Solar Handout Packet

Palmetto Electric Cooperative, Inc.
One Cooperative Way
Hardeeville, SC 29927

Dear Palmetto Electric Cooperative, Inc. (PECI) member-consumer:

Thank you for requesting information about interconnecting a photovoltaic (PV) generator to the Palmetto Electric Cooperative system. To assist our member-consumers, we have developed a streamlined process for the safe, reliable, efficient, and cost-effective interconnection of small renewable energy systems.

Our mission is to protect the safety of cooperative personnel and member-consumers, maintain the integrity and reliability of the grid, and establish mechanisms to ensure rate equity for all member-consumers. Because PV systems can affect the safety and reliability of the distribution system, we have developed technical interconnection standards that address those safety and reliability impacts. These standards ensure that we can continue to provide you and all other member-consumers with safe and reliable electricity service. They are available at:
https://www.palmetto.coop/wp-content/uploads/2016/04/Interconnecting-Distributed-Resources-Less-Than-2-MVA-CES.pdf

We are ready to help you by providing information and answering questions. We want to give you the tools you need to make an informed decision about a PV system.

In this packet, you will find the following documents:

- Steps to a PV system, which will walk you through the various issues associated with a PV system.
- Questions you may want to ask PV installers before purchasing a PV system.
- Frequently asked questions (FAQs) and answers to these questions that member-consumers most often ask their cooperatives.

We look forward to working with you. If you have any questions, please don't hesitate to contact me at 843-208-5508 or bcasavant@palmetto.coop.

Yours sincerely,

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Capital Cost Recovery Resources

As interest in renewable energy grows, some cooperative member-consumers are considering the purchase of a PV system. If you are interested in installing a PV system to replace some of the electricity that your cooperative provides, talk with a cooperative representative about your plans. A "Consumer Guide to Solar for South Carolina Homeowners" can help you navigate the solar installation process: http://energy.sc.gov/howsolarworks

Before you decide to buy a PV system, however, you should examine the economics to determine whether such a system will lower your monthly electricity costs. The Energy Matters Web site—http://www.solar-estimate.org—can help you determine the annual operating cost of a PV system.

Ten Steps to a PV System

Is a PV system right for you? These 10 steps will help you to decide.

1. Determine how much electricity you use and what it costs, both annually and by the kilowatt-hour. Then find ways to make your home more efficient and reduce your energy use.

Start by calculating your average electricity bill. Then conduct an energy audit of your home to identify ways of using energy more efficiently and reducing energy use. Implementing energy efficiency opportunities will almost always speed up the rate of return on your PV investment and additionally may enhance the viability of a PV system project by giving you the lower capital expense associated with a smaller system that will satisfy the new lower energy load. This could lower your electricity bill significantly. The National Rural Electric Cooperative Association (NRECA) recently reviewed several Web sites that host online energy audits. The review identified one Web site—Home Energy Saver—as among the best: http://hes.lbl.gov

A home energy audit may be a good idea. It does not make sense to spend a significant amount of money on a PV system that will produce electricity to power inefficient lights, appliances, and electronics.

Another on-line resource tool available to all Touchstone Energy Cooperative members is http://www.touchstoneenergy.com/our-energy-expertise/renewable-energy/

2. Determine your solar resource.

The solar resource is the average amount of sunlight that reaches a given site. The greater the solar resource, the more electricity a PV system will generate.

A qualified PV installer can provide information on your solar resource. Alternatively, you can evaluate it using an online tool, such as PVWATTS Version 1 from the National Renewable Energy Laboratory, available at http://pvwatts.nrel.gov/

Several site conditions can influence PV performance—shade, roof condition, space required, orientation, and tilt. Shade is likely to have a greater impact on PV system performance than less-than-optimal PV module orientation and tilt (see below).

A qualified PV installer can use software tools to assess the degree of shading a proposed array will experience throughout the year and determine the best PV design.

3. Determine your site's suitability.

If your PV system is to be roof-mounted, the condition of the roof is important. The cost of repairs or a complete re-roofing will be substantially greater once the PV array is in place.

