Solar Open House
Hickory Ridge – October 3, 2015

Why go with Solar Power?

&

How to make it happen for you.

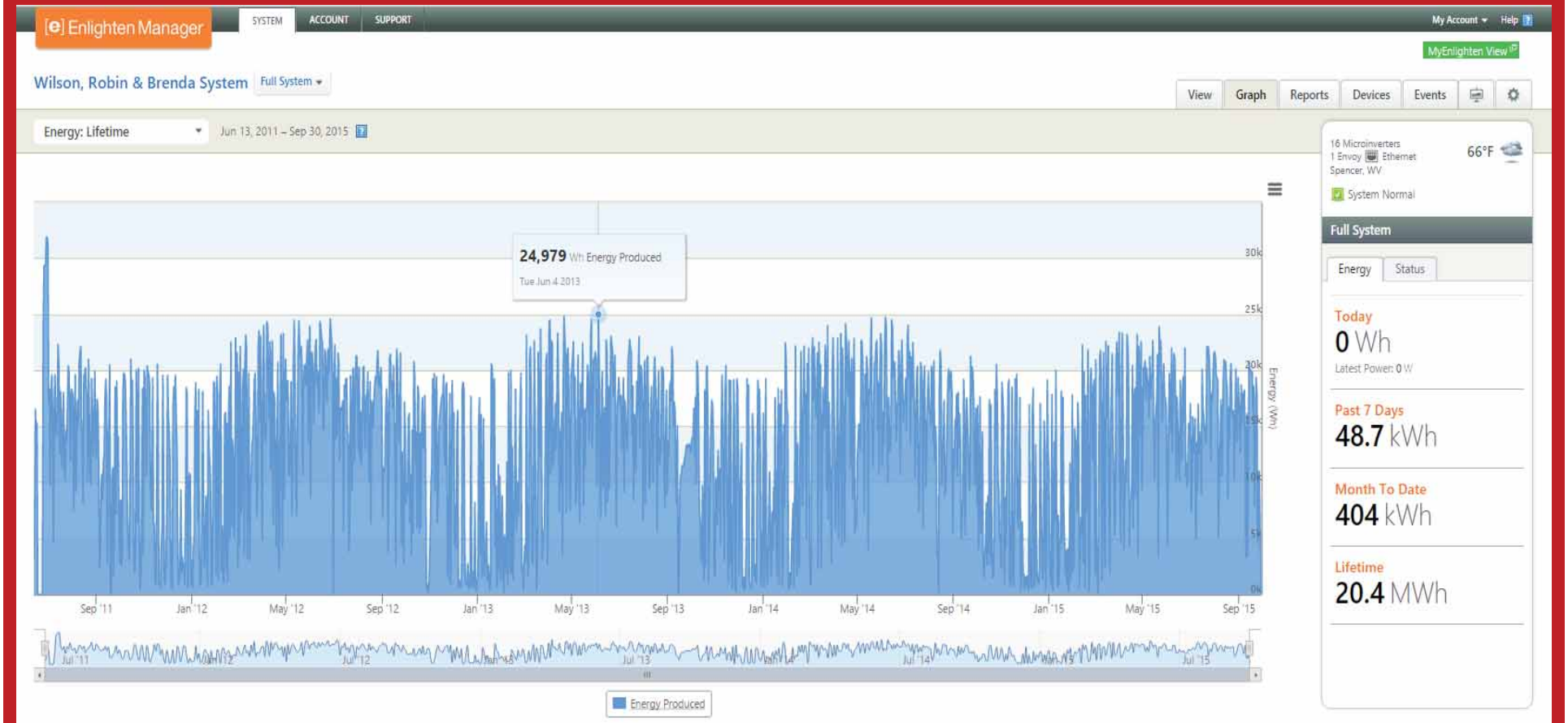
Thank you for your interest in Solar Power

Why Solar Power?

