

Commercial Solar Savings Guide

**GOING SOLAR:
NEW OPPORTUNITIES
FOR BUSINESSES AND
INSTITUTIONS**

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New opportunities are now available for owners and CFOs to substantially reduce their company's or organization's energy costs by installing on-site solar power generation.

By integrating solar power generation into their operations, business and institutional leaders derive major benefits from a stable, reliable power source:

COST SAVINGS:

Considerable electricity cost savings with attractive ROI and payback terms.

ELECTRICITY RATE STABILITY:

Added protection from the economic shock of substantially higher future electric utility rates.

IMPROVEMENT IN LOAD FACTOR:

The use of solar power generation during daylight hours matches the times when utilities operate at their peak load; this helps commercial operations reduce the cost of purchased power.

SUBSTANTIAL FINANCIAL INCENTIVES:

Significant federal and state incentives are now available to finance many solar installations for commercial use.

SOLAR POWER IS NOW AN ECONOMICAL, AFFORDABLE ENERGY-SAVING OPTION FOR MOST BUSINESSES

Solar power generation is now a realistic, cost-saving option for many businesses and institutions for the following reasons:

PRICES FOR SOLAR PANELS HAVE PLUNGED 70% SINCE 2009:

Steep declines in solar panel costs have now substantially increased the economic feasibility of many commercial solar installations.

SOLAR POWER CAN BE LESS EXPENSIVE THAN UTILITY-GENERATED POWER:

Many well-designed and implemented solar projects now can produce on-site electricity below the cost of power generated by the local

utility—even without added financial incentives.

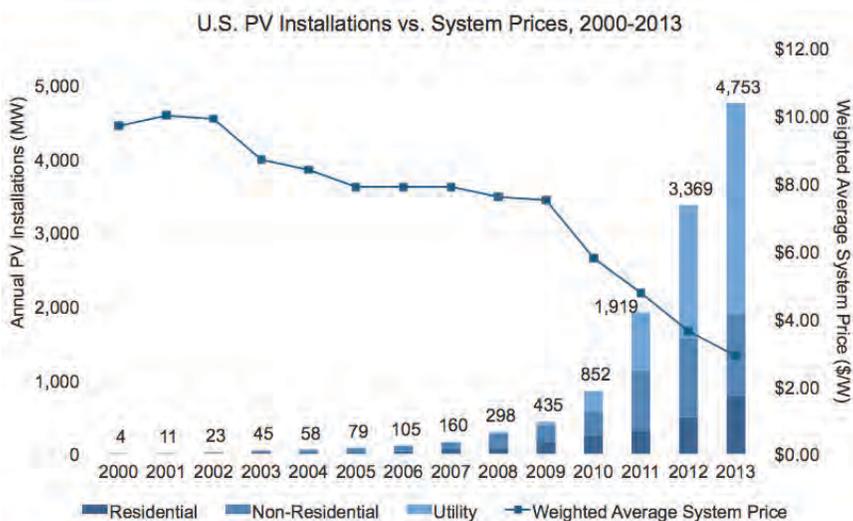
SOLAR POWER IS NOW VIABLE FOR ANY U.S.

LOCATION: Nearly every part of the U.S., including the Northeast and upper Midwest, has enough solar output to make year-round solar power generation an economically viable, worthwhile option.

FUNDING AND FINANCIAL INCENTIVES ARE INCREASING SOLAR POWER ADOPTION:

Because of its increased efficiencies and decreased costs, financing for solar projects is widely available, along with popular federal and state financial incentives.

U.S. Solar: 15X Growth Over the Last Five Years



GTM RESEARCH | www.gtmresearch.com

Source: GTM Research/SEIA U.S. Solar Market Insight

Solar installations have increased dramatically as system prices have fallen.

Many businesses and institutions have characteristics ideal for solar power success, such as unused land and flat roofs.



