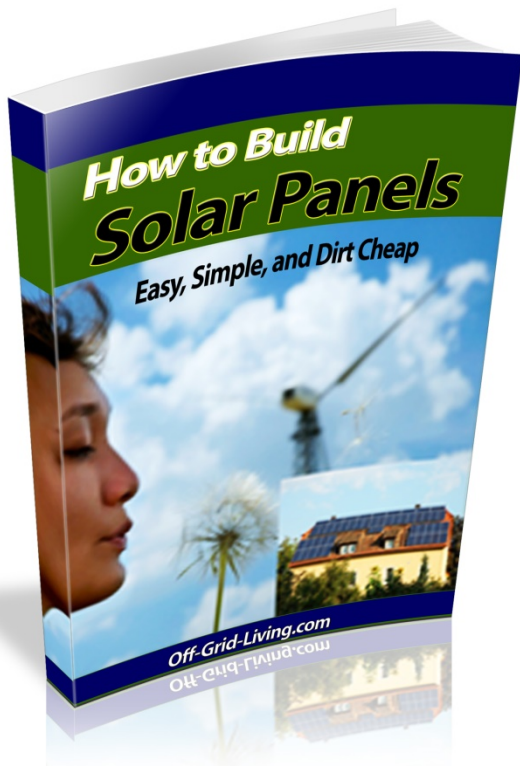


Off-Grid-Living

In An Urban and Suburban World



Lesson #7 ... Considering a Small Solar System

The Disclaimers, Legal Stuff and Butt-Covering Section:

Before attempting to build a solar system for your entire house, take my course "Home Energy Made Easy" Go here: <http://Off-Grid-Living.com> I'll give it to you for free for being a member of this course. Understanding the concepts in that course will save \$1000's of dollars when you go to build your system.

This is but one small section of a complete action plan for building solar panels dirt cheap. Which is one small section of a course on going off the grid in Urban/Suburban America. You can learn how to

- Grow your own food year around, no matter where you live.
- Slash your energy and living expenses by 50% or more.
- Create your own fuel
- Finding economical shelter
- Alternative methods of (Legally) making money
- How to live anonymously

Check out <http://Off-Grid-Living.com>

NOTICE: You Have the Right Give This To Anyone You Want!

But You Can't Resell this Report for your own profit!

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Introduction

The most important thing to take away from this lesson is..

Understanding the factors involved in determining if your location is right for solar energy is the crucial next step.

Is a small PV system feasible, practical, and economical for you? The details in this chapter will help you decide.

- To help evaluate whether a small solar electric system will work for you, you should consider the following:
 - Your available solar resource—do you have clear and unobstructed access to sunlight for most or all of the day, throughout the year?
 - The system size—do you have a roof or area large enough to accommodate it?
 - The economics—is it worth the investment?
 - Local permits and covenants—are there any issues with installing a system?



Let's look at each of these aspects in detail.

Evaluating Your Site's Solar Resource for Solar Electricity

Both the orientation and tilt of your solar panels will affect the output of your solar electric system. You should consider both factors while evaluating your site's solar resource and sizing your system.

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Orientation

PV modules should be oriented geographically to maximize the amount of daily and seasonal solar energy that they receive. In general, the best 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 its performance.

If you plan to mount the modules on your roof, you'll also want to consider these factors:

- Roof orientation and condition
- Local landscape features that shade the collector daily or seasonally
- Local weather conditions (foggy mornings or cloudy afternoons)

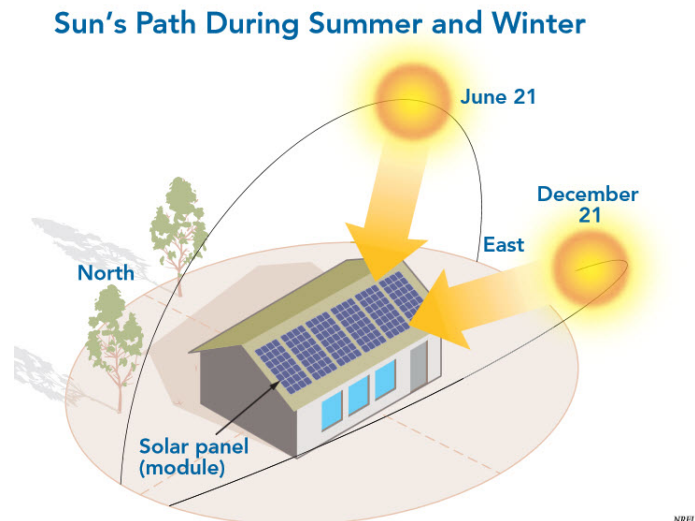
that may affect the optimal orientation and subsequent electricity production of the PV modules.

