Are you ready for Solar ?

Presented by the Plainfield and Cornish Energy Committees

Feb 18, 2016

Are you ready for Solar ?

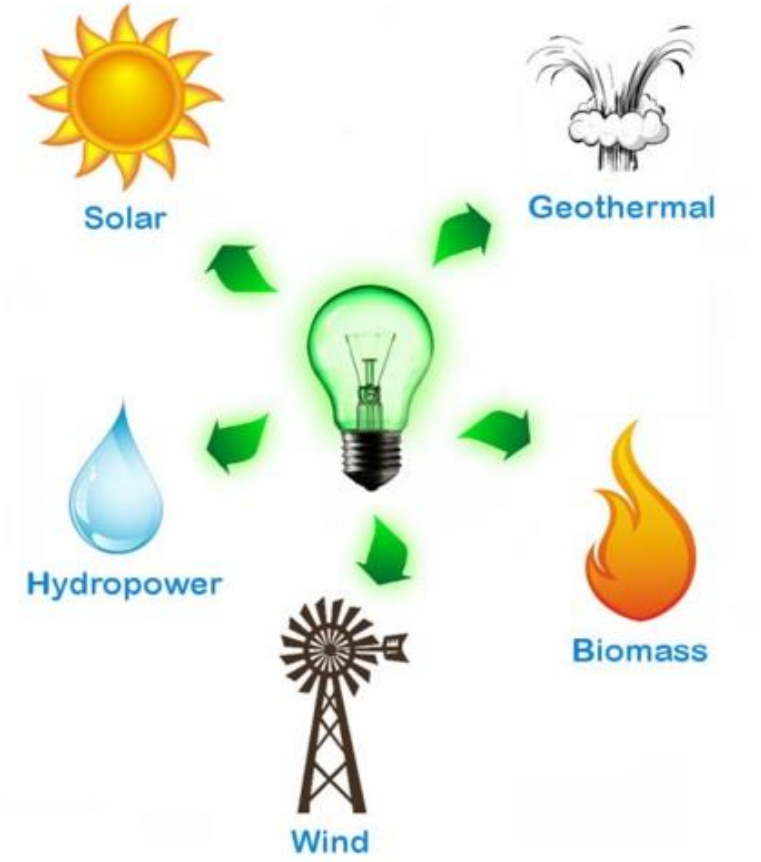
Education
Guidance
Advice

Are you ready for Solar ?

- An Introduction to residential photo voltaic solar energy

- What you need to know to go solar
- Owner experiences
- Discussion

What is Solar Energy?



Renewable energy is the power harvested from natural sources which are not in danger of being depleted

What is PV Solar Energy?

pho·to·vol·ta·ic

ˌfōtəvōlˈtāik, ˌfōtōväl-/

adjective

relating to the production of electric current at the junction of two substances exposed to light.

PV is not solar thermal energy where a different type of collector is used to heat fluids

Solar Photo Voltaic Systems are

- Efficient
- Reliable
- Flexible
- Green
- Cost Effective

How does PV work?

One Solar Cell

Converts solar energy into electricity

One Solar panel or module

- 50 -100 cells in series
- Mechanical support and weatherproofing

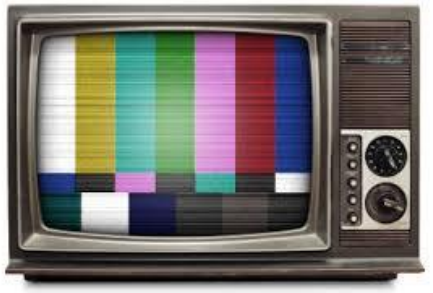
An Array is a set of panels

20 panels can produce 5kW of electricity

What is a kW?

- **watt (W)** – the unit of electric power
- **kilowatt (kW)** – 1000 watts
- **kilowatt-hour (kWh) –** a measure of electric power production or consumption over a period of time

An electric heater rated at 1000 watts (1 kilowatt), operating for one hour uses one kilowatt-hour of electricity



A television rated at 100 watts operating for 10 hours continuously uses one kilowatt-hour of electricity

A 40-watt light bulb operating continuously for 25 hours uses one kilowatt-hour of electricity

What happens when the sun isn't shining?

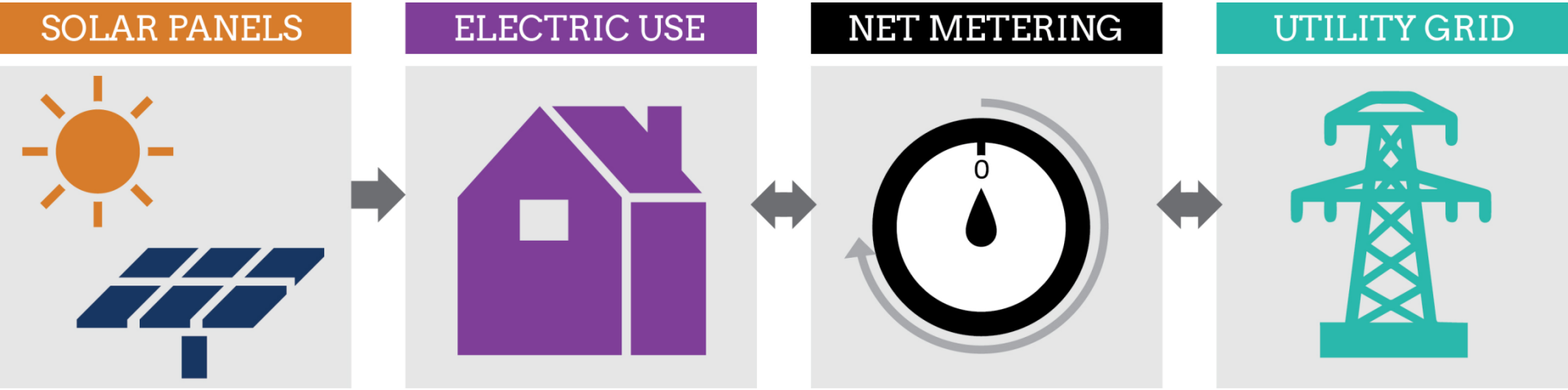
- Use it or lose it

- Store excess electricity : *Battery Backup*

- Let the Utilities manage the excess : *Net Metering*

What is Net Metering?

Net metering allows you to use the electric utility grid like a bank account. You can put electricity into it that you don't use immediately and you can withdraw the same amount later.

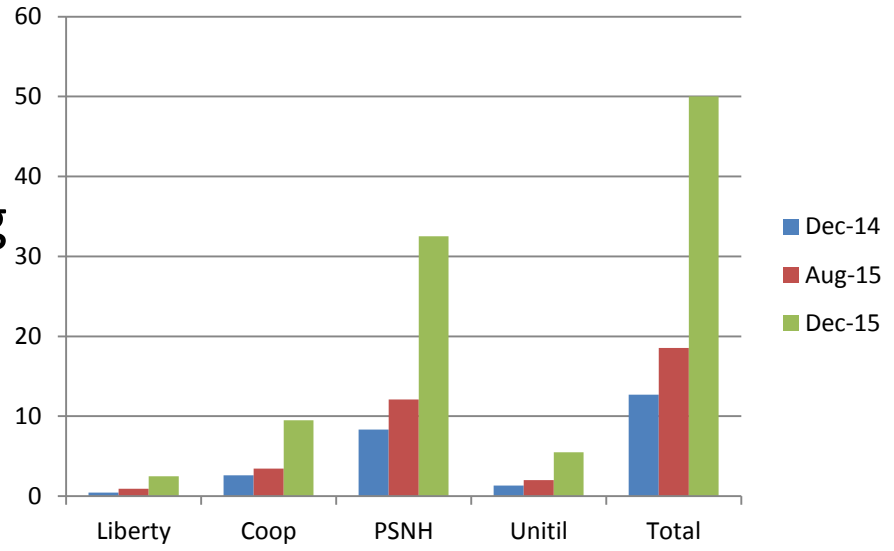


Net Metering is regulated by the NH PUC

What is the Net Metering Cap?

