

Breaking Free from the Grid: Exploring Affordable Solar Energy Options

All signs point to the positive for the solar industry in the United States and forward-thinking corporations, developers and municipalities aren't looking back.

2016 saw the largest year on record for solar installations in the U.S., reflecting a trend with heavy momentum. The combination of low costs, expanding financing options, and even flexibility of space requirements in some areas all point toward the increasing viability of commercial solar.

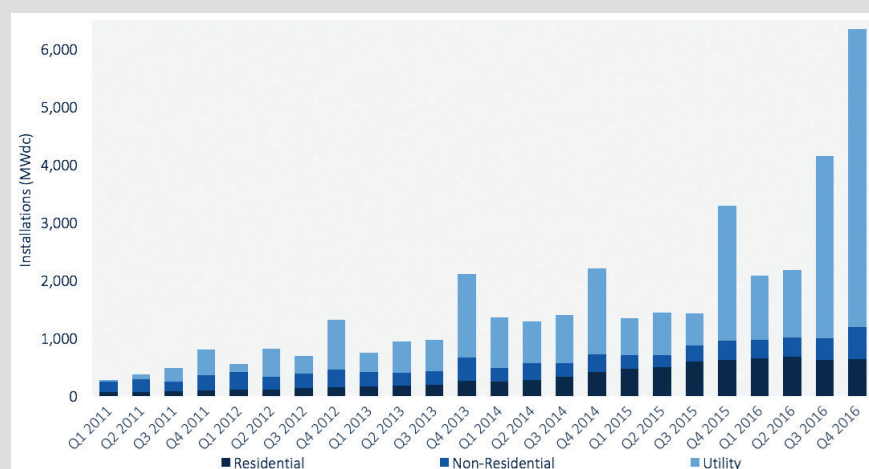
There was a time when commercial solar energy could not break through as a viable option. In fact, for much of solar's existence in the marketplace, expensive components and a slow return on investment all but eliminated it as an economically sound opportunity for most businesses and institutions.

Those days are long gone.

While it's tempting to suggest that no one could have predicted the dramatic rise of affordable solar, the truth is, we now benefit from years of technological advancement, streamlined industry best practices, and market forces that consistently drive solar costs down. As a result, solar energy is a smarter investment today than ever before.

THE SOLAR INDUSTRY HAS ARRIVED

The solar industry benefits from a strong trend of cost improvements. The cost curve is falling as technology becomes more efficient and more installations are built. As an Oxford University study¹ recently reported, solar panels have fallen in price by 10 percent each year since the 1980s, a trend that is likely to continue for the foreseeable future.



ANNUAL U.S. SOLAR PV INSTALLATIONS Q1 2010 - Q3 2016

SOURCE: GTM Research / SEIA
U.S. Solar Market Insight report

¹ Farmer, J. Doyne., & Lafond, Francois. (2016). **How predictable is technological progress?** Research Policy, 45(3), 647-665. <http://dx.doi.org/10.1016/j.respol.2015.11.001>

² Fu, R., Chung, D., Lowder, T., Feldman, D., Ardani, K., Margolis, R., (2016). **U.S. Solar Photovoltaic System Cost Benchmark: Q1 2016.** Retrieved from <http://www.nrel.gov/docs/fy16osti/66532.pdf>



Let's put this rapid cost decline in perspective. To implement solar in 1977, a business owner would have had to contend with a rate of \$76.67 per watt. Today, 40 years later, while seemingly everything from gas to movie ticket prices have risen, that rate has fallen below \$1.50 per watt.²

Simultaneously, the pace of solar installation has increased rapidly during the past 10 years. This exponential growth has ushered in a new era of energy freedom, unlocking numerous benefits for businesses and communities.

WHY SOLAR?

Solar plays a unique role in the energy landscape. While commodities essentially compete with one another and are bought and sold based on constantly fluctuating rates, solar competes with peak power. Solar does not compete with coal or nuclear base load generation. By providing a lower-cost energy source to reduce the amount of electricity used during peak demand hours, a solar array provides a level of cost control that cannot be replicated.

Furthermore, a key virtue of solar is the ease with which it supports traditional energy. Solar brings a stabilizing effect to power grids. Having many diverse forms of generation tied into a power grid lessens dependence on individual suppliers—traditionally large power plants—and lessens the frequency of outages.

As electricity providers, traditional utilities are starting to rely on solar for electrical generation. **Utilities are capitalizing on the stabilizing effect of solar to enhance their own product offering by partnering with solar industry leaders, such as GEM Energy, to fund, build and maintain their arrays.**

WHERE SOLAR PROJECTS BEGIN

Solar development projects typically begin as a simple idea. For example, municipal economic development officers, mayors, superintendents or operations managers learn about organizations similar to their own are finding success in solar and want to learn more about how it could fit their profiles.



The economics of solar can be surprisingly straightforward,” says Jason Slattery, GEM Energy director of solar. “Ultimately, what’s relevant is energy demand profile and costs. Economic feasibility is determined by comparing the price per kilowatt hour drawn from the power grid to solar. Many businesses or entities with need for 24/7 power could be good candidates for solar.



