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TECHNICAL ASSISTANCE

Homeowners Guide to Leasing a Solar Electric System

This guide provides an introduction to solar leases for homeowners considering installing a solar electric system on their home.

Introduction

Solar electric systems, also known as photovoltaic (PV) systems, allow owners to generate a portion of their own electricity. Homeowners have several options in acquiring PV systems, and this fact sheet examines leasing a system. Analogous to leasing a car, solar leases provide a mechanism for the homeowner to obtain electricity generated from the sun without owning the PV hardware.

Solar leases are becoming more common. In 2012, more than 50% of residential solar electric system installations in most major markets were owned by third parties. In these agreements, homeowners enter into a contract with a lessor (the owner) of a PV system. The homeowners make payments to the lessor in exchange for use of the PV system for a specific period of time, typically 15-20 years. The PV system generates electricity that offsets the homeowner's energy use. In areas with net metering, excess electricity generated by the PV system may also be credited to the homeowner's electric bill. The lessor is responsible for the operation and maintenance (O&M) of the system and receives any applicable federal, state, and local tax benefits and incentives, including the Federal Investment Tax Credit of 30% of the eligible cost basis. Typically, the lessor also owns any renewable energy certificates (RECs) associated with the system. RECs certify that the electricity was generated with renewable energy, and the certificates can be sold or traded.

Leases offer many benefits to the homeowner. The traditional monthly payment lease requires little to no upfront costs. The lessor provides all O&M services associated with the PV system. In some cases, the homeowner's monthly utility bill savings can exceed the solar lease payments. Because monthly lease payments are either fixed or escalate at a known rate during the term of the lease, the lease also provides price certainty for the homeowner for a portion of the electric bill over a long-term contract. Leases may also allow homeowners to benefit indirectly from federal tax incentives, for which homeowners are otherwise ineligible. Solar leasing companies can access these incentives and pass along the savings via reduced lease payments.

Photo from AstroPower, NREL 12342

Types of leases

Solar leases are similar to other types of consumer equipment leases, such as auto leases. The lessee pays monthly installments over the term of the lease. In some leases, the monthly installments may include an annual rate increase, known as an escalator. In addition to the typical monthly installment lease, there are also pre-paid and partial pre-pay leases. If a homeowner is willing to make an initial payment, this will decrease the monthly payment amount. However, there can be some consumer concern with fully pre-paid leases.

The benefits of leases for solar electric equipment include lower upfront costs and no operation and maintenance responsibilities.

When the homeowner makes a single payment upfront with no further monthly obligations, the solar provider has received all of its money at the outset of the transaction. Therefore, a concern is that the installer will have less incentive to provide






proactive O&M services to maintain the system. However, this risk is mitigated if the solar lease contains a performance guarantee. A performance guarantee is a commitment by the lessor to compensate the homeowner if the PV system fails to produce a certain minimum level of electricity. This compensation usually takes the form of a per-kilowatt-hour payment for every kilowatt-hour not produced below the guaranteed amount. Such guarantees can help ensure that the solar provider properly maintains the system.

The following terms are among those the homeowner will likely hear referenced by the installer.

Azimuth – An angular measurement, usually in reference to true north. In the northern hemisphere, south-facing PV systems generate maximum energy production, thus the ideal azimuth would be 180 degrees.

Inverter – Converts electricity from direct current (DC) to alternating current (AC).

Interconnection – The process of connecting a PV system to the electric grid.

Kilowatt (kW) – Unit of power equivalent to 1000 watts. Sizes of PV systems are expressed in kilowatts, e.g., a 10-kW system.

Kilowatt-Hours (kWh) – Unit of energy consumption. Homeowners are billed on a kilowatt-hour basis.

North American Board of Certified Energy Practitioners (NABCEP) Certified – A professional solar installer certification resulting from the completion of a rigorous examination process.

Net Metering – The regulation allowing the customer to receive credit for excess electricity not used by the home and returned to the utility grid. Net metering rules vary widely from state to state.

Operations & Maintenance (O&M) – O&M refers to the routine maintenance performed on the PV system, such as inspections and occasional cleaning. PV systems often require a new inverter after 10-15 years.

Performance Guarantee – Some leases may contain a clause that states the lessee will be compensated if the PV system does not meet a minimum kilowatt-hour production level in a given year.

Power Purchase Agreement (PPA) – A contract between a seller and buyer of electricity.

PVWatts – A simple performance calculator for grid-connected PV systems created by the National Renewable Energy Laboratory.

Renewable Energy Certificate (REC) – A REC reflects the environmental attributes of producing clean energy. RECs are priced on a megawatt-hour (MWh) basis.