Another consideration is the space available for an array sized to meet your needs. In bright sunlight, a square foot of a PV module will produce approximately 15 watts of electricity. That's a helpful rule of thumb for estimating how much area you will need. A 1,000 watt (1 kW) PV system, for example, is likely to need 70–120 square feet of area, depending on the type of module used.

PV modules should be oriented geographically to maximize the amount of daily and seasonal solar energy. In general, the optimal orientation for a PV module in the northern hemisphere is true south. However, your modules can face up to 45° east or west of true south without significantly decreasing their performance. Orienting a system to face more to the west will benefit the utility. It does not help the homeowner, however, whose annual output will be lower. If the utility wants a strategic benefit from PV, it needs to compensate the homeowner for the value of the lost kilowatt-hours. Strategically designed solar programs may encourage siting to make a greater impact on the late-afternoon summer peak.

Most PV modules are mounted flat on the roof and so have the same tilt as the roof. The optimal tilt angle for maximizing annual energy production of PV modules is an angle equal to your latitude. Because most roofs are pitched at an angle less than the latitude, you and your installer will need to factor your roof angle into the performance calculations when sizing your system. Some roof-mounted systems can be adjusted for the sun's higher position in the sky in the summer and lower position in the winter.

Although most PV systems are roof-mounted, pole- and ground-mounting also are options. Both have more opportunities for incorporating tracking to maximize electricity production than do roof-mounted systems. A tracking device can increase the output by 25–40% over a stationary-mounted system. In addition, a pole-mounted system can be located far from shading and the array can be tilted and oriented in the best position. However, adjusting the tilt of a pole-mounted array for summer and winter sun may require at least two people.

Talk with a qualified PV installer about the best mounting option for your site.

4. Determine the size of the PV system.

Realistically, the size of your system is likely to be determined more by cost than by desired output. It makes sense, however, to estimate the amount of electricity that you want your PV system to produce. If cost is a constraint, the system could be installed in two phases.

Before determining the size of your PV system, it is advisable to adopt energy efficiency measures that will reduce your annual energy use and thus maximize the value of your PV system.

You can ask your PV installer to help determine the size of your system. You also can begin by calculating your electricity usage and the annual average peak solar hours at your site. A peak sun hour is the average amount of sunlight—summer and winter—available at your site. NREL publishes solar radiation resource maps that provide data on peak sun hours at http://www.nrel.gov/gis/solar.html

Divide your annual electricity usage (in kWh) by the number of peak sun hours to determine the wattage needed for your system.

DOE provides an estimate of the area needed for variously sized PV systems—including 1 kW, 2 kW, 4 kW, and 10 kW systems—for various module efficiency, available at http://energy.gov/energysaver/articles/installing-and-maintaining-home-solar-electric-system

5. Find out what incentives—rebates, tax credits, and loans—are available.

The Emergency Economic Stabilization Act of 2008 includes a residential solar investment tax credit provision. The provision extends the 30% investment tax credit (ITC) for residential solar property for eight years, through December 31, 2016. The provision also removes the cap on qualified solar electric property expenditures (previously $2,000) for a system placed in service after December 31, 2008.

The Database of State Incentives for Renewables & Efficiency (DSIRE) provides detailed information on each state's incentives that apply to renewable energy systems, including PV. These incentives can reduce the installed cost of a PV system significantly. The DSIRE database, available at http://www.dsireusa.org/, provides detailed information on renewable energy tax incentives, loans, grants, and rebates available in each state.

6. Determine the estimated installed cost of the system and calculate return on investment.

PV systems are rated in kilowatts of DC generating capacity (kWdc), and tend to range in size from less than 1 kW to 20 kW. The average cost of an installed residential PV system typically ranges from $3/watt to $5/watt, depending on the size of the system, the region of the country, and the size and maturity of the PV market in that region. An average 2 kW system is likely to cost between $8,000 and $16,000. As a rule of thumb, the larger the system, the lower the per watt cost.

