / AC conversion efficiency (97 percent). It allows simple configurations, is easy to install and is a safer, low-voltage product that meets NEC 2017 regulations.

According to Enphase Energy, which was founded with the vision of making solar simple and energy smart, its collaboration with LG on this Enphase Energized AC module is a prime example of executing on that vision.

Leveraging MLPE components and the expertise of two solar industry pace-setters, the NeON®2 ACe brings together high-performance and a simplified user experience, combining the processes of logistics, installation and monitoring.

Installation, always a concern for homeowners, becomes a quick, two-step roof installation process with this integrated AC module – eliminating the need to install the two products separately. Once roof installation is complete and internal software is set up, Enphase remote monitoring and management software can be controlled from any web-connected device.

“We’re committed to expanding the possibilities the solar industry has to offer by delivering products that appeal to installers and end-users in every aspect,” said Stephen Hahm, vice president and head of LG Electronics USA’s Energy Solutions business. “This partnership with Enphase allows us to streamline the process for consumers, appealing to a wider consumer base while still delivering on the efficiency that customers expect from LG.”

The new LG-Enphase AC module builds on LG’s long-time technology leadership producing high-power DC modules using N type monocrystalline components, as well as Cello technology, all recognized with coveted Intersolar awards, authoritative recognition in the solar industry.

Leading solar players like LG will continue to introduce module-level innovations as the solar industry embraces MLPE’s many benefits in the years ahead. LG MLPE technologies and the company’s broad assortment of solar solutions will be featured at Solar Power International 2017, Sept. 11-13, in Las Vegas.
When driving, I listen to NPR more than I’d like to admit. Don’t get me wrong: I still blast some metal every once in a while to maintain my waning sense of youth, but some good old-fashioned radio journalism stimulates the brain and keeps me informed. Imagine my surprise, though, when I heard an NPR host tell listeners to stay tuned for an upcoming story about a trade case that has U.S. solar companies concerned.

Ever since Suniva filed its Section 201 petition, the Solar Energy Industries Association (SEIA) vowed to lead the fight against the trade case, and the group has done an impressive job of getting its message out both to solar workers and to the public at large. Meanwhile, co-petitioners Suniva and SolarWorld have led a strong campaign of their own. From all parties, propaganda abounds.

For better or worse, the trade case has turned into a David vs. Goliath battle - or, to be more precise, Two Solar Manufacturers vs. Nearly The Entire Solar Industry. The battle came to a head on Aug. 15, when the U.S. International Trade Commission (ITC) held its first public hearing on the petition, and the commission is slated to make its injury determination on Sept. 22. Granted, it’s clear that most everyone in the solar industry, several lawmakers, and even some notable conservative groups like ALEC strongly oppose the petition, but I don’t envy the ITC - this is a tough case.

Suniva and SolarWorld aren’t lying when they argue the U.S. has lost a significant amount of domestic PV manufacturing over the past several years. Unfortunately, jobs have been cut, and lives have been affected. One main reason is that solar imports, especially from Asia, are cheaper and make it difficult for U.S. manufacturers to compete. However, that challenge is not unique to the solar industry, as cell phones, computers, clothing and myriad more products are often less expensive to produce in other countries. That’s a harsh reality of the global market, but does it justify disrupting fair competition and free trade? Shouldn’t a company’s successes or failures be of its own making?

In its Section 201 petition, Suniva proposed new global trade measures that would essentially make modules imported into the U.S. the most expensive in the world. Would such tariffs resuscitate Suniva from bankruptcy? Of course not. Would they help SolarWorld stay afloat? Maybe. Yet despite spearheading the previous U.S. trade actions against Chinese and Taiwanese imports, SolarWorld is still struggling years later.

Testifying at the August ITC hearing, Juergen Stein, CEO of SolarWorld Americas, explained, “[W]e expected the relief to give us the breathing space we needed to respond to unfair import competition. In fact, they did have a positive impact, and they helped us to survive until today. But here we are again. Rather than the long-lasting and meaningful relief we expected, global exports continued to increase.” Stein charged that Chinese manufacturers have set up shop in other regions to avoid the previous trade measures, adding, “Relief under Section 201 is our last hope.”

However, after claiming a past partnership with SolarWorld “turned out to be a poor decision” plagued by delivery and product-quality issues, Dan Shugar, CEO of solar tracker supplier NEXTracker Inc., argued in his testimony, “This is not a picture of a company poised to succeed in the marketplace if granted still another trade remedy.”

Regardless of whether it could somehow help SolarWorld and the remaining U.S. module manufacturers, the Section 201 case poses a major threat to the broader solar industry. As SEIA and independent studies have pointed out, imposing new tariffs and blocking off the U.S. from the rest of the world will only hinder domestic progress, putting thousands of additional jobs at risk. After all, one of solar energy’s most effective selling points is its ever-declining costs; the availability of cheaper modules, no matter from where they originate, allows developers and installers to offer lower prices, thus making utilities, businesses and homeowners more interested in adopting solar.

In a free market, there are winners and there are losers. But if the ITC intervenes and new global tariffs are imposed, U.S. demand for solar will plummet - everyone will lose.
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U.S. Renewables Have Come A Long Way Over The Past Decade

In the last decade, clean energy in the U.S. has grown by leaps and bounds. Technologies that were once novelties - solar panels, wind turbines, LED light bulbs and electric cars - have become everyday parts of America’s energy landscape.

According to a new report by Environment America Research and Policy Center, the U.S. generates nearly eight times as much electricity from the sun and the wind than it did in 2007 - enough to power more than 25 million homes - and the average American uses 10% less energy than he or she did 10 years ago.

The report also cites a 20-fold increase in battery storage of electricity and the meteoric rise in sales of electric cars - from virtually none in 2007 to nearly 160,000 last year - as evidence that a clean energy revolution is under way across the U.S., according to Environment America.

"Despite anti-science, anti-clean energy rhetoric coming from the Trump administration and many in Congress, the science is clear - fossil fuels pollute our air, water and land, threatening our health and changing our climate even faster than scientists predicted," comments Rob Sargant, energy program director for Environment America Research and Policy Center. "The good news is that the progress we’ve made in the last decade on renewable energy, energy savings, and technologies such as battery storage and electric cars should give us the confidence that renewable energy can be America's energy choice."

The report, which was co-authored by Frontier Group, analyzes the growth of key technologies needed to power the nation with clean, renewable energy, including wind, solar, energy efficiency, energy storage and electric vehicles. Beyond a national assessment, the report provides state-by-state rankings on how effectively each state is adopting these technologies.

The report says solar and wind energy have grown exponentially over the past decade. In 2007, solar rooftops and utility-scale power plants produced 0.03% of America’s electricity, or enough electricity to power 120,000 average American homes. By the end of 2016, according to the report, solar power generated
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enough electricity to power 5 million average American homes, a 44% increase over the previous year.

The report says that by the end of 2007, America had built up a modest capacity for generating electricity from the wind, producing 0.8% of the nation’s electricity, enough to power more than 3 million homes. By 2016, wind turbines produced 5.5% of America’s power, enough to power 21 million homes, the report adds. In addition, the report notes 2016 also saw the installation of the 50,000th wind turbine in the U.S., as well as the launch of the nation’s first utility-scale offshore wind farm, off the coast of Block Island, R.I.

Meanwhile, the report says U.S. energy consumption has dropped by 3.6% since 2007, despite a growing population and economy. Between 1950 and 2007, total energy use in the U.S. had nearly tripled.

The report describes the factors that have contributed to the rapid growth in each clean energy category, including improved technologies and plummeting costs. Citing a survey by the U.S. Department of Energy, the report says that between 2008 to 2015, the cost of land-based wind energy fell by 41%; the cost of on-site and rooftop solar PV by 54%; the cost of utility-scale PV by 64%; the cost of home energy storage batteries by 73%; and the cost of LED light bulbs by 94%.

“Every day, we see more evidence that an economy powered by renewable energy is within our reach,” says Sargent. Environment America says the report comes as a growing number of U.S. cities, states, corporations and institutions consider commitments to 100% renewable energy. Currently, over 40 U.S. cities have officially committed to that goal. Nearly 100 major companies, including Apple, Walmart and LEGO, have as well. Hawaii is committed to 100% renewable electricity by 2045, and as of press time, California is considering similar legislation. And in Congress, bills to commit the nation to 100% renewable energy have been introduced in both houses.

“Given the environmental benefits, clean, renewable energy should be the go-to option for businesses, utilities, governments and households across the country,” says Sargent. “It won’t be easy. But we have no choice.”

Germany’s SolarWorld Starts Anew

After reaching an acquisition agreement, Germany-based module manufacturer SolarWorld AG received approval to hand over its German production facilities and its distribution companies in Europe, Asia and Africa to SolarWorld Industries GmbH, a newly formed entity led by SolarWorld founder Dr.-Ing. Eh Frank Asbeck. As of press time, not many details - financial, structural or otherwise - were disclosed, but an August press release indicated the deal will directly save approximately 500 of at least 1,700 jobs.

Reiterating its long-held claim that module oversupply and cheap imports from Chinese-owned companies were hurting the domestic market, SolarWorld AG and its German subsidiaries filed for insolvency proceedings in May and had been working to find a solution to its financial troubles with an insolvency administrator ever since. SolarWorld Americas, the...
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U.S. subsidiary, was not part of that filing.

In the press release posted on a revamped website in August, the new SolarWorld Industries said its plants will continue producing solar products made in Germany, and more than 500 employees at all three locations in Arnstadt, Freiberg and Bonn are entering the new company. The release also said the implementation of a transfer company was planned for a further 1,200 employees.

In addition to Asbeck, the release verified previous reports that Qatar Solar Technologies, a subsidiary of the not-for-profit Qatar Foundation, is a shareholder in SolarWorld Industries GmbH. The release also said the new SolarWorld Industries will exclusively focus on the production of products based on monocrystalline PERC solar cells, such as glass-glass modules with energy generation on both sides.

“I am delighted that after tough negotiations, we have succeeded in developing a future for SolarWorld production,” said Asbeck in the release. “With this restart, we will ensure that solar products are still being developed and produced at a highest level in Germany.”

The release said plans were to start with production capacity of 700 MW, which also can be reverted to the previous capacity of more than 1,000 MW.

“In the past weeks, we have received considerable support from the solar industry of researchers, suppliers and European competitors, but especially from our customers, in order to maintain the sites and the SolarWorld brand,” said Asbeck.

As mentioned, SolarWorld Americas was not part of its parent company’s insolvency filing. Although the Oregon-based manufacturer recently laid off over half of its workforce, Ben Santarris, SolarWorld Americas’ head of corporate communications, told Solar Industry that the subsidiary has “reset” after its recent $6 million cash infusion and is still operating outside of bankruptcy proceedings as of press time.

