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Solar Basics

1. **What is Solar Electricity?**

Photovoltaic (PV): photo = light, voltaic = produces voltage

Photovoltaic (PV) systems, also referred to as solar electric systems, convert sunlight directly into usable electricity in your home or business using semiconductor technology. Sunlight strikes the PV cells and causes the electrons to flow, creating an electrical current (photovoltaic effect).

2. **Basic PV Terminology**

- **DC:** Direct current (produced by solar panels)
- **AC:** Alternating current (used in the homes, business and industry)
- **Efficiency:** Measure of how much of the sunlight is converted to electricity (%)

- **Capacity:** Total amount of power that a system produces
- **Watt:** Basic unit of power
- **Kilowatt:** A unit of electrical power equal to 1,000 watts (most common measurement)
- **Kilowatt-Hour:** Basic unit of energy. The use of 1,000 watts of electricity for one full hour (basic unit of electrical usage billing)

3. What is a watt?

A watt is the basic unit of power. Solar panels and light bulbs are rated in watts.

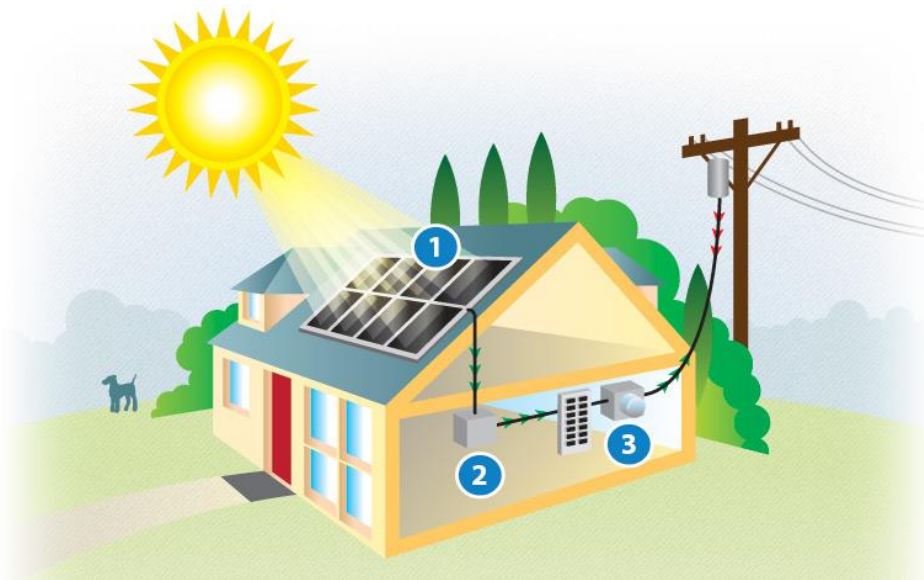
4. What is a kilowatt-hour?

The basic unit of energy: *Energy = Power x Time.*

Example: If ten 100-watt light bulbs are left on for one hour, the energy consumed is 1 kWh (100 w x 10 = 1 kWh).

5. How Does PV Work?

Photovoltaic (PV) systems convert light directly into electricity using semiconductor technology.



1. Individual photovoltaic (PV) cells are connected to panels. Solar panels convert sunlight into direct current (DC) electricity.
2. An inverter converts direct current (DC) into alternating current (AC) for electricity in the home.
3. The utility meter records the net amount of energy generated through the PV system. When you're creating more electricity than you're using, your meter will spin backward and the excess electricity is sent to the electric grid. This helps to offset the cost of your electricity usage at night or on cloudy days when your system is not producing electricity.

System Design

1. What size system should I install on my home or business?

Every site is different and the needs of the system owner vary. System size depends on several factors; including how much electricity (kWh) is consumed on site and the orientation and tilt of the system, as well as available space and capital.

The first step is determining the annual kWh consumption of the home or business. Once calculated, you can pinpoint avenues on how to reduce your energy consumption by implementing energy-efficient improvements, a necessary first step before installing solar. If you reduce your kilowatt-hour consumption, you may be able to install a smaller PV system, in turn allowing for lower up-front costs and a shorter payback period.

Sizing your solar electric system appropriately is the key to a faster return on investment. The production of the proposed system should be parallel with the consumption on site and not oversized. According to AB 920, utility companies are required to purchase excess generation; however, the excess generation is purchased at a reduced rate of about \$0.04/kWh. (See the Net Metering Section for more details.)

Remember that you do not have to offset 100% of the consumption of your home or business. Offsetting any portion can be beneficial and a good way to get started with solar. A rule of thumb is to divide your annual consumption (kWh) by 1700 kWh/year (1kW of solar will generate about 1,700 kWh/year). This will give you an approximate system size to base your design on.

For example: The Smith residence consumes 6,000 kWh/year.
(6,000 kWh/1,700kWh = 3.5 kW)

This means that a 3.5 kW solar electric system would offset 100% of their energy consumption of the Smith residence.

Also, be sure to use our Electric Rate Analyzer Tool to determine how different system sizes will affect your electric bills.

Under California's net metering law, eligible systems cannot be larger than 1 megawatt of peak power output.

There is no minimum system size to be eligible for net metering.