HELPING EXECUTIVES AND CFOs CUT AND STABILIZE ELECTRICITY COSTS, NOW & IN THE FUTURE

Executives and CFOs must battle rising cost pressures on all fronts—from labor and supplies, to distribution and regulatory compliance costs.

Energy is another major cost element expected to rise substantially in the coming years, especially in the Northeast and Midwest. In New York State for example, the U.S. Department of Energy reports that electricity rates for commercial users have increased 25% since 2004.¹ Nationwide, according to the U.S. Energy Information Administration, commercial electric rates are expected to rise by 2.2% annually from 2015.²

U.S. retail electricity prices have increased approximately 20% since 2006. This is due chiefly to investments in the nation's electric distribution grid, which have risen by 400% since 1980, reaching \$27 billion in 2010, according to a Deutsche Bank report based on U.S. Energy Information Administration data.³



Unpredictable electric utility rates will remain common for commercial and industrial users, especially in New York and the Midwestern states.

¹ U.S. DOE, Energy Information Administration. "Electric Power Monthly"

² U.S. Energy Information Administration Annual Energy Outlook 2014 Early Release Overview

³ Bloomberg News



Unforeseen Weather Events Likely to Affect Future Electricity Rates

In the winter of 2014, many electricity customers throughout the Northeast and the Midwest saw ample increases in their electricity costs. For example, New York State electricity prices surged by 50% or more in January 2014 due to unexpectedly cold weather during this period.⁴

According to a weather study by Business Forward, a business policy group, major weather incidents in the U.S. (causing \$1 million or more in damage) have been increasing substantially over the past 30 years: From 20 events during the 1980s, 47 in the 1990s, 48 in the 2000s, but now 36 since just 2010.

Clearly, owners and executives of commercial and institutional operations need solutions to mitigate the risks of unstable electricity rates. Distributed power generation options such as solar electricity and combined heat-and-power (CHP) can insulate companies from these unpredictable increases in electricity costs for decades during the long service lifetimes of these systems.

Expansion Can Trigger Substantially Higher Electric Costs

Business and institutional leaders face additional challenges of potentially higher electric rates when making expansion decisions. For example, operators in certain regions who have previously negotiated lower electricity rate agreements with their local utility may face termination of these agreements when they decide to expand their facility capacity. When this happens, these operators face substantially higher rates.



DISPELLING COMMON MYTHS ABOUT SOLAR

MYTH #1:

Solar is Inefficient and Economically Impractical

There have been substantial generating efficiency improvements in solar panel technology over the past 10 years: Today, total solar installation costs are now just 25% of what they were in 2007.

As a result, electricity costs for a well-implemented solar implementation can often achieve parity with, or be even lower than, local electric utility rates (“grid parity”), even without the substantial financial incentives now offered at federal and state levels.

MYTH #2:

Solar Only Works Well in Very Sunny Areas like the Southwest

Solar energy generation is now not only a strong power generation option throughout most of the continental United States, but is a viable option for less-sunny areas north of the Sunbelt states, such as Ohio, the Midwest, New York State, and the Northeast. In fact, these areas can actually derive a great benefit from solar generation, since solar installations can be optimized to generate power during the winter months of the lowest sunlight.

During partly cloudy winter days, solar panels can generate ample amounts of power (still operating at 90% efficiency), and actually operate more efficiently on sunny, colder days than during the sustained high temperatures found in Southwestern states, where added heat tends to reduce overall solar panel power output.

This is one reason why Germany, a country with just one-half the solar resource potential of the U.S., is a major industrial generator of solar energy. There are now more solar electric power installations in Germany than anywhere in the world today.

MYTH #3:

If We Wait, Solar Technology Will Only Become Even Less Expensive

With total installation costs of solar power generation now comparable to, or less than, local electric utility costs, solar power generation is well within financial reach for most companies. Increases in solar generation efficiency are expected to improve at only a modest and steady level in the future.

