

Kickoff Presentation March 15, 2017



Why Go Solar?



Climate change is
not a hoax!



Save Money on Electricity

How can I reduce my carbon footprint?

Take an overall look at things we can do at home before even considering a solar installation.



Easy ways to reduce your energy consumption

- Turn down the temperature of your hot water heater.
- Install setback or programmable thermostats.
- Get rid of that extra refrigerator in your basement or garage.
- Select Energy Star rated appliances.
- Turn off lights when you don't use them.
- Install compact fluorescent or LED bulbs instead of incandescent bulbs.
- Only run the dishwasher when it is full.
- Update your furnace or AC unit (if it is very old) to a more efficient model.
- Install energy efficient windows.
- Insulate, insulate, insulate.

Schedule a free Home Energy Audit (Able)



Able Home Performance
No Cost Home Energy Assessments

A Mass Save Partner Offering Home Energy Assessments and Insulation Services



BBB Rating:
A+
as of 5/2/2016

[Click for Review](#)



[AHP HOME](#)

[HOW WE CAN HELP YOU](#)

[CONTACT US / SCHEDULE](#)

[NEWTON](#)

myenergyaudit@able911.com

Direct: (781) 436-2639

A great place to start:

www.newtonsave.com or
call 781-436-2639

Just enter your name,
email, and phone

Home energy assessments
are free and are performed
by Able Home Performance



Green Newton

Green Newton strives to empower residents, businesses and institutions to conserve energy and water, promote reuse and recycling practices and adopt more sustainable behaviors.

Green Newton has partnered with Able Home Performance through its [Newton Energy Savers Program](#) to facilitate and encourage energy efficiency by setting a common goal of providing 1,000 No Cost Mass Save® Home Energy Assessments for Newton Residents.

Over 670 homes in Newton have taken this step and you can too! Help Newton lower its carbon footprint by scheduling your no-cost Home Energy Assessment today!

Sign Up for Your No Cost Home Energy Assessment

Name: *

Email: *

Phone

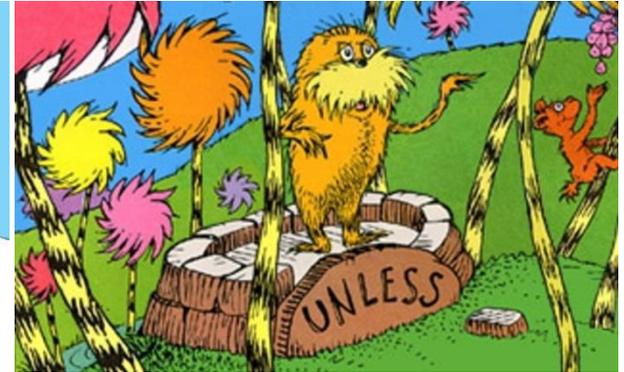
Comments/Questions:

[Submit](#)

Can I really make a difference by going solar?

The CO₂ emissions saved each year with a medium sized residential solar installation is roughly equal to removing one automobile from the road for one year.

Source: <https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator>

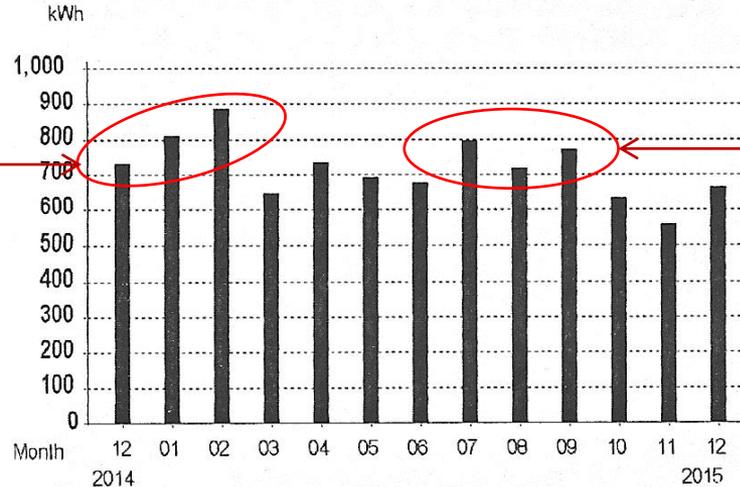


UNLESS someone like you
cares a whole awful lot,
nothing is going to get better.
It's not.

