

Preparing the Roof for Solar Panels

Introduction to Terms and Concepts

Shades of Green
Tool Bench



Solar electricity is a reliable, durable, and clean way to avoid increases in electricity costs in your community. It may not make sense to use solar everywhere (long sunny days are important, in addition to the necessary supportive energy regulations from your state), but if the opportunity does present itself, your organization needs to be fully prepared. Solar installation is a valuable green job skill. Those who are trained in preparing home rooftops to receive photovoltaic (PV) panels have a “bright” future ahead. **Is your YouthBuild housing program PV-ready?**

How Photovoltaic (PV) Systems Work

PV systems are solar energy systems that produce direct current electricity directly from sunlight. What is commonly referred to as a “solar panel” is technically called a module. Each module is made of individual PV cells wired together under framed glass. PV cells are thin silicon wafers that act as semi-conductors which convert light energy into electric energy. Modules are wired together into an array, which is then mounted on a roof or a pole. Other components of the system typically include a charge controller, disconnect switches, an inverter that converts the direct current into alternating current that common appliances use, and finally to either your home’s electrical service panel for household use, to batteries for storage, or in utility-tied systems through the meter and into the utility grid.

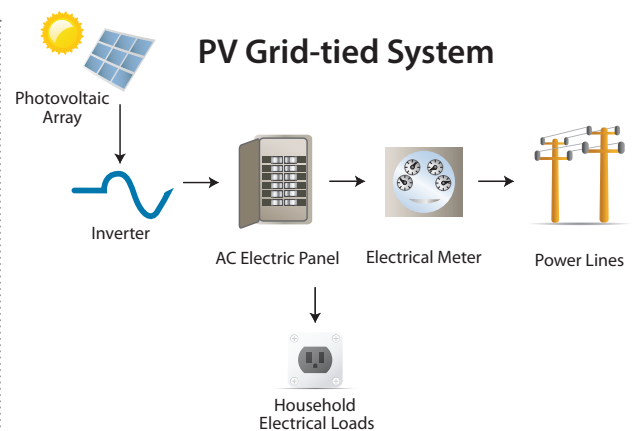


Richmond Works YouthBuild students learn to connect solar panels to a roof in a warehouse sized classroom model, partnering with their local utility. (Richmond, CA)

Utility (Grid) Connections – The Way to Go

YouthBuild housing should plan on grid-tied systems for our solar installations. In a grid-tied system, the customer has the ability to draw power from the grid when enough is not being made by the solar array and to sell excess solar power back to the grid. The other benefit is that because the utility acts like a giant battery, there is no need to purchase and maintain your own batteries.

Unless your YouthBuild homes are super-insulated and efficient, solar panels will rarely generate enough electricity to power the entire electric needs of the household. The solar electricity, however, can offset peak electricity use in the home, lowering the amount of electricity the homeowner needs to purchase from the utility. You can also plan the system so that the homeowner can add more panels incrementally as time goes on in order to ultimately produce excess energy that can be sold to the utility for profit.



Net Metering

The Public Utilities Regulatory Policies Act (PURPA) of 1978 requires that utilities purchase power from qualified, small-power producing system owners. Additional terms and conditions for these purchases vary from state to state. Some utilities offer “net metering” to their customers, where a single meter spins in either direction, depending on whether the customer is drawing power from the grid or producing excess power fed into the grid. At the end of the month, the customer is billed only for the net consumption. Net metering is very desirable to the independent power producer because she/he can sell power at the same retail rate that the utility charges its customers.



Conduit

A conduit is a metal or plastic pipe that is used to contain wires for protection and concealment. A common type of conduit used in PV systems is polyvinyl chloride (PVC) pipe, a rigid nonmetallic conduit. The conduit is attached to walls using conduit clamps and buried beneath the ground between the array junction box and disconnect switch. Tables in the National Electrical Code list the maximum number and size wire which can be run within the given conduit sizes. Too many wires or those that are too large within the conduit will result in overheating and damage to the wires, so selecting appropriate conduit sizing is key.

Inverters

Solar electricity is created in direct current (DC). The flow of DC current is converted to AC through the inverter, mounted near the panels at the home site. Many residential-sized inverters are designed to both convert power from DC to AC and to measure how much electricity your home produces, in order to get credit from your utility ("net metering") for this generation. The wiring from the array to the inverter and on to the grid must be grounded and sized according to local building codes.



Link and Learn

More Information on Solar Power and How it Works: http://www1.eere.energy.gov/solar/pv_basics.html

A Step-by-Step Solar PV Installation Guide from the State of California, with wiring and structural diagrams: http://www.energy.ca.gov/reports/2001-09-04_500-01-020.PDF

Excellent On-Line Solar Retrofit Course for Low-Income House Construction, from the National Center for Appropriate Technology: <http://www.pasolar.ncat.org/>

Guidelines for Accreditation for Solar Training Programs: <http://www.irecusa.org/index.php?id=25>

IREC provides accreditation to a number of excellent renewable energy training centers, including the Florida Solar Energy Center, Solar Energy International, the Midwest Renewable Energy Association, the North Carolina Solar Center, the Great Lakes Renewable Energy Association and the Solar Living Institute. Several utilities with solar installations, such as NYSERDA, PG&E, or SCE collaborate to train new installers or host apprenticeships with local community colleges and labor unions. YouthBuild construction leaders in solar-friendly states should pursue solar training for themselves and as instructors for YouthBuild students. Solar pre-apprenticeships training usually is developed with the help of your local community college, IBEW, and your electric utility, and should follow NABCEP solar installer training procedures.

Training Guidelines from the Interstate Renewable Energy Council (IREC): http://www.irecusa.org/fileadmin/user_upload/WorkforceDevelopmentDocs/Training-BestPractices_Sept_2008_FINAL_01.pdf

North American Board of Certified Energy Practitioners (NABCEP):
<http://www.nabcep.org/certification/pv-installer-certification>

The NABCEP provides certification for both solar photovoltaic and solar thermal installers. After successfully graduating from YouthBuild, students may participate in NABCEP professional training following a registered apprenticeship or pre-apprenticeship in electrical work and/or solar electrical installation.