If you are considering the purchase of a battery bank, the cost will be higher. For a pole- or ground-mounted PV system, installation costs will be greater. In addition, a tracking device on a pole-mounted system will boost the cost of your PV system. You can compare the cost-effectiveness of fixed mount and a single- or dual-axis tracking for your site at http://pvwatts.nrel.gov/

The payback for a PV system is the amount of time it takes for the system to pay for itself in energy savings. Depending on the level of government incentives, the payback period can range from fewer than 10 years to more than 20 years, depending on the cost of the system, the amount of electricity produced, and the retail price of electricity that you buy from your co-op.

You can calculate the simple payback of a PV system using the following formula:

Total of Life Cycle Costs (capital costs + finance costs + O&M costs - federal and state incentives) / Average Value of Energy Generated per Year (kWh generated * cost of power).

In addition, an online calculator is available at http://www.solar-estimate.org.

Note: The payback may be overestimated by using either the formula or the solar-estimate.org calculator if the system is dual-metered but not net metered.

7. Determine what zoning regulations apply to the installation of a PV system, if any, and what building and electrical permits are required. Talk with your neighbors about your plans.

Local zoning laws may restrict where you can place PV panels on your home. Check with your city, county, or local HOA to find out about any restrictions.

You will need to obtain a building permit to install a PV system. Building and electrical codes also may apply. Contact your local building department or ask your PV installer to include the cost of permits in the cost estimate.

After your PV system is installed, it must be inspected and approved by the local permitting agency (usually a building or electrical inspector) and your cooperative. Inspectors may require your installer to make corrections. A copy of the building permit showing the final inspection sign-off may be required to qualify for a solar rebate program, if that type of incentive is available in your area.

Fees for building permits for PV systems range from $200 to $500. If a fee seems inappropriate or excessive, you may be able to get it reduced or waived. Find out what you are being charged for and offer to provide documentation or information that may make the fee unnecessary.

At this stage, talk with neighbors about your plans and listen to any of their concerns. If there are any other PV system owners in your area, talk with them about any concerns their neighbors had and how they dealt with these concerns. Many states have "solar access" laws, which protect homeowners from the most common (aesthetic) complaints.

8. Ask your cooperative about its interconnection requirements, including costs and liability insurance.

If you have not already talked with your cooperative about your plans, do so now. Discuss the steps you have taken to get to this point and provide information on the PV system you are considering. You need to make sure that the system meets the cooperative's criteria for interconnection.

Your cooperative can provide information on its interconnection process and policies, as well as a sample interconnection agreement, and can answer any questions that you may have.

9. Find a PV system installer (if you haven't already done so).

Using a professional, licensed PV installer is the best way to avoid installation problems with your system. A qualified, experienced installer will design a system that meets your needs and site conditions. The installer also can help you with the paperwork for tax credits and rebates.

You might want to start looking for an installer by asking current PV system owners in your area for references. Several Web sites also provide listings of qualified installers. Among them are the American Solar Energy Society, at http://www.findsolar.com/; Energy Matters' Solar-Estimate at http://www.solar-estimate.org/index.php?verifycookie=1&page=solar-installer&subpage=; and the North American Board of Certified Energy Practitioners (NABCEP), at http://www.nabcep.org. NABCEP, considered the most respected solar certification organization in the United States, has a certification program for PV installers. To be certified as a PV installer under NABCEP, an individual must have several years of installation experience and training and also take an examination.

Another option is to ask your state's renewable energy organization or energy office about installers. DOE's EERE Web site provides contact information for state energy offices, available at http://energy.gov/eere/wipo/state-energy-program

Regional organizations, such as the Midwest Renewable Energy Association (MREA—https://www.midwestrenew.org/home) may also be able to help. Also, check the local chapter of the Solar Energy Industries Association (SEIA) to find PV installers; http://www.seia.org/

Once you have a short list of installers, contact at least two of them for quotes for the equipment and installation. Question any quote that appears to be too high or too low.

Some states link installation requirements to incentives. Check the DSIRE database for the requirements in your state, available at http://www.dsireusa.org/

10. Contract for installation of your PV system.

Before actually placing an order, ask the installer for the names of consumers who have installed a similar PV system. Contact those consumers to ask about system performance, reliability, and support from the installer. Also ask if the system is meeting their expectations.