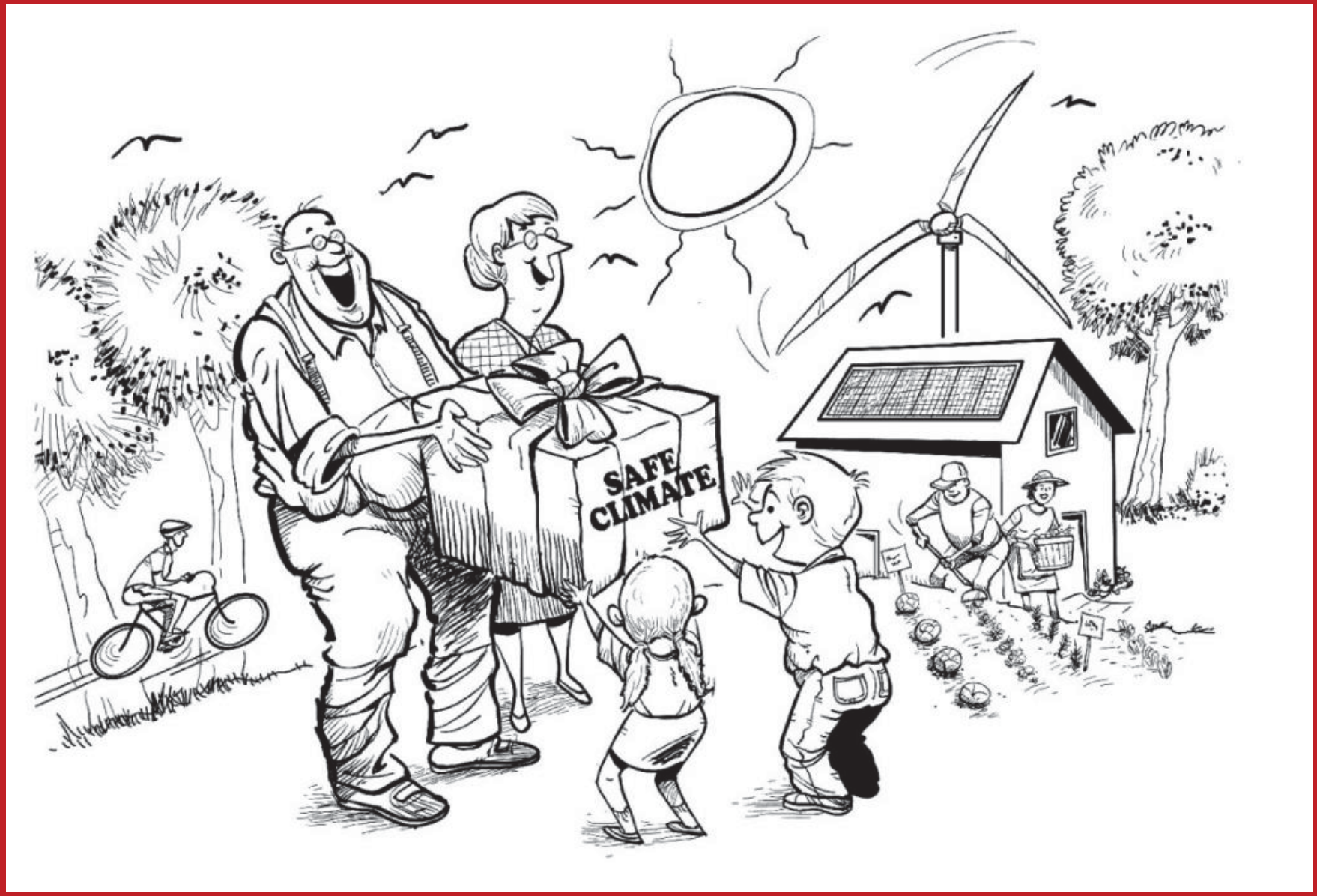
Empowering

Mountaineers are always free

Becoming an power producer



2. Necessary - Builds a safe climate future



2º C / 3.6 º F Agreed by almost all countries as maximum warming, Copenhagen 2009

From: http://act.350.org/signup/math-movie/

Dangerous Carbon Dioxide limit with business as usual

Amount of presently discovered fossil fuels . These stranded assets are the “Carbon Bubble” when we transition off fossil fuels.