Theodor Seuss Geisel, 1971

Check your historical spending on electricity

- Check your electric bills for the last year and calculate your kWh **usage per year** (don't look at \$ spent).
- Factor in a different expected usage if you have anticipate changes in consumption.
- Your goal in adding a solar PV system is to produce enough electricity to satisfy 80% to 100% of your needs, but this will be a lot easier if you reduce your usage.
- Note how your usage changes from month to month



Shorter days = more electricity for lighting

Central AC uses more electricity in late summer

Understand your Electric Bill

Your bill is split into: monthly fixed customer charge **\$6.43** plus:

Supplier Charges }
Delivery Charges } These are billed per kWh

- **Supplier** charges go to the supplier of the electricity that you use. Most Eversource customers have a fixed supplier rate that changes every 6 months.
- **Delivery** charges are set by whomever bills you (Eversource), and change occasionally.

Current rates in ¢ per kWh in Newton (Eversource):

Supplier: 10.32¢

Delivery: 10.77¢

= **21¢ / kWh total**

Where will electric rates go?

- Electricity rates have tended to rise over time. Around +2% to +4% per year.

Part of Eversource's proposal to the DPU is to consolidate and align rate classifications in Massachusetts.

If approved by the DPU, distribution rates on January 1, 2018 would be as follows:

- For a typical residential non-heating customer an increase of \$9.08 per month for average use of 525 kWh per month, representing a 7.9 percent monthly increase.
- For a typical residential non-heating low-income customer an increase of \$2.87 per month for average use of 438 kWh per month, representing a 4.5 percent monthly increase.

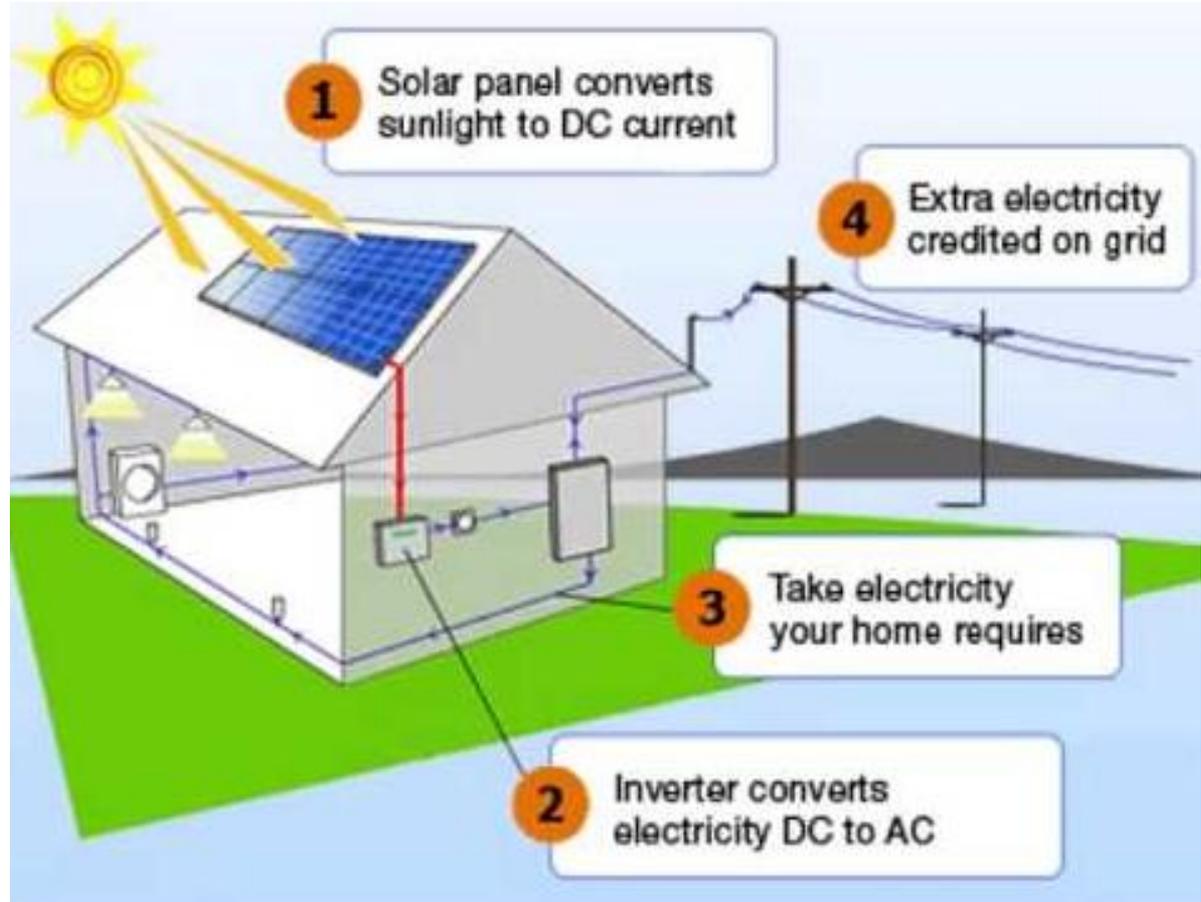
This insert to my Feb '17 electric bill says Eversource is requesting a 7.9% increase in the DELIVERY charges starting in Jan, 2018