“The company is working to return to a path of growth and prosperity,” said Santarris in August. “We needed to right-size the company to adjust to changed market conditions. Having done so, we are re-ramping production and preparing for growth.”

Regarding the U.S. company’s current situation and whether it plans on selling off equipment or other assets, he explained, “We are focusing on core products to serve our loyal customers. If an asset does not contribute to that focus, we might consider selling it to reinvest in growth and innovation.”
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Yes, The U.S. Grid Survived The Solar Eclipse

Thanks to smart planning and the power grid’s ever-growing resilience, the solar eclipse on Aug. 21 went off without a hitch for grid operators and utilities across the U.S. despite the event’s big impact on solar generation.

For example, the California Independent System Operator (CAISO) typically relies on a significant amount of solar energy, but CAISO spokesperson Steven Greenlee verifies, “We did not have any reliability issues large or small - things went very smoothly.”

“The California grid and the western Energy Imbalance Market that serves customers in eight western states performed as expected,” explains Greenlee. “While the eclipse ramp-off and back-on were very fast, we were able to manage them and fortunate that there were not major transmission or generation outages. We also got lucky that the weather in California was nice (Bay Area had fog) and temperatures were seasonable, so loads were reasonable, as well.”

CAISO has “several years of managing solar (and wind) and its variability,” according to Greenlee. “Often, clouds will obscure a portion of the 10,000 MW of our grid-connected solar resources, which we have to replace with other resource types, so we have built up a strong expertise in managing such events.”

As of press time, CAISO was still reviewing just how much of its typical 9,000+ GW of solar production was affected during the eclipse, but Greenlee notes, “Hydro-electric and natural gas provided most of the generation needed to ride through the eclipse and loss of solar output in California.”

Meanwhile, PJM Interconnection, the operator of North America’s largest power grid, reports it also ensured reliable power supplies throughout the solar eclipse.

According to a PJM announcement, the grid operator saw a drop of approximately 520 MW of wholesale solar generation connected to the grid from before the eclipse until the peak of the eclipse. In addition, PJM also estimates that electricity from behind-the-meter solar generation (mostly rooftop solar panels that offset load) decreased by approximately 1,700 MW.

In its announcement, PJM notes it had expected a reduction in power from rooftop panels to result in an increase in electric demand on the grid. However, because of a variety of potential factors, including reduced air conditioning, increased cloud cover and changes in human behavior related to the event, PJM saw a net decrease in demand for electricity of about 5,000 MW throughout the eclipse.

PJM says it will continue to study the impact of the solar eclipse on its system and will integrate lessons learned from the event into preparing for the next solar eclipse, predicted to occur in 2024, when the grid is expected to have more solar generation.

Utility company Duke Energy, which has 2,500 MW of solar capacity connected to its system in North Carolina, reports that it lost about 1,700 MW of that capacity during the height of the eclipse.

Nonetheless, Sammy Roberts, Duke Energy’s director of system operations, says, “We were able to balance the Duke Energy system to compensate for the loss of solar power over the eclipse period. Our system reacted as planned, and we were able to reliably and efficiently meet the energy demands of our customers in the Carolinas.”

Elsewhere on the East Coast, Georgia Power held a Facebook Live event during the eclipse and showed real-time production analytics from the utility’s solar research and demonstration project at its headquarters. John Kraft, spokesperson for Georgia Power, says, “We were glad for the opportunity to help educate customers about our advancements in renewable energy and the part it plays in a diversified energy portfolio.”

According to Kraft, “We have almost 900 MW of solar capacity, including company-owned projects, power purchase agreements, etc. We saw a significant drop in solar production at our small demonstration project at our Atlanta headquarters during the eclipse and expect that solar facilities across the state experienced declines in output, depending on local weather conditions and degree of eclipse darkening.”

However, he adds, “We did not expect and did not have
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customer outages related to power supply because of the diverse generation mix we employ on our system, including solar, nuclear, natural gas, coal, hydro and other sources. The company was well prepared for this event.”

Georgia Power plans to keep adding solar to its grid after the Georgia Public Service Commission last year approved its 2016 Integrated Resource Plan, which includes the addition of up to 1,600 MW of solar and other renewable energy through 2021.

“An eclipse is a rare event, and one that can be planned for, but it did illustrate the intermittent nature of solar that more
commonly occurs with passing clouds, rainy days, at night, etc,” says Kraft. “Like any power source, solar has benefits and
limitations, and when incorporated into a diverse generation mix, as we have done in coordination with the Georgia Public Service Commission, it is an important part of our state’s energy resources.”

### JPMorgan Chase Makes 100% Renewables Commitment

Adding to the growing list of major companies going all-in on renewables, financial services firm JPMorgan Chase has set a new goal to source renewable power for 100% of its global energy needs by 2020. The firm has over 5,500 properties in 60 countries that cover 75 million square feet.

Furthermore, JPMorgan Chase has established another goal to facilitate $200 billion in clean financing by 2025, which the firm claims is the largest commitment to clean financing by a global financial institution. Through this, JPMorgan Chase says it will help scale the impact of sustainability efforts among its approximately 22,000 global corporate and investor clients.

These new goals build on the firm’s history of advancing sustainability in its business and operations. For instance, JPMorgan Chase had previously committed to reducing its greenhouse-gas emissions 50% below 2005 levels by 2020 and has already retrofitted 2,500 branches with LED lighting, helping to cut Chase’s lighting energy consumption by 50% - the equivalent of taking nearly 27,000 cars off the road.

“Business must play a leadership role in creating solutions that protect the environment and grow the economy,” says Jamie Dimon, chairman and CEO of JPMorgan Chase. “This global investment leverages the firm’s resources and our people’s expertise to make our operations more energy efficient and provide clients with the resources they need to develop more sustainable products and services.”

JPMorgan Chase says it will achieve its 100% renewables goal through a combination of installing renewable energy across buildings and branches, signing power purchase agreements (PPAs), and reducing energy consumption.

According to the firm, that includes developing on-site
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solar power generation for up to 1,400 bank-owned retail and 40 commercial buildings globally. Examples of projects under consideration include a solar installation up to 20 MW for the Morga Polaris Corporate Center in Columbus, Ohio - the firm’s largest single-tenant office in the world - and a solar installation up to 7 MW at the new JPMorgan Chase Legacy West Complex in Plano, Texas.

Notably, the firm is already piloting an installation of solar panels at Chase branches in California and New Jersey, with plans to introduce solar technology to thousands of other locations. JPMorgan Chase is also installing large-capacity fuel cell technology at the firm’s commercial sites starting at Metrotech Center in Brooklyn, N.Y., and small-capacity fuel cells at retail sites.

In addition to on-site installations, JPMorgan Chase says it will use the strength of the firm’s global reach and expertise in the renewable power sector to support the development of new renewable energy projects on the grids from which the company purchases power. That includes plans to execute wind and solar PPAs in select markets in the U.S. to offset the firm’s traditional power consumption by 40%.

As a first step, JPMorgan Chase’s Global Real Estate and Global Commodities divisions executed a 20-year PPA with a subsidiary of NRG Energy Inc. in late 2016 to support the development of the Buckthorn wind farm, a 100 MW project in Erath County, Texas. The project is expected to be operational by the end of 2017. Over half of the wind farm’s output was purchased by the Global Real Estate team and will provide electricity for approximately 75% of the firm’s power consumption in Texas and 13% of overall consumption in the U.S. This includes the firm’s new 6,000-employee campus at Legacy West in Plano, Texas, which will open in late 2017.

### Global Energy Storage Market Poised For Strong Growth

The global grid-connected energy storage market remains poised for growth, with the market outlook strengthening until 2025, when it will reach a total installed base of 52 GW, according to a new research note from IHS Markit.

 Authored by Julian Jansen, senior analyst of solar and energy storage at the firm, the research note says the U.S. is expected to be the largest storage market, deploying 1.2 GW in 2020 and seeing a CAGR of 21% from 2017 to 2025. In the short term, South Korea, Japan, Germany, Australia and the U.K. will be the next biggest markets.

Globally, IHS Markit predicts that annual deployment of grid-connected energy storage will grow from 1.3 GW in 2016 to 4.7 GW in 2020 and 8.8 GW in 2025. Furthermore, the grid-connected energy storage market is projected to grow from annual revenues of $1.5 billion in 2016 to more than $7 billion in 2025 with a CAGR of 16%.

As part of the continuous research carried out by IHS Markit across the energy storage industry, a number of macro-trends are emerging. For example, early markets for energy storage from 2013 to 2015 were driven by single applications, such as frequency regulation in the PJM market, or self-consumption in the German residential segment. However, over the course of 2016 and the first half of 2017, new value is emerging for utility-side-of-meter storage, primarily from capacity requirements, the integration of utility-scale solar and island microgrids, according to IHS Markit. This leads to greater growth in the longer-duration storage segment, especially systems of two- to four-hour duration.

In the behind-the-meter segment, IHS Markit adds, system aggregation and demand response programs are enabling value stacking and improving economics, aided by regulatory support and subsidy programs in California, South Korea, Japan or Germany. Therefore, although utility-scale storage dominates the global market today, IHS Markit predicts behind-the-meter deployments will make up - for the first time - more than 50% of cumulative annual storage installs in 2020.

On a regional level, IHS Markit says three key markets currently stand out:

- IHS Markit is seeing a continuous increase in the forecast for the U.S. behind-the-meter market, with Self-Generation Incentive Program funding in California driving deployment across the various applications and revisions to net energy metering programs supporting the long-term development of residential markets.

- There will be sustained market growth in South Korea, despite the completion of major frequency regulation projects this year. Over the coming years, IHS Markit says increasing utility-led programs for renewables integration and mandates for energy storage in public building will support annual deployment.

- Public tenders and large-scale solar+storage are igniting the Australian utility-side-of-meter market, as shown by major announcements from players such as Lyon Group and Tesla, which was recently tapped to build the largest lithium-ion battery project in the world.

IHS Markit says that as prices for energy storage systems continue to fall, previously uneconomical applications, such as the co-location of battery storage with solar PV, are becoming feasible. Driven by declining lithium-ion battery module prices, which have fallen 70% since 2012, the technology is expected to dominate the market over the coming years. With prices for lithium-ion battery modules predicted to fall further, reaching less than $200/kWh by 2019, IHS Markit expects such batteries to also establish themselves as the leading chemistry in longer-duration systems aimed at the two- to four-hour duration segment.
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In 2010, solar power was less than 0.1% of the U.S. electricity mix, and the nation was witness to a number of European countries heavily investing in solar. The U.S. Department of Energy’s SunShot Initiative was launched that same year with the objective of making the cost of solar electricity competitive with other generation sources by 2020, without subsidies. Equivalent to $1.00/W at the utility scale, the federal office’s goal required what seemed to be impossible: innovation and collaboration across all parts of the solar industry value chain. Lofty as it was, SunShot laid out a clear path to achieving these goals and charged ahead, focused on its newly crafted mission.

