

JOE UTASI – Cinci Home Solar

Residential Solar for \$3/Watt

Everything you should know before committing to the project. Things like: Zoning, Permits, Time, Money, Safety, and the NEC (National Electric Code)

RESIDENTIAL ZONING

- Urban setting
- Suburban setting
- Rural

Since getting a permit requires that a zoning code exists, if you are the FIRST to do solar in your village/town/city it may take 3 to 5 months to have laws put on the books to accommodate solar, so this should be one of the first things you do on your path to Solar freedom!

What's your Motivation?

- Going Green
- Saving Money on Utilities
- Safe investment with good ROI
- Prepare for ARMAGGEDON
- Remote Location off the grid
- Unreliable Utilities in your area

How Much Do You Know?

- Read, Read, READ! (great links at www.cincihomesolar.com)
- Subscribe to solar magazines (see links above!)
- Take a course at your local community college
- Go on a “solar tour” of your area
- Talk with owners of current systems to get good ideas and benefit from their experiences

Define Your Solar Needs

- SITE SURVEY – is it even FEASIBLE for you?
- Too many trees? Zoning Restrictions? Bad “compass heading” (best is DUE South!)
- Review your last year’s electric bills and decide what you want to accomplish. This will determine overall SIZE of your system.
- Decide on BUDGET and financing
 - Home equity line, loan, credit card, cash, etc
- What you want vs what you can afford
- Review your financing/payback equation

A quick size calculation

- Your monthly electric bill shows 600 KWH usage
- Your average “peak” sun hours is 4.5/day
- Assume a 30 day month
- Divide 600 by 30 X 4.5 = 4.44 Kilo Watts (4,440 watts)
- You would want at least 80% to ensure a 5 year payback $.80 \times 4400 = 3,520$
- Divide 3520 by the panel size you choose to determine how many panels you'll need
- For a 220 watt panel, you'll need 16.
- A popular size panel today is 230 or 240 watts

Determine Your Level Of Involvement

- Full hands-on, start to finish (lowest cost)
- Shop, inventory parts, manage subcontractors (licensed PV installer, electrician, handyman, brother-in-law, Ex-wife...) – medium cost
- Hire a commercial installer (highest cost – \$6 to \$9/watt)

Design Your System

- Single (traditional) Inverter. Involves high DC Voltages, requires knowledge, skills & CARE! Hyper-sensitive to shading, requires metal conduit runs, NOT easily expandable.
- Multiple “Micro-Inverters” (1 for each panel) Very shade tolerant, simple “branch circuit” wire from roof to breaker box, NO high DC voltages, and EASILY EXPANDABLE.
- Choice #2 has a 5 to 10% cost premium, but has many POSITIVE advantages beyond shade performance.

Mounting Hardware

- Lots of choices. Just make sure your system includes a “load calculator”. This will do all the wind/snow load calculations and provide a “reference” from a Professional Engineer. Most manufacturers have this tool “online” and it is REQUIRED in order to get a permit.
- Find a system that you like and can afford.

Begin Shopping for your parts

- Use the internet (Try www.sunelec.com)
- TAKE YOUR TIME! Be sure to sign up online using your email address for “email specials”
- Work with an “inside sales” guy who knows what you want and what can be substituted.
- Call the Power Company and sign up for “NET METERING” – they will want a “one line” drawing of your PV system, and so will your AHJ (authority having jurisdiction) for your town/village/city.

Economize As Much As Possible!

- Find a “BUDDY” who also wants solar. Best buy on panels is a PALLET – generally 20 to 24 panels.
- Shipping by freight for mounting parts is expensive due to “oversize” (length) so if you buy MORE, the cost/piece goes down.
- Check out “One Block Off The Grid” for GROUP PURCHASES in your area (online) you may be able to get “Dealer” prices if enough people group together. www.1bog.org

SITE SURVEY

- Common Sense approach.
 - Face South, no trees, solid roof with good shingles, roof pitch 4/12 to 6/12
 - Roof mount? Ground mount? 1 or 2 axis “tracker?”
 - Enough room for your panels? Do a “Scale” drawing and see if it will all fit! You’ll need this for your permit application anyway!
- It’s easier (and CHEAPER) to make mistakes ON PAPER, rather than on a Hot/Cold dangerous rooftop!