How Solar Works

Solar panels produce DC (direct current). Houses require AC (alternating current).

An inverter is a device that changes DC to AC.

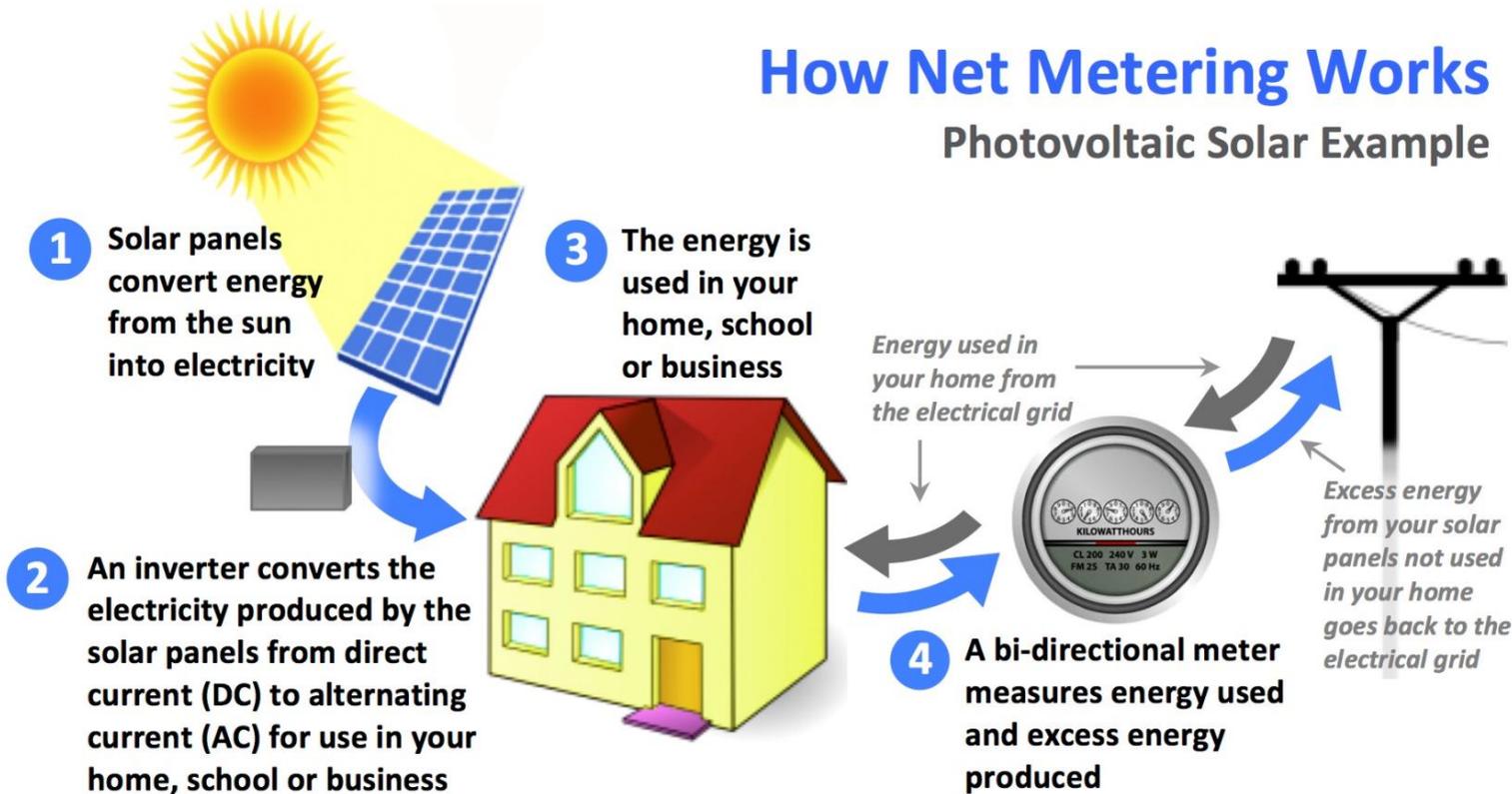
Excess electricity produced is put back on the grid and you get paid for all the electricity that you produce.