Tilt Angle – The angle at which a PV array is set facing the sun relative to the horizontal position.

UL-IBEW Certification – As of October 1, 2012 the Underwriters' Laboratories (UL), announced an agreement to begin offering UL's Photovoltaic (PV) Installer Certification to members of the International Brotherhood of Electrical Workers (IBEW) union and the National Electrical Contractors Association (NECA). The collaboration will provide members access to a nationally recognized UL credential to improve market access to licensed, qualified electricians for safer PV installations.

Choosing a solar leasing provider

There are many factors to consider when selecting a solar leasing provider. Because this contract is a long-term commitment, it is important to read the lease proposal carefully to fully understand all requirements and responsibilities of the lease and to feel comfortable with the provider. Here are some questions to ask when choosing a provider:

- How long has the solar provider been in business and how many leases has it signed? Check the provider's standing with the Better Business Bureau or consumer protection agencies.
- Will a site visit be performed prior to the lease signing? With today's technology, solar providers can often evaluate your home's solar potential using tools such as GPS mapping, without performing a site visit. However, a site visit may be required to evaluate potential shading of the PV system, the existing electrical system, the need for roof reinforcements, or other site-specific considerations that may affect the overall cost of your lease.
- Who will be repairing the system and performing O&M? Are the company and its employees NABCEP certified?
- Ask family and friends about their experiences with different solar providers. Ask for and follow up on references. Ask questions regarding the timeliness of the installation process and the quality of customer service received pre- and post-installation. Is the system performing as expected? Have questions and issues been addressed in a timely manner?
- Obtain at least three bids to compare the various aspects of the proposals, including costs, production guarantees, warrantees, availability of monitoring (and cost of this monitoring, if any), additional add-on costs for such things as trenching, electricity panel upgrades, roof type, roof height, etc. Be sure both components are covered by warranties—20 to 25 years for the solar PV panels, and 10 years for the inverter.

Evaluating lease costs

Leases provide savings for the homeowner when the total cost of the lease is lower than what the homeowner would have paid to the utility for an equivalent amount of electricity over the lease term. This means homeowners must understand the full cost of the lease as well as their expected utility costs in the future.

1. ***Break down the full cost of the lease.*** This includes any upfront payments, as well as monthly payments. Some leases include an annual escalator in monthly payments. Keep in mind that one lease proposal may differ from proposals given to other nearby homeowners. Various factors affect lease pricing and terms, including the homeowner's credit rating, roof condition, roof orientation, electrical infrastructure onsite, local incentives, etc. Homeowners may also receive a discount by agreeing to make automatic payments from their checking accounts.

An Example of Solar Lease Costs[1]

System size	4 kW
System price bid	$16,000
Federal tax credit return to solar lessor	$4,800
Monthly solar lease payments by homeowner	$88 [2]
Homeowner's historic monthly electric bill	$147
Homeowner's monthly savings	$59
Lease term	15 years
What happens at end of solar lease?	Homeowner can purchase the PV system at a depreciated value or they can have it removed.

[1] Data representative as of January 2014
[2] This example assumes that the 4-kW system produces all electric power used by the homeowner

2. ***Confirm whether any upgrades are required.*** Depending on the age and condition of the homeowner's roof and electrical infrastructure, upgrades may be required to accommodate the PV system. These costs may be included in the overall lease cost.

3. ***Understand the estimated production of the PV system.*** The solar provider will provide an estimated production for the system and often times, a performance guarantee. Homeowners can verify these estimates themselves using simple production calculators, such as the PVWatts 3 Calculator. Often the system guarantee is based on PVWatts.

4. ***Understand your current electric rates.*** Electric rate tariffs can be complicated. It is important to understand the cost of energy that will be offset by the PV system. It may not be as simple as dividing the total electric bill by the kilowatt-hours used in a given month. Rates may change monthly, seasonally, and/or depending on the time of use or how much is used. Some costs included in your monthly bill may be fixed and may not be offset by the PV system. Many utilities provide information on their websites that helps decipher all charges applied to a homeowner's electric bill. Check with your electricity provider for more information regarding your energy rates.

5. ***Evaluate assumptions regarding future rate increases.*** The estimated energy savings quoted in your lease proposal may depend in part on expected future utility rate increases. Residential electricity rates in the United States have increased an average of 3% annually over the past 10 years. In recent years, rates have been flat in many parts of the country. The increases vary greatly by location and utility provider. Future utility rates are difficult to predict because they are influenced by many different factors. Historical increases may not be an accurate predictor of future energy rate increases. The U.S. Energy Information Administration provides forecasts of retail electric rates for the next 1-2 years by region in its Short Term Energy Outlook.

