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**On the cover:** Customers, prospective customers and some CEC workers pose in front of the 500 kW Boulder Cowdery Meadows Solar Array, located in Boulder, Colo. Photo courtesy of Clean Energy Collective
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The Next Big Thing

W e’ve all heard it before: “The problem with solar and wind power is that the sun doesn’t always shine and the wind doesn’t always blow.” Enter energy storage, the answer to that often-cited variability problem. Basically, as its name suggests, an energy storage device uses batteries or other technology to store excess power generated by solar or wind when the resources are plenty and holds onto that extra energy for use when they are not. After all, why waste a good thing, right?

In solar’s case, homeowners or businesses can install small storage devices on-site and then use excess solar energy from their arrays at night, thus relying less on their utilities, saving money on electricity bills and realizing even more benefits from their solar investments. The stored energy can also be used as backup power during a grid outage (think of a home generator, but without the fossil fuel). Utilities, on the other hand, can use large storage units - some as big as buildings! - to integrate renewables. By holding onto solar energy, power companies can also deploy that clean energy during peak-demand times and rely less on ramping up coal and natural gas plants, creating a greener grid. (There are other applications and upsides for consumers and utilities alike, but you get the idea.)

During the recent Solar Power International conference, it became clear that nearly everyone, from SEIA leader Tom Kimbis to local solar installers, considered energy storage one of the show’s hottest topics and believed storage could become the next big thing for the solar industry. However, many of those same believers also stated that the energy storage market has some major hurdles to overcome. In order for storage to really take off, they said, the public needs to get more educated about the potential benefits, utilities need to embrace it, lawmakers need to adopt friendly policies, the technology needs to keep advancing, and most importantly, the price needs to decrease.

Do those barriers sound familiar? They should, given that people said those very same things about solar no more than a few years ago. Of course, some still have those concerns about solar, but the industry has obviously come a long way and matured. Each of those challenges is a rung on a ladder that the solar sector had to climb in order to become as successful as it is today, and although the nascent storage market is behind us, it is climbing, too, one rung at a time.

In fact, a recent analysis from IHS Markit suggests the global energy storage market’s inevitable growth will resemble the solar industry’s recent surge, and a separate report shows that, in the U.S. alone, energy storage is slated for another historic year.

It’s no wonder that storage is emerging around the world, as consumers, companies and utilities are looking for ways to take full advantage of renewables. Politicians and lawmakers are also taking notice. For example, the White House hosted a summit earlier this year, during which the Obama administration revealed a slew of public- and private-sector commitments expected to result in about $1 billion in new energy storage investments and at least 1.3 GW more of storage deployment or procurement.

The technology continues to garner support on the state and city level, as well. California, which already established a hefty storage target for the state’s investor-owned utilities a few years back, just passed several new pro-storage laws. Furthermore, Massachusetts recently approved a law that will likely lead to its own energy storage mandate, and a new report found that storage has the potential to yield millions of dollars in savings in the state. In the Big Apple, New York City Mayor Bill de Blasio recently announced the city’s first-ever energy storage deployment target, 100 MWh by 2020, in concert with an expanded solar capacity goal, 1 GW by 2030.

As mentioned, the private sector is also diving into storage. There has been a long list of partnerships and acquisitions lately, including the $1 billion buy of battery developer Saft by France-based oil giant Total, majority stakeholder in SunPower. Storage tech providers, such as sonnen and Tesla, continue to gain more ground in the solar market, and many companies now offer solar-storage financing. Right before writing this editorial, actually, I posted a news item announcing that a utility-scale developer with “solar” in its name is launching an energy storage division.

In conclusion, interest in energy storage is growing, the technology keeps getting cheaper, and the storage market is slated to be a giant opportunity for solar and renewables, overall. It is only a matter of time. ☀
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32,000 Nevada Solar Customers Can Breathe A Sigh Of Relief

The Public Utilities Commission of Nevada (PUCN) has unanimously approved a measure to grandfather in pre-existing solar customers under the state’s previous, more beneficial net energy metering (NEM) rules. The decision is a welcome win for the solar industry, which has been fighting Nevada’s notorious NEM revisions ever since the PUCN ruled to cut buyback rates and increase fees at the end of last year.

The grandfathering measure was an agreement reached between PUCN staff, utility NV Energy, SolarCity and the Bureau of Consumer Protection. Although solar companies and groups - and later, NV Energy - had been calling for a grandfather clause, the PUCN denied such requests up until this latest deal.

According to the Las Vegas Sun, the new compromise also came during the same week that a Nevada district court judge ruled on an appeal that Vote Solar and Earthjustice launched against the PUCN. The nonprofits didn’t win every aspect of their legal challenge, but the judge did rule that the PUCN used “unlawful procedure” when applying the revised NEM rules to pre-existing solar customers.

Following the court’s decision, the PUCN issued a statement saying it was “pleased” the court affirmed the commission’s NEM order on “all substantive issues,” adding the court found that the PUCN “acted lawfully and that the decision to protect non-NEM customers from unreasonable cost shifts was based on substantial evidence.”

However, the PUCN added that the court didn’t affirm the commission’s decision to apply the NEM changes to pre-existing customers, “for whom the court found that the commission did not provide sufficient notice.”

Despite the similar timing, the court ruling was separate from the PUCN’s agreement with NV Energy, SolarCity and the Bureau of Consumer Protection, as the commission noted in its statement that it was “incidentally” already poised to vote on the stipulation.

Under the now-approved stipulation, customers who either installed solar or applied for interconnection before Dec. 31, 2015, will be grandfathered in under the previous NEM rules for a period of 20 years. In other words, effective this December, those solar customers can once again profit from the NEM program they initially signed up for.

**One battle, not the whole war**

The measure is expected to benefit about 32,000 pre-existing solar customers; however, it does not affect future solar adopters, who will still receive rates under the newer NEM program.

In a statement, Jon Wellinghoff, former consumer advocate for the state of Nevada and current SolarCity chief policy officer, said, “On behalf of Nevada’s 32,000 rooftop solar customers, we thank the Public Utilities Commission for unanimously approving our agreement to grandfather existing solar customers.”

According to an Associated Press report, NV Energy President Paul Caudill said, “The Public Utilities Commission of Nevada’s decision today is fair for this set of existing net-metering customers and, at the same time, reinforces the clear path forward they established in February 2016 for those considering rooftop solar in the future.”

With the grandfathering issue behind them, though, solar advocates remain determined to revive rooftop solar in Nevada, whose market was hard hit by last year’s NEM changes. Some solar installers ceased their Nevada operations, and many projects were either canceled or halted.

Erin McCann, campaign manager of advocacy group Bring Back Solar, said in a statement, “This is a tremendous victory, not only for the solar customers whose investments will be protected, but also for the tens of thousands of Nevada solar supporters who have advocated tirelessly for solar since last year’s rate hike.” She continued, “Now, it is vital to restore all Nevadans’ ability to go solar affordably in the future.”

In a post, Jessica Scott, interior west regional director for Vote Solar, said, “While this decision rights a serious wrong for current customers, we urge the legislature to adopt sound energy policies in the upcoming session that will bring solar jobs and solar savings back to Nevada.”

Andy Maggi, executive director of the Nevada Conservation League Education Fund, added, “We still have work to do.”

Nevada solar advocates have turned their attention to rallying behind pro-solar proposals in the 2017 legislative session. In late September, Nevada’s New Energy Industry Task Force passed a number of recommendations that would promote solar in the state.

Gov. Brian Sandoval, R-Nev., had reconvened the task force earlier this year amid the NEM rules and charged the group
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Major Companies Make 100% Renewables Pledge

Bank of America, Apple, Wells Fargo & Co., and General Motors (GM) are some of the latest big-name companies to join RE100, a global collaborative initiative of businesses committed to using 100% renewable electricity. Most of the new members officially announced their commitments during the recent Climate Week NYC event.

During the opening ceremony, Bank of America revealed it will aim to become carbon neutral and purchase 100% renewable electricity for its operations by 2020. Furthermore, the bank says it will work to reduce location-based greenhouse-gas emissions by 50%, energy use by 40% and water use by 45% in its operations across the globe by the end of this decade.

According to the company, these new commitments build on its $125 billion environmental business initiative. "Addressing global issues like climate change and the transition to a sustainable and low-carbon future takes collaboration, innovation and investment," said Anne Finucane, vice chairman of Bank of America. "The expansion of our operations goals to 2020, achieving carbon neutrality, and the pursuit of electrified vehicles and efficient manufacturing, is part of the company's overall approach to strengthening its business, improving communities and addressing climate change."

The company says it currently saves $5 million annually by using renewable energy - a number it anticipates will increase as more projects come online and the supply of renewable energy worldwide by 2020, and during Climate Week NYC, Apple announced that its plastics supplier Solvay SA and phone casing supplier Catcher Technology would both work to use 100% renewable energy by the end of 2018.

"Apple is committed to running on 100 percent renewable energy, and we’re happy to stand beside other companies that are working toward the same effort," said Lisa Jackson, Apple’s vice president for environment, policy and social initiatives, during the opening ceremony. "We’re excited to share the industry-leading work we’ve been doing to drive renewable energy into the manufacturing supply chain and look forward to partnering with RE100 to advocate for clean energy policies around the world."