Dispelling Common Myths About Solar

CONTINUED

An experienced solar implementation partner will carefully evaluate, test, and select the most efficient components of a solar installation, from solar panels to inverters, controllers, and other major components, to ensure optimal performance and durability of the solar power system over the long term.

The essential fact is that if a solar installation now makes economic sense, it will still be economically viable in five years, 10 years, and for its 25-plus year operating lifetime.

Additionally, the federal tax credit (around 30%) and state incentives, such as the New York State Energy Research and Development Authority (NYSERDA) NY-Sun program, offer generous grants that reduce approximately 50% of the total capital cost of solar installations. However, these incentives will not continue much longer: The federal tax credit is slated to be reduced to 10% after December 31, 2016, and some state grants are available on a first-come, first-served basis and decline in value as more incentives are granted. A company considering solar will gain an immediate and

substantial financial advantage by moving ahead with their solar implementation without delay.

Also, companies delaying solar installations with the hope that their costs will be lower in the future must weigh the economic tradeoffs of that against the very real possibility of higher electric rates, which are a near certainty for most of the U.S.

MYTH #4:

We Need Batteries to Store Solar Energy

Most commercial solar implementations are “grid tie” systems, which means they are connected directly to a company’s local electric utility grid. When electricity is needed beyond the generating capacity of the solar installation, the facility draws electricity from the utility. Likewise, any excess power generated by the solar installation is fed back to the utility, which credits the company for this excess generated power.

Grid-tie solar systems require no battery storage, which eliminates the added cost and maintenance of batteries.

MYTH #5:

Solar Installations Require Ongoing Maintenance and Repair

Solar panels are sealed and built to last for decades, requiring no maintenance other than periodic cleaning. Between cleanings, rain will remove much of the accumulated dust which collects on solar panels, and many systems have features to detect if larger obstructions, such as leaves or tree branches, fall onto these panels.

Nominal future replacement costs for other components in solar power generation systems, such as inverters, controllers other components, are often factored into the initial system cost at the time of installation.

COMMERCIAL SOLAR INTEGRATION: THE BENEFITS

Users Report Average Rate Electric Reductions of 20% or More

Solar industry sources report that owners and operators of commercial and institutional facilities who have implemented solar installations experience, on average, a 20% savings in their electricity costs upon implementation.

With a right-sized implementation and a well-engineered interconnection to the local electric utility grid, the cost of commercial solar is often less than the cost of utility-generated power, even without the financial incentives offered by federal, state, and local programs.

Stable Electricity Costs for 25 Years or More

In addition to cost savings, solar power provides steady, predictable year-long electricity output at a fixed cost that can be accurately budgeted every year, without the

risk of price volatility. Because of this predictability, solar-generated electrical power minimizes the impact of future increases in electricity prices for the lifetime of the solar generation system, usually 25 years or longer.

Commercial Solar Installations Stabilize Electric Usage, Keeping Users in Lower Utility Rate Schedules

In addition to cost savings, owners find that adding solar power generation to their overall energy expenditures helps them stabilize their costs by reducing expensive peaks in electricity usage with their local utility. This peak usage reduction helps to prevent a company's or institution's electric usage from rising into higher utility rate schedules, and keeps their overall kilowatt/hour billing rates as low as possible.

**Commercial Solar
Users Can Achieve
Grid Parity or
Better, Compared
to Costs from
Their Local Utility**



Commercial Solar Integration: The Benefits

CONTINUED



Power Purchase Agreement (PPA) Option Helps Owners Lock In Low, Guaranteed Electric Rates with No Out-of-Pocket Costs

Innovative financing programs for commercial solar installations give executives the assurance of long and predictable forecasting options when budgeting for their operation's future electricity costs.