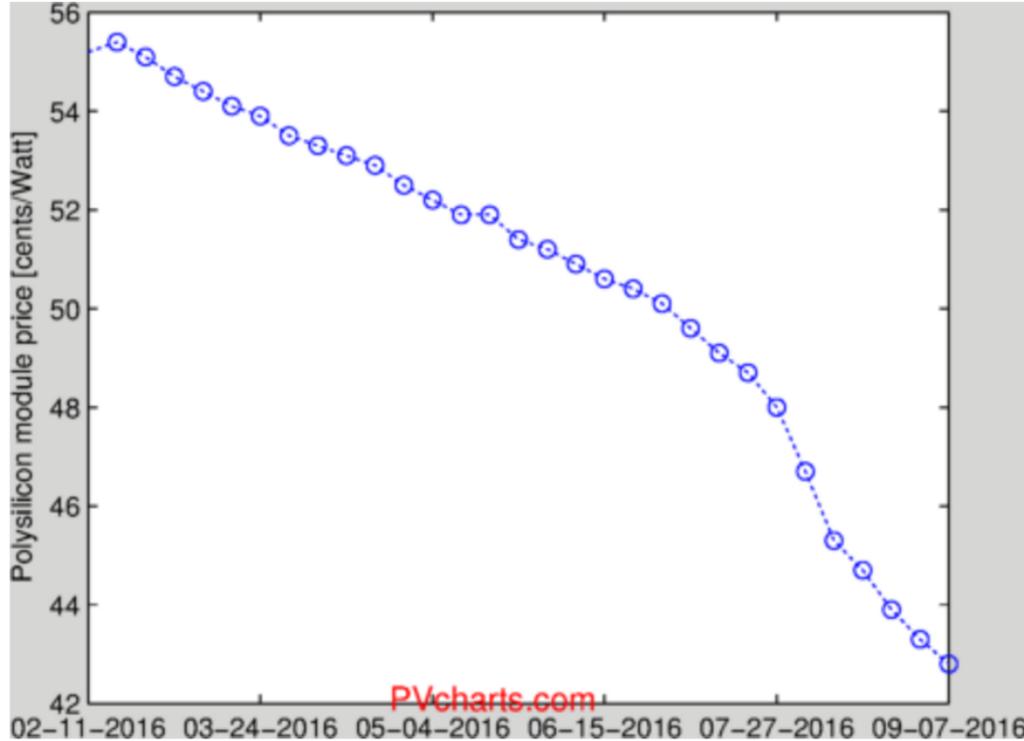
What is Net Metering?

Allows you to get paid for ALL the electricity you produce, even if you produce more than you use in some months.

Think of this like “rollover minutes” on your cell phone plan.