Register your system with your local utility. (PUCO in Ohio)

- Get online and search for a link to register your system. This is IMPORTANT if you want to sell your “SRECs” (see below...)
- **What is a Renewable Energy Certificate (REC)?**
- Renewable Energy Credits (or Certificates) are a tradable commodity for renewable energy in North America. REC’s are sometimes also referred to as ‘green tags’. One REC is the equivalent of one (1) mega-watt hour (MWh) of renewable energy **generation**. The REC represents the environmental and social aspects of the renewable energy generation and ***is considered a separate entity from the electricity itself***. The electricity can be sold separately from the REC as well.
- RECs can be used as a way to track how much renewable energy has been generated for purposes of meeting state RPS (Renewable Portfolio Standard) and/or AEPS (Alternative Energy Portfolio Standard) requirements in compliance markets. Currently approximately 29 states including Ohio participate in an RPS, which requires a certain percentage of electricity sold in the state to come from renewable sources. In voluntary markets, RECs can be used as a way for consumers to purchase renewable energy for its environmental and social benefits.

What about pricing? What's good?

Be Sure to Click our Blog for Secret Deals

SUN BRAND NEW AND NOT THIN FILM

CRYSTALLINE LAMINATE **74¢** /Watt *Click Here to Learn More*

SUN-P-148 **Sold Out** **SUN-P-175** **Sold Out** **SUN-P-180** **Sold Out** **SUN-P-185** **Sold Out** **SUN-P-225** **Sold Out** **SUN-P-230** **Sold Out** **SUN-P-245** **Sold Out**

MONO-CRYSTALLINE Minimum Quantity 10

SV-T-185-LV **SV-T-190-LV** **SV-T-190-HV** **SV-T-200-HV** **SV-T-195-HV**

Click Here for Specs *Click Here for Specs* *Click Here for Specs* *Click Here for Specs* *Click Here for Specs*

\$134 /Watt ANY QUANTITY *30 Year Warranty* *Cosmetics - Click For Detail/Info. - Click*

Canadian Solar **CS6P-230-P** **\$144** /Watt ANY QUANTITY *25 Year Warranty*

Click Model for Specs 

evergreensolar **ES-A 210-fa3** **\$158** /Watt Unit Price **\$148** /Watt Pallets Only *Made in the USA* 

18.30 Vmp | 11.48 Imp *3MW available | 25 year warranty* *Click Here*

(I'm not affiliated with any of the companies shown in these slides...)
This company can be found online at www.sunelec.com

Look Close. This is “Thin Film!”

4000 W DA100-A2		\$ 2.11 PER WATT	
<i>8 strings of 5 modules in series</i>			
Qty	DESCRIPTION	UNIT PRICE	AMOUNT
40	DuPont Solar Panel 100 Watts 77.00 Vmp \$1.69 / Watt	\$169.00	\$6,760.00
8	Fuse Holder - MNTS	\$5.40	\$43.20
8	Solar Panel Cable MC3 Male To Female 10 AWG 50FT	\$41.58	\$335.61
8	Fuse - MINI USLB Midnite Solar BA 600V	\$8.00	\$64.00
1	Xantrex Lightning Arrestor LA302R 300VAC	\$40.00	\$40.00
1	Delta Lightning Arrestor LA602DC 600VDC	\$40.00	\$40.00
1	SMA Sunny Boy Grid Tie Inverter 4000 Watt SB1000US	\$2,072.00	\$2,072.00
1	Disconnect Nonfused SQD DU221RB	\$75.40	\$75.40
1	Square D DC Disconnect 30A 600V Non Fusible D-HU361RB	\$170.47	\$170.47
1	Outback Power Combiner Box FWPV12	\$142.80	\$142.80
		Total	\$9,764.51