Funding a range of research projects, from improving solar energy efficiency and reliability to grid integration and ubiquitous adoption, the office helped put into motion new technologies and processes that chip away at solar costs. Over the course of six years and hundreds of research partnerships, SunShot investments transformed the “going solar” process, reducing the time it takes to install and connect to the grid and dropping the levelized cost of energy by 50%.

Seven years later, the solar industry has met SunShot’s 2020 utility-scale cost target for photovoltaics (PV) - $0.06/kWh - three years ahead of schedule. While the industry could pause to celebrate this major milestone, the path to reaching SunShot’s remaining 2020 goals for commercial and residential PV, as well as concentrating solar power (CSP), is an uphill climb.

As we push toward 2020, SunShot will continue to focus on early-stage research and development to make solar more affordable, durable and efficient. Through SunShot’s

Solar In 2030: Making The New SunShot Vision A Reality

The Energy Department’s solar office reaches a major milestone and lays the foundation for research over the next decade.

by Dr. Charlie Gay
investments and strategic partnerships, the solar industry has crafted a solid foundation that will enable it to reach for SunShot’s 2020 goals and beyond.

**Building Blocks for Success: The Road to 2020**

SunShot’s targeted research and development investments have played a significant role in developing commercially viable solar technologies. Its call for industry-wide, collaborative partnerships has helped to galvanize cost reduction initiatives and shape the industry. Through its competitive awards, SunShot has been able to strategically channel resources to address high-need areas and build a foundation for reaching the sharply defined 2020 goals.

**A Steady Drumbeat of Industry Innovation**

SunShot funds transformative technology solutions and advanced research and development efforts to accelerate solar power cost reduction. The long-term research it funds has identified a portfolio of opportunities to make incremental changes in solar electric generation and grid integration. This research requires steadfast support and persistence - sometimes the return on investment might be a decade away. The private sector isn’t in a position to take on early-stage research, and federal support is needed to make systematic progress in the quest for new pathways to lower cost.

SunShot-funded projects at the national labs have contributed to more than half of solar cell efficiency records, including one of the most efficient solar cells ever created. In 2014, the National Renewable Energy Laboratory (NREL) designed and developed a four-junction cell using metamorphic layers to account for strain induced mismatched lattice constants that achieved a world record of 45.7% efficiency. SunShot’s PV research has also inspired the use of new module materials and designs and even illuminated new electro-optical information at the basic device level. Research at the SLAC National Accelerator Laboratory used X-rays to better understand the contact formation of a solar cell, revealing foundational knowledge about the interface between the semiconductor and conductor that previously could only be empirically optimized. SunShot’s continued focus on improving solar module materials ensures that the industry has options for expanding lifetime and increasing reliability.

**Targeting High-Risk, High-Reward Solutions**

SunShot also funds technology solutions that could generate high-impact results in five years or less. By funding technologies with near-term commercialization prospects, SunShot enables companies to move more rapidly from experimental validation to scale-up. Many businesses do not have access to the capital required to undertake these projects, and often the work needed to accelerate these technologies far exceeds the risk tolerance of venture capitalists. SunShot funds have played an essential role in enabling a diversity of innovations to be primed for private sector support.

One company for example, 1366 Technologies, has been at the forefront of improving silicon wafer manufacturing, which traditionally wastes a lot of silicon during cutting operations. Through SunShot’s project management approach, which requires companies to meet aggressive performance metrics to receive continued support, 1366 Technologies was able to...
develop its efficient kerfless process that reduces the cost of silicon wafer manufacturing by half. Another example, Genability, was funded to create an algorithm that instantly determines how much a customer could save over time, after accounting for the upfront costs, by switching to solar, ensuring that a realistic set of expectations can be met. The software is more than 99.5% accurate, and business proposals built upon the analyses are used by nine out of 10 top U.S. residential solar installers. Overall, companies that have participated in the office’s successful Incubator program have generated more than $34.1 billion in follow-on funding for start-ups and entrepreneurs from over $158 million in public investment.

Eliminating Market Barriers to Reach 2020 Goals

Solar is now more affordable than ever for homeowners and commercial businesses, but to reach the program’s residential solar goal of $0.10/kWh and commercial goal of $0.08/kWh by 2020, there’s still a lot more work that needs to be done. While the cost of modules has decreased dramatically, more daunting challenges facing the industry include helping customers find the information they need, obtain financing, and finalize connection of the power system to the grid. In order to continue to reduce costs and incentivize adoption in emerging markets, increased coordination with local and municipal governments, expanded financing sources, and data transparency are vital. One study from our On the Path to SunShot report series found that new financial instruments could cut the cost of solar by 30% to 60%, showing there’s still a lot of room for improvement.

Many Americans don’t have access to rooftop solar because they don’t own their homes or they live in multi-storied apartments. To help achieve its 2020 solar goals and improve accessibility, SunShot launched the Solar in Your Community Challenge to incentivize teams across the country to work together to expand options for multiple stakeholder groups, including low- to middle-income Americans, nonprofits and tribes. Teams are encouraged to create scalable and replicable models that explore new financial models and program implementation structures that make it easier to go solar. With over 160 teams at work in 40 states and the District of Columbia, the prize competition is already empowering Americans who haven’t been able to take advantage of the booming solar market to seriously consider solar for the first time.

SunShot is also working to improve solar data transparency with its Orange Button program. Through a collaborative industry-wide effort to standardize solar datasets all along the value chain, this program facilitates data exchanges and interchangeability while simplifying financial transactions. At the commercial and utility-scale levels, this work is critical for bridging the gap between the solar industry and financing sources, building investor confidence, and lowering the cost of capital. Because these soft costs account for over half of the system cost, improving transparency and standardizing financial transactions can lead to significant savings. The implications for overcoming market barriers to reach the 2020 goals couldn’t be greater. Increases in market size enable industrial-scale solar, which further lowers cost.

A New Vision for Solar: America in 2030

The past seven years have bolstered the U.S. solar industry, which is quickly building up technical expertise and local capacity to meet the high demand for solar. In spring 2016, as the solar industry surpassed its millionth solar installation, it became clear that the once-nascent industry is now a thriving economic force with installations in all 50 states, employing over 260,000 workers. SunShot’s focus on cost reduction and innovations has established a strong foundation and enabled the industry to meet SunShot’s 2020 utility-scale cost target. The solar industry has outgrown its own roadmap, and it is time for a new challenge that can significantly increase solar’s impact. In late 2016, SunShot announced new 2030 goals for utility, commercial and residential solar - $0.03/kWh, $0.04/kWh and $0.05/kWh, respectively.

At $0.03/kWh, the levelized cost of electricity from utility-scale solar would be reduced by an additional 50% by 2030. This would make solar one of the least expensive power generation options, resulting in further consumer adoption. Because this scenario would also require the industry to address grid integration challenges, achieving this goal would further America’s resilient and reliable energy future, powered by American natural resources.
Rocketing to 2030

Already, SunShot-funded PV research is working toward the 2030 targets. Projects at universities across the country and the Energy Department’s national labs are focusing on increasing module efficiency and durability. There are a variety of ways for the industry to achieve $0.03/kWh for utility-scale solar, but each pathway requires significant improvements in module efficiency, system costs and life span. Ultimately, a mix of cost- and performance-improvement factors enables a variety of realistic paths to $0.03/kWh.

In addition, improvements are needed to enhance the capacity and resilience of our current electricity grid. In this 2030 scenario, hundreds of gigawatts of solar generation could enter the grid in varying amounts and times throughout the day. In order to integrate large amounts of solar onto the grid, strengthening the grid’s capabilities and flexibility will remain an important challenge over the next decade. New technologies like storage, inverters with advanced communication and cybersecurity capabilities, and real-time sensing and control systems for the grid will be needed.

SunShot is currently working with utility partners to test and troubleshoot integrated PV and energy storage solutions that are scalable, secure, reliable and cost-effective. Already, Austin Energy has created a grid management tool that incorporates storage and enables the utility to divert solar resources on the grid to storage facilities so that it can use the power whenever it is needed. The utility plans to create a template for this work, helping other utilities across the country emulate its efforts and optimize their solar resources. SunShot is also working with national labs like NREL to develop the tools and technologies needed for grid operators to maintain control when solar penetration grows. One project is exploring the use of virtual oscillator controls on inverters, using sound waves to synchronize inverters and mimic the inertia created by traditional generation sources.

Every day, researchers across the country work to make SunShot’s vision a reality. The innovations that we’re funding today will have a major impact on our ability to reach these goals. Our office helps to ensure that the solar industry has a pipeline of relevant knowledge, transformative technology solutions, and human resources to meet the rapidly growing demands of electricity users around the country. The exceptional research we support and partnerships created along the way will be critical to meeting these goals and changing our energy future.

Dr. Charlie Gay is director of the U.S. Department of Energy’s SunShot Initiative.
How To Create A Complete Commercial PV Design Package

Solar canopies being lifted by a crane for final installation at Salisbury University in Maryland.

Photo courtesy of Standard Solar.
ight now, the commercial solar segment is one of the hottest in the solar industry. Maybe it’s all the press suggesting it is finally taking off after spending years in solar purgatory. But the influx of new companies into the space has also created a gap between experts and amateurs - and in this space, almost more than any other solar segment, customers need to be dealing with experts.

Unlike utility-scale and residential solar, commercial solar is a complex web of the interwoven needs of the project owner combined with the complicated engineering challenges that frequently come up in commercial projects.

That's why it's important to have a clearly defined engineering protocol that everyone on the team - and those essential members of the ownership and construction crews - understands. Having a well-documented process in place before the project begins leads to fewer misunderstandings, miscommunications and change orders, which often delay projects and can cause failed inspections and deficient energy production.

Here is an example of what I believe it takes to create a complete commercial PV design package.

### Manage the interconnection process

It doesn’t seem like managing paperwork would fall under the engineer’s purview. But when it comes to connecting the solar project to the grid, the coordination, communication and cost management of that critical integration must be carefully overseen by an informed and technically literate individual. Constant communication with the electric distribution company (EDC) and clear documentation are essential for expedient approval and a cost-efficient interconnection.

As a result, it is incumbent on the engineering team to read and understand what’s expected of them to avoid potential problems at the time of commissioning. That means doing the following:

- Reading and understanding all interconnection and power plant construction rules, policies and regulations for the state, utility or region where the project is being built. These regulations can be found at the U.S. Department of Energy-sponsored DSIRE website, as well as on the local EDC’s and state public utilities commission’s websites; and
- Making sure the team has the latest interconnection documents, which are usually housed on the EDC’s website.

Realistically, engineering teams should budget a minimum of six business weeks from the submission of interconnection application to the formal approval to construct from the EDC. It is best practice to refrain from ordering materials until the approval to construct has been obtained. Otherwise, you might end up with a warehouse full of materials for a project that, for whatever technical reason, might not end up getting built or is significantly altered from the original plans.