For example, some leading solar contractors offer a Power Purchase Agreement (PPA), where the entire solar power system is installed with no out-of-pocket costs to the company or institution using the system. Instead, the user agrees to pay stable electric rates for solar-generated power for 25 years (the life of a solar implementation), at electric rates which are lower than those of their local utility, to the third-party owner of the system, who pays for its entire installation cost and bears all the risk of operating the system.

With or without the PPA option, companies and institutions can take advantage of numerous other financing options, all of which provide a greater degree of stability and predictability when managing future electric costs.

ANSWERS TO FINANCIAL QUESTIONS ABOUT COMMERCIAL SOLAR IMPLEMENTATIONS

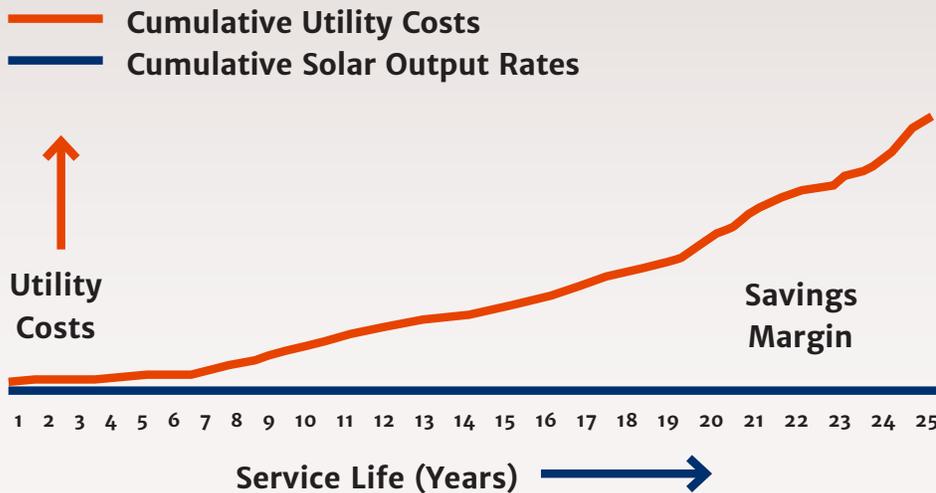
Here are basic answers for owners and financial executives considering solar implementations for their building, plant, warehouse, or campus:

HOW MUCH CAN I EXPECT TO SAVE ON OUR ELECTRIC UTILITY COSTS?

The level of savings available from a solar implementation will vary depending on facility size, power requirements, current electricity costs, location, and other factors. As a general guideline, on-site solar implementations can be configured to save most commercial users at least 20-30% on their present-day electric costs.

Of course, these are general estimates, and the first step in determining your organization's specific savings from a solar implementation is to conduct a thorough on-site evaluation. This begins with an assessment of your prior electric utility costs and an initial evaluation of your location and facility. From this basis, an experienced solar implementation firm can provide an accurate estimate of your projected savings on a solar implementation.

How Much Can We Save?



Over the 25-year lifetime of a solar implementation, commercial companies and institutions can save on average 25% of their electric costs. Over time, and after initial payback period, locked-in solar electricity costs mean substantial savings compared to local utility costs, which are likely to increase every year due to inflation, rate hikes, and weather events.

Answers to Financial Questions About Commercial Solar Implementations

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WHAT FACTORS DETERMINE IF WE CAN BE SUCCESSFUL WITH SOLAR?

While many factors influence the success rates of commercial solar, two considerations in particular are key: Technical and Utility.

Technical considerations include the characteristics of the physical facility and grounds, with solar success dependent on the availability and pitch of roof or land space for mounting a solar panel array, and access to a tie-in to existing metering .