Wells Fargo & Co. also joined RE100 during Climate Week NYC. Mary Wenzel, senior vice president and head of environmental affairs at Wells Fargo, said, “Learning from RE100 experts and other members is going to be critical as we work toward meeting our 2020 sustainability commitments, including our goal of powering 100 percent of our global operations with renewable electricity by 2017 and transitioning to long-term agreements that directly fund new renewable electricity projects by 2020.”

Prior to the Climate Week NYC event, GM also announced it was joining RE100, and the automaker plans to generate or source all electrical power for its 350 operations in 59 countries with 100% renewables by 2050. GM says its new RE100 pledge, along with the pursuit of electrified vehicles and efficient manufacturing, is part of the company's overall approach to strengthening its business, improving communities and addressing climate change.

The company says it currently saves $5 million annually by using renewable energy - a number it anticipates will increase as more projects come online and the supply of renewable energy...
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increases. According to GM, the company has 22 facilities with solar arrays, three sites using landfill gas and four facilities that will soon benefit from wind power. In addition, GM is in the process of adding 30 MW of solar arrays at two facilities in China.

Over 80 companies worldwide, including BMW, IKEA and Google, have joined RE100 so far, and the number of participants is expected to keep growing.

**U.S. Solar Sector Poised For ‘Unprecedented’ Growth Spurt**

Growing 43% year-over-year, the U.S. saw 2,051 MW of solar PV power installed in the second quarter of this year - marking the 11th consecutive quarter in which more than 1 GW of PV was installed, according to GTM Research and the Solar Energy Industries Association’s (SEIA) latest U.S. Solar Market Insight report.

The report says utility-scale solar installations accounted for 53% of all installed PV in the first half of this year. In addition, more solar capacity - 7.8 GW - is expected to come online in the second half of this year than has ever come online in a single year.

“We’re seeing the beginning of an unprecedented wave of growth that will occur throughout the remainder of 2016, specifically within the utility PV segment,” said Cory Honeyman, GTM Research’s associate director of U.S. solar research. “With more than 10 GW of utility PV currently under construction, the second half of this year and the first half of 2017 are on track to continue breaking records for solar capacity additions.”

According to the report, the residential market segment hit a major milestone earlier this year when it hit 1 million residential rooftop installations. The report notes that California’s solar market has experienced a bit of a slowdown, but other states’ markets, including Utah and Texas, have helped pick up the slack. In total, residential PV installations grew 1% over the first quarter of the year and 29% annually.

California exceeded expectations, however, in the non-residential market segment, where it represented an unprecedented 50% of the segment’s installations for the quarter. The non-residential market experienced some constraints in the second quarter of the year due to expiring incentives in the Northeast and growing net-metering debates nationwide, says the report, which adds that the U.S. non-residential market segment grew 5% over the first quarter and 50% year-over-year.

According to the report, the second half of 2016 will benefit from emerging project types and growing support of solar by states and utilities.

The report notes that by 2021, more than 30 states in the U.S. will have added more than 100 MW of annual capacity; in addition, 20 of those states are expected to be home to more than 1 GW of total operating solar PV.

Tom Kimbis, SEIA’s interim president, said, “Solar works in all 50 states, and this report proves that what many would consider non-traditional markets are now firmly a part of the clean energy movement.”

**Communities Designated ‘Open For Solar Business’**

The SolSmart program, which is funded by the U.S. Department of Energy’s SunShot Initiative, has recognized 22 city and county communities across the country with gold, silver and bronze designations for encouraging solar market growth.

These 22 communities are the first to receive SolSmart designations since the International City/County Management Association (ICMA) and The Solar Foundation launched the federally funded program in April. A SolSmart designation signals that a community is “open for solar business,” helping to attract solar industry investment and generate economic development and local jobs. SolSmart aims to designate 300 communities during the three-year program.

The 14 communities receiving SolSmart Gold designation include Austin, Texas; Boulder, Colo.; Columbia, Mo.; Fremont, Calif.; Fort Collins, Colo.; Gladstone, Mo.; Hartford, Conn.; Kansas City, Mo.; Milwaukee, Wis.; Minneapolis; San Carlos, Calif.; Santa Monica, Calif.; Santa Rosa, Calif.; and Satellite Beach, Fla.

The one community receiving SolSmart Silver designation is Boulder County, Colo.

The seven communities receiving SolSmart Bronze designation include Burlington, Vt.; Claremont, Calif.; Denver; Philadelphia; Redwood City, Calif.; Saint Paul, Minn.; and Somerville, Mass.

“The communities receiving SolSmart designation are now well positioned to attract new solar businesses and take advantage of the dramatic job growth we’ve seen in the industry,” said Andrea Luecke, president and executive director at The Solar Foundation. “We hope many more cities and counties will be encouraged to join SolSmart and help even more homes and businesses go solar.”

“The good work that local governments undertake day-to-day often happens under the radar,” added ICMA Executive Director Robert J. O’Neill Jr. “It is wonderful to see the Department of Energy recognize the accomplishments of these outstanding communities.”

To achieve designation, cities and counties take steps to reduce solar “soft costs,” which are non-hardware costs that can increase the time and money it takes to install a solar energy system. Examples of soft costs include planning and zoning; permitting; financing; customer acquisition; and installation labor.

Troy Schulte, city manager of Kansas City, said, “Expanding solar energy not only helps fight climate change, but also attracts more entrepreneurs to the city while creating new jobs. A SolSmart designation shows that our city is truly on the cutting edge of clean energy development nationwide.”

As part of the program, a team of national solar experts led by The Solar Foundation offers no-cost technical assistance to help participating cities and counties achieve designation.
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**Start-Up Announces Rooftop Solar Tracker**

Although tracking systems are prevalent in the ground-mount solar market, a California-based start-up has announced a new dual-axis solar tracker designed and built specifically for the commercial and industrial rooftop sector.

Edisun Microgrids Inc., a company created at technology incubator Idealab, has launched its new PV Booster tracker system. Edisun claims that by continuously facing solar modules toward the sun, the dual-axis system increases the energy production by 30% and yields 20% better economics versus conventional fixed-tilt installations.

Bill Gross, CEO of Edisun Microgrids and founder of Idealab, said PV Booster brings “the proven economic benefits of solar trackers from the ground to the rooftop, enhancing returns, as well as opening the market to a large and underserved customer base.”

According to the company, the system has a low wind profile, and its embedded intelligence automatically retracts modules at night and during periods of high wind. Furthermore, Edisun says the trackers are powered by a brushless, low-voltage motor that consumes less than 0.01% of the total installation energy generated and uses a battery backup unit to maintain operations when grid interruptions occur.

The company says PV Booster is now available to customers, including rooftop owners, project developers, installers, distributors and region-specific partners.

**UL Publishes Long-Awaited Inverter Standard**

Following months of anticipation, global safety science organization UL has published a new inverter standard update that is expected to significantly help with solar integration onto the grid - UL 1741 Supplement A (SA).

UL has also announced a new Advanced Inverter Testing and Certification Program, which the group says will utilize UL 1741 SA to test and certify inverters and other utility-interconnected distributed generation (DG) equipment for grid-support functions, enabling smarter, safer, reactive grid interconnection.

“Brownouts or blackouts have demonstrated the far-reaching impacts of utility grid instabilities,” said Jeff Smidt, vice president and general manager of UL’s energy and power technologies division. “We are pleased to now publish the latest updates via UL 1741 SAa for grid-support utility-interactive inverters to meet the current market need for a more stable utility grid.”

As UL explains, advanced inverter testing is smart, reactive control of DG for support of ongoing modernization of grids utilizing increasing levels of DG and renewable energy resources. UL says traditional utility interconnection requirements (IEEE 1547) require DG devices to disconnect when the grid is experiencing stability issues. The UL 1741 SA specifies the test methods needed to build the foundation enabling DG devices to stay online and adapt their output and overall behavior to stabilize the grid during abnormal operation, rather than simply disconnecting.

The State of California previously announced that inverters installed in the state will be required to comply with the Rule 21 grid-interconnection requirements within one year of publication of the UL 1741 SA. Other states are considering adopting similar installation requirements, especially in areas with high levels of DG and solar penetration.

In other news, UL has also acquired energy engineering services and advisory firm AWS Truepower - a move UL says will expand its global renewable energy portfolio by strengthening full lifecycle solutions for wind and solar energy sectors.

AWS Truepower is an Albany, N.Y.-based company providing renewable energy services through five business units covering project advisory, performance engineering, due diligence, information services and grid solutions. Its service portfolio complements UL’s current renewable energy offering focused on testing, inspection and certification, as well as performance verification of solar, wind and energy storage systems.

AWS Truepower’s employees will join UL and remain with the company. As of press time, AWS Truepower is expected to continue operating under its current brand name “for the time being.”
Companies Launch Solar+Storage Financing Programs

Two companies have separately announced new solar-plus-storage financing.

Tabuchi America has launched the GEOSmart SolPower Program, a 20-year loan program and lease option that the company says will provide $300 million in financing for residential solar-plus-storage installations.

To design and offer the program, Tabuchi joined forces with the Electric & Gas Industries Association (EGIA), a non-profit energy-efficiency and renewables advocate. EGIA delivers financing and discounted business and training solutions to contractors, manufacturers and distributors. Just as new financing and incentive programs are driving a booming residential solar market, the GEOSmart SolPower Program helps meet growing demand for home energy storage by providing new financing choices to homeowners, according to Tabuchi.