The fossil fuel industries now have five times more known reserves than the 565 that would push us over 2 degrees Celsius. Their plan is to use these reserves.

3. Fun

Like watching bees make honey,
sit back and watch sunlight make electricity.

Local DIY encourages innovation and shared solutions –
Our neighbor Don Alexander created the rack design which thanks to his internet blogs are being used in Canada and the US.
Thank You Don!

Bill Howley with his Hybrid system

Solar Choices:

Off Grid: + independence - cost and maintenance of batteries

Grid Tied: + Excess power builds credit on your power bill plus SRECs income. - Power goes off when the grid is down

Hybrid System: Grid tied with battery back up + OK when grid is down - Expense and battery maintenance

Costs for our system 2011

Expenses - Our System

16 REC 215W modules / panels	
16 Enphase 190 micro inverters, 240VAC	
16 Enlighten 5 year subscriptions	
1 Elphase Envoy Communication Gateway	
2 Install Kits AC Branch Circuit	$12,300.00
235 ft. # 2 Aluminum Wire	$500.00
Rack for panels - local made	$1,200.00
Miscellaneous Expenses	$412.00
Labor	$450.00
Total before tax credits	$14,862.00
Federal tax credit for solar 30 % (after 2016 ? 10%)	$4,458.60
WV Solar tax credit (no longer available)	$2,000.00
Total after tax credits	$8,403.40
Cost per Watt	$2.44

Grid tied solar panel with Enphase microinverter

Envoy that connects your solar panel performance to the internet

Our return on investment / payback is 16 years

Return on Investment - feedback welcome robin@wvcag.org

Cells with variables for analysis

Year	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
First Year 6-15-11 to 6-14-12 - 4.75 MWh actual power produced. Second Year 4.70 MWh actual power production																			
.03% loss per year of output, actual st	2.46	4.97	4.57	4.69	4.65	4.62	4.59	4.56	4.53	4.49	4.46	4.43	4.40	4.37	4.34	4.31	4.28	4.25	4.22
Yearly income from PV panels																			
IF SRECs ~ $17 / Mw	41.82	84.54	77.72	79.68	79.12	78.57	78.02	77.47	76.93	76.39	75.86	75.32	74.80	74.27	73.75	73.24	72.73	72.22	71.71
17																			
Five year cumulative SRECs totals in $					362.89					750.26					1,124.27				
Estimated Electric Rate																			
any variation from .08722 / Kwh (↓) from 2012 change rate to .0915																			
1.01	0.08722	0.08809	0.09150	0.09150	0.09150	0.09242	0.09334	0.09427	0.09522	0.09617	0.09713	0.09810	0.09908	0.10007	0.10107	0.10208	0.10310	0.10414	0.10518
Yearly Avoid Cost - Electric bill saving:	214.56	438.08	418.34	428.86	425.86	427.11	428.36	429.61	430.87	432.13	433.40	434.67	435.94	437.22	438.50	439.79	441.08	442.37	443.66
Return on Investment (ROI)	256.38	522.62	496.06	508.54	504.98	505.67	506.38	507.08	507.80	508.52	509.26	509.99	510.74	511.49	512.26	513.02	513.80	514.58	515.37
% ROI	3.1%	6.2%	5.9%	6.1%	6.0%	6.0%	6.0%	6.0%	6.0%	6.1%	6.1%	6.1%	6.1%	6.1%	6.1%	6.1%	6.1%	6.1%	6.1%
Cumulative Return on Investment		9.3%	15.2%	21.2%	27.2%	33.3%	39.3%	45.3%	51.4%	57.4%	63.5%	69.5%	75.6%	81.7%	87.8%	93.9%	100.0%	106.1%	112.3%

