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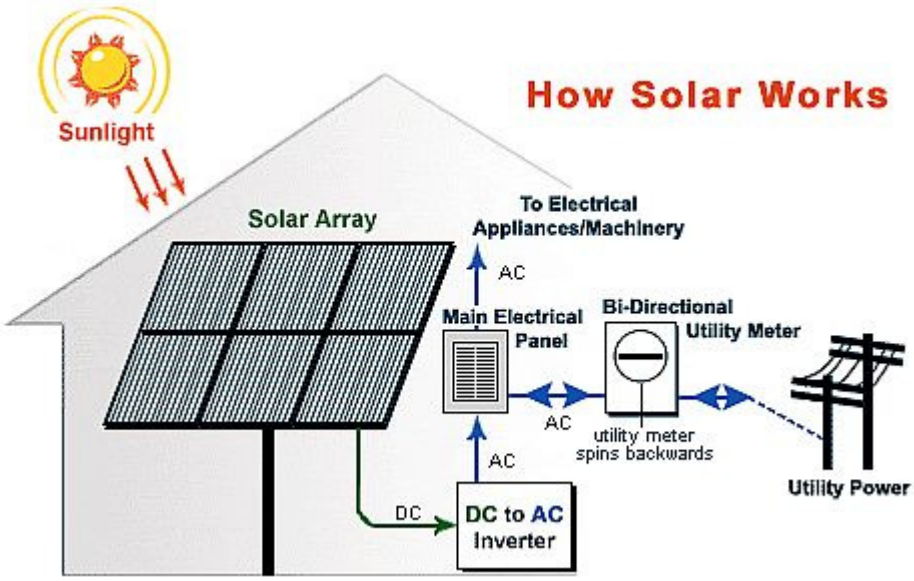
How to set up a house for solar power



Solar power is a clean, reliable form of renewable energy generated by converting energy from the sun's radiation into electricity. You can harness this power for your home a lot more easily than you might think. Solar cells are not cheap to set up initially, and I would recommend that you use them in conjunction with existing power in your home. Here is the basic setup for connecting solar power to your home so that you understand the process.

Instructions

Difficulty: Easy

Step1

Solar power energy systems are not inexpensive. That said it's important to compare them within context of other types of home improvement projects. Home buyers and realtors view a solar photovoltaic or solar hot water heating system as a significant value-added improvement – similar to adding a deck or remodeling your kitchen. Plus unlike a deck or kitchen remodel, you also gain one-up on your power bills. Here are some foolproof ways to estimate the cost of a solar photovoltaic or solar thermal system and to figure out if a solar energy system makes sense for you.

Six Easy Steps To Estimate Cost of a Solar Power System

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Step2

Solar power systems often get an additional financial boost as well: many jurisdictions and utilities across the USA offer attractive financial incentives to drive down the upfront capital costs associated with a solar power system.

Here are some foolproof ways to estimate the cost of a solar photovoltaic or solar thermal

system and to figure out if a solar energy system makes sense for you. Let's start with a home photovoltaic (PV) system.

Step 1: Estimate your home's electricity needs

To get started, it's good to have a sense of how much electricity you use. You'll have a better point for comparison if you find out how many kilowatt hours (kWh) you use per day, per month, per year. Your utility bill should include that information.

Of course, the utility bill will also display your costs and many utilities include a graph that displays how your monthly energy use/cost varies throughout the year. That helps you estimate where your highest energy use is and at what time of year.

New Home Construction

If you are constructing a new home, then you'll need to estimate your demand based on the type of equipment you plan to install and your home's square footage. The pross call this "your load".

To figure out your anticipated load, create a table to record the watt use for each appliance. Each appliance – be it a water heater, electric light, computer, or refrigerator – should have a nameplate that lists its power rating in watts. Or you can get the information from the manufacturer's website.

Some labels list amperage and voltage only; to obtain watts multiply the two together (amperage x voltage = watts). In another column, record the number of hours each appliance is expected to operate. Then multiple the watts and hours together to estimate watt-hours used per day. Since it's hard to anticipate all electric loads (it may get tedious scouting out every toothbrush and mobile phone cell charger), you might want to add a multiplier of 1.5 to be safe.
Step3
Step 2: Anticipate the future

In 2005, average residential electricity rates across the USA ranged from about 6 to nearly 16 cents per kilowatt hour depending on where you lived. Average retail and commercial electricity rates have increased roughly 30% since 1999 and the upward trend will likely continue especially as costs for the coal and hydropower used to generate that electricity rise as well. So think about your home electricity needs and present and future cost in relation to one another.
Step4
Step 3: How much sun do you get?