Under the GEOSmart SolPower Program, customers receive financing directly from EGIA’s GEOSmart Financing Clearinghouse to cover the installation of PV systems and Tabuchi smart inverters and batteries. EGIA provides financing at fixed annual percentage rates from 10 years at 1.99% and 20 years at 4.99%, as well as options for no down payment and no prepayment penalty. The loan covers materials, installation and development up to 100%, and loan term options are 10, 12, 15 and 20 years. Tabuchi says participants in the program own the system and all tax and solar incentives directly, without using their homes as collateral.

“The market is full of interest in solar-plus-storage, but high upfront costs and the complexity of seeking out separate solar and storage systems has been a roadblock for too long,” said Harumi McClure, chief operations officer and president of Tabuchi America. As of press time, the GEOSmart SolPower Program is available in 17 U.S. states.

Separately, Sharp Electronics Corp.’s energy systems and services group is now offering financing for commercial and industrial solar PV systems coupled with its SmartStorage energy storage solution.

The company says its new program is dedicated to $0 down financing for solar projects integrated with Sharp’s SmartStorage behind-the-meter energy storage system and is available to developers and integrators, as well as end users. During its initial phase, program funding of $25 million is expected to support the deployment of more than 12 MW of hybrid systems within the next 12 months.

“Financing is a critical piece to the advancement of the energy storage industry,” said Carl Mansfield, general manager and founder of the energy systems and services group.

According to Sharp, the SmartStorage system is designed to work synergistically with solar as part of an integrated hybrid energy solution.

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You probably didn’t get into the solar business because you love lead generation. However, all solar businesses, especially residential solar providers, need to operate and thrive on their lead sources. With the explosion of the Internet, online channels have become a clear starting point for solar installers to find the residential leads they need. It’s not easy, though. In fact, figuring out online lead generation can be confusing. And time consuming. And expensive. Pardon the pun, but residential solar providers have been sold every online marketing program under the sun. Media hucksters, ad agency pretenders and virtual carnival barkers have been happy to promise “all the quality residential leads you need” for your solar company. Meanwhile, what a lot of them really mean is, “We can help you achieve many useless things.”

Pard on the pun, but residential solar providers have been sold every online marketing program under the sun. Media hucksters, ad agency pretenders and virtual carnival barkers have been happy to promise “all the quality residential leads you need” for your solar company. Meanwhile, what a lot of them really mean is, “We can help you achieve many useless things.”

They will spend your money to generate “impressions,” “events,” “conversions” and all sorts of theoretical activity. But you don’t want activity - you want (all together now) leads! High-quality, productive leads that turn into profitable sales.

To understand how online lead generation works - and how it doesn’t - let’s explore five myths of online residential lead generation for solar companies.

**Myth #1: Paid search is easy to do**

Paid search (also known as pay-per-click) is a straightforward process. There’s no black magic here. You or the marketing agency you hire could waste thousands of dollars generating impressions, visitors and clicks - without getting the leads you need.

A big advertising agency, for example, may tell you that it will spend $5,000 of your money on paid search advertising in New England during the month of January, the coldest month of the year in that region. And the agency will find a way to do that - whether or not there really are $5,000 worth of effective search terms it can bid on.

That’s the good news. The bad news is that it’s easy to do poorly, expensively and ineffectively. You or the marketing agency you hire could waste thousands of dollars generating impressions, visitors and clicks - without getting the leads you need.

There are times of the year when it’s simply not wise to be
spending money on online advertising. In the aforementioned example, that money would be better spent in April or May, when New England homeowners are more likely to become leads and, ultimately, buyers of solar services.

Wisely spending your money requires an understanding of many factors, including which search terms to buy, which to avoid, the value of phone calls, the right level of qualification, over-incentivizing and more. Buying the term “solar,” for example, may seem like a good use of your budget - unless, of course, your ad shows up on a search for “solar system” or “solar flares,” in which case you’ve wasted your money.

Well-executed campaigns are very complicated. Hiring a company or an individual who has expertise in paid search - and the solar industry - is particularly important.

Myth #2: “My site is already optimized for ‘organic search’”

This one’s almost not a myth because, at its heart, it’s true: If you can do organic search well (a.k.a., search engine optimization, or SEO), there’s nothing more valuable. Plus, it’s free.

Nonetheless, doing this in a way that makes your site consistently stand out is very difficult. With organic search, your website’s ranking is never finished - it’s a living, breathing thing that needs constant care and feeding. Furthermore, everyone who builds a website these days is building it to be optimized for search engines, so any advantage is hard won and even harder to hold onto.

Unlike paid search, SEO is black magic. Even if you manage to get to the top of your particular category, the next time Google modifies its algorithm (something it does regularly), you can be cut off at the knees.

It gets worse. Within organic search, Google is actively choosing winners and losers, and with a bias toward larger players and bigger brands. Google views larger companies as a better bet than most local providers. Although this may change, it’s still a major frustration for many locally oriented solar providers.

Finally, there are many SEO firms trumpeting their “successes” all the time. They delight in showing that your website now ranks high on specific terms in your particular town (e.g., “solar panels, Natick, Massachusetts”). While this appears to be success, reality often tells a different story. The term “solar panels Natick, Massachusetts” may only attract half-a-dozen visitors for an entire year. In that case, your SEO firm has essentially spent a lot of time, effort and your money to get your site a half a visitor a month. In effect, you’re leading a race that no one else bothered to run.

This is all not to say you shouldn’t optimize your website in this way. It’s just that at this point in the evolution of search, doing SEO is table stakes - the price of just being in the game.

Here are the factors that matter most when it comes to SEO:

Longevity. Yep, that’s right. The age of your website/domain is what matters most in the eyes of Google. So, although the guy you hire to improve your SEO will hopefully do his best,
you need to be in the game for years, not months, for your website to be at the top.

**Inbound links.** This refers to links from other websites that link back to you over the course of time - a sign that others like your website. And while there’s been a lot of chatter about how important inbound links are, this is still a significant factor in rankings.

**Quality, fresh content.** Google likes active websites with active pages. The more you write and post about solar, the better.

My point is not to scare or dissuade you from paying attention to organic search. That said, you want to be aware of where this fits in the mix and to be clear on what you can and cannot achieve.

**Myth #3: Social media is all that really matters**

“Everybody’s doing it, and your customers spend a ton of time there, so that’s where you need to be, as well” - it’s a common refrain. However, it’s just not very effective if you’re looking for qualified solar leads. There’s an immense gulf between the heavy-breathing hype and the metrics and traffic that matter. Social media has its role, but it’s not in lead generation - an area where social media has been historically weak.

Does social media have value for some businesses? Absolutely. Big-name brands, such as Starbucks, Coke and GM, that want to connect on a more personal level do see benefits. So do “offer-based” companies like “cash for gold,” free e-book giveaways and even online classes. But if you want the phone to ring with qualified leads, most social media activities (e.g., Facebook and Twitter updates and banner ads) are going to struggle.

On the other hand, one aspect beneath the social media umbrella that is certainly worth your attention is customer reviews. Places like Angie’s List, Google and Yelp provide opportunities for customers to perform local searches and read reviews across a wide range of businesses. Keep in mind that homeowners feel a big sense of risk when hiring a solar company. Positive reviews will help allay customer fears. Many local businesses have zero reviews. Just having a handful about your company can make a big difference, so encourage your customers to post there.

What about negative reviews, though? Won’t you get some of those if you encourage customers to post, and won’t those hurt you? Not really. Everybody who has reviews has some bad ones, but there’s more to lose by having no reviews at all. So long as you don’t have a lot of negative reviews, you’ll be on the right side of the current landscape.

**Myth #4: Online listings will make the phone ring**

If you’ve been in the solar business for more than 20 minutes, you’ve no doubt received solicitations to list your business...
with one of the 60 or 70 online directory services out there, such as Yellow Pages and SuperPages. Unfortunately, these types of services drive a small fraction of traffic. Yes, the salespeople for online listing services love to screech about how “you are missing out!” if you don’t sign up with them.

Not really. All of these listing services combined deliver less than 10% of what the major search engines do. Regardless, don’t ignore online listings entirely. They serve a legitimate purpose - mostly by helping local businesses get found by the real search engines - so make sure your listings are set up accurately, once, and then just leave them alone.

The right way to create these listings is to load them up with as much information as possible. Max out the number of images, videos, logos, payment information and descriptions that you’re allowed to submit. The more information your listing has, the more the search engines and directories have to display to their visitors.

Still, don’t worry too much - a “best efforts” degree of investment of your time and energy is all you need.

Myth #5: Now that everything is online, the phone doesn’t matter so much

One of the key mistakes some solar companies make regarding online leads occurs when they take their eye off the ball on the telephone side of the business. That’s a problem. No matter how smart and efficient you are in generating leads, if you’re not great on the phone, you’ll ruin the leads anyway.

Here’s what “great on the phone” means:

Lightning-fast callbacks. In the eyes of a prospective customer, the speed with which you respond to an inbound lead is a test of your service quality. Every minute that ticks by after a prospect contacts you is a moment that he or she can be calling your competitor - or forgetting the solar project altogether.

Dedicated, well-trained phone staff. This is the front end to your entire business. If the person on your staff who speaks with prospects first is unfriendly or uninformed, you are going to lose a piece of business.

A smooth, systematic, efficient phone process, every step of the way. Do you prescreen prospects adequately? Do you set appointments consistently? Do you make confirmation calls for sales appointments? Do you follow up on questions?