The Net Metering Cap

The NH PUC allows the state's electric utilities to grant net metering to its customers in order to provide up to 50 mW of electricity from renewable resources.



- Liberty and Eversource are not accepting new applications
- Senate Bill 333 asks that the cap be increased to 75 mW
- The additional 25 mW will be divided proportionately among the state's distribution utilities
- 60% of each utilities' share will be for facilities generating less than 100kW

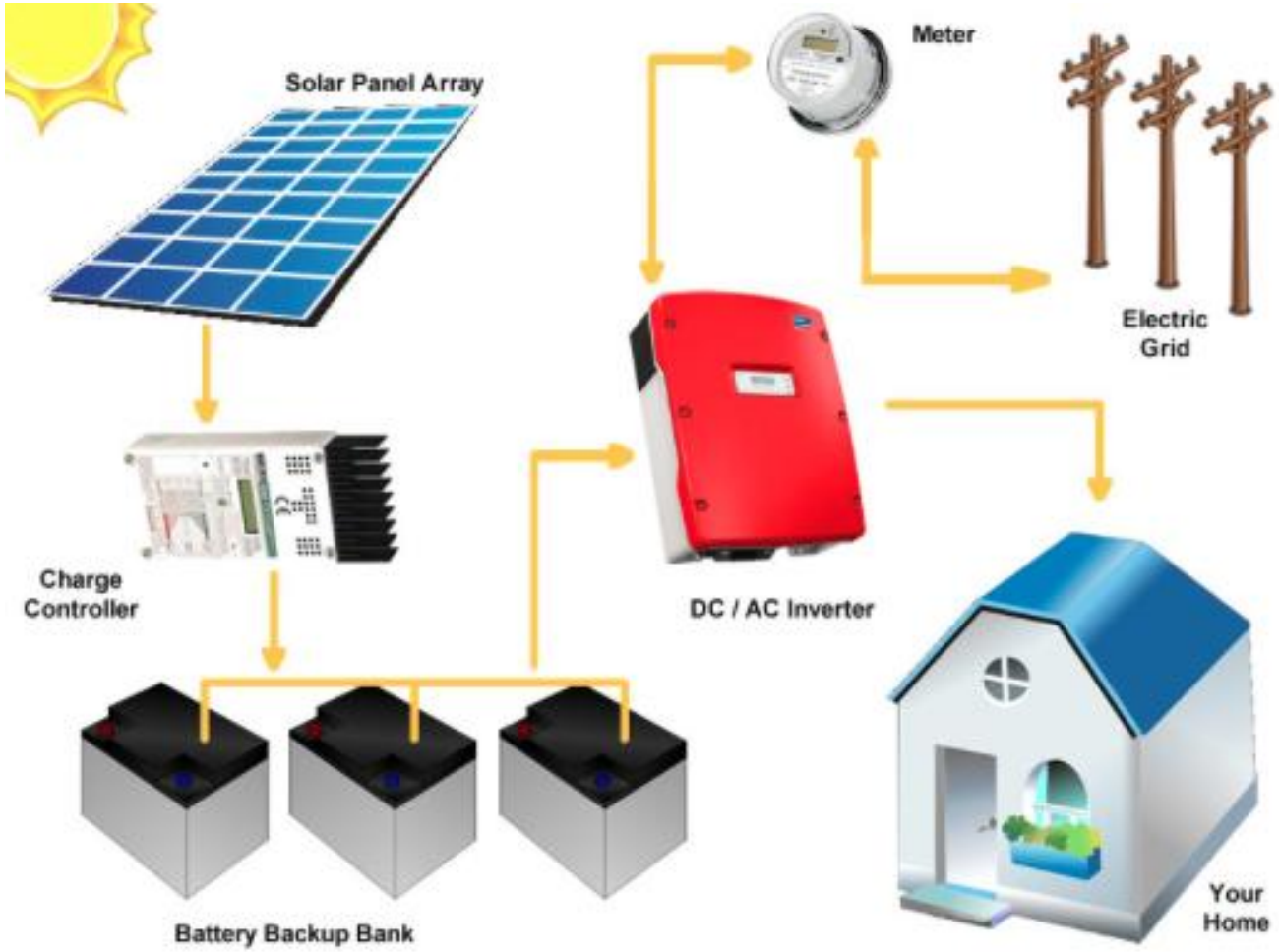
What Kind of PV System do I want?

Decision 1

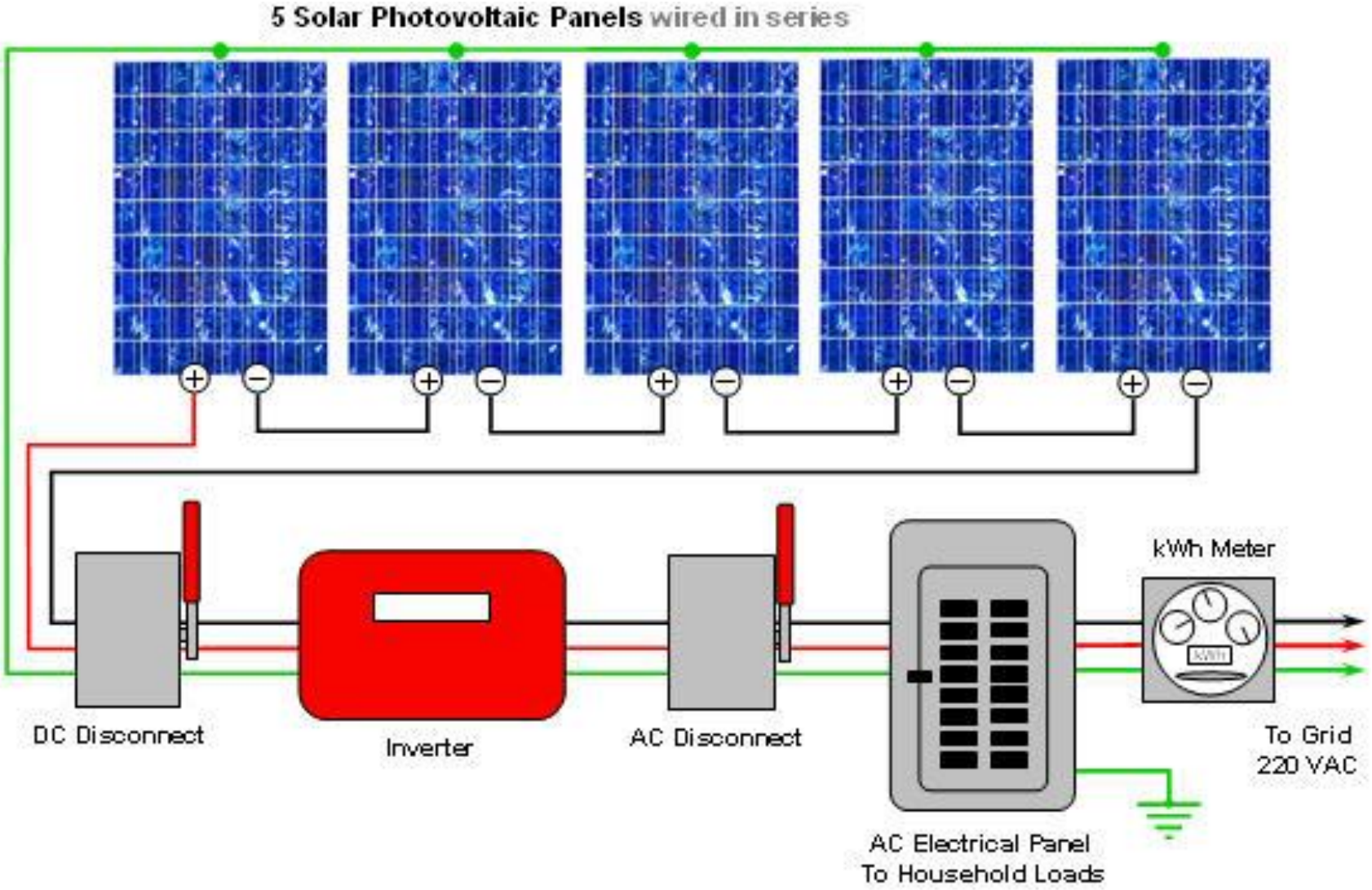
Off Grid?