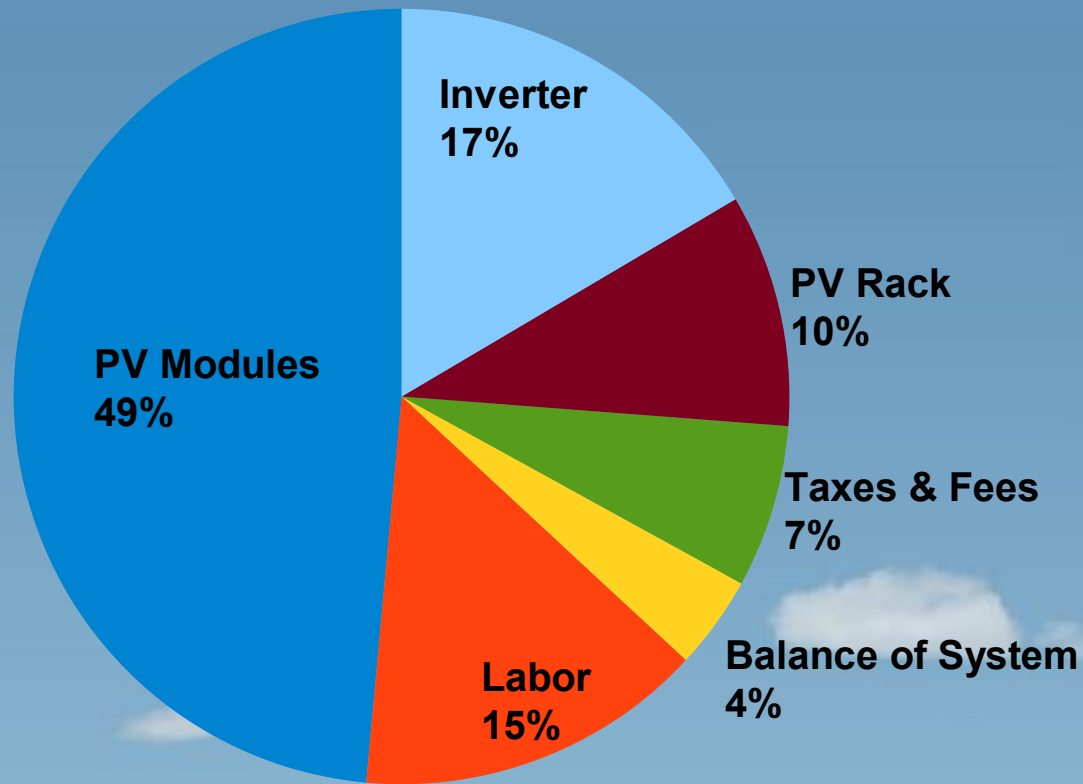
Although this will work just fine, “thin film” is heavier (more glass) and much less Efficient , which means it will take many more panels. Also, the MOUNTING HARDWARE Is not included in this pricing. Some “thin film” panels are just glass (2 layers) and require Different type of mounting than normal panels with aluminum frames...

“Standard” type system

3150 W ES-A-210-FA3B			
<i>1 string of 15 modules in series</i>		\$ 2.24 PER WATT	
Qty	DESCRIPTION	UNIT PRICE	AMOUNT
15	Evergreen Solar Panel 210 Watts 18.30 Vmp B \$1.50 / Watt	\$333.90	\$5,008.50
1	Solar Panel Cable - MC4 Connectors 50ft	\$43.86	\$43.86
1	Disconnect Nonfused SQD DU221RB	\$75.40	\$75.40
1	MNFI:SF20	\$8.00	\$8.00
1	Fuse Holder - MNTS	\$5.40	\$5.40
1	Xantrex Lightning Arrestor LA302R 300VAC	\$10.00	\$10.00
1	SMA Sunny Boy Grid Tie Inverter 3000 Watt SB3000US	\$1,598.00	\$1,598.00
1	Delta Lightning Arrestor LAC02DC 500VDC	\$40.00	\$40.00
1	Midnight Solar Combiner Box MNPV3	\$80.58	\$80.58
1	Square D DC Disconnect 30A 600V Non Fusible D HU361RB	\$170.47	\$170.47
		Total	\$7,070.21