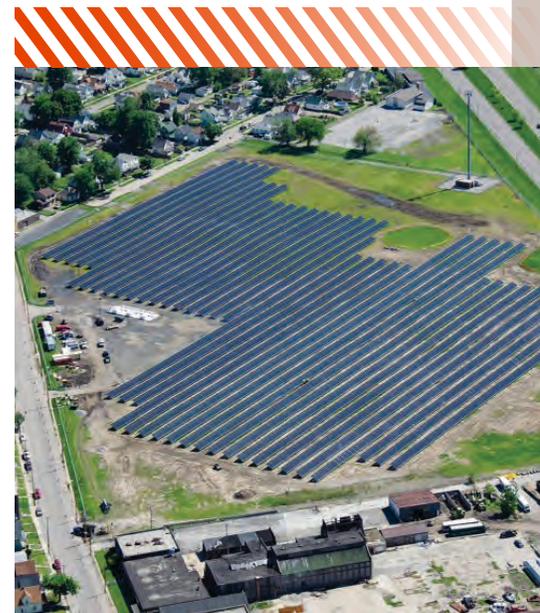
Utility considerations include electrical consumption, which is typically measured in kilowatt hours (kWh) per year.

HOW MUCH POWER CAN I EXPECT TO GENERATE?

Commercial businesses and institutions typically generate between 20% to 30% of their total electric usage from a solar installation, although many have generated a much higher percentage than that.

Using a ‘remote net meter,’ it is possible for some users to generate over 100% of their electricity from solar, by selling excess power during high input times (such as seasonal summer and winter periods) back to their local utility, and draw power from the utility only as needed. Remote net metering is popular in some regions, encouraging low cost sites to be used for arrays. For example, over 80% of awarded projects in the last round of funding from the New York State Energy Research and Development Authority (NYSERDA) were from remote net metering.

Solar installations are optimized to generate maximum economic solar power for a specific site location, based on that site’s climate, solar activity throughout the year, mounting options (rooftop or ground mount), and several other factors. This approach ensures that a solar implementation will generate maximum available solar power even during periods of lower sunlight. Other solar system design features, such as optimized power distribution methods, also improve the efficiency of solar power systems.



Answers to Financial Questions About Commercial Solar Implementations

CONTINUED

With today's substantially lower solar panel costs, many well-designed and implemented solar installations can generate electric power at a cost which is equal to, or lower than, power generated by the site's local electric utility.

But the addition of federal and state financial incentives and innovative funding options will certainly enhance the economic advantage.

Key State and Federal Incentives are Now Available

Depending on your state, grants or other incentives may be available to cover a portion of the total capital outlay for a solar implementation. Some incentives are available on a first-come, first-served basis.

An experienced solar implementation partner can help you identify incentive opportunities and take care of the application paperwork process, securing all the grants, financing, deal structure, and tax filings.

SOLAR INVESTMENT TAX CREDIT

The federal solar Investment Tax Credit (ITC) provides a 30% tax credit on the cost of a commercial solar installation. According to the Solar Energy Industries Association, the ITC has helped the number of annual solar power installations grow by 1,600% since its inception in 2006. This 30% tax credit is available through December 31, 2019. The ITC then steps down to 26 percent in 2020 and 22 percent in 2021. This fact, combined with the dramatic decrease in the cost of solar installations, provides a major incentive to consider solar implementation before this deadline.

Combining federal and state incentives provides substantial cost savings on commercial solar power implementations. In some cases, this can reduce the total cost of a solar installation by up to 50%.

THE SOLAR FUNDING PICTURE: THREE OPTIONS

In addition to the substantial federal and state incentives that reduce the cost of solar implementations, new funding options provide flexible and affordable financing for commercial solar installations.

1. Power Purchase Agreement (PPA)

Under a Power Purchase Agreement (PPA), a solar installation is financed by a third-party investor group, who owns the installation and sells power to the private company. With the PPA option, businesses and institutions gain the benefit of a solar implementation without bearing any out-of-pocket costs, in exchange for agreeing to buy solar power under the PPA for the lifetime of the agreement, usually 25 years. A PPA also transfers all maintenance costs and other risks away from the organization using the system to the third-party owner of the solar installation. The third-party owner then assumes the risk of providing the solar power generated from

the system to the user, who only pays for the actual electricity they receive and use.