You get the idea. Your phone operation needs to work well - 100% of the time.

In conclusion, online lead generation is fantastic; it has changed the solar industry for the better. Nonetheless, it has also raised the bar on what it takes to be successful. Keep these five myths in mind the next time you’re given the opportunity to “invest in online marketing.” They will help you spend your money well and ensure that you get more than your fair share of great residential solar leads off of the Internet.

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Early distributed generation (DG) models inspired us to believe that we could all participate in the mission to democratize and decarbonize our energy infrastructure. Yet, for a long time, that was really only true for a quarter of U.S. households and businesses. For the other 75% or so, putting a solar PV system on their roof or property either wasn’t possible or wasn’t practical. Those hurdles are being addressed today through the proliferation of community solar, an adaptive DG model that has opened the door to a vast new customer base— one that includes all of us.

For the initiated, community solar, or roofless solar, allows multiple unrelated customers— including renters, condo owners, businesses of any size, nonprofits and municipal entities— the option to share in the clean energy generation of a professionally designed and maintained utility-scale solar PV project located in a participating utility territory. Community solar developers utilize economies of scale to design and operate solar installations from several hundred kilowatts to several megawatts, providing broad and equal access to solar energy.

Rapidly increasing demand from both consumers and utilities is credited for community solar’s explosive growth in the U.S., and rightfully so, as both parties realize tangible economic, environmental and social benefits. Consumers are embracing community solar as a way to hedge against rising electricity rates, save money on their monthly bills, support energy independence and help reduce carbon emissions. Utilities are getting on board because it provides the ability to offer a cost-effective renewables program in a way that allows them to meet renewable portfolio standard requirements outside the net-metering framework, maintain a grid-tied connection with their customers, and protect against retail rate erosion.

Adaptability and scalability are fueling the optimism for community solar’s future, but so are falling solar equipment costs, program management efficiencies gained through enterprise software, and lower development and capital costs - all of which are allowing programs to be offered at a cost equal to or less than traditional fuel sources.

The model is now one of the fastest-growing segments in the solar industry, blossoming from just two projects in 2010 to about 90 today, spanning 25 states and dozens of cooperative, municipal, and investor-owned utilities, with a collective capacity exceeding 100 MW. Forecasts from the Na-
tional Renewable Energy Laboratory show community solar accounting for up to 50% of the U.S. distributed PV market by 2020, representing $8.2 billion to $16.3 billion of cumulative investment.

Although we have reached a collective understanding that the “experimental phase” of community shared solar is over, there is also a greater appreciation for the fact that launching and maintaining a successful program is neither simple nor straightforward. It is complex, requires diverse skill sets and looks starkly different from one market to the next. There are common phases and components of the process that every developer, asset owner or project sponsor must navigate to get a project off the ground. Here are the most significant ones:

Product design

There are a wide variety of products and projects that are identified as “community solar,” each with variations in program economics, targeted subscribers and flexibility. As the community solar market evolves, we are learning more and more about how program design - including upfront costs, financing options, contract length, renewable energy credits, incentives and even customer relations - can influence customer behavior and program success.

At present, two general categories are most in play: 1) the upfront purchase model, under which customers make an upfront payment to buy individual panels and the corresponding monthly bill credits for the power they produce; and 2) the subscription or pay-as-you-go model, under which customers contract for bill credits, generally to offset 100% of electric usage, and then pay the project developer a percentage of the value of their credits, generating a net savings.

In all scenarios, project developers must do the upfront research to determine the value proposition to which target audiences will be most responsive. The product needs to be compelling enough to drive broad consumer participation, particularly for risk-averse consumers, while providing economics that meet developer and financial requirements.

Project finance

Like any other medium-scale solar facility, there is not one way to finance a community solar project or portfolio of projects. Developers work with the same sources they would during other projects, including local and regional banks, tax equity partners, and investment firms. For construction debt and even long-term debt, working with smaller regional banks instead of the larger institutions can be advantageous because single projects or multi-megawatt portfolios are a good size for them and transaction costs are lower. Tax equity is a growing segment of finance, but it is generally a source for developers meeting a much larger-scale threshold.

The main difference with community solar is that because there is usually a large pool of customers participating - typically a mix of individuals, businesses, and institutional organizations, such as municipalities - there can be a more complicated risk analysis than for projects with a single off-taker. This diversity can mitigate credit issues for financiers, particularly for projects that specifically include low- and moderate-income customers. In case of customer default, the account can simply be turned off and the default risk becomes the cost of remarketing that portion of the project.

It is also worth noting that engaging well-vetted software tools for customer acquisition and program management provides a significant advantage because it minimizes risk and helps meet the rigorous requirements for most lenders and financial partners.

Legal, securities and consumer protection

A successful community solar project, as well as a robust, long-term market, depends heavily on generating positive customer experiences. Thus, it is imperative for community solar developers and project stakeholders to comply with all legal, tax, and regulatory requirements and provide customers and potential customers with comprehensive and clear disclosures. Suffice it to say, this is one of the most complex aspects of community solar program development, and it can be one of the costliest if done improperly and without the appropriate specialists.

Community solar programming requires compliance with utility, business, land use, tax and securities regulations. Participation structures can be delicate, and state regulations vary widely. For instance, if the sale of interests or subscriptions in a community solar program is deemed a securities offering, it would incur substantially more time and expense and would be subject to a higher risk and extent of liability than if the solar garden’s structure did not constitute provision of a security. It seems obvious, but it is not that difficult for project developers to overstep state and federal securities laws in this way. There are relatively clear ways to avoid the product being a security - customer benefits are delivered via utility bill credit and are aligned with a customer’s expected annual utility charges - but it takes careful legal analysis, nonetheless.

Regulatory considerations can include a maximum kilowatt/megawatt capacity, a minimum number of customers, geo-
graphic restrictions on members, and a maximum amount of offset credit allowed per member. Expertise is required to properly navigate these components, particularly for project portfolios serving multiple utilities and jurisdictions.

**Project development/delivery**

Like finance, project development is much the same as with most solar facilities, with the primary areas of focus being site acquisition and permitting, system design and procurement, site preparation and installation, project commissioning, and operations and maintenance (O&M) procedures. Projects should be sited for convenient access to the grid, maximum grid benefit and lowest cost.

Good economies of scale start around 1 MW, and at 2 MW or greater, they get better. (A 1 MW facility will support 200 to 400 customers, depending on the mix of customer types.) The lower installed cost per watt translates into better pricing for the utility program and its participants, making it more attractive and successful.

It is also important for project development and customer acquisition to happen in appropriate timing with relation to each other. That is, you do not want to interconnect a project and then begin the sales and marketing process, nor do you want to sign up a throng of customers who then get parked in an unusually long development process.

**Accounting and billing**

The accounting and billing arrangement is a key element of successful program execution. Each participant’s share of a facility’s electricity output must be monitored and reported to the utility, the production is then merged with the customer’s corresponding credit rate, and the utility, in turn, provides credits to each participant’s monthly bill. It isn’t uncommon for developers and utilities implementing community solar programs to encounter technology hurdles and increased costs for updating a billing system or for other administrative expenses or use of resources.

Software available today can now automate this process, making it more efficient, reliable and cost-effective than any manually executed process. Comprehensive software platforms obtain production data, seamlessly integrate with existing legacy billing systems, apply credits directly on customer bills, provide all reporting, and allow developers and utilities to manage multiple facilities.

**Program management**

A typical array can provide power to hundreds of customers, all requiring administration for accurate bill credits. An integrated software platform will ease the burden on the utility and/or developer’s customer service team by automating important administrative processes while reducing the risk of errors. Complete program management tools will include customer enrollment, bill crediting, facility administration, and ongoing customer engagement, often for multiple facilities in the same program.

Customer enrollment can become efficient and cost-effective by creating an easy route to participation. Enrollment platforms should provide the consumer with specific program information, custom proposals and contracts with e-signature
capabilities. When customers have the ability to research their utility’s program, receive accurate quotes, and sign up for participation online, participation increases, creating a successful program early on.

Software used for community solar program management should also have the ability to manage program rules and limitations, expedite financial tracking and program reporting, and provide document storage and accessibility. Details of a facility and customer information made easily accessible to utility staff will continue to improve and automate program management of a community solar array.

**Marketing and sales**

Because community solar is in high demand, it would seem that reaching and enrolling customers would be relatively simple. And often it is. One New York developer recently signed up more than 400 customers in just a few hours. But unfortunately, that is generally more the exception than the rule. In most markets, the bulk of potential customers don’t have a strong enough unaided understanding of the model or product options to be ready for immediate purchase. Not surprisingly, consumer education is paramount, and it should be done early, often, and across all traditional and social channels.

Community solar’s signature advantage, however, is that because a solar-ready roof and the corresponding site inspection and irradiance studies are not required to participate, community solar customer acquisition can be done completely online and at a fraction of even the lowest cost achievable by rooftop solar. Engaging and converting prospects into customers requires a comprehensive, seamless online experience - one empowered through a simple-yet-thorough program description, a savings calculator, a custom proposal generator, real-time credit check, electronically signed documents, and secure payment processing. The marketing program should also accommodate and fully leverage utility involvement when available. Prospective customers will find this the easiest way to buy solar, ensuring high prospect conversion and efficient project sellout.