This one uses standard silicon panels, so there are fewer of them. A single “inverter” is used, which means higher DC voltage on the roof, so more care must be taken during installation and setup. Also prone to shading issues. Again, HARDWARE is not included. Figure about 25cents/watt for hardware cost. Even with hardware added, this package still comes in BELOW \$3/watt!

Component Costs by %



You can save the labor costs, but you've still got permit and inspection costs, along with any electrician labor you may need to do a safe, reliable connection to your utility!

Performance numbers and REALITY

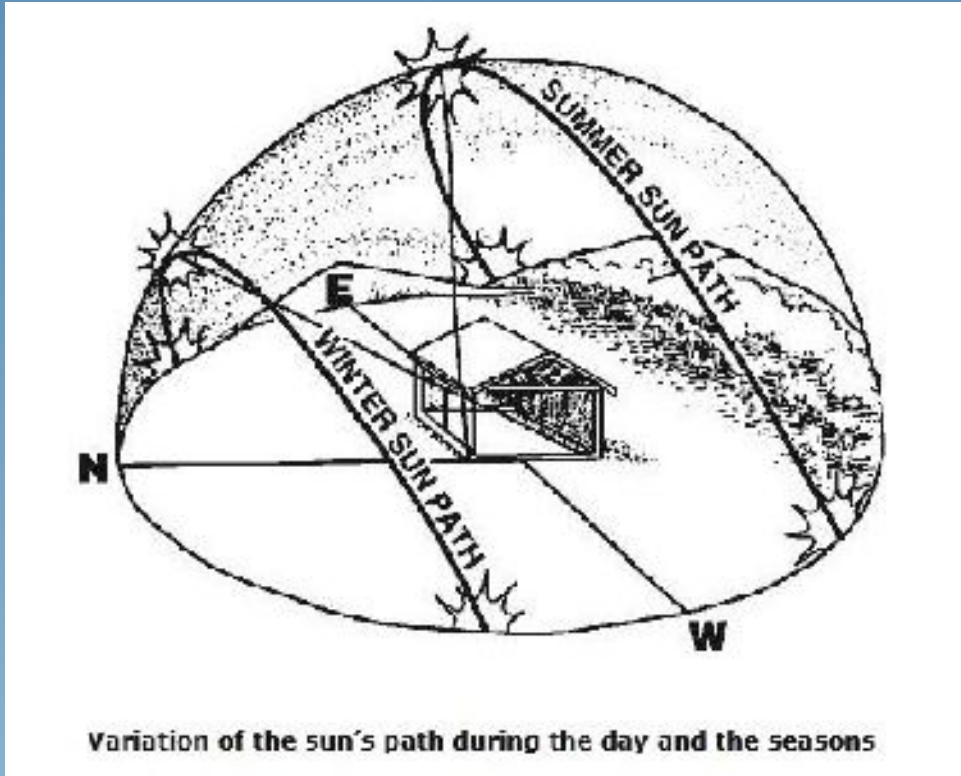
- Your new system will reach it's maximum capability about 3 days per year.
- Real world LOSSES include: shading effects, dirt, dust, wire losses, conversion losses, temperature losses, connector losses, etc.
- Figure on REALISTICALLY getting 80 to 85% of the WATTS rating for your system on a regular basis. More in summer, less in winter. You might get more, but don't count on it!
- KEEP IN MIND: As electricity costs rise your SAVINGS WITH SOLAR will RISE as well!!

1 And 2 Axis Trackers



Good example of SINGLE axis tracking “ground” mount. Between \$1000 and \$2000 each, unless you’re handy and trust your workmanship...

WHY track the sun?