The Florida Solar Energy Center has conducted a study to examine how a 2-kW photovoltaic system would perform if installed on a highly energy efficient home across the continental USA (http://www.fsec.ucf.edu/en/publications/html/FSEC-PF-380-04/).

The study accounted for all factors that impact a PV system's performance such as the temperature effect on the photovoltaic cells, the amount of sun peak hours in various regions, and the efficiency of inverter to convert solar derived energy from DC to AC.

As the study implies, solar photovoltaic systems work just about anywhere in the US. Even in

the Northeast or in "rainy Seattle", a pv system can pencil out if designed and installed properly. In New York or New Jersey, a one kilowatt system should produce about 1270 kilowatt hours of electricity per year, in Seattle, a one kilowatt system should produce about 1200 kilowatt hours per year. In the Southwest, of course, those ratios will be much greater.

Solar contractors in your area can help determine the best size for your solar photovoltaic system.

Step 4: Size your system

In general, solar photovoltaic systems sized between 1 to 5 kilowatts are usually sufficient to meet the electricity needs of most homes. One advantage of grid-tied systems is that you can use solar PV to supplement or offset some of your electricity needs; therefore you can size your system to match your budget and always add to the system later if needed.

Also as a side note, here's a rule of thumb to remember to help you estimate the physical space your PV system might need: one square foot yields 10 watts. So in bright sunlight, a square foot of a conventional photovoltaic panel will produce 10 watts of power. A 1000 watt system, for example, may need 100 – 200 square feet of area, depending on the type of PV module used.
Step5
Step 5: Know your rebates

Many states and local jurisdictions offer rebates, tax credits and other types of incentives to homeowners for installing residential photovoltaic and solar domestic water systems. To view a comprehensive database of the incentives available for renewable energy visit http://www.dsireusa.org.

At the Federal Level, you can take advantage of a 30% tax credit (of up to $2,000) for the purchase of a residential solar system at least until December 31, 2008.

Step 6: Run the numbers

Although the cost for a solar PV system will depend on the size of the system you intend to install, your electricity rate, the amount of kilowatt hours you expect to generate, and the state/local rebates/tax credits that may be available, the formulas for calculating the returns are pretty much the same.

For those who appreciate having the formulas, use the ones listed below to do a quick ballpark estimate of how much a solar photovoltaic system might cost you.

Retail Price for Solar Photovoltaic System
+ Building Permits
- $2,000 Federal Tax Credit
- State or Local Tax Credit or Rebate
- Utility Rebate or Other Incentive
= Net Investment

Kilowatts of electricity generated from PV per year
x Kilowatt hours used per year
= Annual Kilowatt energy from the PV system

Annual Kilowatt energy from the PV system
x Current Residential Electricity Rate
= Annual $$ Saved

Yearly Excess PV Energy Produced
x $$ credit applied per watt
= Annual Value from Net Metering

Of course, a more accurate assessment can be made by a pro. Work with a solar power contractor to size and price the right system for you. As is true with any major purchase, don't hesitate to ask for several bids from different contractors.

Many solar power providers will provide you with a comprehensive estimate. Helpful information to know includes:

- Total cost to make the system operational (labor cost for design and installation and equipment costs)
- Equipment (Make and Model)
- Warranty info
- Permit costs, if needed
- Tax, where applicable
- Federal tax credits
- State or local jurisdiction tax credits or rebates
- Utility rebates
- Expected Renewable Energy Certificates or Net metering credits
- Expected operation and maintenance costs
- Projected savings

Step6
Solar Thermal (also called Solar Hot Water)

Solar thermal systems capture the sun's energy to heat water and are one of the most cost-effective renewable energy systems. They are used to heat hot water tanks and/or a heating system. A solar pool heating system is another type of solar thermal system designed specifically to heat a pool or hot tub.

Generally it's worth investigating the economic viability of installing a solar hot water system if you have an electric water heater with utility rates of at least 5 cents per kilowatt hour and have tax credits or rebates available. (It may even be worth changing out a gas-powered water heater if your costs are at least $8/million BTU).

The formulas for costing out a solar water heater system are similar to estimating the cost for installing solar PV system. Many solar energy professionals can help you determine what system might work best for you.

Heating Your Swimming Pool with Solar Power

Although few jurisdictions provide financial incentives for using solar energy to heat a swimming pool or hot tub, in general, using solar power to heat your pool is a "no-brainer" from a return on investment standpoint.

The electricity used to heat a pool during the swimming season often amounts to the same amount of energy that homes-without-pools consume over a year. Combining a solar thermal system to generate heat for the pool with a solar thermal pool cover to retain the heat generated can further maximize efficiencies and extend your swimming season.

Most installers recommend that a solar collector used to heat a pool is sized at roughly half the square footage of your pool surface area. Solar thermal panels typically last 10 – 20 years and come with a 10-year warranty.