**Operations and maintenance**

O&M may not be an obvious customer-facing component of a community solar program, but it is one that can have a direct impact on long-term program success. A professionally designed and maintained facility maximizes equipment efficiency and life span, which in turn maximizes performance, reduces cost and allows for better overall economics. This is an important part of the value proposition for new customers, yet it is also equally important for customer retention.

O&M services include electrical maintenance and system checks, panel additions and replacement, inverter maintenance/replacement, insurance for the array, monitoring of the array’s production, and weather station monitoring. This is also an area where integrated software is making great strides.

Funding long-term O&M services is usually baked into the retail pricing and held in third-party escrow, providing financiers, project sponsors and consumers with the confidence that the project will generate power - and value - for the intended term.

**Customer engagement**

Utilities and project owners can maintain and enhance valuable customer relations through customer engagement platforms. This type of customer engagement increases program participation levels and maximizes participant retention. Much like a facility’s O&M function, “Customer E&M” is the often underestimated and undervalued process of ongoing, long-term customer engagement and management. Continued engagement helps customers make a strong connection with their renewable energy assets.

A customer-facing online portal should provide visibility and education, including energy production, bill savings, environmental benefits, updates and account messaging, and sharable information viewable across platforms.

Ongoing customer engagement is the most important component of any successful community solar program. A customer-facing online portal provides participants with a direct connection to their solar panels. Further, this robust engagement through software allows a smooth transition to the evolving world at the grid edge, integrating new services and customer programs.

Despite the vast complexity in getting a project or program from concept to sellout, enthusiasm is rising and markets are opening. Some of the country’s largest investor-owned utilities and most advanced co-ops and municipal utilities are turning to community solar solutions in ways that are significant enough in size to serve a meaningful number of customers and achieve significant economies of scale. And retail demand is escalating as consumers become more educated and excited by the model and its value proposition.

Community solar is still some ways away from mainstream status, and the rapid scaling needed to reach its gigawatt-scale future requires a continued focus on innovation and creativity, the persistent pursuit of efficiencies, and expanded partnerships throughout the development process. With every program, solar providers, regulators, utilities, and advocates have a better understanding of the opportunities and barriers to reaching community solar’s multi-gigawatt destiny.

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How Adhesives Help Advance The Overall Solar Sector

Adhesives are addressing some of the industry’s most pressing issues.

by David McDougall

Without question, solar is one of the fastest-growing energy technologies in the world today. Its rapid growth, fueled by substantial investments and greater market penetration, has led to major advancements on the hardware and installation fronts. Adhesives have played a big role in the development of both; they are literally the glue that holds it all together.

Although their primary purpose is to bond the glass, aluminum, silicon and plastic components together in a single package, adhesives are valuable to solar equipment manufacturers in many other ways. They reduce stress points, leaks and corrosion; offer enhanced electrical insulating properties; and provide resistance to extreme environmental conditions.

To get a better sense of the role adhesives play in the advancement of solar technology, let’s walk through how they are addressing some of the industry’s most pressing issues: fierce competition, installation challenges, manufacturing hurdles, and the need to find the right solar partners.

A crowded playing field

Solar is a fiercely competitive industry that has been undergoing serious growth and evolution. Although technology advancements and lower costs are great for consumers, they present both challenges and opportunities for developers. The rugged competition means new technologies have to be ever-more efficient, reliable and cost-competitive to gain traction. Adding to that pressure, offerings must get to market as quickly as possible to stake a claim in the space, extend product life in the evolving landscape and maximize profit margins before competition turns an innovation into a commodity.

Solar draws on many fields for innovation, but bringing multiple components together in a finished product depends increasingly on sealants and adhesives. System developers are recognizing that the cost of solar installations doesn’t end with the purchase of panels; it also includes the price of maintenance and installation, which must be amortized over the life of the unit. To help reduce these costs, adhesive suppliers can customize a package that integrates with an installer’s procedure. This method allows the sealing process to be integrated into the overall procedure, streamlining installation and reducing labor hours, thus lowering installation costs.

Not only must module manufacturers outdo competitors within the solar industry itself, but they also must compete against the overall energy sector. For example, fossil fuels have meant solar panels have always been challenged to increase efficiency. That means the industry must work to remain cost-competitive and create new materials, which should address growing trends, such as dual-glass or back-contact modules.

With that, the pressure is on adhesives to ensure modules are tough enough to withstand shipping, the rigors of installation and years of exposure.

Installation challenges

There’s no getting around the physical challenges facing solar installations. By definition, they take place outdoors and in areas where they will face maximum heat and radiation. But weather issues don’t end there. In most habitats, the system will face rain and moisture, as well as seasonal changes in temperature. With solar modules having to withstand these extremes for decades in order to amortize their final costs, it’s even more critical for equipment manufacturers to choose an adhesive that can make projects last. Some solutions include the following:

Butyl solutions: These versatile sealants are compatible with a wide range of roofing materials and used in architectural, household and industrial markets.

Silicones: These are ideal for projects with metal-to-metal systems and with glass-to-substrate systems.

MS polymers: Silyl-modified polymers are used in roof materials like asphalt and are better suited for projects with low surface energy materials, such as asphalt shingles.

Understanding how to match the ideal sealant with the best racking system can open doors to more creative and efficient installations. This is critical because companies are constantly challenged to reduce installation times. Faster installations can support revenue growth or cost savings. Incorporating the proper sealants into the installation process will allow system owners to enjoy the benefits of solar energy sooner.

Manufacturing hurdles

The solar sector, like other industries, has gone through a series of design changes aimed at making products better. Solar
modules need to generate more power, last longer, and be less expensive to purchase and install. In addition, in a competitive environment, module makers need to create that product with the secret sauce that differentiates them from the rest. Improvements in today’s solar panels are different from those of just a few years ago. The list of changes and advancements is extensive, including the following:

• Within panels, individual cells are being connected with adhesives and encapsulated with adhesive films for protection from the elements;
• Module architecture is changing with the use of back-contact cells;
• Double glass is being used to help produce robust modules and reduce degradation due to time and exposure to the elements;
• Modules are becoming lighter through the use of thinner glass and lighter frame components;
• In some cases, frames are being eliminated entirely through innovations in glass and sealing technology;
• Manufacturing is being streamlined by replacing solder with conductive adhesives; and
• Structural adhesives are increasingly being used to simplify and speed up on-site installation of completed panels.

More changes are coming. For one, module manufacturers will continue to explore improvements that boost and extend the life of their products, requiring metals, glass and solar cells to come together in a package that safely generates electricity. For this to happen, adhesive and sealant technology must keep pace with the changes, as these materials have to hold the package together.

Second, design changes are inevitable. University labs and start-ups are creating the next generation of cells and modules at this very moment. Still, even with some exotic design changes, adhesive’s role will be to protect and hold all of the materials together.

Finding the right adhesives partner
Taking advantage of adhesive technology can help throughout the solar value chain, from component development, to module production, to installation. But it isn’t as simple as just replacing one technology with another.

First, production methods have to change. This may actually help control costs, as adhesive and sealant technologies will, in many cases, reduce labor requirements and extend product life. To evaluate the change and to implement it, companies need expertise, as well as the material.

Second, there are many adhesive and sealant technologies to choose from and many variations within each. Partnering with an experienced provider will help identify and fine-tune the right “tool” for each aspect of the design and production process. With potentially dozens of options for any single application, choosing the best option means balancing compatibility with materials to be joined, all aspects of processing, the cost to find each application’s ideal material, and more. The following are a number of top considerations for determining partners and materials:

• In choosing partners, look for providers with a broad range of offerings. This will help ensure “technology agnostic” advice based on your needs rather than on the provider’s possibly limited capabilities.
• Consider all aspects of any recommended solution, from material cost to process changes. Look at issues such as shelf life, storage and mixing requirements.
• Consider the material’s field-proven capabilities. New can be good, but companies need a tested solution that lasts. After all, it must work for a 25-year product lifecycle.
• Check the provider’s experience. The best material is only as good as the provider’s ability to match your needs and support the necessary processes before, during and after implementation.
• Finally, having reliable delivery and support is a must. Material in a warehouse half a world away is useless, and a production line that is shut down waiting for support produces no revenue.

A bright future
Solar’s rapid development has disrupted the entire energy market. Although there are many challenges, there are also plenty of opportunities for growth. Companies looking to capitalize on the latter must think about solar holistically, including the role of adhesives. By being strategic and deliberate about the use of adhesives, businesses can differentiate themselves in a crowded playing field, ensure long-lasting modules and improve their bottom lines.

David McDougall is the senior business development manager for the photovoltaics group of H.B. Fuller, which provides adhesives, sealants and specialty chemicals for various industries.
Reducing Failure Components In Solar Tracking

Risk analysis can help ensure trackers - and, thus, entire solar projects - remain reliable and cost-effective.

by Bob Bellemare

On April 20, 2010, a single device called a blowout preventer (BOP) led to one of the worst environmental and financial disasters ever recorded. The BOP failed to seal a well shut after the explosion on the Deepwater Horizon oil rig, resulting in 11 deaths and millions of gallons of oil flowing into the Gulf of Mexico over 87 days before the well could be capped.