Two Axis Tracker Example




The sun's intensity falls off as the angle between the sun and the face of the panel changes. Convenience and cost generally outweighs the advantage of a tracker!!!!

PV WATTS: What to expect.



**AC Energy
&
Cost Savings**



Estimated annual output for PV system based on 80% system efficiency.

Station Identification		Results			
City:	Dayton	Month	Solar Radiation (kWh/m ² /day)	AC Energy (kWh)	Energy Value (\$)
State:	Ohio				
Latitude:	39.90° N	1	2.64	373	23.48
Longitude:	84.33° W	2	3.00	398	23.46
Elevation:	305m	3	3.96	398	31.23
PV System Specifications		4	5.26	498	42.83
DC Rating:	3.0 kW	5	5.69	536	36.10
DC to AC Derate Factor:	0.830	6	6.03	536	46.10
AC Rating:	3.3 kW	7	5.86	536	46.10
Array Type:	Fixed Tilt	8	5.59	539	46.95
Array Tilt:	22.6°	9	4.92	440	37.84
Array Azimuth:	195.0°	10	4.36	421	36.21
Energy Specifications		11	2.33	246	21.16
Cost of Electricity:	\$6 c/kWh	12	2.07	211	18.15
		Year	427	4051	424.07

Click here for a great tool located at NREL.ORG website (just google pv watts!) that provides realistic estimates of what your electricity production/\$ savings will be for your specific location.

Let's Review SRECs...

- SREC stands for “Solar Renewable Energy Credits”
- This is NOT the electric power that is used to reduce your monthly bill!
- It is merely the act of “Generating power via a Renewable energy source.”
- Not all states have SREC requirements
- You must be a LICENSED “renewable energy generating source” to participate.
- Apply for a license with your state “Public Utilities Commission”

More on SRECs

- Everything you could possibly want to know about srecs can be found at: http://www.srectrade.com/ohio_srec.php

Energy Year	Projected SRECs Required (MWh)	RPS Solar Requirement	SACP
2009	7,000	0.004%	\$450
2010	17,000	0.01%	\$400
2011	52,000	0.03%	\$400
2012	105,000	0.06%	\$350
2013	160,000	0.09%	\$350
2014	215,000	0.12%	\$300
2015	275,000	0.15%	\$300
2016	330,000	0.18%	\$250
2017	415,000	0.22%	\$250
2018	495,000	0.26%	\$200
2019	580,000	0.30%	\$200
2020	670,000	0.34%	\$150
2021	750,000	0.38%	\$150
2022	850,000	0.42%	\$100
2023	945,000	0.46%	\$100
2024	1,040,000	0.50%	\$50

Some install photos from my primary and weekend homes.