To be eligible for some rebates, your system must be unshaded between certain hours during certain times of the year. Some states also have laws that establish your right to protect your solar access through the creation of a solar easement.

- If a rooftop can't be used, your solar modules can also be placed on the ground, either on a fixed mount or a "tracking" mount that follows the sun to orient the PV modules.

Tilt

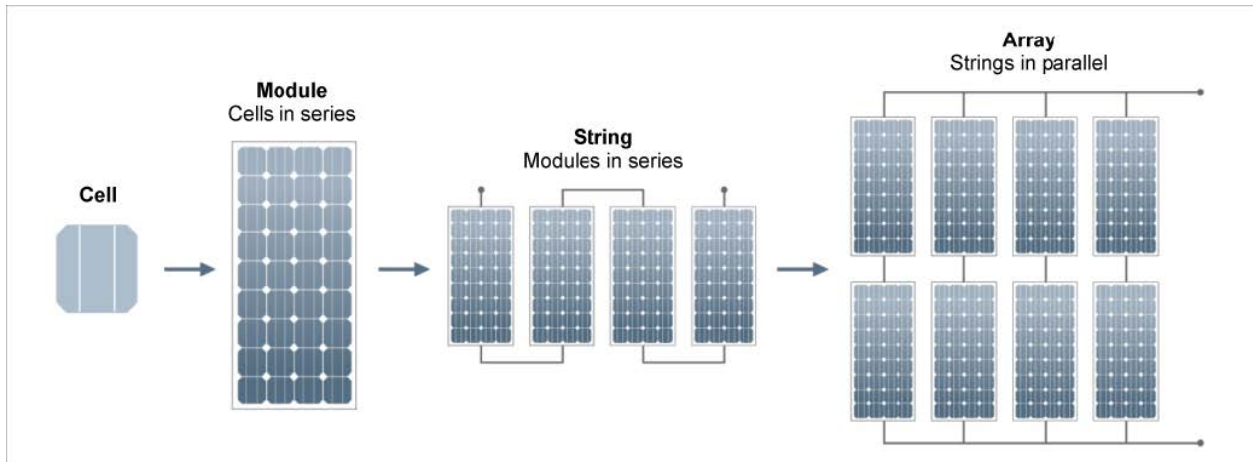
Most PV panels are mounted flat on the roof, and so have the same tilt as the roof. Although the optimal tilt angle for your modules is an angle equal to your latitude, fixing the PV panels flat on an angled roof is generally not a problem. However, because most roofs are pitched at an angle less than the latitude, you will need to factor your roof angle into the performance calculations when sizing your system.



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Sizing your solar system

- Accurately sizing the components of your solar system, helps ensure that your system will produce the amount of power you want it to produce. This is especially important for stand-alone systems, which are not connected to the electricity grid.



- However, because PV is modular, you can always add to your solar energy collector should you need more power down the road.
- First, consider what portion of your current electricity needs you would like your PV system to meet. For example, suppose that you would like to meet a certain percentage of your electricity needs with your PV system. You can contact your utility company and request the total electricity usage, measured in kilowatt-hours (kWh), for your household or business over the past 12 months or consult your electric bills if you save them.
- If you reduce your electricity loads, you can generally buy a smaller, less expensive PV system.
- PV systems are classified by their rated power output, that is the peak power they produce when exposed to solar radiation of 1000 watts per square meter. Systems rated between 1 and 5 kilowatts are generally sufficient to meet most of the needs of home owners.

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- The table below provides an estimate of the roof area needed for several systems. A solar professional can make, or help you make, more precise calculations at your site before you purchase a system.