Grid Tied?

Battery backup?



A PV Solar System contains a few components



PV Components - Panels

PV Components - Mounting

Decision 2

- roof or ground?
- fixed or adjustable?

Roof or Ground Mount?

Aesthetics

Accessibility for maintenance

Cost

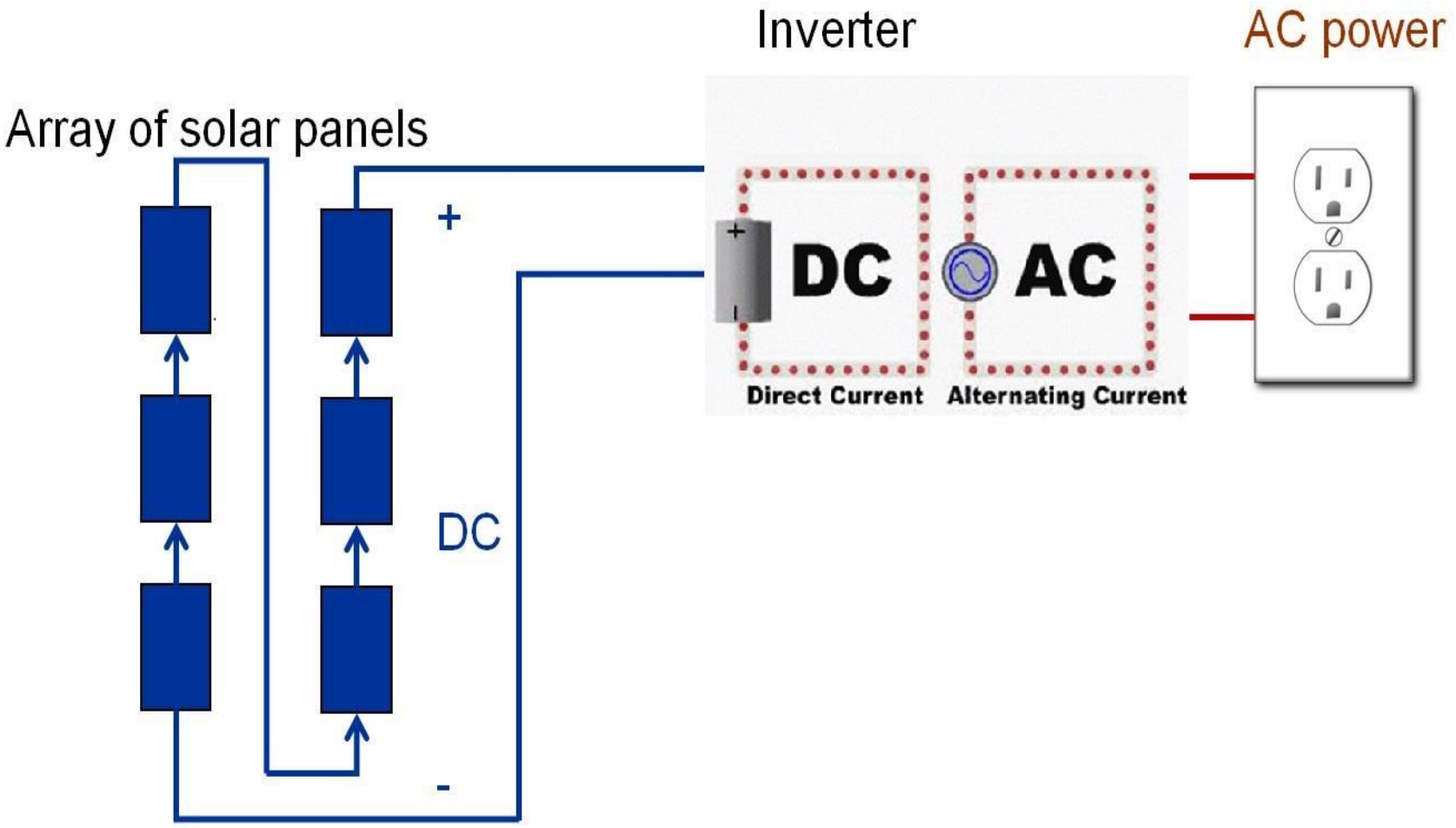
Considerations for Roof Mount

- Orientation
- Structural integrity of the roof
- Amount of available space

Considerations for Ground Mount

- More flexibility
- Wind loading
- Trenching

PV Components - Inverter



PV Components – Inverter

Decision 3

- String?
- Micro Inverters?
- Optimizers?

How to decide?

String Inverters are:

1) Mature technology – converts DC from all panels to AC
2) Large, heavy units
3) Sized to match solar array – one wall mounted unit
4) Lower cost

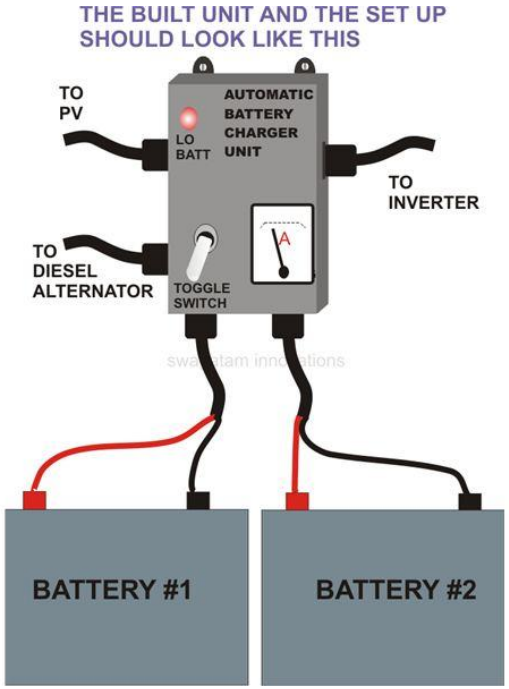
Microinverters are:

1) Small electronic devices, one per panel
2) No high voltage DC – converts DC to AC at the panel
3) Easier to expand your PV array
4) Most have 25-year warranty