The cost of solar PV modules is coming down

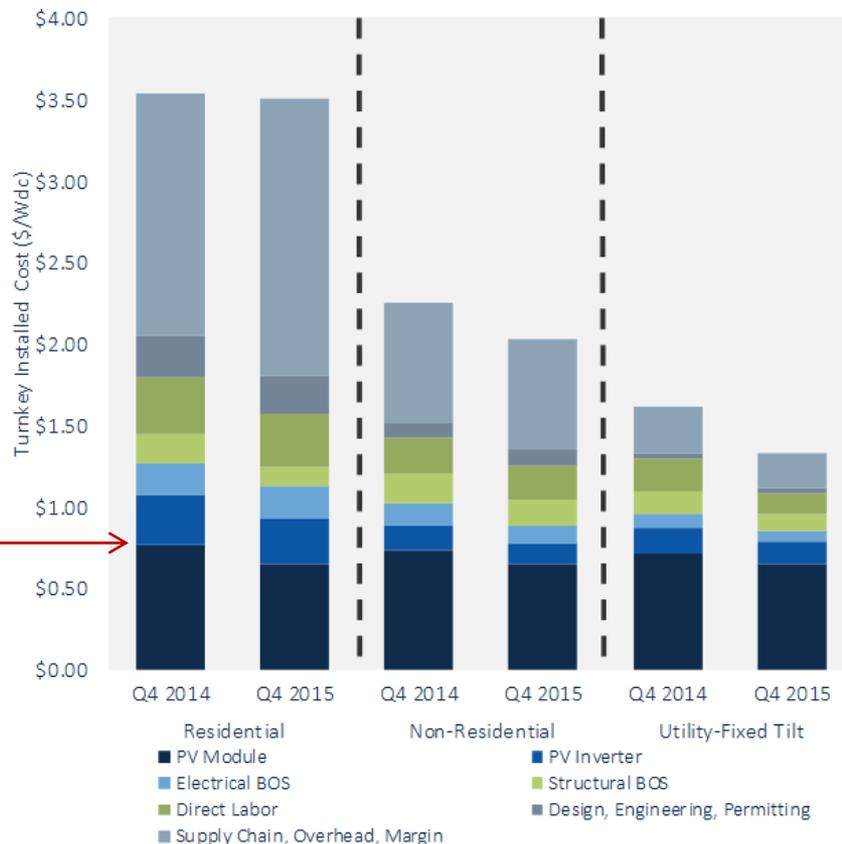


Many cells are assembled to create a solar module. This is the finished product which a consumer or installer purchases.

Source: Pvcharts.com

The cost of the PV modules is a fraction of total

FIGURE: Modeled U.S. Average System Costs by Market Segment, Q4 2014 vs. Q4 2015



PV Module Cost
About 12% of Total

The permit from the City of Newton costs a lot!



INSPECTIONAL SERVICES DEPARTMENT
CITY OF NEWTON
1000 COMMONWEALTH AVENUE
NEWTON, MA 02459-1449
617-796-1060

BUILDING PERMIT

JOB WEATHER CARD

PERMIT # 15080832	APPLICANT
Date Issued: 09/23/2015	[REDACTED]
Permit Fee: → \$520.00	
District Inspector: Buddy Lamplough	
PROPERTY	OWNERS
Location: [REDACTED]	FORMAN CRAIG E & BRENNER LINDA S
Zoning District: SR3	[REDACTED]
SBL: 21021 0013	
PURPOSE	
Install a roof mounted solar pv system	Estimated Cost: [REDACTED]
	Approved By: 
Inspectional Services Department	

This permit conveys no right to occupy any street, alley or sidewalk or any part thereof, either temporarily or permanently. Encroachments on public property, not specifically permitted under the Building Code, must be approved by the jurisdiction. Street or alley grades as well as depth and location of public sewers must be obtained from the Department of Public Works. The issuance of this permit does not release the applicant from the conditions of any applicable sub-division restrictions.

PERSONS CONTRACTING WITH UNREGISTERED CONTRACTORS DO NOT HAVE ACCESS TO THE GUARANTY FUND

- Work shall not proceed until the inspector has approved the various stages of construction.
- Approved plans must be retained on job and this card kept posted until final inspection has been made. Where a certificate of occupancy is required, such building shall not be occupied until final inspection has been made.
- Permit will become null and void if construction work is not started within six months of the permit issue Date as noted above.
- Where applicable separate permits are required for Electrical, Plumbing &

Note that the city of Newton building permit for my project was over \$500!

Why is Massachusetts a good place for solar now?

Massachusetts was the #4 state in 2015 for solar installed power, and has been #4 for 3 years.