How long it takes to break even on the cost of your solar power pool system depends on where you live. In California or other parts of the Southwest, you'll break even in 1 to 3 years but places as "far north" as Canada, a solar pool heating system pencils out over a slightly longer period of time.

Instructions
Difficulty: Moderately Challenging
Things You'll Need:

- Photovoltaic Solar Panel
- power converter
- extra power switch
- optional battery pack

Step1
The first thing you need to do is estimate your homes daily, monthly, and yearly power consumption. You can do this by charting the information provided in your electric bill, or you can read my article here that explains how to do this:

http://www.ehow.com/how_2322439_estimate-homes-power-consumption.html
Step2
 Once you have determined your homes power consumption, you will want to build a power supply system that will handle your needs and can also exceed your needs by roughly 30%. We are discussing the use of solar power here, however it is very common to use both solar power and grid power combined to service your homes needs. You should account for using both in your calculations.
Step3
 You will need to purchase photovoltaic solar panels for use on your home. Solar panels have come a long way since their development. There are a variety of solar panel products available on the market such as solar shingles, roll out solar sheets, and solar panels. Photovoltaic solar panels are still the most efficient and lowest cost on the market. You want a single panel that can product at least 250 watts of direct current at its peak. Anything less than 250 watts of direct current is useless for home use. Solar panels last about 30 years, losing approximate 0.5% of their efficiency each year. The only required maintenance is to hose them off a couple of times each summer. Do this from the ground, with a nozzle on your hose.
Step4
I also would recommend that if you want to get started integrating solar power into your power system, that you look into trying to supply at least 5000 watts of power to your home with the solar panels daily. So you should try to get at least 20 250 watt panels (5000 watts) for minimal home use. This can easily run a fridge, water pump, and a few light circuits in

your home and lessen your dependency on grid power. This would also be an excellent back-up power source in case of an emergency.

Step5

Panels can be secured to your roof using a rail mounting system that should be provided with the panels, or which can be purchased separately. Follow the directions included when installing these rails on your roof. Panels can be flush mounted or tilted up to accommodate your roof slope. Ideally, a solar system will go on a southwest-facing roof. However, the direction it faces does not matter as much as you might think. West and south are quite good and southeast, east and north-northwest can provide good pay back too. JUST MAKE SURE THERE IS NO SHADE ON YOUR ROOF.

Step6

Since we are discussing the integration of a solar system here that still uses grid power, it would not be necessary to install a battery bank in this step for storing power for nightly use, as your home will still use the grid power at night. It would be best to run washing machines and dryers at night to utilize the power of the grid. If you decide to go completely off the grid, you would have to invest in a battery bank system in this step to store the direct power coming out of the solar cells. So the power would run from solar cells to battery bank to power inverter.

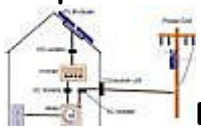
Step7

Here is where you use a power inverter to convert the solar energy and the stored energy in your batteries (if needed) into energy your home can use. Each panel is connected in series and all of the electricity that is coming out of the panels is direct current right now, or DC current. A home and the general power we use is called AC or alternating current power. So the power inverter takes DC power and turns it into AC power. You can either connect the solar panels directly to the inverter and then into the home grid, or you can connect the inverter from the battery banks into the home grid. The inverter, which converts direct current from the panels to alternating current used in your home, will need to be replaced after about 15 years. Expect to pay $2000 for the part and $400 for the labor, unless you install it yourself.

Step8

Now we will run the power from your inverter into the homes electrical service panel. or breaker box. The power from the electrical panel will be distributed to any electrical loads in your home. Since you are sharing both solar power and grid power in this example, I would recommend that you insert a second box next to your service panel for the solar panel feed, and also provide a switch on this feed so that you can shut it off if needed.

Step9



During the peak hours of the day, when the sun is shining brightly and your power use is low, if you happen to create excess power by the solar system on your roof, the power will flow into the grid through your electric meter. This will cause your meter to run backwards gaining you a credit with the utility company. Net metering legislation states that the utility company must credit you at retail rates (the same rate they would have charged

you). Therefore, time of use customers will be credited peak rates for power fed into the grid during peak hours. It is also important to note however that you can not actually lower your electric bill to zero. Your energy company will buy your power, but only to the extent that it drives your net energy bill to zero. They will also charge you a monthly "account fee" of about $5/month that covers services like maintaining the grid and coming to read your meter. Some power companies actually call this a "Green Fee". DO NOT TRY TO OVERSIZE YOUR SYSTEM TO FEED THE GRID.

Step10

You should also check into state rebates and Federal tax credits (which you claim on your 1040 Tax Form) when installing a solar system on your home, as these are an important part of the cost/benefit decision.