Solar electric rates in a PPA are set at levels which are lower than electric utility rates, offering immediate savings with no capital outlay, and stable, predictable energy rates for the lifetime of the solar implementation.

Under the PPA option, businesses and institutions may also receive tax and depreciation benefits, which are passed through by the solar implementation partner direct to the user.

2. Leasing

Commercial organizations also have the option of financing their solar installation under either a capital or operating lease option.

Under a capital lease, the user's lease payments are applied to the total cost of the solar installation. At the payoff of the lease period, the user then owns the solar installation outright.

With an operating lease, users make lease payments over a seven-to-10 year term, with a residual payment at the end of the lease term. The operating lease option enables an organization to keep the cost of its solar implementation off its balance sheet, and still receive the tax and depreciation benefits.

3. Self-Funding

Organizations that finance their own solar installation can often receive the greatest savings, payback, and ROI benefits.

Self-financing offers businesses and institutions the greatest financial benefit from capital ownership and tax depreciation deductions. These benefits are further enhanced when combined with the 30% federal tax credit for solar installations, and various state and local funding incentives available.

THE FIRST STEP:

Your solar implementation partner can perform a detailed assessment of your current electricity costs to determine your potential.



SOLAR RULES OF THUMB: KEY FINANCIAL GUIDES FOR COMMERCIAL SOLAR IMPLEMENTATION

75%
Reduction in
Solar Installation
Cost

Substantial declines in manufacturing costs (75% since 2009) have now made solar a cost-effective option for many businesses and institutions.

+25%
Average electric
rate savings-
commercial

Many commercial customers are now saving between 20-30% in their electric utility costs with their own solar power implementation.

#1
Solar to be the
world's largest
source of electric
power by 2050

Solar power generation is projected to become the world's largest source of electric power by 2050, according to the International Energy Agency.

25 YRS
Rated Service
Life for Commercial
Installations

A commercial solar implementation will generate steady power throughout its rated lifetime of at least 25 years, producing electricity at the same cost for its entire service life, to insulate your organization from increases and fluctuations in electric utility costs.

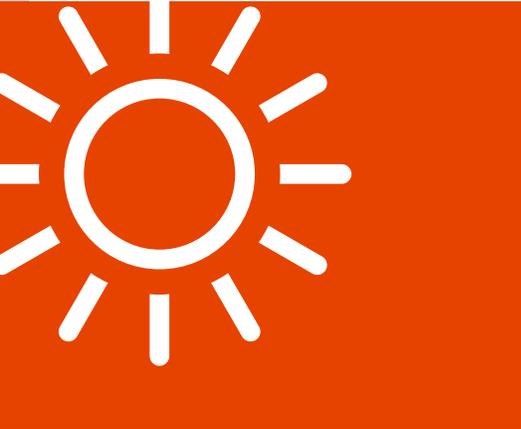
80%
of Miami's Sunlight
Available Everywhere
Else in the U.S.

Every state in the continental U.S., including the Midwestern states, still receives no less than 80% of the sunlight of Miami, FL, making solar a realistic option for these areas and anywhere else in the continental U.S.

**= GRID
PARITY**
Solar Costs Now
Equal to Utility
Costs

In most cases (and often without any extra financial incentives) costs for solar-generated power have now achieved "grid parity," meaning they are now equal to or less than the cost of utility generated power.