Athens Electric – Drake Chamberlin
````Athens, Ohio

The price of solar panels has come down 75% in the last 6 years

2011 Our panels + inverters cost / watt = $ 3.58

2013 Panels + inverter cost / watt = $ 1.94, each $ 484.38

2014 Panels + inverter cost / watt = $ 1.82, each $ 455.35

		@	TTL
16	REC, 250W, MODULE, REC250PE BLK, BLACK, HOSIDEN - 011-02587 Each 15 218.42 3,276.30	251.18	4,018.93
16	2.1 ENPHASE, M215-60-2LL-S22, 60 CELLS, 215W, 240 & 208 VAC, MC4 PV CONN - 030-07701 Each 15 132.82 1,992.30	152.74	2,443.89
2	3.1 ENPHASE TRUNK CABLE,16 CONNECTORS, PORTRAIT, WITH TOOL, TERMINATOR, CAP, 40 CLIPS FOR M215, 240V - 052-10002 Each 1 327.75 327.75	376.91	753.83
2	4.1 ENPHASE BRANCH TERMINATOR FOR M215, ET-TERM - 030-07711 Each 2 13.68 27.36	15.73	31.46
6	5.1 ENPHASE WATER TIGHT CAP FOR M215, ET-SEAL - 030-07717 Each 6 2.80 16.80	3.22	19.32
1	ENVOY	483.00	483.00
	TOTAL		7,750.43

20 MODULE SYSTEM $9,106.77

Description / Item Code	Units	Quantity
HANWHA, HSL60P6-PB-4-250TW, PV MODULES, 250W, POLY/WHITE/BLACK, H4, CHINA - 011-06524	Each	20
ENPHASE, M215-60-2LL-S22, MICRO-INVERTER, 215W, 240/208 VAC, MC4 PV CONN - 030-07701	Each	20
ENPHASE ENVOY COMMUNICATIONS GATEWAY WITH ETHERNET BRIDGE PAIR - ENV-120-01 - 030-07705	Each	1
ENPHASE ENGAGE, ET10-240, PORTRAIT 240VAC, 12 CONNECTIONS, WITH TERMINATOR, CAP, AND 30 CLIPS - 052-10001	Each	2

Where Do We Go From Here?
Bell Scientist Daryl Chapin 1956 lecture: A solar array to power a house would cost ~ $1.4 million. "However exciting the prospect is of using silicon converters for power... clearly we have not advanced to where we can compete...commercially."

West Virginia Solar Coops save people about 25 % because they buy in a group of 20 or more.

http://www.wvsun.org/