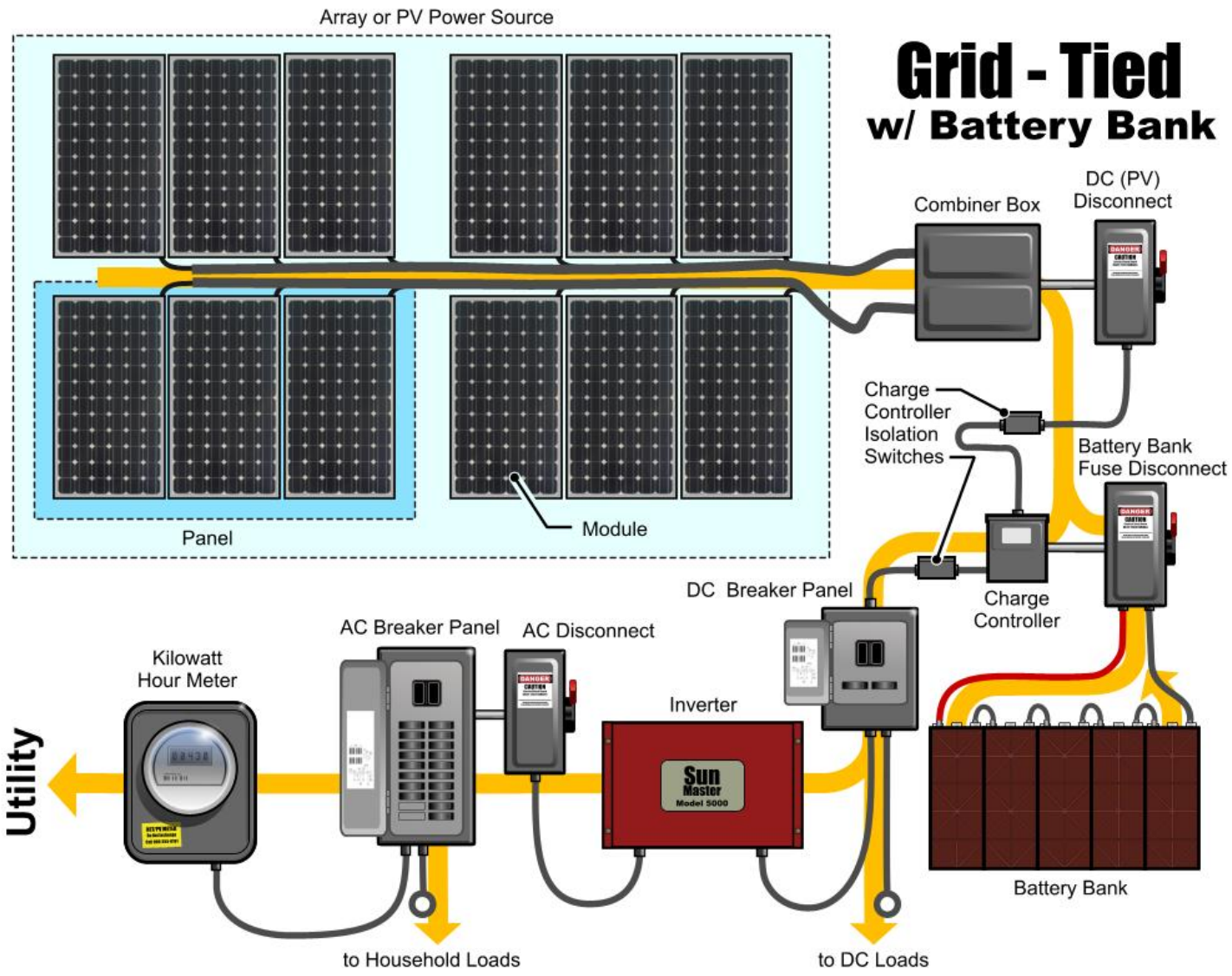
Optimizers are:

1) Similar to microinverters in concept, but use a string inverter
2) One per panel for optimization
3) Simpler electrical components

Battery Backup



PV System – putting it all together

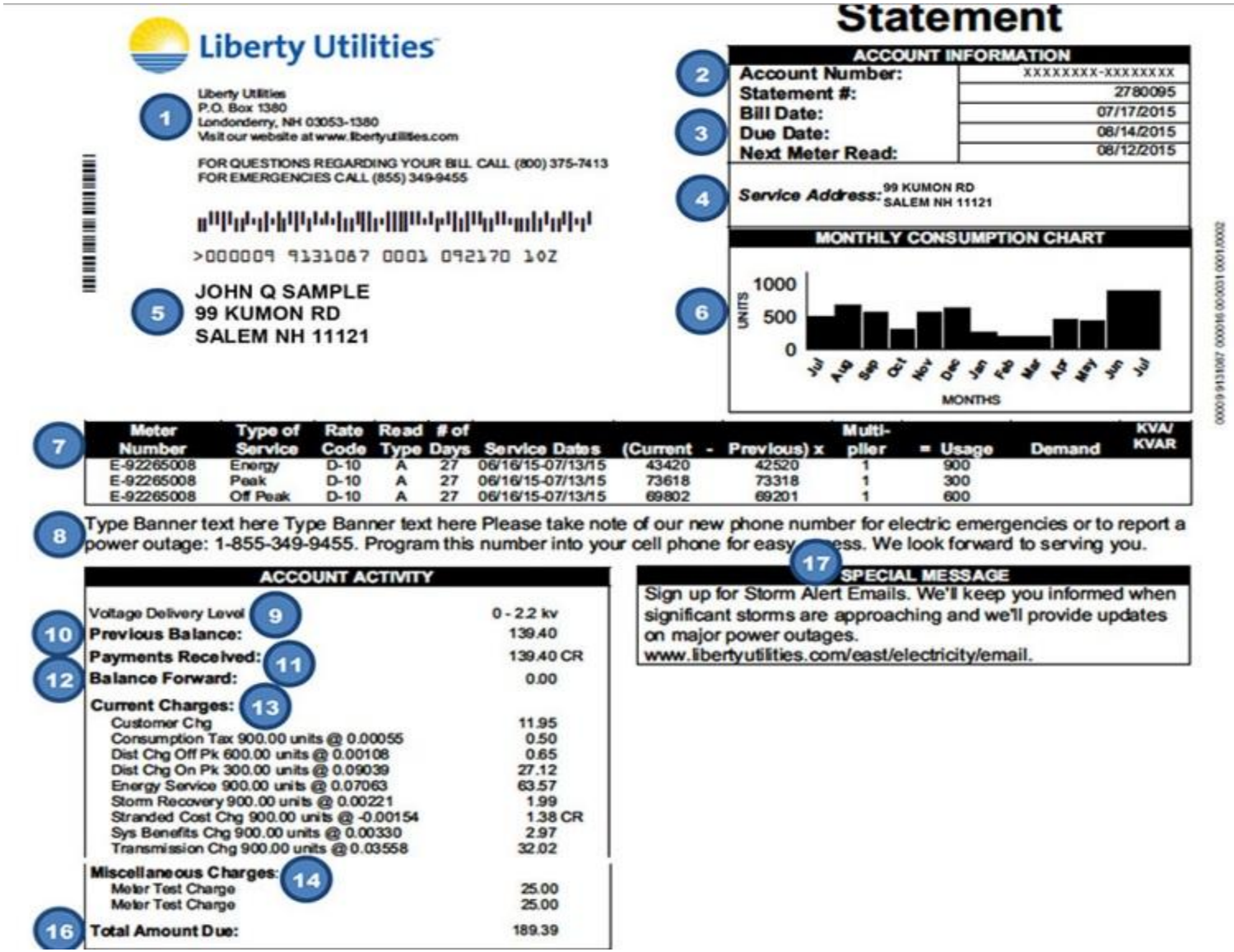


Decision 4

What size system do I need?