### Conduct a detailed engineering site visit

You might be surprised, given how hands-on most engineers are by nature, that this is an often underestimated step in the process. But no matter how good the photographs are or how many angles they depict, there is never a substitute for getting out into the field to see first-hand what a site looks like - and what hidden engineering challenges you might uncover. A proper detailed engineering site visit requires no less than two people and two to eight hours on-site, depending on size and complexity.

After all, there are certain important engineering considerations that shouldn’t be determined while sitting behind a desk, such as the following:
- Measuring and locating all shade structures and obstructions or understanding the limitations imposed by site topography;
- Determining the proper type of mounting system to be used, depending on both the type of project and the type of material on which the racking will rest;
- Identifying where the array may most effectively interconnect with the electricity system - something most EDCs require detail on before they give the project the go-ahead;
- Deciding how the project will interconnect - what materials will be necessary, what the code-compliant configuration might look like and what the most effective way to produce the proper outcome might be (another item the utility may insist on before giving a project approval); and
- Figuring out where the inverters and balance-of-systems equipment will be located.

In the end, a site visit allows the engineer’s trained eye to see and identify potential trouble spots before they become obstacles to delivering a project on time and on budget.

### Select the proper components

This may sound like a simple process, but one mistake can easily cost tens of thousands of dollars or significant productivity losses - hurting your company’s reputation in the business. So, take care when you’re selecting the two most critical components to make sure they’re exactly right for the project, and remember the following guidelines:

#### Modules

Keep in mind that a solar module made for utility-scale projects may not be the best fit for a commercial roof-mount project or a carport. Do your due diligence and consider factors like expected module-technology performance in the climate at the site, shade tolerance, energy density and (unfortunately) the ability of the vendor to deliver. If you’ve been paying attention to solar news lately, there is a shortage of modules on the market. You want to make sure when you’re selecting module vendors that they will be able to deliver their products on your schedule, not on theirs.

Oh, and check with your project financier: It’s entirely possible the financier already has a relationship with one specific supplier or has other considerations you’ll need to take into account.

#### Inverters

Anyone specifying inverters must first find out from the utility what its requirements are before even
beginning the procurement process. The last thing an engineer wants to have happen is to discover - too late - that the inverter he or she has specified doesn't have the required features the utility needs for interconnection.

Research the market and familiarize yourself with the different inverter technologies and products available from quality manufacturers. Review the system design to verify which inverters will function properly in the project's environment and with the specified modules. Then reach out to inverter manufacturers with the specifications necessary to optimize your project. Though the turmoil roiling the module market is not occurring in the inverter market, even some great inverter manufacturers have come and gone. Consider that the inverter is the heart of the PV system and is by far the most common point of failure. Be sure to select a vendor that will be there with strong support and a solid warranty when you need it.

If you follow similar steps for the other components, the system being engineered will be well integrated, and the construction team will feel the benefits and take notice.

Manage third-party engineering vendors

Despite what engineers might tell you (or themselves), sometimes they can’t do everything on their own. In those situations, it’s important to know what you don’t know and acquire outside assistance to make sure even the parts of the projects you aren’t an expert in are done right.

The first step, of course, is identifying those areas where third-party professional engineering services are necessary, which could include (but are certainly not limited to) electrical, structural, civil, geotechnical, environmental and controls.

Once those areas have been identified, the next step is deciding on the scope of the work any outside firms will be doing so they can craft their bids to specific parts of the projects. Be sure to walk through your proposed scope and coordinate requirements with competing bidders, which ensures that any comparisons will be accurate and fair.

Left to their own devices, many third-party engineering firms would bid on items that may be unnecessary while inadvertently leaving critical work that can end up as change orders and unexpected budget overruns later. I'll admit that we have learned the hard way that it is often lower cost to take the time to have a complete scope up front than to have a professional return to the site later to complete additional investigation. If such confusion can be avoided with specifics in the request for proposals, fewer problems will await you down the road.

During the vendor selection and evaluation process, keep the project manager in the loop with respect to the budget and what has been agreed to so that there are no surprises as the project moves forward.

Design in stages

When our team at Standard Solar is working on designing a commercial system, we work through three stages of design work. Breaking it down into three milestones allows for a rigorous quality review every step of the way, which provides more opportunity for mistakes to be corrected before being constructed in the field. Our three design stages are 30%, 60% and 90%. Here’s what you should look for at each stage:

30% - Start by assembling all possible information about the project, including existing structural drawings, existing electrical diagrams, topographic maps - anything that is relevant to ensuring the engineers have all the necessary information before they start their designs.

With engineering complete, the Standard Solar team begins module installation for a ground-mount project at Carroll Community College. Photo courtesy of Standard Solar

Now you're ready to generate your array layout, determine conceptual electrical design and generate drawings that show the inverter placement, point of interconnections, approximate DC and AC conduit routes, and other major equipment locations. The 30% design typically only includes two to five pages but entails a tremendous amount of homework and background analysis to deliver a good result.
60% - Now that the conceptual design is out of the way and adjustments have been made based on peer and client feedback, it’s time to generate a detailed array layout. This should include drawings of sub-array electrical configuration, including combiner boxes, rapid shut-down devices, and AC accumulation panels, as well as conduit routes from the array to inverters, inverters to accumulation panels and, finally, from panelboards and switchboards to the point of interconnection.

At this stage, you should perform National Electrical Code wire sizing calculations, voltage drop calculations and conduit fill calculations and generate preliminary equipment elevations, including inverter pads, DC disconnect/inverter/combiner-box rack mounting, the AC accumulation panel, interconnection location, fence details, and mounting system elevations.

Once you’ve gotten your peers, project team and manager to review the plans, make the necessary changes and drawing updates based on their input. Now you can generate the first draft of the Bill of Materials, including all the major materials we’ve discussed. It’s also critical that you and your team continue coordination and management with the utility and key product vendors. Once this stage is reached, we at Standard Solar will often obtain any required professional engineer stamps and submit to the authority having jurisdiction (AHJ) for permit.

90% - By now, you’re nearly finished. It’s time to finalize the system layout, including string diagrams, wire management details, electrical-equipment-wiring details and the location of the disconnecting means. As necessary, this will also be the stage where you detail the data acquisition system or control system components, where they will be mounted and how they are integrated with the PV system.

At this point, you will update the energy production model and adjust any calculations accordingly. Appropriate third-party engineers should be continuously involved throughout each stage, and their feedback should be incorporated into the plans, along with any comments or requirements returned from the AHJ’s review.

Submit the plans to your final internal peer review, as well as a final collaboration with the project team and management team - and now you’re ready to put the finishing touches and conduct a detailed page-turn with the construction crews’ leaders and any subcontractors before construction commences. Reviewing and coordinating the design with the construction professionals installing the job is critical. Most mistakes, poor practices or constructability issues can be identified and avoided at this stage.

If commercial solar project engineers move through these steps (and any others they feel are necessary to add), it will greatly improve the odds that the commercial project they’re designing will go smoothly.

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Solar’s Effect On Seemingly Unrelated Industries

From firefighters and code officials to real estate appraisers and developers, professionals whose jobs “touch” solar technologies are getting solar smarter.

by Ruth Fein Revell

The sirens are cut as the truck rolls up to an involved structure fire. If you’re a firefighter first on the scene, you don’t have time to pause before you put everything you know into action.

Once it’s established the house is empty, you advance toward the billowing smoke. Then the entire squad stops dead in their tracks. There are solar panels on the roof that you couldn’t see from the front. You rely on your recent training; no time is wasted as power to the home and the solar equipment is safely shut down (to the extent possible). Now you can confidently approach the roof.

Without effective solar education and training, this scenario might not play out the same way in another neighborhood, where first responders didn’t have the knowledge and confidence to respond without skipping a beat.

In many areas of the country, firefighters are becoming better prepared for emergencies where solar technology is present. They’re alleviating their safety concerns. They’re able to swiftly identify and shut down even less-visible solar systems. They know where they can operate safely with a solar-energized system in play, as well as when they can or can’t create a rooftop escape route for heat and smoke. New in-person and interactive online training courses are helping firefighters and other first responders become solar smarter. And with increased knowledge and a plan, they can approach and act automatically, as they do for other structural emergencies.

“PV systems are becoming more prevalent in our communities, and firefighters need to understand how to safely work around them,” says Derek Alkonis of the Los Angeles County Fire Department.

Precisely. Homeowners across the U.S. are increasingly adopting solar, so more firefighters are coming into contact with solar installations every day. “The primary message here is clear,” says Laure-Jeanne Davignon, director of workforce development for the Interstate Renewable Energy Council (IREC), who is working in partnership with the International Association of Fire Fighters (IAFF) to develop and offer training. “Nobody wants first responders to wait for an emergency to learn the answers to important questions about solar technologies.”

Professionals involved in the solar industry are in a unique position to help. “Pass the word along,” says Davignon. “Be sure first responders in your area know they can take an online PV safety course specifically for firefighters, and it’s free, so municipal and volunteer fire companies of all sizes and budgets have the opportunity to learn how to more confidently, safely and effectively operate around solar-equipped structures.”

This training isn’t a commercial venture, she explains. It was designed by experts from the solar industry and the fire service, taught by active career firefighters, supported by the IAFF and the National Association of State Fire Marshals, and funded by the U.S. Department of Energy’s (DOE) SunShot Initiative. Most importantly, video-simulated environments allow first responders to practice the skills they’ve learned before they pull up to a PV-powered structure.

Other professionals are increasingly affected by the U.S. solar boom, as well. Within the construction industry alone are builders and developers, electricians and plumbers, and roofers...
and architects (and the local code officials who inspect all of their work). And the list is growing to include a host of seemingly unrelated industries, such as realtors, appraisers, financial loan officers, and commercial and residential building maintenance managers.

Typically, what they need to understand goes beyond the basic benefits of solar technologies, including the value solar brings to a property, residents and a community. Knowledge of on-site shared solar options and the often-complex rate design and interconnection policies that differ by state and utility may be important to their work, in addition to complementary technologies, such as energy storage.

While some professional associations are beginning to tackle this knowledge need by integrating solar into their professional education, help is often a product of nationally funded education and training initiatives for so-called “allied” solar professions. The DOE’s Solar Training and Education for Professionals (STEP) project, for example, provides help.

Real estate offers a good illustration. Research on single-family residences shows that customer-owned PV systems provide similar benefits to home sales as other upgrades - think new kitchen. Yet, most real estate education classes still don’t even touch on solar energy.

According to the Lawrence Berkeley National Laboratory, solar-powered homes result in a higher sales price, reflective of the value of the solar array, and they spend less time up for sale on the market. Real estate agents and appraisers need to understand how to accurately value solar in the marketplace so they can leverage it in marketing for resale or for refinancing.