Sample solar co-op cost breakdown

Example, not actual co-op pricing. System size will vary	3 kW	9 kW
System cost before incentives ($4.00/Watt)	**$12,000**	**$36,000**
Co-op discount (up to 25% off)	$3,000	$9,000
Initial upfront cost after co-op discount ($3.00/Watt)	**$9,000**	**$27,000**
Federal tax credit (30% of system cost)	$2,700	$8,100
Estimated annual electricity savings	$325	$975
Estimated annual SREC income	$144	$432
Total Cost (after one year)	**$5,831**	**$17,493**

3.5 KW system produces 1.2 Megawatts per year

Roof Mounted Solar Array:

Comprised of (4) SolarWorld (SW 235W) modules connected to (4) Enphase M-215 micro inverters. Array producing 1241kWh annually per kW DC based on PVWatts.org solar estimating tool for array oriented at 18.5 degree tilt and 210 degree azimuth. Array is supported by an XRS rail mounting system.

Roof Mounted Solar Array:

Comprised of (11) SolarWorld (SW 235W) modules connected to (11) Enphase M-215 micro inverters. Array producing 1178kWh annually per kW DC based on PVWatts.org solar estimating tool for array oriented at 18.5 degree tilt and 120 degree azimuth. Array is supported by an XRS rail mounting system.

mtvSolar

CLIENT	Renewable Energy Consultant	ISSUE	DRAWN BY	DESCRIPTION
Robin Wilson 1569 Jackson St. Charleston, WV 25311	Lisa Mitchell	5-13-13	DF	For a total system size of 3.525kW

“Net Excess Generation - Credited to customer's next bill at retail rate with no annual true-up (perpetual rollover).”

MonPower
A FirstEnergy Company

Bill Based On: Actual Meter Reading

April 29, 2015
Account Number: 110 088 632 705

Amount Due: $5.00

Due Date: May 20, 2015

20-0008 **2**

Billing Period: Mar 31 to Apr 28, 2015 for 29 days
Bill For: ROBIN WILSON
VIRTUAL NET METERING - HOST ACCOUNT