- What are your energy goals?
- **Electric Hot Water Heater? Electric stove? Electric Dryer?**
- The actual amount of electricity produced is dependent on how much solar energy reaches your site.
- Average size PV system is 5kW

Look at your electric bill



Liberty Utilities

1 Liberty Utilities
P.O. Box 1380
Londonderry, NH 03053-1380
Visit our website at www.libertyutilities.com

FOR QUESTIONS REGARDING YOUR BILL CALL (800) 375-7413
FOR EMERGENCIES CALL (855) 349-9455

>000009 9131087 0001 092170 10Z

5 JOHN Q SAMPLE
99 KUMON RD
SALEM NH 11121

Statement

ACCOUNT INFORMATION

2 Account Number:	XXXXXXXX-XXXXXXX
Statement #:	2780095
3 Bill Date:	07/17/2015
Due Date:	08/14/2015
Next Meter Read:	08/12/2015

4 *Service Address:* 99 KUMON RD SALEM NH 11121

MONTHLY CONSUMPTION CHART

6

7

Meter Number	Type of Service	Rate Code	Read Type	# of Days	Service Dates	(Current - Previous) x	Multi-plier	= Usage	Demand	KVA/ KVAR
E-92265008	Energy	D-10	A	27	06/16/15-07/13/15	43420 - 42520	1	900		
E-92265008	Peak	D-10	A	27	06/16/15-07/13/15	73618 - 73318	1	300		
E-92265008	Off Peak	D-10	A	27	06/16/15-07/13/15	69802 - 69201	1	600		

8 Type Banner text here Type Banner text here Please take note of our new phone number for electric emergencies or to report a power outage: 1-855-349-9455. Program this number into your cell phone for easy access. We look forward to serving you.

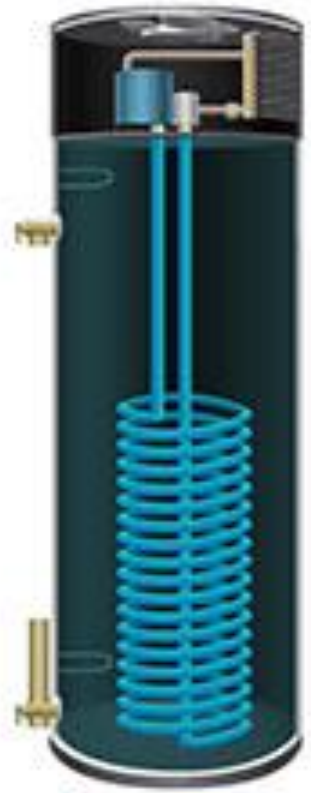
ACCOUNT ACTIVITY

9 Voltage Delivery Level	0 - 2.2 kv
10 **Previous Balance:**	139.40
Payments Received: 11	139.40 CR
12 **Balance Forward:**	0.00
Current Charges: 13	
Customer Chg	11.95
Consumption Tax 900.00 units @ 0.00055	0.50
Dist Chg Off Pk 600.00 units @ 0.00108	0.65
Dist Chg On Pk 300.00 units @ 0.09039	27.12
Energy Service 900.00 units @ 0.07063	63.57
Storm Recovery 900.00 units @ 0.00221	1.99
Stranded Cost Chg 900.00 units @ -0.00154	1.38 CR
Sys Benefits Chg 900.00 units @ 0.00330	2.97
Transmission Chg 900.00 units @ 0.03558	32.02
Miscellaneous Charges: 14	
Meter Test Charge	25.00
Meter Test Charge	25.00
16 **Total Amount Due:**	189.39

17 **SPECIAL MESSAGE**

Sign up for Storm Alert Emails. We'll keep you informed when significant storms are approaching and we'll provide updates on major power outages.
www.libertyutilities.com/east/electricity/email.

More on sizing: Three reasons to potentially "think big" and oversize your system



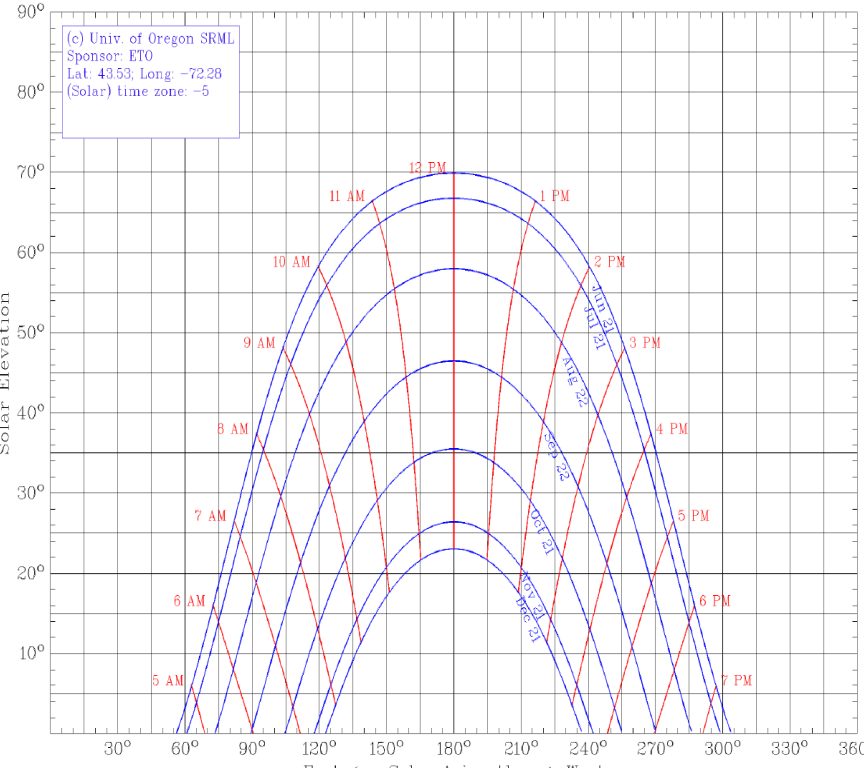
1) **Electric Heat Pump Water Heaters**
   - Relatively new to the market; very efficient
   - **Solar water heating from your PV system!**
2) **Electric Air-Source Heat Pumps**
   - Becoming more viable in this climate
   - **Solar space heating from your PV system!**
3) **Electric Cars**
   - Even if a Tesla Model S isn't in your future, a Nissan Leaf might be…
   - **Transportation fueled by your PV system!**

Don’t forget…

- You can supply all your electricity with a smaller solar system if you improve electric efficiency.
- A few tips:
  - Stop using old refrigerators.
  - If you don’t like compact fluorescent lights, try LEDs.
  - Super-efficient “heat pump” dryers are now available in the US.
  - Great resources are at energystar.gov

Do I have a good location for solar panels?