Always check with a licensed installer or contractor to determine the true optimal size of your system for the portion of your consumption that you wish to offset with solar.

2. How do I find out my past annual consumption (kWh)?

Contact your electrical utility provider. You can also simply add up the kWh consumption from your last 12 months of electric bills.

Once you know your annual kWh consumption you can move forward to making your home more energy efficient, reducing before producing. You can then move forward with sizing and designing your system.

3. **How much do photovoltaic systems cost?**

The price of a photovoltaic system is determined based on a number of factors, including system components and configuration, the difficulty of installation and available incentives. To be clear, the costs mentioned here are the installed costs. This means the final cost (before rebates) to the consumer for the equipment and labor to install and connect a photovoltaic system.

The cost of solar has decreased by 48% since 1998*. The current average installed cost (\$)/watt for a residential solar electric system in California is between \$4-\$7/watt, while larger commercial and institutional systems typically cost \$3-\$7/watt. Generally speaking, the larger the system, the lower the cost. In addition, the larger the number of systems, for example a new home construction development of 200 homes, the lower the cost.

Contact a local contractor/installer to receive a quote.

4. **How efficient are photovoltaic modules?**

Photovoltaic module efficiencies range from 5%, for some thin-film technologies, up to 19% for single crystalline (rigid) technologies. These percentages refer to the conversion efficiency, or the percentage of sunlight that is converted directly into electricity. Conversion efficiency is a critical issue when space is limited. The more efficient the module is the less space that is needed to produce the desired amount of electricity.

5. **Where should I put my panels?**

PV panels can be installed on your roof or as a ground mount. Speak with your contractor about where on your property will yield the highest production. In our region, the ideal direction to have your panels face is south or west.

6. **What are the components of my system?**

Here is a list of components that may be included in your PV system. For more information about your PV system components, please view the webinar "Understanding Your PV System."

- Solar Panels/Modules – The tools to collect the sun's power and produce direct current (DC) power.
- Inverter – Converts DC power into alternating current (AC) power. AC power is what we use in our homes and businesses. Central and micro are the two types of Inverters.
- Service/Utility Meter – This meter is a bidirectional smart meter that can keep track of any excess kWh production that you may send back to the grid.
- Kilowatt-hour Meter – This meter keeps track of the kilowatt-hours your system has produced since the system was turned on. Note: Not all systems have a kilowatt-hour meter installed.

- AC Disconnect - This is a device that the utility can use to turn off your PV system in an emergency or service situation. Note: Not all systems have an AC disconnect.
- Conduit – Conduit is what the wiring for your PV system is housed in. Conduit is usually rigid piping such as EMT (electrical metallic tubing), flexible aluminum or PVC (polyvinyl chloride) piping.

7. Do solar panels and inverters come with a warranty?

Solar panels typically come with a 25-year production warranty. Your inverter may come with a 10-year warranty. Most inverter manufacturers offer a supplementary 10-year extended warranty for an additional cost. Contact the inverter manufacturer for more information.

8. Where can I find a list of solar installers in the Calabasas area?

To find a list of active solar contractors in your area, visit [California Solar Statistics](#). This site lets you search for installers by ZIP code, city, county, utility or statewide. The list you receive will provide you with the contractor's name, address, phone number, website, number of installs in the chosen area and average price per watt.

Incentives

1. What are the current state and federal incentives?

Residential

The CSI residential incentive program has exhausted its funding for our territory, and as of April 11, 2014, at 5:00 p.m., the residential wait list will be closed to new applications. You may view the status of an existing wait list application or review the wait list process.

For customers of Southern California Edison (SCE), refer to the **Trigger Tracker** website for available funding at www.csi-trigger.com.

In addition to the California Solar Initiative rebate, you may also be eligible for the 30% federal tax credit. Check with your tax professional.

Net Metering

1. What is net metering?

This program is for customers with solar electric or wind generating systems. If your system produces more energy than you use, you can earn bill credits for the excess power you put back into the electric grid. You can later use that credit to cover the power you may need at times when your own self-generation doesn't fully meet your needs.

2. Does our utility company offer net metering?

Yes; Under California law, all public and private utilities, including irrigation districts and cooperatives, that operated prior to January 1, 1998 must offer net metering. New electric service providers who began selling electricity after January 1, 1998 may choose to offer net metering.

3. What are the benefits of Net Metering?

You can receive full retail value for the production of your system. Net metering allows you to use the power that your solar electric system produced and offset the consumption in your own home. Your utility provider acts as a bank to store your production, then allowing you access that power to offset your own consumption. This is equivalent to getting full retail value for the power your system produced.

You can receive wholesale value for the excess production of your system. If your solar electric system produces more than kWh you consumed annually, your utility provider will purchase excess energy from you, at a wholesale rate. Currently, the buyback rate is ~\$0.04/kWh. (See the Net Metering Section for more details.)

You can store power on the utility grid. Due to the fact that you get credit for your excess power generation, it is not necessary to install a battery storage system. However, some may still decide to opt in for a battery backup for storage. Through net metering, your utility provider acts as your “battery bank,” storing your power free of charge.

The interconnection process is streamlined. Customers participating in net metering can use the simplified interconnection online application. This is particularly beneficial to businesses because it simplifies a previously complex process.