1065 STEEL HOLLOW RD
SPENCER WV 25276

To report an emergency or an outage, call 24 hours a day 1-888-544-4877. For Customer Service, call 1-800-686-0022. For Payment Options, call 1-800-736-3407. Pay your bill online at www.firstenergycorp.com
Bill issued by: Mon Power, PO Box 3615, Akron OH 44309-3615

Messages

To avoid a 2.00% Late Payment Charge being added to your bill, please pay the **Amount Due** by the Due Date.

Your meter is scheduled to be read once a year. If you would like to provide us with a monthly meter reading, please visit www.firstenergycorp.com/aboutyourbill or call 1-800-686-0022 between May 27, 2015 and the close of business on May 30, 2015. Otherwise, you will receive an estimated bill for the months your meter is not read.

For your safety, if your service has been disconnected, do not attempt to reconnect it. While this is illegal and could result in prosecution, removing a meter base or touching any of the wires can also cause death or serious injury through arcs of electricity, explosions or fire. Meters are only to be accessed by authorized utility personnel.

All of our employees wear photo ID badges. Always ask for an employee's ID before letting anyone in your home. If you are still not sure, please call the company.

An important message to dog owners - to ensure that our meter readers' visits to your home are safe and productive, please keep your dog secured in an area away from the path to your meter.

Account Summary	Amount Due
Previous Balance	5.00
Payments/Adjustments	-5.00
Balance at Billing on Apr 29, 2015	**0.00**
Mon Power - Consumption	**5.00**
Total owed by May 20, 2015	**$5.00**
As a Checkless customer - Total charges of $5.00 will be deducted from your account on May 20, 2015	