Ensure that the PV panel manufacturer offers at least a 20-year limited warranty and the inverter manufacturer offers a five-year limited warranty. The panels and inverter must be Underwriters Laboratories (UL) listed. Also ask the installer about a warranty for the work.

Questions to Ask PV Installers

Cooperative member-consumers interested in installing a PV system should ask installers or contractors the following questions:

1. What are your credentials? How long have you been in business? How many grid-connected PV systems have you installed?

Look for installers that have been in business for at least five years. Installers certified by NABCEP must pass a rigorous examination and demonstrate that they possess a high degree of experience or education related to PV system design and installation.

In addition, you should ask the installer for a portfolio of recent residential projects and the names of at least two people who have had a PV system installed that is the same as, or similar to, the one you are considering.

2. What is the estimated total installed cost? What do the panels cost? What does the inverter cost? What is the estimated installation cost?

It is important to know the total installed cost of a PV system to ensure sufficient budgeting for the system. Budget for installation labor expenses, as well as the cost of equipment rental, construction materials, electrical components, shipping, and sales tax.

3. How long is the warranty? What does it cover? Parts? Labor? Can it be extended? If so, what will it cost?

The PV panel manufacturer should offer a 25-year warranty for crystalline modules and 20 years for thin films. Warranties for inverters should be for at least five years. Make sure the warranty covers all aspects of the removal, shipping, repair, and reinstallation of components. Cooperative member-consumers should ask owners of PV systems purchased from the same installer about performance and reliability before making a decision on an extended warranty, if it is available.

4. Are the PV panels and inverter UL-listed?

Both the PV panels and the inverter should be UL-listed. Most utilities require that an inverter have a UL 1741 certification for interconnection with the grid. As

part of the certification, the inverter is required to fail open in the absence of power on the grid.

5. Does the installer offer packaged systems?

Packaged systems, which include everything needed to generate electricity, can facilitate the interconnection process for the cooperative. Cooperative member-consumers should look for systems that are UL-listed and have been pre-certified. The cost of a grid-tied packaged system, uninstalled, depends on the system size. A 1 kW system is likely to cost between $6,000 and $8,000, while a 4 kW system can be expected to cost between $12,000 and $20,000.

6. If the system is to be roof-mounted, how will the installer mount it?

The performance of PV panels mounted flush on the roof will decrease during the winter if the roof is at a shallow pitch. Some installers may address this issue by adding one or two panels to the array. While the additional panels will compensate for the decreased winter performance, they also will significantly increase heat gain during the summer, reducing output.

Cooperative member-consumers may wish to consider alternatives, such as mounting panels at a greater angle on the roof or mounting the array on the ground or a pole.

7. What are the advantages and disadvantages of adjustable rack mounts and tracking devices?

Adjustable rack mounts—both ground and roof—can be repositioned seasonally to optimize energy output but they will increase the cost of a PV system. Cooperative member-consumers should ask the installer to estimate the improved performance of a system with adjustable rack mounts and then weigh the higher output against the increased cost.

Tracking devices—PV mounting devices that follow the sun—can increase the output of a PV system by 25% to 40%, compared with a fixed-mounted array. They are either electrically or thermally operated and usually are mounted on a pole. Trackers are most effective at sites with dawn-to-dusk sun, and provide a great increase in output in the summer. Because of their moving parts, trackers may require increased maintenance.

Although trackers increase the cost of a PV system, the total cost of a tracked system may be less than that of a fixed system because a smaller tracked system can produce more electricity. For example, a 3 kW tracked system can produce as much electricity as a 4 kW fixed system. The higher output of a tracked system makes it possible to scale down the size—and thus the cost—of the PV system.

Consumers should ask the installer to evaluate their site with a tool such as the Solar Pathfinder (available at http://www.solarpathfinder.com/) to determine if a tracker makes sense.

Legal Notice:
The Consumer Handout Packet was created for the benefit of NRECA members and their consumer-members as part of the CRN's Cooperative Small Wind Guide. Some of the contents of the Consumer Handout Packet is specific to Palmetto Electric Cooperative, Inc.

This work contains findings that are general in nature. Readers are reminded to perform due diligence in applying these findings to their specific needs.

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