Although the solar industry fortunately does not have the same exposure to the dramatic consequences of a BOP problem, the failure of devices in a large utility-scale solar field can lead to crippling operations and maintenance (O&M) costs or even outright economic impairment if poor technology choices are made. Fortunately, the solar industry can turn to risk analysis techniques applied in analogous situations, such as the “N-1” approach for analyzing catastrophic failure risk and a straightforward “failure rate” approach for assessing long-term O&M costs.

Given that tracker systems literally form the very foundations of utility-scale solar projects, applying these techniques to that equipment can greatly impact the overall long-term reliability and performance of such solar plants.

The need for long-term reliability

The geographic footprint and number of devices in a utility-scale project can be staggering. A typical 100 MW site can require over 300,000 solar panels. Each solar panel, if vertically mounted side-by-side, occupies about 40 inches of width (over 3 feet) - meaning a 100 MW solar field can have nearly 200 miles of racking!

With solar trackers now commonly used in these large...
projects in order to boost production and match energy demand curves, the solar plant owner has to maintain numerous electronic and electromechanical devices, such as motors, controllers and sensors, and all of them represent potential maintenance and failure points spread out over hundreds of linear miles. Depending on the tracker technology selected, the number of these electronic and electromechanical components can range from a couple hundred to tens of thousands.

Not only do these devices need to operate reliably in normal conditions, but they must also be designed to ensure survivability in extreme events, such as high winds or snow loads. Owners of such a facility face a delicate balancing act of driving a low upfront cost for the project while ensuring O&M costs are in check and there is no practical exposure to catastrophic events.

Because solar trackers all do the same function - move solar panels east to west during the day in concert with the sun - it can appear to the untrained eye that all trackers are similar, with little or no differentiation. This is not the case, though, as there are three distinct types of tracker technologies available on the market today, and each can have dramatic implications on both upfront costs and long-term O&M costs.

Rotating linked row: In this design, rows of modules are linked with a rotating driveline, which could lead to high terrain flexibility and a large reduction in the number of components needed to track the sun and survive extreme events, such as high winds. Some designs have fewer than 200 electronic and electromechanical components per 100 MW project site and do not rely on wind stow for survival. As an example, a single 2 hp motor can drive approximately 2,520 solar panels. One potential disadvantage of this approach is that a driveline impedes the area between rows for mowing and module cleaning with tractors. However, some standard practices in the solar industry - such as manual panel cleaning, robotic panel cleaning and above-ground wire management, where row traversal is impeded regardless of tracker design - make this a non-issue for many modern utility-scale solar plants.

Push pull: Think of these designs as “shutter blinds,” where a single actuator “pushes and pulls” rows of panels by means of a lateral linear motion drive shaft. Although relatively straightforward in design, these devices normally require flat terrains for perfect alignment of the drive shaft, and because all the force is transferred through the “center rod,” hefty equipment may be required to move the panels and also to withstand high loads, such as wind events. For similar reasons, a single large actuator may only be capable of driving 800-1,700 panels. These systems tend to be material-heavy due to their design architecture. Recently, in an effort to compete in the market, push-pull manufacturers have lightened the structure and employed active wind stow to compensate for the lighter structure. Although push-pull trackers may suffer from inflexibility and range of motion limitations, the good news is that the number of electronic and electromechanical components is limited to approximately 1,000 per 100 MW project site.

Independent row: True to its name, this design “self contains” each row of panels and removes the row-to-row connection element. This may free up movement between rows for routine maintenance, such as module cleaning with tractors or vegetation management if cabling is placed below ground instead of strung between tracker rows. Typically, the row can drive up to 90 standard modules, but each row must have its own motor, controller and other sensory devices to track the sun. This design often comes with an option to either wire the motor to an AC supply or have a battery-driven operation in which the battery is charged by a solar panel. Because each row is self-contained, this design can lead to up to 30,000 electronic and electromechanical components in a 100 MW project site. Although a “wired” solution might afford more reliable day-to-day and stow operation, the additional wiring could also increase install costs, and the system might be exposed to a larger number of failures in a lightning event, which can lead to system-wide failures should each row’s motor or controller be destroyed in a strike.

The “N-1” approach

Deepwater Horizon fell into one of the most common traps of failing to adequately analyze both the economics and needed maintenance programs to ensure the safe operation of a long-lived asset. A foretelling 2003 technical paper assessed the very conundrum facing oil rig owners of balancing the risk of failure of a BOP against the costs of maintaining and testing the device. That paper provides interesting approaches for how to analyze the failure rates at a component level in order to develop a comprehensive maintenance strategy for the BOP. Unfortunately, the advice in that paper was not taken to heart in the Deepwater case.

One approach for looking at survivability in extreme events is an N-1 analysis, which is commonly used in the utility industry for ensuring power system reliability. In this approach, no single event such as a power plant outage will, in turn, lead to a catastrophic result such as a system-wide blackout. This technique can similarly be applied to a utility-scale solar facility by asking very basic, but important, questions. Does the failure of a device such as a motor, battery or controller during an extreme event lead to potential system-wide failure? If so, what are the “backup” plans or remedies in such a scenario?

Occasionally, there is only one last line of defense, which must work when called upon to act. In the oil rig case, that was the BOP device. The owner needs a well-thought-out maintenance and testing program for such a device, or, as in the Deepwater case, the owner subjects itself to enormous risk. This risk can easily be overlooked, as a last-defense device, such as the BOP, is rarely “exercised” because its only function occurs in an extremely rare event, such as a well explosion.

For solar trackers, there are similar issues to confront - is the tracker required to be in a certain position (known as “stow”) in order to survive a wind event or a snowstorm? If so, how
can that stow action be 100% ensured? Using an N-1 approach can help an owner truly understand its risk exposure and required investments to minimize exposure to such extreme events.

Stowing is such an important issue in some tracker designs that it is worthy of further explanation. Think of a row of panels as a wing or a kite, and you can imagine how wind might interact with them. As winds increase, so do the forces on the panels, which in turn are transferred throughout the racking and tracking system. In an effort to cut costs by “thinning” steel, many tracker manufacturers require that the panels be placed in a flat (or stow) position to survive wind speeds generally over 60 mph. In other words, if the panel is in any position other than flat and experiences a wind speed exceeding 60 mph, the tracker can rip apart and result in catastrophic failures. Other manufacturers do not “thin steel” and, therefore, design their trackers to survive wind events with the solar panels positioned in any orientation.

The need to stow or not in a wind event could lead to a significant impact on proactive maintenance required. A tracker that needs to stow typically requires anemometers to detect wind speed, inclinometers to detect the angle of the panels, and control systems and a secured power source to operate properly. In the case of a battery-driven system requiring stow, one must ask what the backup is if the battery fails. A break in the linkage of sensitive measurement devices and controls has the potential to lead to catastrophic results.

The “failure rate” approach

We’ve all done it: bought the cheapest tool available only to find we got what we paid for - a maintenance nightmare or an outright early failure of the tool. A 100 MW solar project could represent over $100 million in upfront costs, so owners rightfully want to drive that cost down as low as possible. Blind spots can emerge, however, where the bright light of the “cheapest” equipment casts a shadow on the total long-term cost of owning that equipment, which is easily forgotten.

A failure rate analysis can be useful to quantify the possible long-term ownership cost of equipment. Take, for example, a tracker design for which one equipment supplier (“Motor A”) uses a single motor to do the job, while another tracker supplier (“Motor B”) uses 30 smaller motors to achieve the same functionality. In this example, assume the motors from each supplier are of identical reliability, with a 1% probability of failure in any given year. Motor A’s part cost is $600, and Motor B’s part cost is $100, meaning the 30 smaller motors when added up would cost $3,000.

There is one additional major differentiator in this example - it can cost similar amounts to send a truck and person to a solar site to replace a Motor A or Motor B failure. Because there are more motors in Motor B’s system, the instance of needing to send repair personnel to the project site is also higher.

Doing a straightforward calculation of multiplying the motor’s failure rate by its cost and the number of motors required and then further multiplying by the labor cost reveals the expected annual average maintenance cost for Motor B is 650% (6.5 times) higher compared with Motor A. If Motor B’s design is of commercial quality (with a 2% annual failure rate) and Motor A’s design is of industrial quality (1% annual failure rate), the difference becomes even starker, with Motor B now costing 1,400% (14 times) more than Motor A’s design to maintain. As you can see in the chart below, this becomes a numbers game, and if one tracker design uses significantly more components that require maintenance and periodic replacement, the operational costs increase exponentially. Additionally, continuous equipment malfunctions will surely impact power plant production, as well as expose these stowed tracker systems to more severe consequences.

<table>
<thead>
<tr>
<th>Assumptions</th>
<th>Annual Expenses</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Probability Of Failure</strong></td>
<td><strong>Motor A</strong></td>
</tr>
<tr>
<td><strong>Part Cost</strong></td>
<td><strong>Motor A</strong></td>
</tr>
<tr>
<td><strong>Labor Cost To Replace</strong></td>
<td><strong>Motor A</strong></td>
</tr>
<tr>
<td><strong>Number Of Parts</strong></td>
<td><strong>Motor A</strong></td>
</tr>
<tr>
<td><strong>Expected Annual Maintenance Cost</strong></td>
<td><strong>Motor A</strong></td>
</tr>
<tr>
<td><strong>Motor B % Increase</strong></td>
<td>650%</td>
</tr>
</tbody>
</table>

Summary

Through straightforward analysis techniques and asking hard questions about survivability in extreme events, a solar project owner can avoid the pitfalls that have occurred in many industries when making equipment choices and developing O&M cost projections. This is especially true for long-lived assets such as solar trackers put out in remote harsh weather environments - where what can happen almost certainly will happen over 30+ years of operation. When rigorous analysis is done, we normally find old adages turn out to be true.