Azimuth - Pointing true south is best

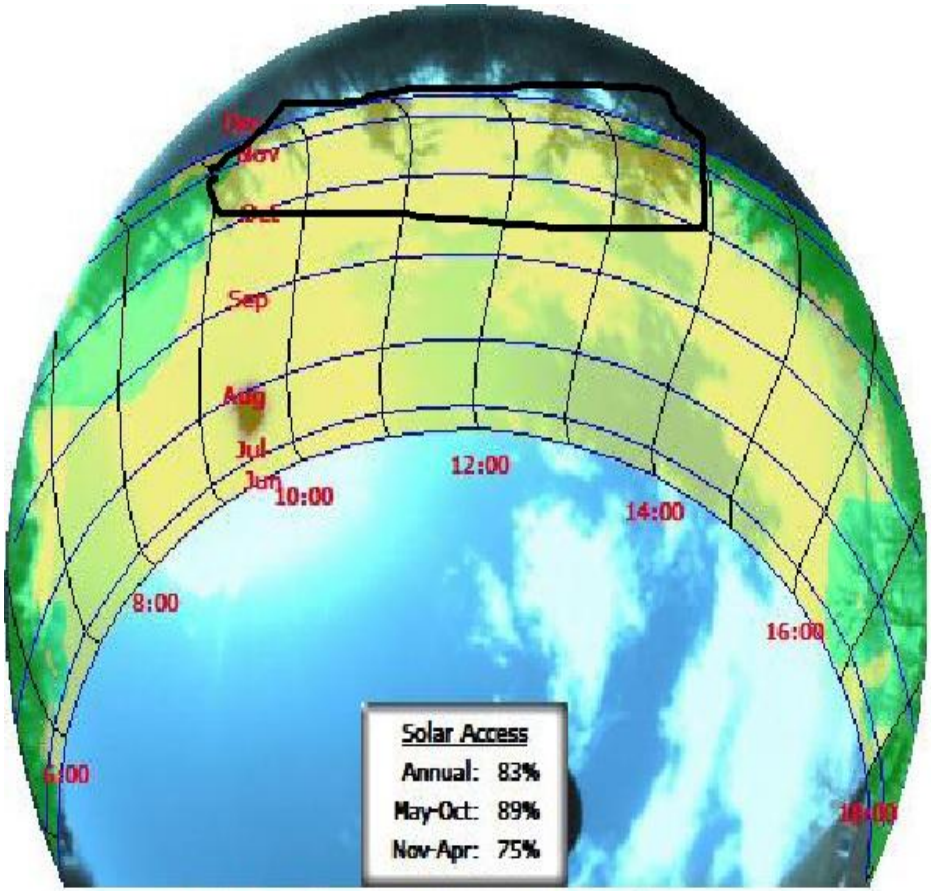


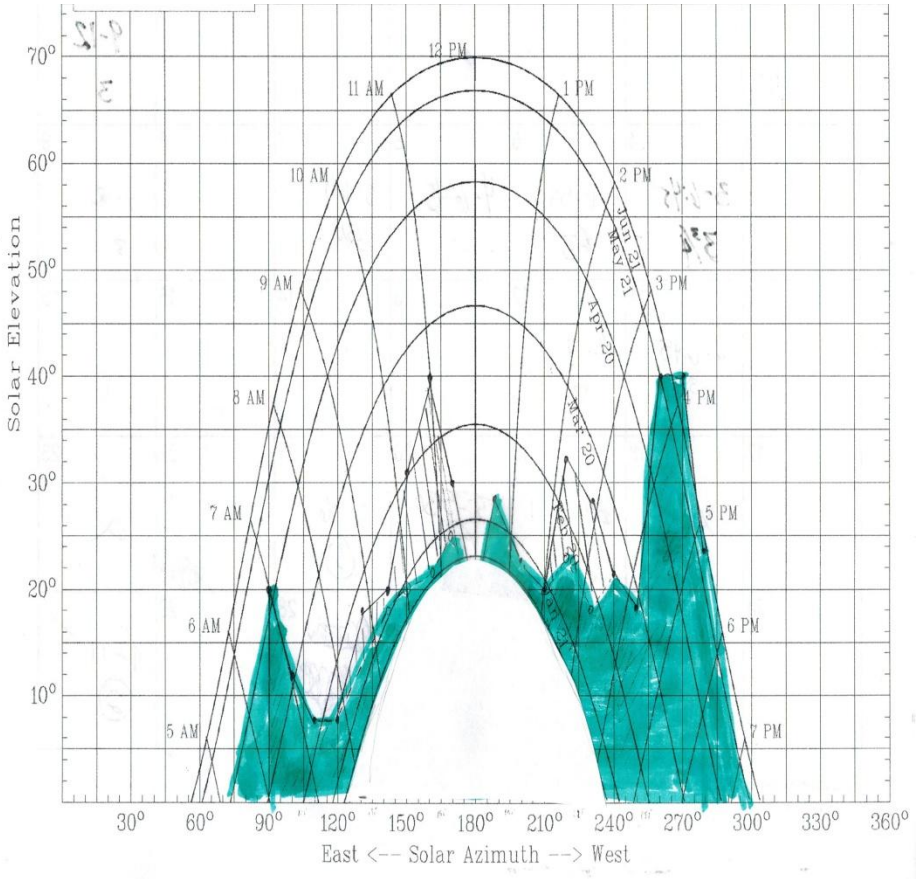
% of optimal generation		W	SW		S		SE	E	
		270°	225°	210°	180°	150°	135°	90°	True
		285°	240°	225°	195°	165°	150°	105°	Magnetic
	60°	65%	85%	89%	92%	88%	83%	63%	
15/12	51°	70%	89%	94%	97%	92%	88%	68%	
12/12	45°	73%	92%	96%	99%	94%	90%	71%	
9/12	37°	77%	94%	97%	100%	96%	92%	75%	
6/12	27°	81%	94%	97%	99%	96%	93%	79%	
	25°	81%	94%	97%	99%	96%	93%	80%	
3/12	14°	84%	92%	94%	95%	93%	91%	83%	
Roof Pitch Tilt Angle									