Through the STEP project, solar education is reaching an increasing number of allied professionals through industry-specific educational forums and Web-based continuing education courses, and the conversation is beginning to trend in industry blogs and through other social media channels.

Similar inroads are being made with code officials, architects, engineers and other building design professionals so that they’re better equipped to facilitate effective solar-ready buildings.

Furthermore, managers of multi-tenant residential and commercial buildings, building maintenance managers and, frequently, homeowners association managers are also faced with decisions about investing in solar.
“Raising awareness among multifamily residential housing stakeholders about the opportunity and value of solar is critical to expanding consumer access to solar energy, particularly to removing barriers for this underserved market,” says IREC Regulatory Director Sara Baldwin Auck.

Organizations like the Center for Sustainable Energy, IREC and the California Solar Energy Industries Association are jumping in. They’re working to enable multifamily property owners and managers in California with information and assistance they need to make smarter solar decisions. Through a project supported by the DOE’s Energy Solar Market Pathways Initiative, the goal is to take advantage of California’s existing virtual net metering tariff, which allows for a multi-metered, multi-tenant property to install a single solar electric system that can be shared by multiple on-site tenants and common load utility accounts, resulting in direct, on-bill savings.

To help more multifamily solar projects come to life, the team is partnered with EnergySage on the development of an online multifamily portal to connect multifamily building owners and residents with interested solar contractors. And new online resources include these toolkits for apartment and condo owners and managers, as well as for contractors.

The National Apartment Association (NAA), recognizing increased interest from its members (more than 73,000 members, operating 9 million apartment units globally), is very visibly supporting solar as part of an industry trend toward sustainability.

“Our members are moving forward with growing interest in solar, especially with more access available through financing and contracting opportunities in the last few years,” says Holly Charlesworth, NAA manager of government affairs. “With growing use of solar in our members’ communities, it’s starting to make financial sense for these building owners, with the cost of on-site and community solar going down.”

Solar has been on the NAA radar for some time. Now
the organization is actively highlighting the success stories of its members and developing new resources to educate them, such as an upcoming guide that will identify various paths for apartment buildings to go solar. The NAA Education Institute helps the industry workforce keep up with the latest industry trends (including renewable energy and energy efficiency) through online and classroom training and credentialing.

The development of micro-credentials is one cutting-edge path IREC is leading that may soon play a key role in the training and validation of solar skills within other professions. A good example is the NAA Education Institute, which is working with IREC to develop an energy-efficiency micro-credential for apartment maintenance professionals.

“Today, we see emerging as a pressing priority quality third-party validation of specialty skills both for clean energy allied professionals whose jobs ‘touch’ solar in some way and for add-on skills for full-scope credentials that currently exist within the clean energy professions,” according to Anna Sullivan, associate director of IREC’s credentialing program.

No matter if it’s a single-family dwelling or a large shared multi-tenant project, at the core of any solar installation are the permits and approvals necessary to complete the array, flip the switch and start generating clean energy. As permitting authorities encounter higher volumes of solar permit applications, keeping the process moving efficiently is as important for them as it is for the solar industry.

“With so many jurisdictions involved, consistency and standardization are among the keys to driving down the installed cost of solar and other renewable energy,” says IREC’s Auck.

With no standardized permitting process in the country, and some 25,000 jurisdictions, the inspection and permitting process is a huge challenge to improve. Although PV systems can be as straightforward as many of the electrical systems code officials review or inspect, the technology is advancing at lightning speed, new electrical codes are pertinent, and best practices are constantly evolving. Keeping up is critical, as is improving the plan review process to help authorities having jurisdiction (AHJs) complete a solar plan review as effectively and efficiently as other plans. This is particularly important because many local inspectors wear multiple inspection hats.

“One of the things most valuable for a contractor is building confidence with an inspector so they feel you know and follow the applicable codes and standards,” says Don Hughes, a 20+ year code official with Santa Clara County, Calif., who was involved with the development of the first PV online training course (PVOT) designed for code officials just five years ago.

“PV online training is an excellent source for PV installers, as well as code officials and inspectors; they can all be participants in speeding up the permitting process while never compromising safety or the effectiveness of an installation,” adds Joe Sarubbi, who directed the development of the original PVOT and its most recent update for IREC and the International Association of Electrical Inspectors (IAEI). “It is now in code compliance with the 2008, 2011 and 2014 versions of the National Electrical Code and includes a new lesson covering the 2012 International Fire Code, with building and fire safety related to residential PV.”

New in-person code courses are also available to build on what code officials already know - with the IAEI, International Code Council and NABCEP all offering continuing education units. The goal is to introduce solar PV concepts in a way that demystifies the technology.

Once solar is installed and operational, the question of value comes back to a final group of professionals, appraisers, and the lenders and underwriters who review their appraisal reports.

“Solar brings new appraiser challenges to learn more about electricity, how it is priced, how much the solar PV costs, how much it produces, how long it lasts, and how to find solar data,” explains Adomatisc Appraisal Service's Sandy Adomatisc, SRA, who develops and teaches solar courses for appraisers, for the Appraisal Institute and, most recently, for a new course launching in September that includes emerging technologies such as energy storage.

One of the biggest challenges for appraisers is getting the complete information they need - and in a consistent way - so they can properly compare and evaluate properties with installed solar.

“MLS is the best database residential appraisers have, and rarely does the listing provide sufficient detail of solar to allow an appraiser to find sales that are comparable,” according to Adomatisc. To complicate the problem, often homeowners don’t have all of the details about a system, particularly if it is older or was installed before they owned the home.

As the challenges evolve, solutions are surfacing. For example, Berkeley Lab suggests public access to solar data could be through a central data repository, which would help resolve complications to the valuation of a property by identifying solar PV characteristics by address.

In the meantime, the Appraisal Institute just updated its AI Residential Green and Energy Efficient Addendum, which now has a page dedicated to solar PV. “If property owners and solar installers completed this solar page and made it available to the appraiser and lender at loan application, it would make a big difference in the accuracy of the appraised value,” says Adomatisc. ✪

Ruth Fein Revell is a freelance writer based in Saratoga Springs, N.Y., who also manages communications for the Interstate Renewable Energy Council, a national independent organization advancing fact-based clean energy regulatory policy and quality workforce development for 35 years.
As the solar photovoltaic (PV) industry in the U.S. continues to evolve, there are a growing number of local companies that install residential PV systems and a number of emerging online platforms that make it easier for customers to obtain installation quotes. However, in 2015, 10% of the highest-volume installers - in terms of number of systems installed - accounted for about 90% of installed residential systems. New research from the U.S. Department of Energy’s National Renewable Energy Laboratory (NREL) shows that homeowners can benefit by seeking quotes from a range of suppliers.

We find that high-volume installers tend to quote higher prices than others when delivering quotes to the same customer. Some customers may prefer working with high-volume PV installers and be willing to pay premium prices for a variety of reasons. Nonetheless, our research shows that all customers can benefit from obtaining more quotes before making a decision and that all customers could benefit from increased access to more offers.

Our research uses actual quote data from EnergySage, a PV quote provider in the U.S., to explore how an installer’s company size affects its pricing. The study analyzes the market position and pricing behavior of “high-volume” installers - any company that installed more than 1,000 residential PV systems from 2013 to 2015 - and “low-volume installers,” which refers to all other companies.

EnergySage’s online platform provides multiple PV quotes, helping prospective PV customers comparison shop for solar and determine their savings by adopting solar. The company provided NREL with more than 1,550 quotes for customer-owned systems made to 351 customers in 27 states and the District of Columbia from February 2014 to October 2016. In addition to the quotes from EnergySage-affiliated installers, the study also included quotes from other installers that EnergySage customers voluntarily submitted. The study limited the quotes to customer-owned systems in order to compare prices according to a single metric: dollars per watt ($/W).

The data included 176 high-volume installer quotes with an average quote price of about $3.99/W compared to 1,412 low-volume installer quotes at an average of about $3.62/W (see Figure 1).

The primary benefit of using quote data over installed system price data is the ability to compare the prices of different offers quoted to the same customer (Figure 2). Comparing prices quoted to the same customer allows self-consistent control for home characteristics that affect installation costs, such as roof pitch and construction materials. In the analyzed database, 142 customers received at least one quote from both a high- and low-volume installer.

We use a paired differences test to study price differences between high-volume and low-volume installer quotes made to these customers. For instance, if a high-volume installer quoted $3.90/W and a low-volume installer quoted $3.80/W to the same customer, the paired difference equals $0.10/W for that customer. The average paired difference in our study was $0.33/W. In other words, high-volume installers quoted $0.33/W higher, about 10% higher, than low-volume installers on average when quoting to the exact same customer. High-volume installers quoted higher than low-volume installers in about 70% of quote pairs we analyzed. The difference in high-volume installer quote prices is robust after controlling for system size, quote date, module efficiency, inverter type, and whether the quote was provided via EnergySage’s online platform or directly to the customer.

Our findings suggest that high-volume installers quote higher, on average, than low-volume installers. The price quote differences can be significant - a difference of $0.33/W translates to $1,650 for a typical 5 kW residential system. These results prompt two questions: Why would high-volume installers quote higher than low-volume installers, and why would customers accept higher prices? Using economic theory and insights from similar markets, our analysis discusses possible answers to these questions.

Figure 1: Quote Price ($/W) Distributions For High-Volume And Low-Volume Installers

![Figure 1: Quote Price ($/W) Distributions For High-Volume And Low-Volume Installers](image)

We find that high-volume installers tend to quote higher prices than others when delivering quotes to the same customer. Some customers may prefer working with high-volume PV installers and be willing to pay premium prices for a variety of reasons. Nonetheless, our research shows that all customers can benefit from obtaining more quotes before making a decision and that all customers could benefit from increased access to more offers.

Our research uses actual quote data from EnergySage, a PV quote provider in the U.S., to explore how an installer’s company size affects its pricing. The study analyzes the market position and pricing behavior of “high-volume” installers - any company that installed more than 1,000 residential PV systems from 2013 to 2015 - and “low-volume installers,” which refers to all other companies.

EnergySage's online platform provides multiple PV quotes, helping prospective PV customers comparison shop for solar and determine their savings by adopting solar. The company provided NREL with more than 1,550 quotes for customer-owned systems made to 351 customers in 27 states and the District of Columbia from February 2014 to October 2016. In addition to the quotes from EnergySage-affiliated installers, the study also included quotes from other installers that EnergySage customers voluntarily submitted. The study limited the quotes to customer-owned systems in order to compare prices according to a single metric: dollars per watt ($/W).

The data included 176 high-volume installer quotes with an average quote price of about $3.99/W compared to 1,412 low-volume installer quotes at an average of about $3.62/W (see Figure 1).

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Figure 1: Quote Price ($/W) Distributions For High-Volume And Low-Volume Installers

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Why would high-volume installers quote higher prices than low-volume installers?