Usage Information for Meter Number S07380119	
Apr 28, 2015 KWH Reading (Actual)	4,196
Mar 31, 2015 KWH Reading (Actual)	4,132
Kilowatt Hours Metered	64
Apr 28, 2015 KWH Reading (Actual)	14,195
Mar 31, 2015 KWH Reading (Actual)	13,840
Kilowatt Hours Out	355
Apr 28, 2015 Banked KWH Credit	10,572
Mar 31, 2015 Banked KWH Credit	10,281

Charges From Mon Power	
Customer Number: 0804831047 5001139458	
Rate: Residential Service MP-RSAF	
Base Charge	5.00
Current Consumption Bill Charges	**5.00**

Detail Payment and Adjustment Information	
04/21/15 Payment	-5.00

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Payments/Adjustments	-5.00
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Mon Power - Consumption	**5.00**
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Detail Payment and Adjustment Information

[e] Enlighten

Multiple Year Energy Report

Wilson, Robin & Brenda System

Spencer, WV

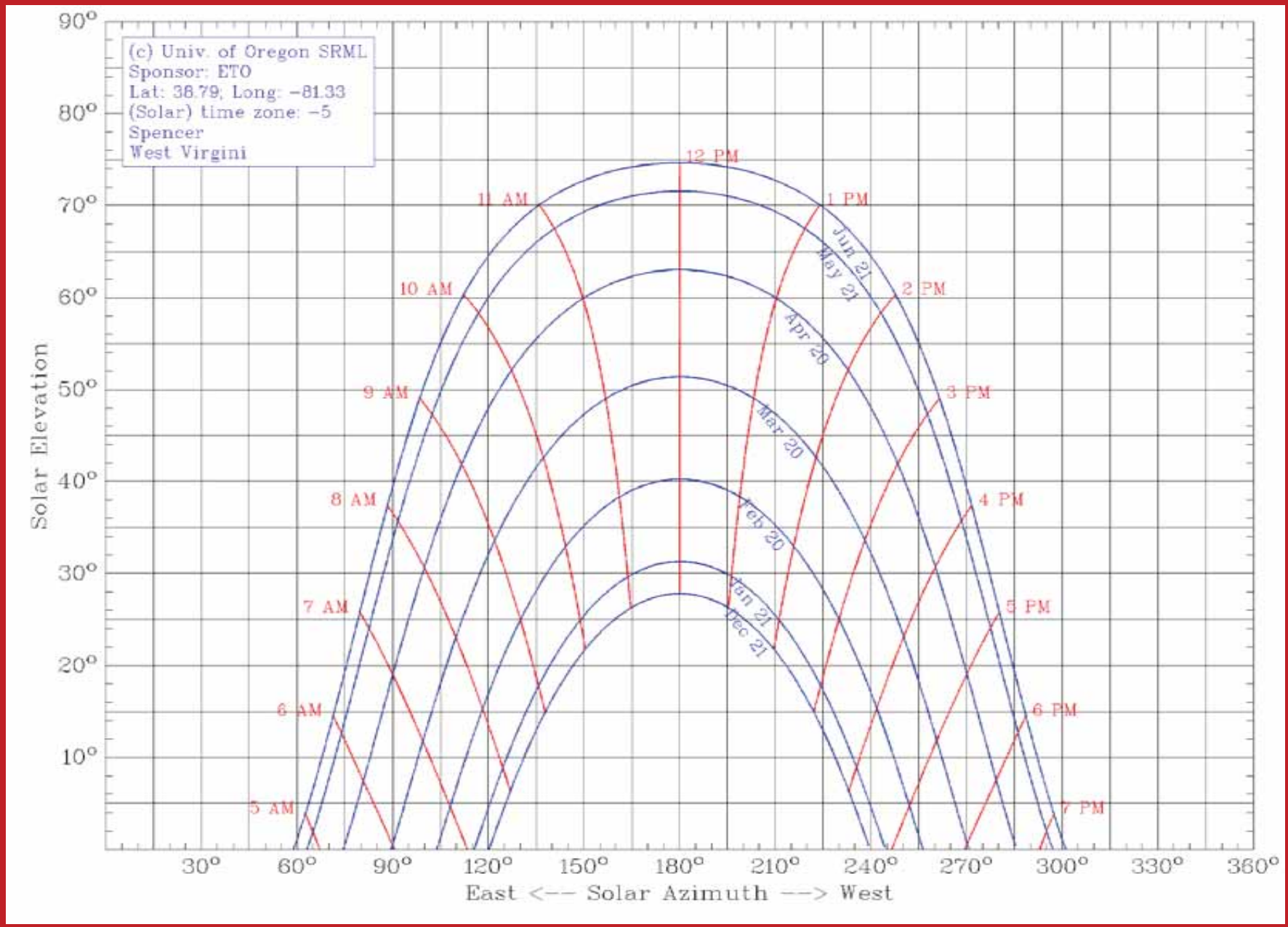
Generated for Robin & Brenda Wilson
on 09/30/2015

This report provides up to five years energy production ending with the year 2015.

Month	2011	2012	2013	2014	2015
January	0 kWh	269 kWh	235 kWh	296 kWh	205 kWh
February	0 kWh	318 kWh	225 kWh	296 kWh	313 kWh
March	0 kWh	441 kWh	336 kWh	455 kWh	405 kWh
April	0 kWh	473 kWh	490 kWh	444 kWh	425 kWh
May	0 kWh	546 kWh	525 kWh	536 kWh	560 kWh
June	230 kWh	579 kWh	491 kWh	539 kWh	453 kWh
July	503 kWh	504 kWh	518 kWh	529 kWh	474 kWh
August	496 kWh	519 kWh	472 kWh	450 kWh	515 kWh
September	330 kWh	426 kWh	387 kWh	417 kWh	404 kWh
October	323 kWh	329 kWh	353 kWh	266 kWh	0 kWh
November	302 kWh	400 kWh	320 kWh	272 kWh	0 kWh
December	275 kWh	169 kWh	220 kWh	188 kWh	0 kWh
Total	**2,460 kWh**	**4,973 kWh**	**4,572 kWh**	**4,687 kWh**	**3,755 kWh**

Month	2011	2012