One of the first steps to incorporate solar into an energy mix is to examine current electricity consumption and usage patterns. All organizations use energy, but no two energy usage profiles are alike. For this reason, there is not a “one size fits all” solution. Proper analysis of electrical consumption profile is critical to adequately size each solar installation.

In some ways, when energy is used can be as important as the quantity used. This is a key element in designing and sizing a solar generating asset. For example, a facility that uses its highest amount of energy during second-shift hours requires an array that harvests more electrons at midday. However, both oversizing and undersizing carry the potential for negative economic impact. **Every load profile has a sweet spot that will deliver the strongest economic benefit according to its usage pattern.**

To right-size a solar solution, a clear picture of current energy use is critical. GEM Energy, for example, conducts a comprehensive analysis of energy usage patterns and electricity demand at the onset of all potential solar projects. Is there a time of year during which energy usage spikes? Which operations incur the greatest energy expense? Answers to these questions guide the design phase to optimize the array configuration for maximum savings.





Still, since solar arrays typically are structured as long-term contracts, the prospect of forecasting electric rates can be daunting. Utility rates can be volatile and subject to any number of external factors. Forecasting electric rates 25 years out is an inexact science, but historical data can provide a reasonably reliable model. Amidst wildly fluctuating rates associated with gas, coal, and oil, solar—by contrast—provides a strong option for stability and cost control. Sunlight is free.

TAKING THE HASSLE OUT OF RAISING CAPITAL

Raising funds to cover the investment of solar is no longer a painstaking process. This is one byproduct of the growth of solar for which everyone can be thankful. Solar is now mainstream.

Multiple layers of approvals must be met to guide a project through to the final green light. Finance review committees must sign off on viability; senior staff reviews tax equity and traditional debt analyses; and legal firms work out third-party finance ownership details, secure site leases, and ensure everything is properly set up in terms of compliance. GEM Energy manages the funding/financing phase for its customers. This involves demonstrating to a financier that the undertaking is an investment-grade opportunity likely to deliver significant ROI throughout the life of the contract.

DESIGN, DELIVERY AND MAINTENANCE

The location of a solar array calls for careful consideration. When evaluating a potential site, both short-term and long-term factors come into play. A site that is appealing today, easy to acquire and rich in sunlight, may not be ideal five, 10 or 15 years from now.

During the site selection phase of a project, GEM Energy forecasts geographic variables during the next 25 years. For example, extensive commercial development near an array could have an adverse effect on performance. Building an array next to a dirt or stone road will result in power output reduction over time due to dust. Even elements like vegetation around systems should be low-growth to minimize maintenance.

Once a site is selected and final designs are completed, permits are secured and construction is cleared to begin. Considering these variables at the outset helps ensure longer life, lower maintenance, and greater return on the investment.

Though solar is a rapidly changing industry, the importance of technical capability remains paramount. Solar projects often mean multiple contractors, but a partner such as GEM Energy can simplify the relationship as a one-stop-shop. As part of the Rudolph Libbe Group, GEM Energy can serve as both developer and design-build contractor. Avoiding external or third-party contractors means its customers benefit from the elimination of fee-on-fee situations, more accurate budgeting, and precise scheduling. In effect, it brings speed and efficiency to a process often stalled by regulatory red tape and muddied by multiple third-party service arrangements. Using in-house expertise for the entirety of these processes also assures clients that each partner approaches solutions with the same clear picture.

Designing and building a solar solution are simply the first phases of a long-term partnership. Monitoring and maintaining an array is critical to the long-term viability of the system. Projects should be designed and constructed in a way that minimizes the amount of maintenance required down the road..



The idea of utilizing solar is based on saving money, and needs to be based on sound economic principles first,” says Jason Slattery, GEM Energy director of solar. “Solar is cost effective today without incentives.





For operations like installing high voltage tie-ins, having in-house licensed electricians and NABCEP-certified solar installers enables better quality control and avoidance of the trial and error sometimes associated with third-party partnerships. **GEM Energy calls on experienced in-house civil/sitework, carpenters, laborers and equipment operators to execute these complex projects, offering a total turnkey construction project.**

STREAMLINING ACCESS TO SOLAR SOLUTIONS

As a long-term solution, solar development plays a larger role in reducing operating costs and boosting efficiency in a number of sectors. Historically, developing solar meant a significant investment. Today, solar customers can take advantage of innovatively structured agreements that reduce upfront costs drastically.

Sourcing a solar investment through a power purchase agreement (PPA) delivers instant cost savings. Under a PPA, a third-party investor steps in to back the construction of a solar array, and the property owner purchases the power produced by the array, not unlike a traditional monthly power bill. The property owner immediately gains the benefit of utility electric cost savings without incurring the cost of implementation.

Ohio Northern University (ONU) took advantage of this offering in 2016 when it enlisted GEM Energy to secure funding, and design, build, and maintain the resulting two megawatt solar array. The array will provide 10 percent of ONU's electricity consumption per year.