One possibility is that competitive advantages allow for charging higher prices. Most customers only obtain a few quotes; thus, high-volume installers may face few rivals when providing a quote to a customer. By contrast, low-volume installers may perceive greater competitive pressures to undercut the prices of high-volume installers in their territory. Further, low-volume installers are generally less able to offer third-party ownership (TPO) products than high-volume installers. As a result, they are not as active in TPO markets, and high-volume installers face less competition when bidding to customers interested in TPO products.

Most prospective customers are first-time buyers and largely unfamiliar with PV installation. In markets for similarly novel and complex products, like consumer electronics, customers often use reference points such as brand names and advertising to select between product options. High-volume installers may be better positioned to use their scale, brand awareness and marketing to attract these first-time buyers and charge higher prices.

Additionally, higher quote prices by high-volume installers may reflect some diseconomies of scale in residential PV installation. In particular, they may incur higher customer acquisition costs than other low-volume installers. High-volume installers have invested in broad-ranging customer acquisition strategies such as mass marketing and door-to-door canvassing. These customer acquisition efforts have allowed some installers to scale in size but have also proven to be costlier than methods more commonly used by low-volume installers, such as customer referrals. As a result, customer acquisition costs in the U.S. solar industry have increased in recent years, especially among high-volume installers.

Why would customers accept higher prices from high-volume installers, if lower prices are available from other low-volume installers?

Some customers may prefer working with high-volume companies for a variety of reasons, such as the ability to honor contractual terms and warranties.

Furthermore, some customers may use an installer’s volume as a proxy for quality. That is, some customers may assume that high-quality installers attract more business, and as a result, an installer’s volume is an outcome of its quality. These perceptions could lead some customers to pay higher prices for high-volume services.

Our results indicate that customers benefit by shopping around, even if those customers prefer high-volume companies. However, collecting PV quotes can be a daunting process. To obtain multiple quotes, prospective customers must identify and contact installation companies, have conversations with these installers, host site visits, provide home information, and make other investments of time and effort.

Our research shows that policies and consumer products that facilitate the quote collection process can significantly benefit PV customers and potentially increase their likelihood of adoption. Third-party quote platforms can help customers collect more quotes from a variety of high- and low-volume installers and also allow those customers to more easily compare them. Furthermore, easier quote collection could increase inter-installer competition and reduce quote prices overall.

A corollary result of our study was that quote prices were significantly lower, on average, on EnergySage’s quote platform than when received directly from installers. Lower prices on the quote platform could reflect competitive pressures on installers that expect to compete with many other companies and may result in increased adoption of PV.

Prospective PV customers face a variety of choices during solar adoption, including the choice of an installation company. Our research suggests that installer choice matters. We find that high-volume installers tend to quote higher prices, on average, than low-volume installers. At the same time, high-volume installers may offer additional value propositions such as TPO products that may be more attractive. All customers can benefit from obtaining more solar quotes before buying.

Eric O'Shaughnessy is a market research analyst and Robert Margolis is a senior analyst at the National Renewable Energy Laboratory. This article is adapted from an NREL report co-authored by them, titled, “Using Residential Solar PV Quote Data to Analyze the Relationship between Installer Pricing and Firm Size.”
As the residential solar-plus-storage market matures, energy independence won’t be about grid defection but about benefits for both customers and utilities.

by K Kaufmann

The New York Times got it wrong.

In a recent story about how Green Mountain Power (GMP) is rolling out solar-plus-storage systems in Vermont, the paper suggested the effort is noteworthy because it lets customers power their homes “entirely disconnected from the grid.”

Which is true, kind of. The 5 kW Tesla Powerwall units the utility is making available to its customers allow them to operate off-grid for several hours in times of emergency or if needed to balance supply and demand on the grid.

However, the real game-changer in the GMP program is that it requires customers to agree to shared access - that is, letting the utility monitor and, at times, control the storage units, which are installed behind their meters. GMP can then aggregate power stored in the batteries and use it, for example, to lower its need to buy electricity during times of peak demand, which in turn provides savings that can benefit all of its customers.

The program is still in its early stages, says Kristin Carlson, GMP’s vice president of strategic and external affairs, but 900 customers have already called in to express interest.

“This is the energy future we see, where every [new customer] gets a meter, and they get a battery,” she says.

Shared access has long been a sensitive issue in the utility industry - another point the Times article missed. Customers have tended to balk at allowing utility control of any device in their homes - hence the difficulty some utilities have had in getting residential customers to sign up for summertime air conditioning cycling programs.

Making shared access the default option - as GMP has done, with apparently little customer pushback - signals a paradigm shift with potentially far-reaching impacts.

Grid defection is no longer the main narrative on residential solar-plus-storage. Rather, utilities, customers and technology developers are recognizing that the way to unlock the cost savings, energy reliability and resilience that solar-plus-storage can provide is through aggregation and collaboration. “Energy independence” is still an industry buzz term, but its meaning has shifted toward a focus on customer control and choice.

“People want to control their own destiny, whether 100 percent off grid or still connected but with more control,” says Bryan Christiansen, chief operating officer at Vivint Solar, a national installer now rolling out a residential storage offering in partnership with Mercedes-Benz. “[You can bring] more distributed energy resources into the marketplace and coordinate resources with utilities.”

“I think that is absolutely the smartest solution,” agrees Leia Guccione, a principal at the nonprofit Rocky Mountain Institute (RMI), which has published a number of reports on the role of storage as a tool for energy sector transformation.

“That creates the opportunity for customers and some third parties to be part of aggregated resources that will create a positive dynamic,” she says. “Solar, smart inverters, batteries [and] smarter appliances can be part of a virtual power plant. That is where the industry should be going; that will move the market fastest and help us reform the grid for everyone’s benefit.”

This holistic view of the market also turns up in discussions on whether utilities or third parties should be the actual aggregators, owning and accessing behind-the-meter equipment and data. Guccione sees it as an open question, with arguments to be made for both sides.

“I don’t think, at this point in time, one is better than the
other,” she says. “Both are a change from what we have today. We think it is important to innovate around these ideas to get more information on what we should incentivize.”

Pacific Gas and Electric (PG&E) led the nation in new residential storage installations last year, according to the Smart Electric Power Alliance’s (SEPA) 2017 Utility Market Survey. The Northern California utility is now rolling out a pilot project - in partnership with Tesla Energy - to test the grid-support services that aggregated behind-the-meter storage can provide.

In this case, Tesla is being the third-party aggregator for the solar and storage systems it is installing on 30 homes in San Jose, says Alex Portilla, PG&E’s principal project manager for distributed energy management systems. But the utility is looking at other options, he says.

“There will be some cases where we have a more active role,” Portilla says. “We’re working out where it makes sense for us. Who is in the best position to create value or transactions in the wholesale market or use [storage] assets for distribution? Where do you need control, and who controls? Who is the conductor?”

**A fundamentally different conversation**

Creating value - and multiple revenue streams - is what the developing solar-plus-storage market is all about, across the residential, commercial and utility-scale segments.

Simply put, the pairing of solar and storage offers a range of cost-saving and grid-support benefits for customers, utilities and the grid. Consequently, for all their wariness and resistance to solar, utilities appear to be on a much faster learning and acceptance curve with storage, according to Matt Roberts, vice president of the Energy Storage Association.

“The conversation we’re having on energy storage is fundamentally different [from solar],” says Roberts. “This is a new era of the grid. Storage is a lot more similar to what the utility has always done. It helps you move energy across time. There are so many possibilities to extract the full value; it’s going to take customers and utilities working together to make it successful.”

The residential sector has, thus far, been the smallest and slowest part of the storage market, but some industry watchers see a number of factors that could accelerate growth.

SEPA’s 2017 Utility Market Survey found that 33 utilities put a total of 557 residential storage units on the grid last year, bringing the national total to 1,762 residential interconnections.

“When we looked at the raw data from the energy storage survey, it reminded us of our first solar market survey in 2007, when only a handful of utilities had any deployment to report,” says Nick Esch, the SEPA researcher who led the survey. “More than 40 percent of the 97 utilities who responded to this year’s survey didn’t have any energy storage online at the end of 2016.”

Even PG&E, the industry leader in SEPA’s findings on the residential sector, is seeing only a trickle. The utility interconnects about 5,000 rooftop solar systems per month, Portilla says, but this past June, it had only 25 storage interconnections, and several of those were part of the San Jose pilot project.

What will change that trickle to a steadier stream is, of course, economics coupled with consumer demand. The growing electric vehicle market is expected to provide the economies of scale that will keep battery prices spiraling down.

Guccione notes that both storage and solar prices are falling faster than RMI projected in a 2014 study that estimated going off grid with solar-plus-storage would be economically feasible in a growing number of states in 10 to 30 years.

Rate increases or restructuring will also likely be a factor as residential rates go up or time-of-use rates or demand charges are rolled out, as some utilities are now proposing.

“We can say with pretty high confidence, if anything, the full [grid] deflection and partial deflection scenarios are going to be economically viable sooner than forecast,” Guccione says.

But, just because going off grid is economically feasible, it doesn’t mean utilities will face massive grid defections, she says. Echoing Vivint’s Christiansen, Olaf Lohr, director of business development for sonnen Inc., says that customers understand energy or utility “independence” as a measure of choice or control.

Sonnen, a Germany-based storage company focused wholly on the residential market, has also partnered with GMP, providing the storage units paired with rooftop solar at a low-income mobile home park in Waltham, Vt.

“You are trying to keep as much energy in the microcosm of your home, drawing as little from the grid, exporting as little to the grid,” he says, noting that sonnen’s customers can hit levels up to 70% or even 90% of their energy use. Customer demand is building, Christiansen says. Vivint made its decision to move ahead with storage based on market research showing that 52% of current residential solar customers are interested in battery storage, he says. Similarly, 51% of those looking to go
Solar within the next five years said they would be interested in including storage in any new installation.

Such figures are drawing utility interest, as well. SEPA’s utility storage market survey found that while only 9% of responding utilities currently offer a residential storage program, 72% are researching, planning or considering one.

“Storage may not yet be a mainstream utility resource, as solar is rapidly becoming, but clearly, many in the industry can see the point on the horizon where that starts happening,” says Tanuj Deora, SEPA’s executive vice president and chief content officer. “They understand storage will be deeply disruptive and transformative in the value it brings to the grid - even more so than solar - and they need to start preparing for those changes now.”

Visibility, cybersecurity and ease of use

The caveats in all of this are the technical and strategic issues that still need to be addressed, says Beth Chacon, utility Xcel Energy’s director of grid storage and emerging technologies.

“The market is new, and I think everyone is trying to figure it out,” she says. “What is it you want to accomplish with your batteries? We do need visibility; we do need cybersecurity; we have to work through all these things.”