Tilt – The angle of fixed panels should be close to 37 deg

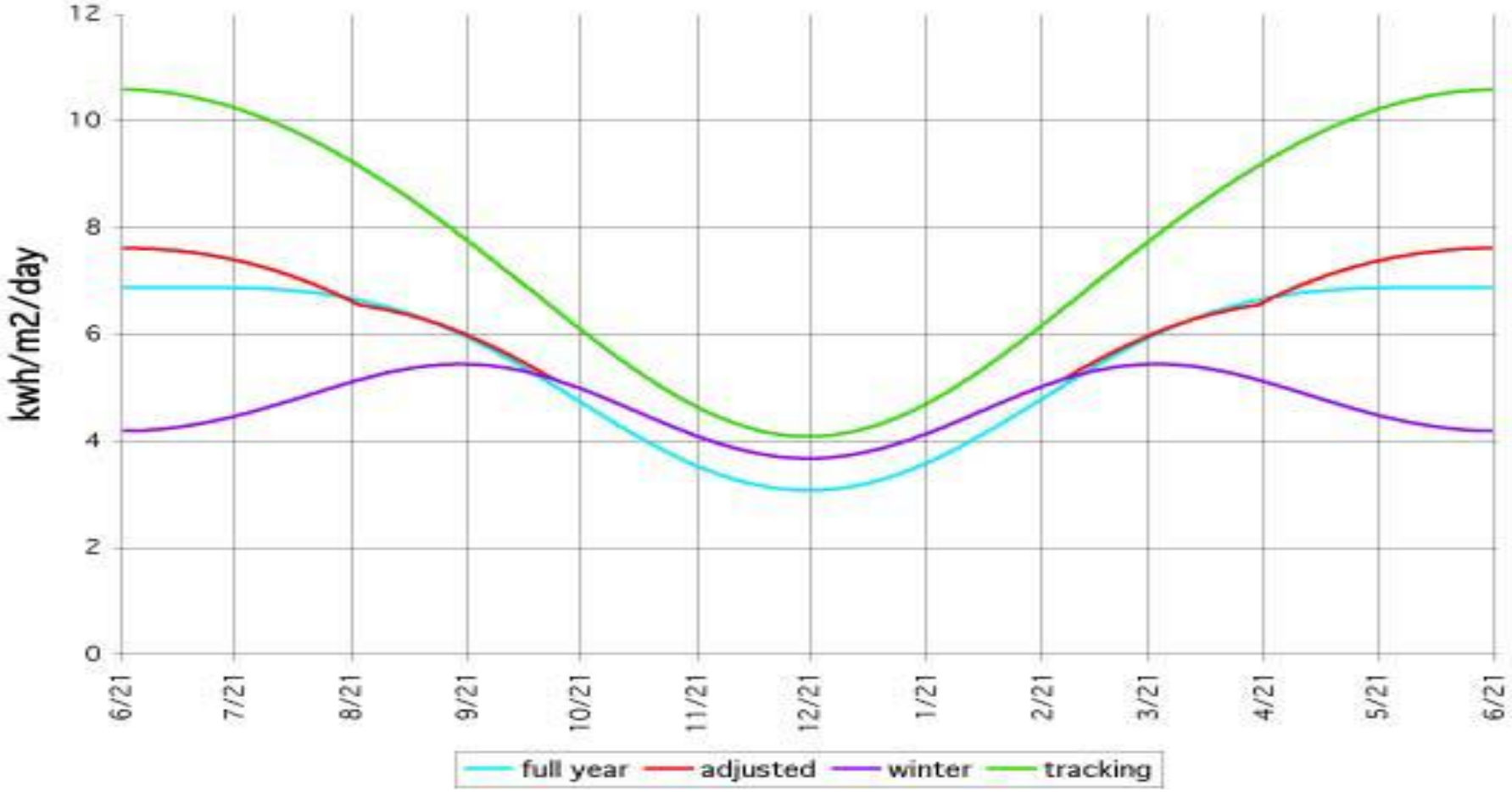
Avoid shading!