The 11-acre solar array sits on property owned by ONU. The demand savings generated by the array are projected to realize between \$60,000 and \$100,000 each year. As traditional costs rise and solar costs remain consistent, ONU is in a position to realize even greater savings as the 25-year PPA matures.

ONU students also benefit from the solar array as it is incorporated into the renewable energy curriculum as an interactive, hands-on learning concept.



As the turnkey solar developer, GEM Energy managed the entire process. From site work expertise taking into account storm water retention and navigating municipal permitting processes, through the varied general maintenance skills that will keep ONU's solar array operating effectively for decades, GEM Energy guided ONU's project from concept to completion.

LEVERAGING PROGRAMS TO INCREASE AFFORDABILITY

Growth in the solar market has benefitted from a number of federal, state and local incentive programs.

The Solar Investment Tax Credit (ITC) is a 30 percent federal tax credit scheduled to remain in place through 2019 before permanently settling at 10 percent for commercial projects. The ITC can be supplemented by multiple state and municipal incentive programs.





Every state approaches solar incentives in a different way. Many states, including **Illinois** and **Massachusetts**, act as strong advocates for solar, offering valuable incentive or tax credit programs to boost solar viability for rate payers. New York recently enacted a clean energy standard mandating 50 percent of the state's energy consumption be drawn from renewable sources by 2030. In addition, New York offers solar customers a variety of tax credits and power rebates to support its energy initiatives.

Another popular structure that states use to incentivize solar is direct performance payment. Through this program, solar customers are rewarded, typically with Solar Renewable Energy Certificates (SREC), for the power their solar assets produce. Illinois, New Jersey, and Massachusetts base a large portion of their solar incentive strategies on this method. This structure enables solar customers in these markets to establish a reliable, user-driven supplemental income stream.

In addition, many municipalities across the country now encourage solar with sales tax incentives, property tax exemptions and more.

SOLAR IN SURPRISING PLACES

Solar development has found a home in markets that feature unique challenges and opportunities. Since space for an array is a critical element for any solar solution, organizations with sprawling campuses or situated near underutilized tracts of land are in an excellent position to boost efficiency through solar.

The Toledo Zoo, for instance, has utilized a 2.1 megawatt solar array to generate approximately 30 percent of its electricity per year. With conservation as a key pillar of the Zoo's mission, and a constant need to responsibly manage operating costs, installing a solar array was a natural fit.



The land upon which the array operates, around 22 acres contiguous to the Zoo property, previously sat unused as a brownfield site: contaminated and stranded in receivership with an increasing tax liability. To bring the property back to life, the Zoo enlisted GEM Energy to guide the project from acquisition of the land to completion and the subsequent maintenance. GEM Energy collaborated with city and county officials to run the property through a process to reset the taxable liability, along with sewer and water debts, to zero. This process repurposed the brownfield site as a taxable contributor to the municipality.





The Zoo saw significant energy cost savings the day the array was commissioned, with zero out-of-pocket expense. In addition to the cost savings associated with reduced consumption, the Zoo benefited from peak demand savings as a result of solar being on its side of the meter. With the load profile structured in its favor, the Zoo is able to reduce its grid power consumption during the most expensive times of the day. This resulted in savings of \$200,000 on top of the consumption savings during the array’s first year of operation. What’s more, the Zoo’s emission reduction is just under 400 vehicles taken off the road per year.

LOOKING FORWARD TO A FURTHER EVOLVING MARKET

The next innovations in the solar industry will occur in the emerging photovoltaic storage market. By allowing facilities to control the energy they produce on-site, this is already becoming a strong offering for forward-thinking corporations and municipalities. With photovoltaic storage capabilities, the user continues to have access to energy generated on-site when the solar array is not generating electricity.

Aging infrastructure is a challenge municipalities face across the country. Especially east of the Mississippi, power generation and delivery systems installed generations ago are approaching the end of their useful lives. In most cases, the electrical infrastructure used today remains unchanged from Thomas Edison’s design.

“We’re looking at outdated electrical infrastructure systems that in some cases are more than 70 years old,” said Slattery. “Everywhere you look there are still power lines on telephone poles, carrying electrons from a centrally distributed plant miles and miles away. Municipalities are at the forefront of a huge growth opportunity to modernize with best-in-class technology through storage and solar. Both add to grid reliability and prevent widespread cyber-attacks against the grid.”

SELECTING THE RIGHT PARTNER FOR THE JOB

The design, development and execution of a solar integration project is best guided and carried out by an experienced, proven partner that knows the challenges, opportunities, and advantages involved with delivering an effective solution. GEM Energy has been in the solar business for a decade with the core Rudolph Libbe Group construction business in place since 1955. The experienced and financially stable team navigates projects expeditiously through the complex process—from ideation, design, and permitting to construction and maintenance.

In addition, the expertise of the entire Rudolph Libbe Group provides clients with solar-generating resources quickly and no-out-of-pocket capital solutions.

The convergence of lower costs and innovative services, such as those offered by GEM Energy, have ushered in a golden age of solar; one in which organizations of varied size and scope have access to high quality, cost-effective solutions that deliver savings on day one.



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