Xcel is moving forward with a pilot program in Colorado that, like PG&E’s, will test the grid-support capabilities of storage, Chacon says. However, in this case, the storage will be installed both behind the meter and on distribution feeders. As at GMP, customer interest is high, she says.

But whether interest translates into technology adoption, program participation and, ultimately, market growth may depend on ease of use. Many of the solar-plus-storage systems now being launched have “set it and forget it” energy management systems that provide both the shared access utilities need for aggregation and the control and emergency backup power important to customers.

“We’re finding our customers don’t want to be told to do laundry at 2 a.m.,” says GMP’s Carlson. “They don’t want to be inconvenienced. What’s critical is to use these innovations to make people’s lives easier and make the pricing such that it makes sense for people.”

GMP’s storage program is set up so that customers pay $15 per month for the Powerwall units in their homes, she says. Guccione agrees financing must be simple, but she argues, value may also be a key factor in customer acceptance.

“Keep in mind, smartphones are a lot more complicated than landline phones because they have so much value,” she says. “Customers had very few barriers to learning how to use them. We need to take that kind of dynamic into consideration. If we provide enough value, complexity is not that big a barrier for customers.”

sonnen is going to put that concept to the test later this year when it brings its sonnenCommunity program to the U.S., Lohr says. Basically, the system is a community-level platform that allows residential customers with solar and storage to buy and sell power among themselves. In Germany, thousands have signed up to participate.

The U.S. version will be connected to the grid, he says, so it can also offer grid-support services, and participants will get credits on their bills for excess energy they make available to others on the platform, he says.

While Lohr would not divulge the location or other details on the rollout, he did say sonnen has partners and is investing its own resources to get the program off the ground in the U.S.

He believes getting residential storage into the energy mainstream will not be linked to absolute penetration levels, but to specific applications reaching a critical mass in different areas, based on the value and benefits they deliver. Rather like what’s happening at GMP.

“We are on the edge of this innovation and this technology that is happening in storage,” Carlson says. “There will be innovation that comes out next year; there will be something we can’t imagine. We want to be nimble enough for our customers to take advantage.”

Of course, the growth of residential solar-plus-storage with shared access is part of the much larger changes going on in the energy industry as more distributed energy resources, on both sides of the meter, come onto the grid. Keeping pace with technological change - and the unpredictability it brings - will require a commitment to cross-industry collaboration and finding solutions that optimize benefits for customers, technology providers, utilities and the grid.

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Another Pro-Solar Bill Dies In Maine

For the second consecutive time, Maine state lawmakers narrowly failed to override the governor’s veto of compromise legislation meant to help boost rooftop solar.

The first time was back in April 2016, when Gov. Paul LePage, R-Maine, vetoed a popular bill to replace Maine’s solar net energy metering (NEM) policy with a novel market-based program. The bill was the result of a comprehensive stakeholder process among solar companies, utilities, environmental groups and lawmakers, but legislators sustained LePage’s veto after falling just three votes short of the necessary two-thirds majority.

As a result, the Maine Public Utilities Commission (PUC) was tasked with addressing the future of NEM, a policy under which utilities compensate solar customers for their excess energy with credits. This past January, the PUC issued a ruling to gradually phase out NEM for rooftop solar customers, and although the commission included an important grandfather clause, many solar advocates joined NEM critics in speaking out against the ruling.

Dissatisfied with the PUC decision, state lawmakers went back to the drawing board earlier this year and devised a new bill: L.D.1504, or “An Act to Modernize Rates for Small-Scale Distributed Generation.”

However, LePage also struck down the new bill in July, and the House recently sustained the governor’s veto in August. Given his previous veto last year and public criticism of NEM, LePage’s decision came as no surprise.

In his veto letter for L.D.1504, the governor wrote, “This bill is poor policy, and as I have noted many times, net energy billing subsidizes the cost of solar panels at the expense of the elderly and poor, who can least afford it.”

What was surprising, though, was the state legislature’s repeated failure to override LePage’s veto this time around. That’s because L.D.1504 had overwhelmingly passed both chambers in June with the two-thirds majority support that would be needed to nullify a veto.

Although the state Senate ultimately voted 28-6 to override the veto in August, the bill died after the House only voted 88-48 - which, like last year’s failure, was again three votes shy of the required two-thirds rule. Over a dozen House members didn’t show up to vote, and seven Republican representatives pulled their initial support for the bill and voted against a veto override.

L.D.1504 originally aimed to fully reverse the PUC’s ruling, but the final version included compromise amendments that still would have reduced NEM rates and weakened a few solar-friendly provisions. Nonetheless, the bipartisan bill contained several key measures championed by solar advocates.

For example, L.D.1504 would have officially solidified NEM in state law and repealed new PUC-established fees for solar customers. It also would have lifted a barrier to community solar adoption in Maine, increasing a state cap on how many participants can share in a single community solar project tenfold from 10 electric meters to 100 meters.

Perhaps most notably, L.D.1504 would have ordered the PUC to conduct a cost-benefit analysis of net-metered solar,
Policy Watch

The solar bill was a significant compromise, crafted almost exclusively by Republican lawmakers and falling far short of the comprehensive solar bill considered in 2016, but the outcome was the same: The governor’s baseless ideology, aided by false claims from utilities, prevented Maine from moving forward with clean solar energy,” says Dylan Voorhees, climate and clean energy director for the Natural Resources Council of Maine (NRCM), a big proponent of L.D.1504. “This failure leaves Maine with an arbitrary 10-person limit on community solar farms and allows the backward, extreme PUC rule on net metering to take effect.”

With the bill now dead, the PUC’s NEM phase-out plan is slated to kick in at the start of 2018.

Meanwhile, a coalition including NRCM, the Conservation Law Foundation (CLF), the Industrial Energy Consumers’ Group, and New England solar installer ReVision Energy has vowed to move ahead with a lawsuit challenging the PUC ruling. NRCM says the case, launched in the Maine Supreme Court in May, “should be decided by the end of the year.”

CLF attorney Emily Green charges that the state legislature’s failure to override LePage’s L.D.1504 veto will have “a direct impact on the wallets of businesses and families across our state.”

“Despite the bill’s overwhelming passage in June and widespread public support, clean energy in Maine has once again fallen victim to Governor LePage’s and utilities’ anti-progress stance,” Green claims. “Regardless of this regressive decision by the legislature, CLF will continue fighting to ensure that solar power has a bright future in Maine.”

- Joseph Bebon

Con Edison Wins Approval For Low-Income Solar Program

The New York State Public Service Commission (PSC) has approved utility Con Edison’s proposed pilot program to build solar arrays on company-owned rooftops and properties to make renewable energy available to low-income customers.

Con Edison says it expects to begin installing the first solar panels in 2018 on properties in Brooklyn, Queens and Westchester County. In this initial phase, the utility plans to install enough panels to generate 3 MW of power to serve 800 to 1,600 of its customers. Con Edison says there will be no cost to low-income participants, each of whom could realize savings of at least $60 per year.

The utility notes several factors have made it difficult for low-income customers to access solar energy: Many of them rent their homes or live in multi-family buildings where they do not have control of their roofs, and the upfront costs of installing solar and ability to borrow money can also be barriers.

“We thank the state Public Service Commission for its careful review and approval of the first phase of our Shared Solar Pilot Program, which will make renewable energy available to a group of customers who have been largely shut out of the solar market,” says Matthew Ketschke, Con Edison’s vice president of distributed resource integration. “More customers having access to renewable energy will mean a cleaner environment here in New York City and Westchester County.”

“This pilot program will not only show how community distributed generation, or CDG, can benefit a low-income neighborhood; it will also contribute to Governor Andrew M. Cuomo’s visionary [50% by 2030] clean energy standard adopted by the commission last year,” comments PSC Chair John B. Rhodes. “By serving low-income residents with clean energy, Con Edison is filling a niche that hasn’t been fully served in the state. Furthermore, we believe this project, and the insight gained from this pilot, will lead to market development of other shared solar arrays around the state that will bring the benefits of clean energy to more low-income customers.”

According to Con Edison, developers will bid competitively for contracts to install arrays on utility-owned properties. The utility also plans to begin forming partnerships with community organizations that can help get the word out to customers who may be able to benefit from the program.

Although the pilot project will initially total 3 MW, Con Edison also proposed in its 2016 filing an expansion to 11 MW that could serve a total of 6,000 low-income customers if the pilot is deemed successful. The utility estimates the cost of the first phase of the program to be about $10 million.

N.C. Governor Backs Solar, Fights Wind Moratorium

Citing the importance of the legislation for the solar industry, Gov. Roy Cooper, D-N.C., has signed into law H.B.589, a comprehensive energy bill that is expected to help boost North Carolina’s solar sector but also establishes a moratorium on new wind farm permits in the state through 2018.

The legislation is the result of a long stakeholder process among legislators, renewable energy developers, utilities and many other parties, but the controversial wind development measure was added in the eleventh hour. Making it clear that he opposes the wind side of the bill, though, Cooper has also signed an executive order aimed at mitigating the effects of the moratorium.

“A strong renewable energy industry is good for our environment and our economy,” the governor states in a press release. “This bill is critical for the future of significant increases in our already-booming solar industry. I strongly oppose the ugly, last-minute, politically motivated wind moratorium.
However, this fragile and hard-fought solar deal will be lost if I veto this legislation and that veto is sustained.”

Led by state Reps. John Szoka, R-Cumberland, and Dean Arp, R-Union, House lawmakers crafted the comprehensive approach to overhauling and modernizing North Carolina’s energy policies. According to a press release from the House speaker, H.B.589, otherwise known as the Competitive Energy Solutions plan, implements a competitive bidding process for solar developers to control costs and foster market-driven solutions for power customers in North Carolina. The legislation also establishes a rooftop solar leasing program in the state, which is expected to allow customers to work with private parties and take advantage of a competitive market to install renewable energy with competitive pricing. Among other actions, H.B.589 also creates a Green Source Rider Program, which will allow large utility customers, such as corporations, to offset their electricity usage with renewable energy.

In a statement, Abigail Ross Hopper, president and CEO of the Solar Energy Industries Association (SEIA), thanks Cooper for his “leadership in signing … a measure that will significantly enhance the solar market in North Carolina and continue the growth of solar jobs within the state.”

“The programs created by this legislation, namely the competitive solicitation process for new utility-scale solar and the addition of a rooftop solar leasing program, will help North Carolina retain its position as a top market for solar in the United States,” Hopper explains.

Randy Wheeless, spokesperson for North Carolina-based utility company Duke Energy, says, “We are pleased to see this important legislation signed into law - paving the way for a smarter energy future and benefiting all North Carolina customers. The solar aspects of this legislation will benefit residential, commercial and industrial customers alike - saving them money and allowing for more ways to secure renewable energy while also protecting the reliability of the energy grid. We look forward to offering new solar energy programs for our customers.”