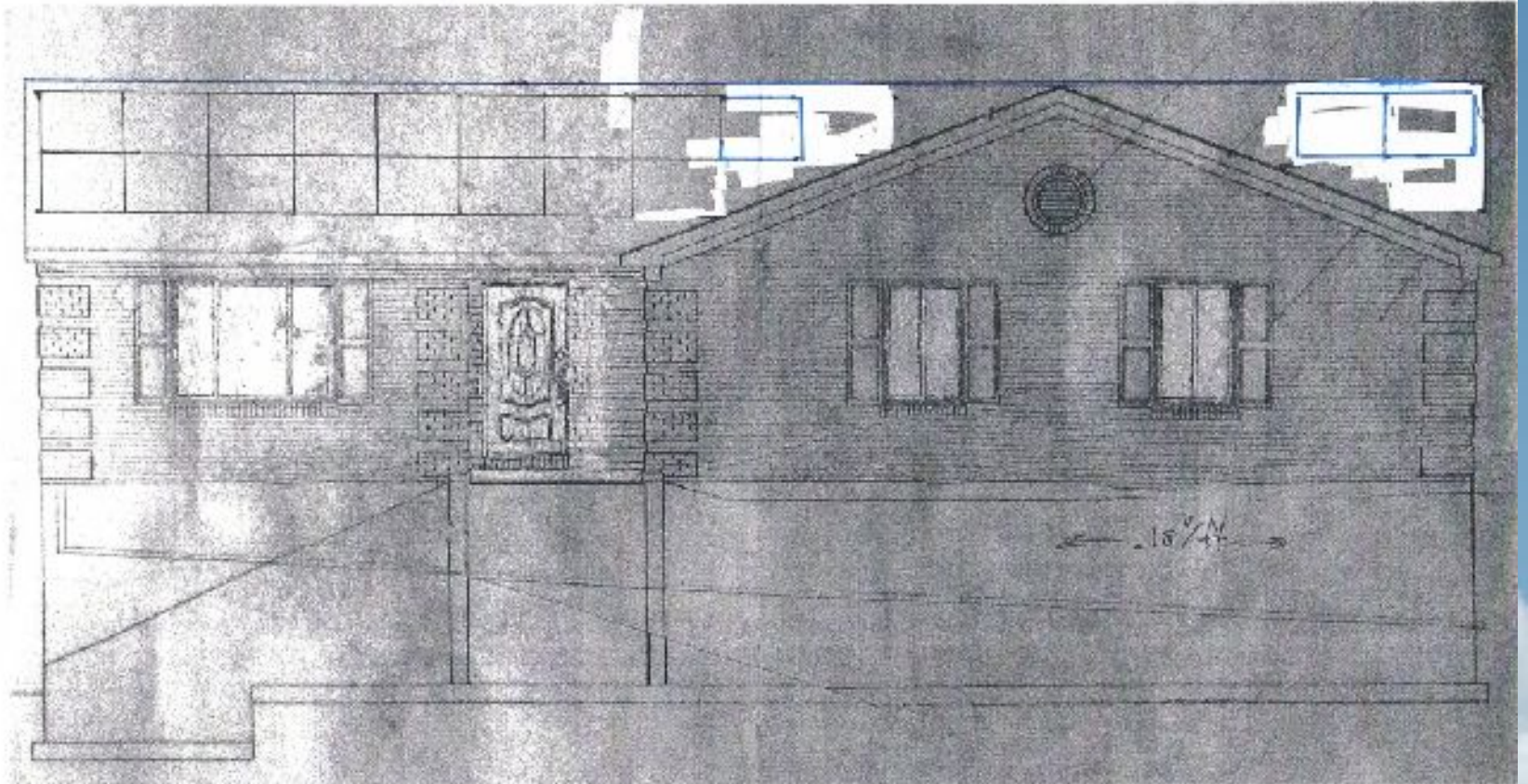








ALL PANELS PORTRAIT MOUNT:





Latest enphase PV WATTS feature

Overview

Power Production 0 W	Today's Energy 3.02 kWh	Past 7 days 115 kWh	This Month's Energy 231 kWh	Lifetime Energy 1.31 kWh
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Array Builder

[Launch Array Builder](#)

Array Name	# of Modules	Azimuth	
Lifea Newborn Home	16	195	Array Details ▾

Array Details Array Details ▾

✔ Array details saved successfully.

PV Module

Conellation Enbu ▾

Cost of Electricity \$/kWh

DC Wiring kW

DC to AC Derate Factor

Array Type ▾

Tilt °(degrees)

Azimuth °(degrees)

PV Watts Results Generated: Mon September 19, 2011 05:22 PM EDT

[Show Results](#)

Month	Solar Radiation (kWh/m ² /day)	AC Energy (kWh)	Energy Value
January	2.58	127.0	\$20.81
February	3.08	155.0	\$25.75
March	4.63	253.0	\$40.77
April	5.93	314.0	\$50.26
May	5.81	317.0	\$51.21
June	6.41	375.0	\$59.75
July	6.21	365.0	\$59.21
August	5.92	330.0	\$55.15
September	5.20	295.0	\$50.22
October	3.17	174.0	\$27.99
November	2.61	114.0	\$20.24
December	2.31	122.0	\$24.48
Year	4.93	6105.0	\$149.81

Thank You!