YOUR FIRM'S PATHWAY TO SOLAR IMPLEMENTATION: HOW TO PUT SOLAR TO WORK FOR YOUR BUSINESS OR INSTITUTION



Will your organization be able to reap the significant savings and price stability benefits from a solar installation? Here are the typical steps involved in the decision to move forward with a solar power installation:

1. INITIAL FINANCIAL SAVINGS ANALYSIS:

As a first step, a solar implementation partner will evaluate your historical electric utility costs to develop an initial assessment of the potential savings and payback performance from your facility's solar implementation;

2. SITE ASSESSMENT AND FINANCIAL REPORT:

Next, the solar implementation partner will evaluate your facility and its site to determine the best location for your solar installation (rooftop or ground-mount), and estimate its size, configuration, and cost. At this stage the contractor will also provide a cash flow savings analysis, payback schedule, and 10-to-15 year ROI analysis on the solar installation;

3. DETAILED DESIGN STAGE:

The next stage involves more in-depth work for the solar contractor to produce a detailed design proposal to serve as the planning and project implementation guide for your specific solar implementation;

4. INSTALLATION:

For build-out, the contractor will then order components and parts, confirm the construction schedule, and then begin the installation process, which usually takes 30-60 days.



SELECTING THE RIGHT SOLAR POWER IMPLEMENTATION PARTNER: QUESTIONS TO ASK

Selecting an implementation partner for a solar installation requires careful consideration of this vendor's prior experience and level of expertise in implementing successful solar installations.

When evaluating a potential solar power system designer, installer, or contractor, here are some critical questions to ask:

How have you tested and evaluated the solar panels and other key components you intend to use in our solar installation?

There are a wide variety of solar panels and other major components available from many different vendors, and each of these vary in their performance

and efficiency characteristics. An experienced and knowledgeable solar contractor has performed careful due diligence to evaluate the range of available solar panel options to select only the best, most efficient solar panel model and type for use for each installation, and also performs the same careful evaluation of other key components, such as inverters and control systems.

How have you integrated the key components of the solar implementation for maximum power generation and efficiency?

Solar panels may be the most recognizable part of a solar installation, but they are part of a system of components which must all work together over the life of the installation to ensure optimal power efficiency.

Your solar contractor should have an ongoing program to evaluate, test, and configure the key components of the systems they install, such as inverters and control