Roof Area Needed in Square Feet							
PV Module Efficiency (%)	PV Capacity Rating (Watts)						
	100	250	500	1,000	2,000	4,000	10,000
4	30	75	150	300	600	1,200	3,000
8	15	38	75	150	300	600	1,500
12	10	25	50	100	200	400	1,000
16	8	20	40	80	160	320	800

- For example, to generate 2,000 watts from a 12%-efficient system, you need 200 square feet of roof area.

The Economics of a Small Solar Electric System

- The economics of a small solar electric or photovoltaic (PV) system are determined by both the capital and operating costs.
 - Capital costs include the initial costs of designing and installing a PV system.
 - Operating costs include the costs associated with maintaining and operating the PV system over its useful life.

The factors that affect both capital and operating costs include:

System components

- Whether you buy, or build your solar panels.
- Whether you opt for a grid-tie, or stand-alone system.
- Cost of inverters, charge controllers, or batteries.

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Working up a complete itemized budget of parts necessary for your system is the first step in understanding if a solar system will make economic sense in your situation.

A good place to start working up your budget is with the price list included with this course. The budget below ISN'T what it would cost to build your own using my system, but it is what you can expect if you don't. The prices below **exclude** labor.

Item Budget for 4K Solar PV System			
	<i>Date Prepared:</i>		12/14/13
Item	Quantity	Price	Total
Modules:			
Sharp ND-250QCS - 250 watts STC	18	274.00	4,932.00
Inverter:			
Fronius IG 4000 4.0 kW	1	2,028.00	2,028.00
Array Mounting:			
ProSolar R-136 1 1/2" Standard 136-inch Rail	12	22.88	274.56
A-SPLICE Splice Bar	8	4.39	35.12
End Clamps C1810EC	16	2.29	36.64
Mid Clamps C250IMC	16	2.29	36.64
WEEB PMC Grounding Clips	10	1.05	10.50
WEEBL-6.7 Grounding Lugs	4	4.93	19.72
WEEB-6.7 Bonding Jumpers	8	8.26	66.08
End Caps	8	1.53	12.24
P-CN-1 Channel Nut	32	0.50	16.00
FastJack 6-inch Standoff FJ-600-1	12	9.91	118.92
FastJack E-Series Flashing & Collar FJE-Flash	12	5.55	66.60
FastJack 2X Bracket 6061-T6	4	7.93	31.72
Electrical Components:			
WIEGMANN Enclosure, Steel, 6 x 6 x 4 In	1	34.75	34.75
Net Meter Socket - Circle AW 011-HLP 125 amp	1	67.26	67.26
Square D HU361RB 30A DC Disconnect Non-Fusible 3-Pole	1	119.03	119.03
Square D DU221RB 30A AC Disconnect Non-Fusible 2-Pole	1	61.88	61.88
MC4 Cable Extension #10 AWG PV Wire 20ft	4	36.16	144.64
Wire - THWN-2 #8 AWG - Red (per foot)	250	0.45	112.50
Wire - THWN-2 #8 AWG - White (per foot)	250	0.45	112.50
Wire - THWN-2 #8 AWG - Green (per foot)	150	0.45	67.50
Bare Copper #6 AWG Grounding Wire (per foot)	20	0.90	18.00
OCPD - Siemens 30 Amp 2-Pole Breaker	1	12.25	12.25
Conduit - Cantex 1" x 10' PVC, Schedule 40	20	3.08	61.60
Conduit cement, elbows, fittings and clamps	1	50.00	50.00
Safety Stickers	1	25.00	25.00
Misc supplies (caulking, zip ties, etc.)	1	25.00	25.00
CA Sales Tax @ 9%			773.70
Shipping and Freight Charges			200.00
TOTAL COST:			\$9,570.35

How To Build Solar Panels

PS...Don't forget you can get personalized coaching at Off-Grid-Living.com/
For some this is the ideal way to get hands on experience as well as personal attention needed to make this work for you.

Coming Up Next ...

Lesson #8: "Materials Needed to Build a Small Solar System"

Now that the prep work is done, in the next lesson we'll be covering the material tools needed to build a small solar system. Now that you've seen what it costs commercially you'll be pleasantly surprised at what it will cost to build your own.