Though satisfied with the legislation’s solar aspects, SEIA’s Hopper states, “Unfortunately, the last-minute inclusion of an 18-month wind moratorium was both unnecessary and disappointing, and we hope the governor’s executive order can help mitigate that portion of the bill. We stand by our colleagues in the wind industry and hope that legislators will see the positive economic development that both solar and wind offer to rural North Carolina.”

U.S. Senators Introduce Community Solar Bill

U.S. Sens. Michael Bennet, D-Colo., and Martin Heinrich, D-N.M., have introduced the Community Solar Consumer Choice Act of 2017. The Senate bill, S.1670, would make permanent an existing U.S. Department of Energy program that promotes community solar by providing technical assistance at the request of state and local governments and includes specific provisions focused on boosting community solar in low-income communities. The bill would also encourage federal government participation in community solar nationwide.

The senators introduced the bill in coordination with the first annual Community Solar Summit, which was recently in Denver. Bennet also wrote an op-ed emphasizing his support for this clean energy development, highlighting community solar’s origins in Colorado and underscoring its importance for the country.

“Community solar is one of the most promising developments in renewable energy,” Bennet wrote in the op-ed. “It expands access to clean energy resources and helps households and businesses save on their electricity bills. Colorado is leading the way in this new model, but we have only begun to realize its promise.”

Several solar organizations and businesses have praised the introduction of the bill. For example, Jeff Cramer, executive director of the Coalition for Community Solar Access (CCSA), says, “CCSA - and its 36 industry members - welcome United States Senators Bennet and Heinrich’s leadership to encourage the expansion of consumer choice and access to solar for all through this legislation.”

“Community solar offers an opportunity for virtually any household or business to receive clean energy and utility bill savings from solar power,” adds Stan Greschner, vice president of nonprofit solar installer GRID Alternatives. “This bill specifically recognizes underserved communities that can most benefit from access to solar and the need to develop targeted solutions to ensure that households at lower income levels can participate.”

Paul Spencer, CEO of Clean Energy Collective, notes the national community solar developer has “grown to employ over 100 workers out of our Louisville, Colo., headquarters, with hundreds more engineers and skilled laborers constructing and operating our projects across the country. We see firsthand the benefits these local clean energy projects bring to communities, consumers and the electric grid, and it is our mission to make affordable community solar an option for everyone who wants it.”

Gov. Cooper
The Home Depot has announced the addition of solar installations at 50 stores across the U.S. as it continues to expand its alternative energy portfolio. The home improvement specialty retailer says the roll-out will total approximately 22 MW and essentially make mini solar farms out of the selected stores’ unused rooftops.

The solar installations are expected to reduce electricity grid demand by an estimated 30% to 35% annually at each Home Depot store - the equivalent of powering 2,300 average U.S. homes for a year, according to the company. The average store roof, at approximately 104,000 square feet, will accommodate 1,000 panels.

The Home Depot says it is working with Current, powered by GE, on solar installations at 20 stores in New Jersey, as well as at eight stores in Connecticut, Maryland and Washington, D.C. Those installations will total 11.9 MW.

“Home Depot is a great partner to demonstrate the value of on-site solar energy as a practical, affordable and important business strategy and drive further market adoption,” says Erik Schiemann, general manager of solar at Current. “We are now beginning to leverage digital technology to collect data that will help our customers become even more efficient.”

According to Current, its team will add metering technology as part of the solar installations at select Home Depot stores in each region. Digital tests will gather data about local grid interaction and on-site plant production, as well as detailed weather tracking sensor data. These insights will help The Home Depot optimize energy usage long term at similar locations, the company adds.

In addition, The Home Depot says it has teamed up with Tesla on 22 solar installations totaling 10 MW on stores in California and New York, six of which will also utilize Tesla Powerpacks to store energy and dispatch additional power as needed.

“Our alternative energy projects are important elements of our sustainability and operations efforts, as they reduce carbon emissions while also lowering our energy costs,” says David Hawkins, vice president of labor and operations for The Home Depot.

The company’s current alternative and renewable portfolio includes solar power purchase agreements in Delaware and Massachusetts; fuel cells at more than 170 stores and distribution centers; the Los Mirasoles Wind Farm northeast of McAllen, Texas, announced this January; and the Zopiloapan Wind Farm in central Mexico, added this June.

The Home Depot says these rooftop solar projects will bring the company’s alternative energy footprint to more than 130 MW as it pursues the goal of utilizing 135 MW of alternative and renewable energy by 2020. Construction on the selected stores will continue throughout 2017.

Kansas Utility Dedicates First Community Solar Project

Westar Energy and partners have cut the ribbon on the Kansas utility’s first community solar project. According to Westar, the 1.2 MW installation in South Hutchinson, Kan., includes nearly 4,000 panels and gives customers the choice to receive some of their electricity from solar without installing private generation.

“Working together, we can expand renewable energy in Kansas efficiently and affordably,” says Greg Greenwood, Westar Energy senior vice president of strategy. “Community solar introduces new choices for our customers and makes it possible for any customer to have some of their energy from the sun.”
Energy from the community solar plant is available by subscription to Westar customers, and about 20% of the solar energy from the facility is being used at Dold Foods in Wichita, where Hormel Natural Choice bacon products are prepared and packaged.

“SoCore is honored to have worked with Westar Energy to bring reliable and cost-efficient renewable energy to the local community and to meet the needs of a great business like Hormel,” says Russell Young, senior vice president of operations of Chicago-based SoCore Energy, which developed and will own and operate the solar facility. “Solar is now a clear part of the Hutchinson economy, generating locally produced power which provides affordable energy choices to meet the needs of residents and businesses alike.”

“Supporting renewable energy helps us achieve our company’s goal to reduce non-renewable energy use by 10 percent by 2020 and is also important to the Hormel Natural Choice bacon brand,” says Joe Peine, plant manager of Dold Foods. “We are proud to support the generation of clean, renewable energy through community solar. Community solar is beneficial to the air quality of our communities, helps to create jobs and provides for the local economy.”

University Of Notre Dame Powers Facility With Solar

Inovateus Solar has completed a 144.72 kW solar photovoltaic installation for the University of Notre Dame in Indiana. The ground-mounted system is located at the Kenmore Warehouse storage facility and is the largest solar array built by the university to date.

According to Inovateus Solar, the project is connected to the main electric power feed for the building and will generate approximately 194,000 kWh of electricity annually, offsetting nearly one-third of the total electricity used by the facility. A net-metering agreement signed between the storied university and Indiana Michigan Power calls for any power generated in excess of the building’s immediate demand to be fed into the local grid for use by the utility and credited to Notre Dame.

“The Kenmore project has brought Inovateus’ mission of building a brilliant tomorrow into our own community and has deepened our already-strong ties to Notre Dame,” says TJ Kanczuzewski, president and CEO of Inovateus Solar. “Both as intensive energy consumers and sustainability leaders, colleges and universities like Notre Dame represent a compelling economic and sustainability use case for large-scale solar and renewable energy deployment.”

“We would like to thank Inovateus for their efforts on the Kenmore Warehouse installation, which adds another important component to the university’s sustainability commitment,” says John Affleck-Graves, Notre Dame’s executive vice president. “Along with solar power applications, we are implementing a number of strategies to reduce our carbon footprint to be good stewards of our environment.”

Florida Co-ops ‘Harness The Power Of The Sun’

Seminole Electric Cooperative Inc., a Tampa, Fla.-based generation and transmission cooperative, has announced that its 2.2 MW Cooperative Solar project is operational. The project is located in Hardee County, Fla., south of the Polk County line near Seminole’s Midulla Generating Station.

The project features more than 8,000 single-axis tracking solar PV panels, which rotate to follow the movement of the sun throughout the day. The electricity generated from Cooperative Solar will be shared by each of Seminole’s nine distribution electric cooperatives.

“I believe solar energy has a role in the future of our industry and the future of Seminole,” says Lisa Johnson, Seminole’s CEO and general manager. “With Cooperative Solar, Seminole is proud to provide our nine member electric cooperatives with the opportunity to harness the power of the sun.”

Seminole adds that the valuable information learned from operating this first solar facility will benefit the co-op and its members as Seminole continues to evaluate adding new resources to its energy mix.
Solar Industry Stands United Against Trade Case

Last month, hundreds of solar workers descended upon Washington, D.C., for a hearing at the U.S. International Trade Commission (ITC) as a show of force against Suniva and SolarWorld’s Section 201 petition. Since the petition was submitted in April, we at the Solar Energy Industries Association (SEIA) have heard nearly universal opposition from solar companies large and small and across all sectors of the U.S. supply chain.

If the remedies sought by Suniva are implemented, it would double panel prices, halt many gigawatts of U.S. solar installations and cost 88,000 Americans their jobs. The workers who showed up from Massachusetts and Minnesota and North Carolina and California and Pennsylvania and New Jersey, among others, did so because they recognize that well-paying American jobs are at stake - theirs.

We demonstrated at the August 15 injury hearing that the bankrupt companies’ failures were the result of their own poor management decisions. And now the ITC is due to decide Sept. 22 whether solar equipment from other countries is a “substantial cause” of serious injury to these companies. It is not.

The broader industry is unified in opposition, and if the case moves forward to a remedy stage, we all must be ready to make a strong argument that these two companies and their hedge fund investors should not be paid to cover their bad bets. While the ITC will have an additional two months to recommend a remedy if injury is determined, the decision ultimately would lie with the president. As an industry, we have engaged with leaders in the Trump administration, and we will continue to make them aware of the terrible effects of this petition if the case moves forward.

One red herring the other side has come up with is that they represent American manufacturing. But this case would hit domestic manufacturers particularly hard. There are more than 600 solar manufacturing facilities across the U.S., making modules, cells, inverters, and racking and mounting systems, and they are often exporting these products around the world. America’s solar industry supports 38,000 manufacturing jobs, and the proposed trade barriers will undercut demand across the board, including in our manufacturing sector.

While SEIA is putting great emphasis on this trade case and the thousands of jobs at risk, we are not halting the work we do in other critical areas. State policy, grid modernization, codes and standards and removing barriers to solar adoption are all major areas of focus concurrent with the trade fight. But it is true that the trade case is the biggest threat to our industry.

In the past five years, the cost of solar has dropped by 63%, installed capacity has more than doubled and employment has skyrocketed past many traditional fuel sources. Free and fair trade supports this dramatic growth in America. Continuing to foster smart policy will triple U.S. solar capacity by 2022 and bring total employment in solar to more than 300,000 workers.

If we lose the case, on the other hand, solar will be priced out against fossil fuels and other renewables, and the jobs will start to dwindle, as production of new solar plants falls off the table.

Abigail Ross Hopper is president and CEO of the Solar Energy Industries Association.
2017 MARKS THE TEN YEAR ANNIVERSARY OF THE ISLE OF EIGG ELECTRIFICATION PROJECT

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