January	0 kWh	269 kWh
February	0 kWh	318 kWh
March	0 kWh	441 kWh
April	0 kWh	473 kWh
May	0 kWh	546 kWh
June	230 kWh	579 kWh
July	503 kWh	504 kWh
August	496 kWh	519 kWh
September	330 kWh	426 kWh
October	323 kWh	329 kWh
November	302 kWh	400 kWh
December	275 kWh	169 kWh
Total	2,460 kWh	4,973 kWh

You can figure out when your solar site will get direct sunlight

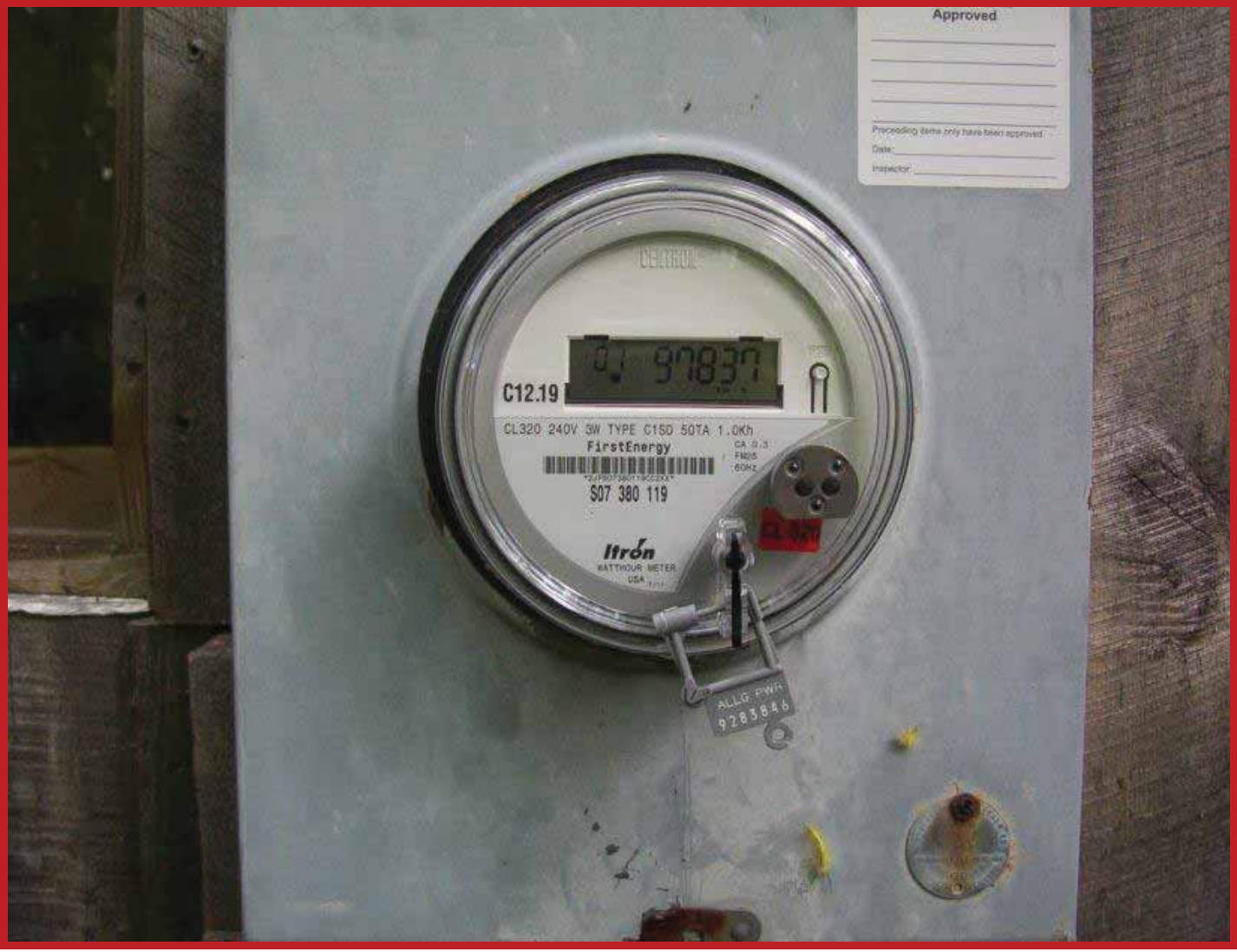


Carroll Christensen and Robin making and checking the adjustable solar rack

In big solar areas roof solar instillations are done in one day. Mine took working off and on took three months. Do it your self solar install saves half the cost.

When your solar array is finished it is hard to wait for the electrical inspector, Max Hill, and the Mon Power inspection.

Net Meter counts backwards from 99999 when you generate a surplus.



Thomas Massie Congressman from Kentucky
Tea Party + Off grid solar

My house is solar powered. I tell Republicans, you can hate the subsidies - I hate the subsidies, too - but you can't hate solar panels. These are rocks that make electricity, so they are incapable of receiving your hate.

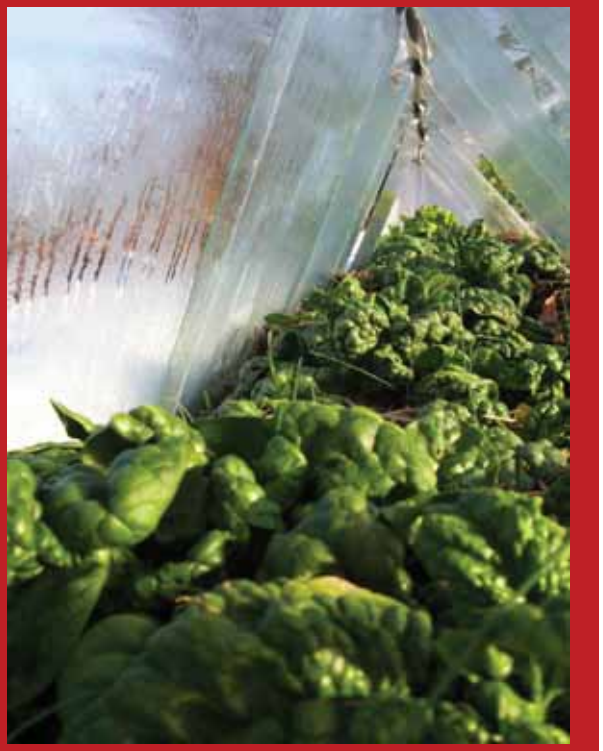
The real subsidies are to power plants that externalize cost of carbon pollution to future generations and the public's health.

TUSK
TELL UTILITIES SOLAR WON'T BE KILLED

Passive Solar Home Heating

Natural Convection air flow brings 96 ºF warm air into the house and heats the crawl space to heat the floor. Plus earth sheltered helps insulate our addition.

New Vision in Philippi, West Virginia promotes solar power and sends panels and lights to families without electricity in Kenya and the Dominican Republic



Local Production:

- Food
- Electricity
- Housing
- Transportation