Solar Survey

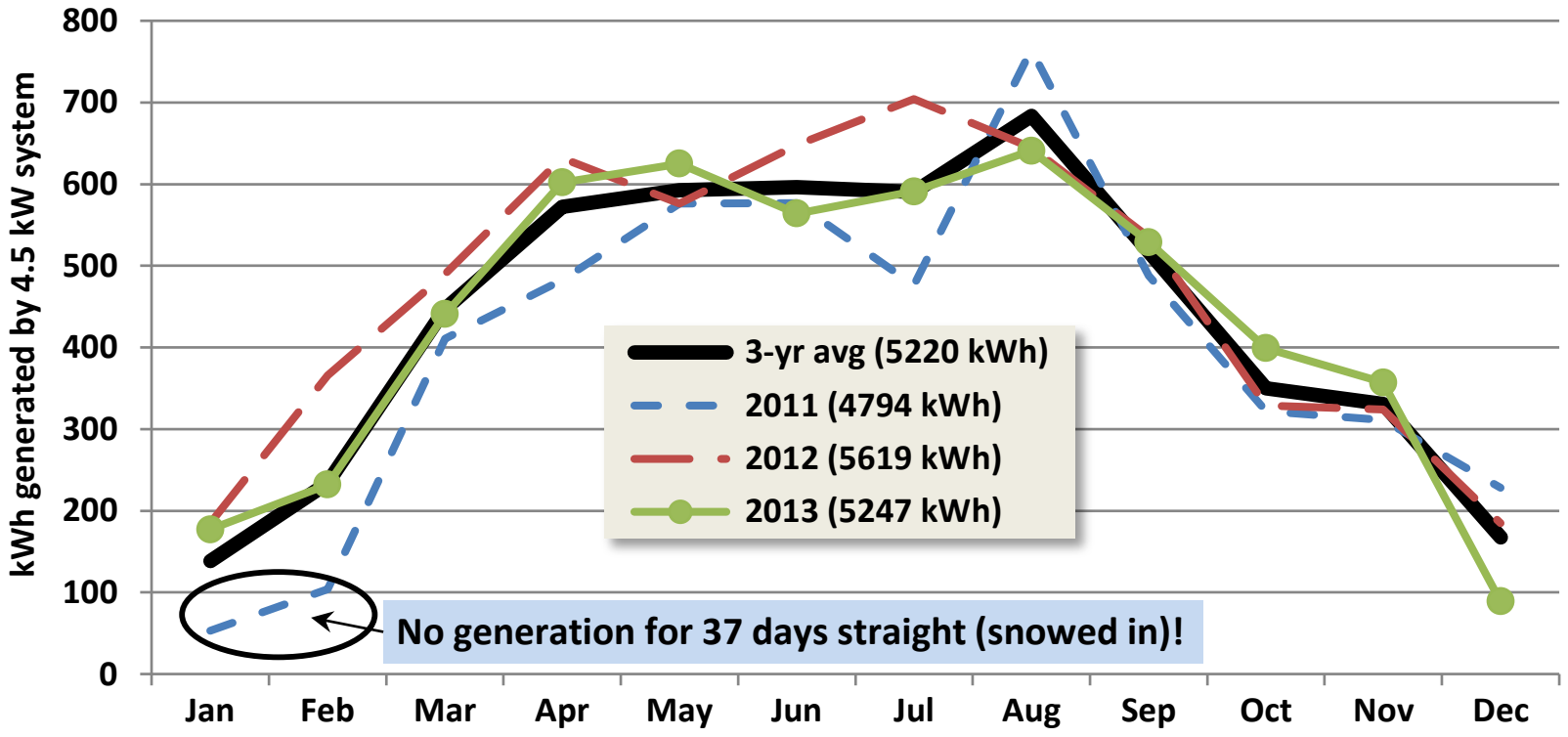




Seasonal affect of tilt

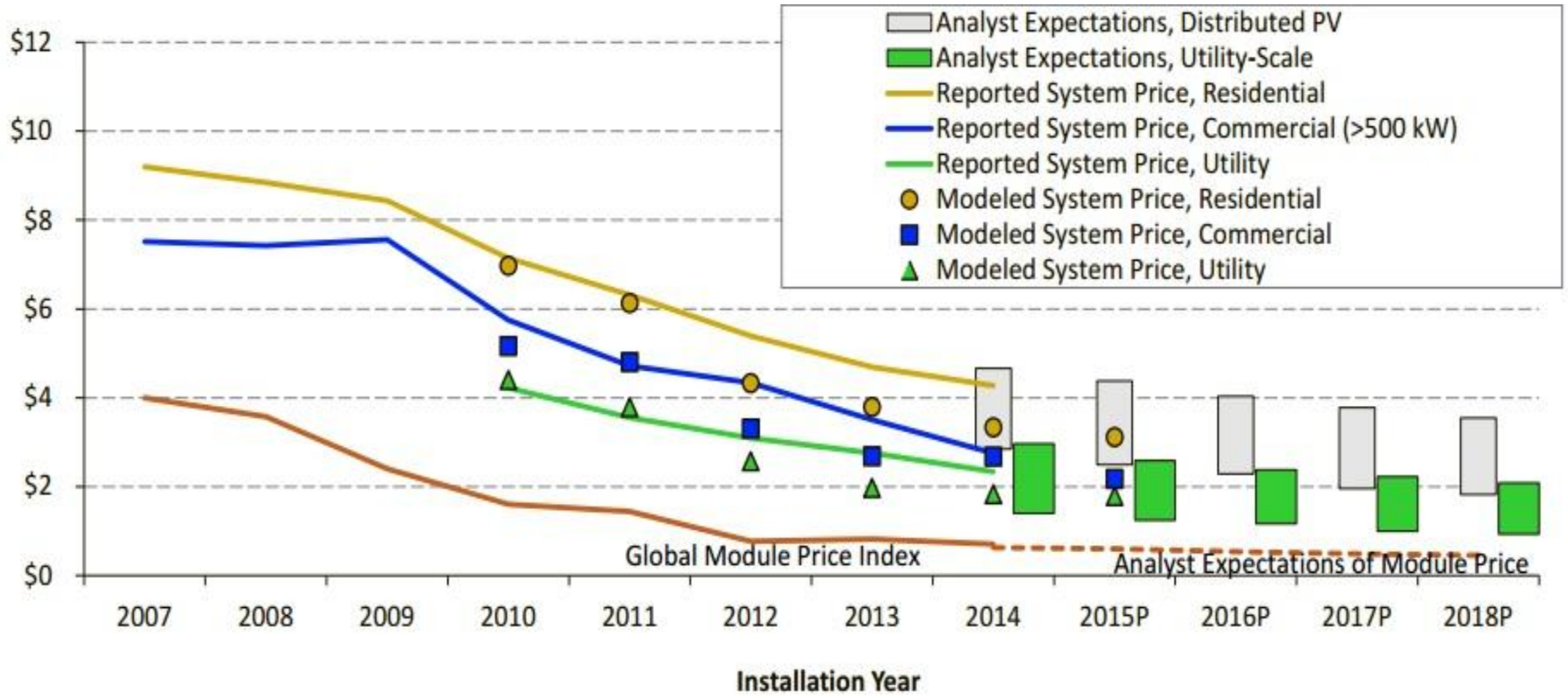


3 year history of a 4.5 kW system



Thanks to Mark Bolinger of the Lyme EC

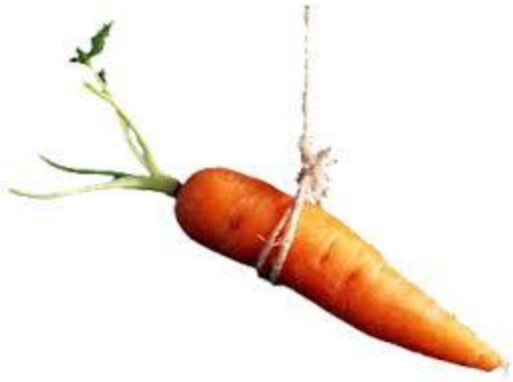
How much does a PV system cost?



Less than $4/watt installed

5kW system less than $20000

Residential Incentives



Federal: 30% investment tax credit ("30% ITC")

- ***Scheduled to decrease to 10% starting in 2019 through 2021***
- Credit is claimed on IRS Form 5695: Residential Energy Credits
- Paperwork is simple: enter total system cost and multiply by 30%; copy the result to Line 52 of Form 1040

State (PUC): Cash rebate of $0.50/W up to a max of $2500, or 50% of system costs – whichever is less

- Two-step application process, likely handled primarily by the installer
- Systems as large as 10 kW eligible, but rebate maximum is 5 kW

Utility: NHEC customers get an additional cash rebate of $0.25/W up to $1375 (*in exchange for your RECs*)

How much does a PV system actually cost?

(An example of a 5KW system at $4.00/watt)

Example Installed price:	$20,000
Less 30% tax credit:	- $6,000
Less $.50/watt PUC rebate	- $2,500
Plus tax on rebate	+ $625
Actual cost:	$12,125
(Recs $160/yr * 10 years	- $1600)

That's $2.45/watt installed

Payback / ROI

System cost is $12125
Yearly electricity expense is $1000 at .20/kWh
Production/consumption is equal at 5000kW/year

Your payback period is ~12 years, then you get…

13 years of free electricity worth $13000!

That's an annualized Return on Investment (ROI) of 6.56%!

And a reduction of 89.56 tons of CO2 over 25 years!

Financing Options

Home Equity Loans

Installer Finance Programs

vitalcommunities.org/energy/solarize-financing/

Leasing?

Application, Permitting and Property Taxes

1) **Utility application for Net Metering**

   If you intend to install a Solar PV system this year, get your Net Metering interconnect application into your electric utility ASAP! You will need to have a specific system selected, but will have a chance to amend the application before you install.

2) **Town Permitting - Plainfield**

   Very simple process if PV system will be installed on the roof of an existing structure or on the ground below 15 feet. Planning board hearing is needed for large systems.

   Subject to structural and electrical inspection by town inspector or licensed electrician

3) **Town Permitting – Cornish**

   A permit is not needed if a new permanent foundation is not required

   An electrician/Installer needs to sign Certificate of Completion for Utility Interconnect

4) **No property tax impact!**

   NH allows towns to exempt solar property from taxation

   Plainfield provides a $500 assessment waiver for residential solar installations

Six reasons to act NOW!

1) **The NH PUC Net Metering cap may be reached again soon**
2) The 30% residential investment tax credit begins to decrease to 10% starting in 2019 through 2021
3) State and utility incentives may decrease or disappear
4) Net Metering regulations may change
5) If you are concerned about climate change: immediate CO_2 reductions are better than future CO_2 reductions
6) Interest rates are low, which makes financing more viable

What you can do to prepare

1) **Figure out how much electricity you consume in a year**
   - Your electricity bill should tell you this, or the power company can
2) **Might your consumption change significantly in the future?**
   - Electric car? New addition to the family, or kids heading off to college? Upgrading to a new efficient refrigerator? Heat pump hot water heater?
3) **Think about viable locations for your PV system**
   - Roof- vs. ground-mount; consider trimming or thinning trees as necessary
4) **Ask questions**
   - The Energy Committees and "solar ambassadors"
5) **Attend our Solar Installers Expo on March 17**
   - Learn from the pros! Schedule a site visit!
6) **Help spread the word!**
   - If you're not ready, maybe you know someone that is!

How to Select an Installer

What *products* do they sell?
What *services* to they provide?
What *support* do they offer?

Come to our installer exposition on Mar 17
Come to our Open Houses
Talk to your friends and neighbors
Compare quotes – cost per kWh

Or Do It Yourself

Do you have more time than money?

Are you afraid of heights?

Its simpler than you think

Packages are available

Solar Raising

Electricity is Dangerous!

DIY is not for everyone…
- You need confidence in your electrical and mechanical ability
- You wont get the same level of professional support or advice
- You may find that financing options are not available

When in doubt, get professional help!

Additional Resources

- A copy of this presentation
- Links to pertinent utility web pages
- A Complete list of local Solar Installers
- Energy Calculators
- Cost/ROI Calculators
- And much more can be found at www.plainfieldnh.gov/energy/energy.htm (click on Solar Resources)

Are you ready for Solar ?

We’re here to help

Education

Guidance

Advice

Owner Experiences

Evan and Lee Oxenham (Plainfield) have a fairly typical roof mount system

Bill Cable and Mary Boyle (Cornish) create more energy than they use

Vince and Pat DeMasi (Cornish) are off grid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