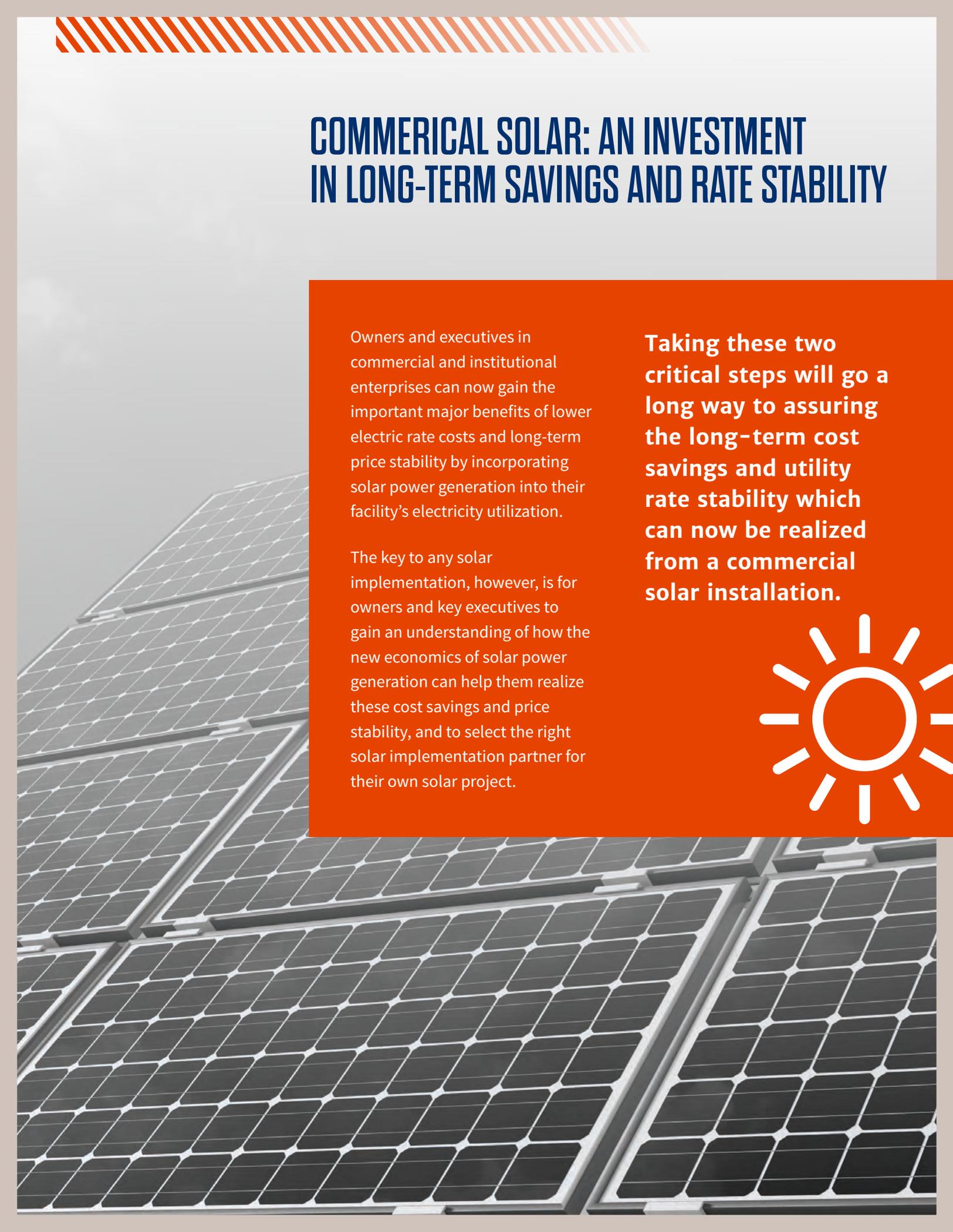
systems. For example, inverters—which convert solar-generated DC power to usable AC power—can be networked in a distributed architecture to act as a single unit for highly efficient operation. Using this distributed architecture, solar power can be selectively routed to a single inverter during cloudy days, maximizing energy output. Developing these types of complex solar energy-handling systems requires deep knowledge of how each of these components can be networked together to achieve this optimal efficiency.

What is your experience in handling the building code and local zoning aspects of a solar installation?

An experienced solar contractor should also be an experienced builder, having solid background in planning and implementing installations that conform to your area's local building codes and zoning regulations. An experienced solar contractor will assess every aspect of code and zoning compliance in advance to avoid delays and cost overruns on your solar installation project.



COMMERCIAL SOLAR: AN INVESTMENT IN LONG-TERM SAVINGS AND RATE STABILITY



Owners and executives in commercial and institutional enterprises can now gain the important major benefits of lower electric rate costs and long-term price stability by incorporating solar power generation into their facility's electricity utilization.

The key to any solar implementation, however, is for owners and key executives to gain an understanding of how the new economics of solar power generation can help them realize these cost savings and price stability, and to select the right solar implementation partner for their own solar project.

Taking these two critical steps will go a long way to assuring the long-term cost savings and utility rate stability which can now be realized from a commercial solar installation.



ABOUT GEM ENERGY:

A multi-faceted resource for power generation and conservation, GEM Energy is a trusted adviser to leading organizations in the institutional, industrial, governmental and commercial sectors. While what we do is technically complex, it's simple to explain: We optimize the efficiency of your facility for reduced operating costs. Our expertise includes combined heat and power (CHP) system design and integration using Capstone micro turbine technology, and comprehensive solar development from funding through array installation.

A member of the Rudolph Libbe Group, GEM Energy is ranked 15th among Solar Power World's Top Solar Developers of 2016. GEM Energy is the only Ohio-based solar developer to make the list and is 70th among the Top 500 North American Solar Contractors

The company has installed a total 33.5 megawatts, with 18.5 megawatts installed in 2015.



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