Simplicity, quality and preparedness are your best insurance policies for ensuring the financial health of your utility-scale solar project.

Bob Bellemare is chief financial officer of Array Technologies Inc., a New Mexico-based manufacturer of solar tracking systems. The chart and all photos in this article are courtesy of Array Technologies.
Calif. Regulators Reject Utility Challenge To NEM 2.0

The California Solar Energy Industries Association (CALSEIA) is promoting another solar policy victory, as the California Public Utilities Commission (CPUC) has approved a resolution denying all legal challenges to the recently adopted net energy metering (NEM) rules for solar customers.

In January, the CPUC issued a decision to create the NEM “successor tariff,” known as NEM 2.0, which CALSEIA says did not include the new fees and lower compensation rates proposed by the state’s three investor-owned utilities. The decision made significant changes, with increased assessment of non-bypassable charges and mandatory time-of-use rates for residential customers, but it left in place the fundamental structure of NEM, CALSEIA adds.

The utilities responded by filing “applications for rehearing,” which alleged the decision contained legal error by ignoring many of the utilities’ arguments. Pacific Gas and Electric’s (PG&E) application challenged the decision as a whole, and the application from Southern California Edison and San Diego Gas & Electric challenged certain aspects. A ratepayer group, The Utility Reform Network, and a coalition of utility unions also challenged parts of the decision.

The CPUC resolution rejects those legal challenges, and although CALSEIA notes the CPUC made two minor tweaks to the language of the decision, it did not change any elements of the order.

“This was a frivolous legal maneuver by utilities, paid for by ratepayers, and the commission has put an end to it,” charged Bernadette Del Chiaro, executive director of CALSEIA.

The utilities have the option to appeal to state court, but CALSEIA believes it is unlikely they will do so because the chances for success are low. “Hopefully, the utility harassment of the CPUC is over,” added Del Chiaro. “They didn’t get everything they wanted, and it’s time to move on.”

In a statement to Solar Industry, a PG&E spokesperson said the utility “strongly supports the continued, sustainable growth of private solar.”

“With their final decision on NEM, the CPUC did not make the smart energy reforms that are needed to ensure a sustainable market for solar in California,” said the spokesperson. “While we are disappointed the CPUC decided to not move forward with a rehearing, PG&E is committed to working with all parties to find the right balance to support continued growth of solar.”

According to CALSEIA, attention is now focused on the precursor activity to creating the next version of NEM. The CPUC has again hired the E3 consulting firm to build the next version of a solar cost-benefit model, and the methodology will likely be debated for two years. CALSEIA says the main question at issue is the extent to which utilities can incorporate distributed generation into their forecasting and spend less money on the distribution grid. The CPUC will take up NEM again in 2019.

Controversial Clean Power Plan Gets Day In Court

On Sept. 27, a federal court heard long-awaited oral arguments for and against the Clean Power Plan (CPP), the Obama administration’s landmark climate change initiative. As of press time, though, a final ruling is not expected for quite some time.

Created by the U.S. Environmental Protection Agency (EPA), the CPP created the first-ever regulations to cut carbon pollution from existing U.S. power plants, but implementation of the rules remains stalled until a lawsuit against the EPA is settled. Launched by over two dozen states and other groups, the legal challenge charges that the federal initiative is an illegal overreach of the agency’s power under the Clean Air Act and that the new standards will cripple the coal industry. Separately, other states and local governments, as well as myriad environmental and clean energy groups, joined the EPA as allies in defense of the CPP.

In the hours-long hearing in September, the U.S. Court of Appeals for the District of Columbia Circuit listened to oral arguments from both sides. Signifying the importance of the case, 10 of the circuit court judges took part in the hearing, rather than the usual panel of three judges. Six of the participating judges were Democratic appointees, and the remaining four were Republican appointees. (The court’s 11th judge, Chief Judge Merrick Garland, had recused himself from the case beforehand, as he is President Barack Obama’s nominee for the U.S. Supreme Court.)

The Obama administration is openly confident in the legal merits of the CPP, and the Solar Energy Industries Association (SEIA) publicly supports the initiative.

“When it comes to fighting climate change - a grave environmental and national security threat - it’s critically important
for the United States to lead by example. The Clean Power Plan does exactly that and should be upheld on its merits,” said Tom Kimbis, interim president of SEIA, in a statement.

He later said, “We expect that the court will correctly determine that the EPA has acted well within its authority under the Clean Air Act and look forward to its decision ultimately upholding this critical rule.”

Meanwhile, West Virginia Attorney General Patrick Morrisey, who helped lead the lawsuit, said in a press release, “We finally had our day in court, and it didn't disappoint. The arguments lasted over seven hours and covered a wide variety of legal defects with the regulation. If the court agrees with any one of them, we will prevail. All along, I’ve been very clear. While I don’t know exactly when and where, I’ve always believed that we have the law on our side and will successfully defend coal miners and all the hard-working families in our state. We now await the court’s decision.”

Although the oral arguments were highly anticipated, as of press time, the circuit court is not expected to issue its ruling for months. Further complicating matters, the court’s decision will almost certainly be appealed and sent to the U.S. Supreme Court, which still has a vacant seat following the death of Justice Antonin Scalia earlier this year. If the Supreme Court issues a tied vote – a possibility unless a new Supreme Court justice is appointed - the circuit court's ruling would hold.

**Ontario Halts Large Renewables Procurement**

The government of Ontario has suspended the second round of its Large Renewable Procurement process and the Energy-from-Waste Standard Offer Program, effectively halting the procurement of over 1 GW of wind, solar, hydroelectric, bioenergy and energy-from-waste projects.

According to the province, this decision is expected to save up to C$3.8 billion in electricity system costs relative to Ontario’s 2013 Long-Term Energy Plan (LTEP) forecast. Individually, this would save the typical residential electricity consumer an average of approximately C$2.45 per month on his or her electricity bill, relative to previous forecasts.

Consultations and engagements will begin this fall with consumers, businesses, energy stakeholders and indigenous partners regarding the development of a new LTEP, which is scheduled to be released in 2017.

In supporting clean energy development, Ontario says it has attracted billions of dollars in private-sector investment and generated over 42,000 jobs in the clean technology sector. The province has about 18 GW of wind, solar, bioenergy and hydroelectric energy contracted or online, and the electricity supply is now over 90% emissions-free. In fact, the province says Ontario is home to more than 99% of all installed solar PV capacity in Canada, and the province successfully eliminated coal-fired electricity generation in 2014.

“Over the course of the last decade, Ontario has rebuilt our electricity system and secured a strong supply of clean power,” said Ontario Energy Minister Glenn Thibeault. “Our decision to suspend these procurements is not one we take lightly. As we prepare for a renewed LTEP, we will continue to plan for our future and ensure Ontario benefits from clean, reliable and affordable power for decades to come.”

Nonetheless, the Canadian Solar Industries Association (CanSIA) says it is disappointed and believes the decision will have significant ramifications for Ontario. In a statement, John Gorman, president and CEO of CanSIA, said the decision “represents a significant back-step from previously committed renewables procurement in the province that we believe will be required to deal with supply and GHG emission risks, such as delayed nuclear refurbishment schedules, unmet conservation targets, or increased demand as a result of electrification to meet the province’s climate change targets. Canceling or delaying the procurement of renewable electricity could leave Ontario unprepared to effectively deal with these risks cost-effectively and without increasing electricity sector GHG emissions.”

Gorman added, “CanSIA remains hopeful that the upcoming LTEP process will provide further opportunities for the industry.”

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**City Of Albuquerque Sets 25% By 2025 Solar Target**

The Albuquerque, N.M., City Council has unanimously passed a resolution to create a new solar energy standard for city facilities.

The resolution says, “The City of Albuquerque recognizes the benefits provided through solar energy for improving environmental health, public health and growing the economy and desires to renew its commitment to this important clean energy solution by establishing the goal of generating 25 percent of energy for city facilities from solar power by 2025.”

In a local KOB4 report, Pat Davis, a city councilor and sponsor of the resolution, pointed out that although a few city buildings currently have solar, much more could be done to increase Albuquerque’s clean energy efforts.

“We have 300 days of sunshine,” Davis said. “Why haven’t we done this before?”

According to the resolution, the measure orders the Energy Conservation Council to submit an implementation plan for the new solar standard by the end of second-quarter 2017.

Meanwhile, nonprofit group Environment America, which says its New Mexico chapter helped advocate for Albuquerque’s new target, has launched a nationwide campaign to convince other cities and local governments to generate much more of their power from the sun. According to the group, the “Shining Cities” campaign will engage and mobilize thousands of Environment America members, volunteers and supporters to convince local governments to expand the use of solar power.

The Shining Cities campaign aims to get at least 20 localities to go big on solar by the end of 2017. This fall, Environment America and its state affiliates have set their sights on half a dozen cities and counties in Georgia, Maine, New Jersey, New Mexico, Oregon and Washington state.
End the year on a strong note by closing deals, and creating new leads for 2017!

Solar Power PV Conference & Expo - Chicago is coming to the Midwest for the first time.

The event will feature 50+ exhibitors who make an impact in the Midwest solar market, or are hoping to increase business in the region.

