

Solar PV Electric Systems; is there a good fit for me?

As you travel about the state of Pennsylvania you have likely observed a growing number of Photo Voltaic (PV) electric solar arrays on homes, farms and businesses in the past 5 years or so. Similarly, if your travels have taken you to neighboring states you observed the same trend elsewhere. You may have wondered what caused this upswing in interest in renewable energy generation and if you could put a system to work for you. Well if you own a rooftop or have a patch of ground to spare the answer to the last question is an emphatic Yes!

Why the growing recent interest?

But first let's consider what caused the growing interest in PV electric projects on homes and businesses. In Pennsylvania and in neighboring states the state governments have passed laws that require electric distribution utilities and unregulated competitive generation providers who sell electricity to consumers, to provide a percentage of the electricity they sell from renewable and sustainable energy (alternative) generation sources.

What was the "game changer"?

To facilitate this process and provide a level playing field for anyone interested in producing and selling alternative energy the same law established a tradable commodity called an Alternative Energy Credit that represents the value of the attributes of clean free energy sources compared to electricity produced from fossil fuel generation. Because of this, a person or business can generate and use solar electricity, and on top of that they can sell the "credit" that comes from generating renewable electricity.

Systems that qualify to participate under the law must meet operational, safety and a few other requirements. That may sound very complicated but qualified installers can design and install systems and take care of the details as part of the package. Once your system is installed and operational the electricity produced is treated like conventional electricity on the grid (within certain limits) and for each 1,000 kWh produced the system owner earns one alternative energy credit (known generically as a renewable energy credit or REC) to trade for cash and help pay off the system investment.

Solar PV system components have made significant technological advances in just the past 5 to 10 years which has

greatly improved their reliability and reduced their cost. Also, because the two primary components (the solar panels and the current/voltage inverters) are built in a wide variety of sizes, the systems are scalable and can be designed and built to meet the needs and the budget for most system owners. So if your budget limits the size of system you can install today, the system can easily be expanded in the future as needs change or as finances permit. Systems on homes can range in size from less than 1,000 watts (1 kW) to well in excess of 50,000 watts (50 kW) depending on the needs and budget of the individual system owner.

Roof or ground mount?

Depending on the site conditions systems can be located on roofs that are generally un-shaded, and that provide good southerly exposure. When considering roof mount installations a thorough analysis by a qualified specialist must be made to determine the remaining life of the roofing system and the ability of the support structure to bear the additional weight that a system adds to the overall roofing system. Before installing a roof mount system any shortcomings found with the roofing system or the roof structure must be corrected.



Roof Mounted PV Panels use specially designed hardware to attach to the roof without compromising water tightness.

If conditions preclude the use of a roof mount system, or if there is a preference not to do a roof mount system, ground mount arrays are a good alternative, especially when there is space available with southerly exposure and underutilized ground.

Pennsylvania's net metering rules also permit virtual metering applications in which PV systems installed within a 2 mile radius of related electric distribution accounts can share the produced electricity. This provision can be beneficial to farm operations that may have multiple metering points in proximity to a PV system.

What is the right size system for my needs?

The trend over the past five years has been toward the installation of larger systems for both homes and businesses. This can be attributed to the increase in experience with system operations that have demonstrated Solar PV's high degree of reliability as well as its financial benefits. But a rapid decrease in the cost of system has also lead to an increase in the average size of new systems. One reasonable approach is to aim to replace 50% to 75% of the annual electric usage on an account. A typical home or small business in Pennsylvania that uses on average 1,000 kWh per month - you can determine your annual usage by adding up the kWh consumption for the past twelve months or by contacting your electric distribution provider for that information.



A ground mounted solar PV array

In the case of homes using 1,000 kWh per month, a typical system in Pennsylvania with a capacity of 5,000 watts (5kW), optimally installed, will produce in the range of 5,500 to 6,500 kWh per year. This will offset about 50% of the annual usage and decrease the annual electric costs accordingly.

A system this size currently costs somewhere in the range of \$4.00 to \$6.00 per watt installed. Prices will vary depending on regional variability and the cost of permits and inspections, but these numbers should provide reasonable guidelines. So the 5,000 watt system in this example should cost in a range of \$20,000 to \$30,000 installed.

How do systems pay for themselves?

System owners who install before the year 2017 can automatically reduce the cost of the system by 30% by taking advantage of a federal tax credit that, as of this writing, is still in effect. System owners also can register their system in the state of Pennsylvania to participate in the Alternative Energy Portfolio Standards program (AEPS) and receive additional cash incentives.

Systems in the AEPS program qualify to sell a Renewable Energy Credit for each 1,000 kWh that their system produces. This may sound complicated but there are service providers, known as Aggregators who, for a fee, can make participation in this program a breeze.

Government incentives, the avoided purchase and sale of electricity, and the REC market all help to reduce the payback period of investments in PV Systems. System owners who take advantage of the Federal Tax rebate and get a good price for their Renewable Energy Credits can expect to have their investments paid back in less than 10 years. The REC price varies with supply and demand and has, to date, had little price certainty.

Permits & Inspections

Under all circumstances if you decide to install a system to offset the electrical usage in your home or business make sure the installer procures the necessary permits and has the work properly inspected and approved. Permitting requirements vary greatly across the state from being very restrictive and expensive to locales where there are few permits required. In jurisdictions with active zoning make sure to get a copy of the local limitations and restrictions before you sign a check to purchase equipment, or sign a contract.

At a minimum, all installations must pass a National Electric Code inspection before they are energized. The danger of fires and death or injury from electrical shock is too great to cut corners when it comes to any type of safety inspection. Your electrical distribution provider will require this inspection before allowing your system to sell electricity back to the grid.

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Visit the Penn State Extension renewable energy programs website: <http://energy.extension.psu.edu>

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