6. ***Evaluate any additional assumptions the solar installer is making in the proposal.*** For example, a solar installer may include an assumption about an increase in property values as a result of installing solar as a component of the total return on the investment. In addition, consider any potential impacts to your homeowners' insurance rates or property taxes to fully understand all of the costs and benefits of installing a PV system.

7. ***Compare the lease to other financing options.***[1] Solar leases are just one of a number of financing options available to homeowners. Once you have received your lease proposal, it may make sense to compare it to other financing options for your PV system, such as a direct system purchase from a local installer, or other options such as participating in a community solar program. If a prepaid lease is under consideration, evaluate the opportunity cost of the prepayment. Would this prepayment be better spent on another project? Online tools exist to allow homeowners to learn more about solar and compare available options. Homeowners may also enter into a power purchase agreement (PPA) with a PV system owner. Similar to leasing arrangements, with a PPA, the PV system is owned by a third party. In these agreements, homeowners do not lease the PV equipment but instead purchase the output of the PV system on a per-kilowatt-hour basis, rather than paying a fixed monthly fee. Under a PPA, the homeowner only pays for the energy produced by the system.

Key lease terms and conditions

Homeowners may want to clarify the following points with a solar leasing company before signing a solar lease.

- What's included in the typical lease package? Your solar provider may require you to sign multiple documents, including the lease agreement, documents related to the sale of renewable energy certificates, net metering, and interconnection agreements, etc.
- What happens if I move, sell my house, or need to terminate the lease? Leases typically allow for a few options in the event you decide to sell your home. You may transfer the lease to the new buyer. The new buyer will need to meet the credit requirements and be approved by the solar provider. Another option will be to pay off the lease and add the value of the PV system to the home's asking price. Some providers may also allow you to relocate the system to your new home as long as you pay the cost of the move.
- What happens if I need to replace the roof? In the event that a roof replacement is required during the term of the lease, the homeowner may be required to pay the solar provider for removal, storage, and reinstallation of the PV system. Depending on the age and condition of the roof, it may be wise to replace the roof prior to the installation of a PV system.

[1] For more information on financing options, visit: http://www1.eere.energy.gov/solar/pdfs/48969.pdf

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- What happens at the end of the lease term? Leases typically offer three different options at the end of the lease term. Homeowners may 1) renew the lease, 2) request the PV system be removed, or 3) purchase the system at fair market value. Fair market value is a price determined by a third-party appraiser at the time the system is sold.
- Who is responsible for O&M? Who do I contact if there is a problem with the PV system? Typically O&M is included in the lease payments. O&M may be provided by your solar provider or a third party. The lease documentation should be clear regarding who to notify if there is a problem with the PV system. The homeowner may be required to notify the solar provider within 24-48 hours of detecting an issue.
- What are the insurance requirements? As the system owner, the lessor is responsible for insuring the PV system. However, the homeowner may also be required to have a minimum amount of insurance coverage on the house and/or add the lessor as an additional insured party.
- Is there a performance guarantee? How is it established and what happens if the system does not perform as expected? The performance guarantee should state how the homeowner will be compensated if the system does not produce as much energy as expected. Be aware that solar modules degrade (i.e., produce less electricity) over time. Typical degradation rates are assumed to be 0.5% annually.
- What happens if the provider goes out of business? As with any long-term transaction, there is a risk that your provider will go out of business. It is possible that the original lessor will sell your lease to a third party investor (not unlike when a home mortgage gets sold by one company to another). In that case, the investor will still likely have a vested interest in the operation of the PV system and would likely seek out a new O&M provider to continue to service the leases. Because solar leases are still relatively new in the marketplace, there are a few instances where providers have gone out of business, but to date those instances appear to be isolated cases involving small-scale providers.
- Can I monitor the production of the PV system? Many solar providers offer homeowners access to an online monitoring system that tracks production of the home's PV system. This may be free or may involve an ongoing fee.

NREL's solar deployment and market transformation assist the market by applying our expertise and knowledge to address market barriers to solar technology development.

NREL's mission is to be the leader in technology innovation and to advance renewable energy efforts around the world. Let NREL help propel your organization toward a more sustainable energy future.

For more information about NREL's range of deployment and market transformation activities, visit our website at *www.nrel.gov/tech_deployment*.

Additional Resources:

Solar Leasing for Residential Photovoltaic Systems http://www.nrel.gov/docs/fy09osti/43572.pdf

Estimate energy production from PV systems http://www.nrel.gov/rredc/pvwatts/grid.html.

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NREL/BR-7A40-60972 • July 2014

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