Join 1,500 of your colleagues for two days of networking and a robust education program featuring two tracks: business and policy.

Expand your business. Gain insights from industry experts:

- Community Solar
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- Finance
- ...and more!

Learn more and register at www.events.solar/pvchicago
Solar Comes To San Francisco ‘Painted Lady’ Home

Sunrun has announced that one of San Francisco’s famous Painted Lady homes - recognizable from the opening scenes of TV sitcom “Full House” - has gone solar.

The house, which sits on a row of classic Victorian homes, is one of the city’s most photographed locations, the residential solar company notes. The homeowners of the Painted Lady opted for a Sunrun solar lease.

The installation of the solar panels is the latest step in a series of energy-efficient renovations made since the home was purchased in 2014. Despite the Victorian home’s modern upgrades, including rooftop solar, it has maintained its original architecture from its construction in 1892 - serving as an example of preserving history while sustaining the future through renewable energy, says Sunrun.

“We think this is a really special property, and we’ve put a lot of love into transforming this historic landmark into the modern, energy-efficient home it is today,” said homeowners Côme Lague and Charlene Li.

Sunrun notes that the home will also be one of the first in the continental U.S. to pilot the company’s solar-plus-storage system, the Sunrun BrightBox, which is designed to help homeowners maximize their savings by storing excess energy the sun produces during the day to use later at night. The first BrightBox was installed in May in O’ahu and is currently available to homeowners in Hawaii. Sunrun plans to offer its storage solution to more California homeowners and roll it out more broadly in the next five years.

“We’re proud to help such a unique and iconic property in our hometown of San Francisco to go solar and start saving money,” said Michael Grasso, chief marketing officer at Sunrun. “Solar is really for everyone, and this development demonstrates that it’s possible to pay respect to the past while still keeping an eye to the future.”

Mitsubishi Electric Walks The Walk On Solar

Well, this makes sense! A company is powering its U.S. headquarters using its very own solar panels.

Mitsubishi Electric US Inc. has installed a 369 kW solar PV system on the rooftop of its U.S. headquarters in Cypress, Calif. Mitsubishi Electric Corp. was founded in 1921 and manufactures a diverse line of products, including PV modules, automation equipment, escalators and elevators, and heating and cooling products.

The 1,380-module system was installed at the headquarters building, located within Warland Investment Co.’s Cypress Business Park, using Mitsubishi’s 690 Diamond Premium and 690 Diamond Pro modules. According to Mitsubishi, the system can save the company 85% in electric costs, which totals $2 million over the next 25 years. Based on current electricity usage, the system is expected to cover 90% of the Mitsubishi facility’s power needs, allowing the system to pay for itself in less than five years.

The system was designed and installed by California-based installer Sun Integration. It includes 10 Yaskawa - Solectria Solar PVI 36TL transformerless, three-phase string inverters and non-penetrating racking by PanelClaw. The company says the ballasted racking, combined with Mitsubishi Electric’s modules, was key to obtaining a quick approval of the installation by all parties, including the building owner, Warland Investment Co.

“Mitsubishi Electric is pleased to contribute to the community and environment by producing clean energy with our own solar modules,” said Kiyoshi Furukawa, president and CEO of Mitsubishi Electric US Inc. “The system proves that businesses can be both environmentally and financially sustainable.”

Mass. Officials Dedicate 3 MW Brownfield Project

Officials have dedicated a 3 MW solar project built on a 10-acre brownfield site in Westfield, Mass. During a ceremony, Massachusetts Lieutenant-Governor Karyn Polito; Westfield Mayor Brian P. Sullivan; and Mark Noyes, president and CEO of ConEdison Development, developer of the solar project, celebrated completion of the 8,844-panel installation.

“We applaud Westfield and ConEdison Development for their ingenuity in transforming a brownfield into a source of clean energy and look forward to future projects continuing the growth of the commonwealth’s vibrant solar industry,” said Polito.

Noyes added, “This state understands the importance of clean energy. The visionary policies of Massachusetts have
allowed solar sites like this to flourish throughout the commonwealth.”

Prior to project construction, the reclaimed land had been an underutilized former gravel pit listed as a brownfield. Development of the site required the processing of approximately 60,000 cubic yards of construction demolition debris, all of which was subsequently used on-site for grading and roadways, according to ConEdison Development. Moreover, working closely with city and state agencies, the company established a wetland replication area, allowing the site to serve as an attractive location for wildlife to thrive in the future.

The solar installation, owned and operated by ConEdison Development, will provide solar power to Westfield Electric & Gas under a long-term power purchase agreement.

NRG Signs Up Big-Name Firms For Community Solar

NRG Energy’s renewables business has broken ground on five community solar projects totaling 29.1 MW in Minnesota and reached agreements to subscribe several national business customers.

“Across Minnesota, we are hearing the same strong message from residents and businesses alike: They want to be powered by affordable, renewable energy,” said Drew Warshaw, vice president of community solar at NRG. “Community solar gives them that opportunity - a simple, cost-effective path for residents and businesses to go solar without having to put panels on their roofs.”

NRG says its commitment to developing community solar in Minnesota (the state where NRG began operations in 1989) is moving forward, with 25-year solar subscription agreements signed by more than 1,000 residents and several large businesses in the state, including the following: U.S. Bank has local six sites subscribing, including the iconic U.S. Bank Plaza in Minneapolis; Land O’Lakes, a national member-owned agricultural cooperative based in the Minneapolis-St. Paul suburb of Arden Hills, has its corporate headquarters subscribing; Macy’s has three of its local retail sites subscribing; and Ecolab, a global company focused on water, hygiene and energy technologies and services headquartered in St. Paul, has several corporate facilities subscribing.

“We seek out partnerships that positively impact the environment, and participating in this unique community solar garden initiative is a great example of that,” said Reba Dominiski, senior vice president of corporate social responsibility at U.S. Bank.
The Rise Of DG Solar And Competition

Both utilities and distributed generation (DG) solar companies are competing to provide electricity to customers. Utilities have their incumbent business models to protect, whereas DG solar companies are applying new solar and storage technologies so that customers can generate their own power. Unfortunately, this competition between utilities and DG solar companies has the potential to divide the solar industry.

But we are missing the two most important points about solar power. First, solar power is clean - the best solution to the looming global warming disaster. And second, solar power is inexpensive; an unshackled, competitive market for electricity enables customers to purchase their power from the least-expensive source. The Solar Energy Industries Association continues to focus on these high-level customer benefits while at the same time grappling with the ups and downs of the solar coaster.

Everyone reading Solar Industry magazine already knows that solar is the cheapest way to generate electricity. Utilities are signing power purchase agreements for $0.04/kWh, Apple just committed to power for $0.053/kWh, and residential companies all over the country are installing quality rooftop systems for less than $0.06/kWh.

Unfortunately, most of the U.S. public - not to mention influential journalists and policymakers - are still under the mistaken impression that solar is “expensive.” Because of economies of scale, the enormous solar plants that utilities are installing all over the U.S. generate electricity for much less than gas, nuclear and coal. But these low solar prices extend to homeowners, too. With easy solar financing, 25-year warranties and thousands of experienced solar contractors around the country, there is almost no reason for homeowners NOT to go solar now.

For the first time, we are seeing real competition for retail electric customers, whether residential or commercial. Free markets for solar-generated electricity mean lower costs for residential and business consumers, more local installation and manufacturing jobs, and continued technological leadership.

When generation was expensive and centralized, we needed a utility industry run by monopolies. Now with inexpensive DG solar and storage a reality, this monopoly business model adds costs, limits economic growth and constrains our continued technology leadership.

One just needs to compare retail electricity rates to see the savings that can be achieved with DG solar. Homeowners can already compare the average $0.12/kWh they pay for utility power with the $0.06/kWh they pay for power from their own solar panels, and with the $0.04/kWh solar generating costs from utilities.

Comparing investor-owned utilities (IOUs) to municipally owned utilities (MOUs) sheds additional light on the current cost burden from utility power. My local IOU charges an average of $0.22/kWh for residential electricity. Right down the street, a local MOU charges an average of $0.11/kWh for exactly the same product. Same power, same place, twice the price.

The difference is their business models. My local IOU gets a guaranteed 10% rate of return - while at the same time spending hundreds of millions of dollars lobbying the state utilities commission, legislators and the public. On the other hand, my local MOU is incentivized to deliver power to its customers at the lowest possible rate. Without the profit motivation, MOUs do a much better job at delivering inexpensive electricity.

It is my hope that we make this transition to clean and inexpensive power in a way that benefits our customers. I have two suggestions. First, we should take every opportunity we can to correct the “solar is expensive” narrative - especially when statistics about cheap rooftop solar costs are ignored. And second, we should support our state and national solar organizations. Technology is enabling our current transition to rooftop solar, but our individual and corporate advocacy efforts are needed to accelerate this change.

Barry Cinnamon is CEO of Cinnamon Solar, a San Jose, Calif.-based residential solar contractor, and Spice Solar, a supplier of built-in solar racking technology. He is also a former president of the California Solar Energy Industries Association.
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- **Advanced Technology:** PERC and 4 busbars drive >18% module efficiency
- **Reduced System Costs:** Robust design, 1500V and simple installation
- **Certified Reliability:** 3X IEC, salt mist, ammonia

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- **Superior Aesthetics:** All-black design coupled with outstanding power output
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