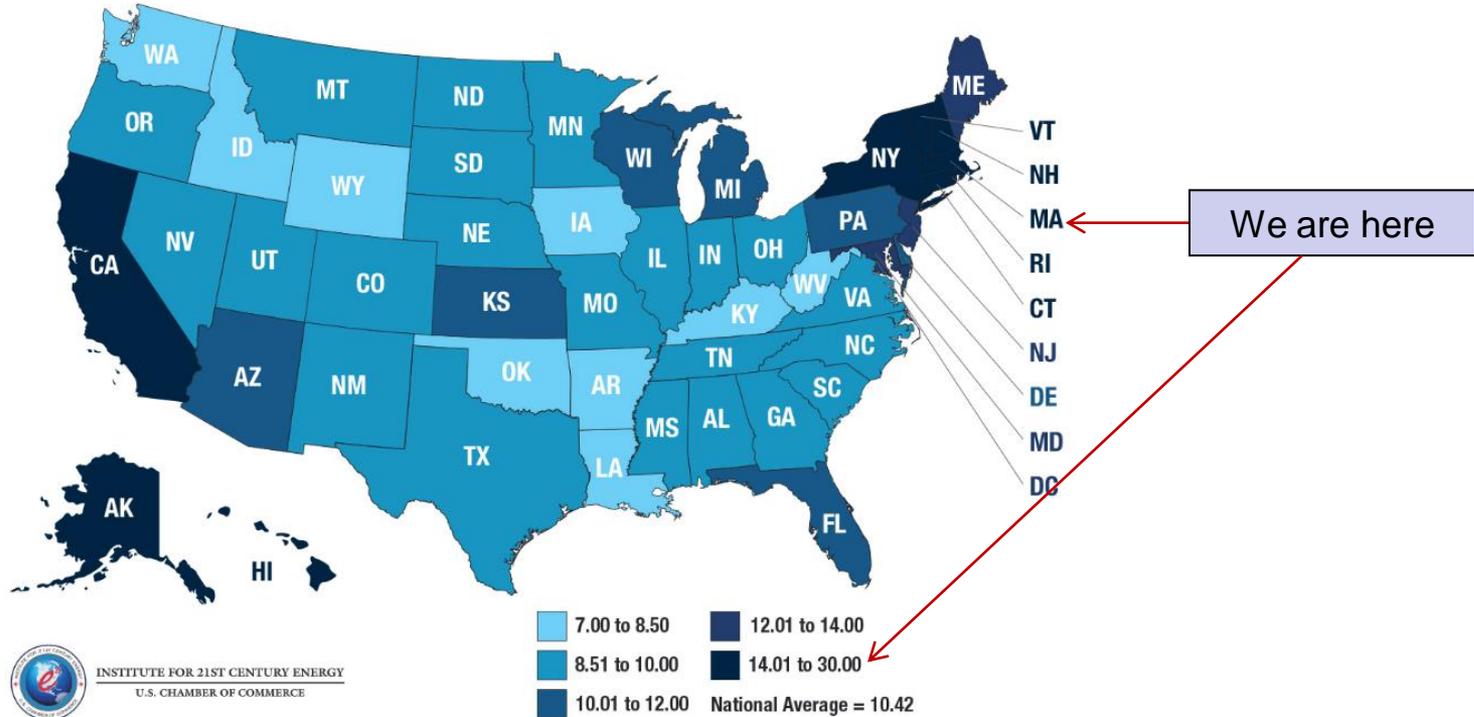
Figure 2.1 Annual State Solar PV Installation Rankings

State	Rank			Installations (MWdc)		
	2013	2014	2015	2013	2014	2015
California	1	1	1	2,621	3,549	3,266
North Carolina	3	2	2	335	397	1,134
Nevada	12	3	3	47	349	307
Massachusetts	4	4	4	240	317	286
New York	9	7	5	72	147	241
Arizona	2	5	6	421	247	234
Utah	30	23	7	2	14	231
Georgia	7	16	8	91	45	209
Texas	8	8	9	75	129	207
New Jersey	5	6	10	236	240	181

Source: U.S. Solar Market Insight Executive Summary 2015 Year In Review
www.greentechmedia.com/research/subscription/u.s.solar-market-insight

The high cost of electricity in Massachusetts

2015 U.S. Average Electricity Retail Prices (cents per kilowatt hour)



INSTITUTE FOR 21ST CENTURY ENERGY
U.S. CHAMBER OF COMMERCE

How can a purchased solar system pay for itself?

- Saving on electricity costs is real money in your pocket but...
If we are talking about buying a solar system for \$30,000, you would need to wait decades to save that much on just electricity cost savings.
- So how do we get to financial breakeven earlier?



Financial Incentives

Financial Incentives

- Federal Tax Credit (through at least 2019)
 - State Tax Credit
 - No state sales tax on purchase
 - MA law state that new solar installations are exempt from property tax increase for 20 years. Thus, if you add a \$30,000 solar installation to your home, your real estate property assessment cannot be raised due to the solar installation for 20 years (it can still go up, but not due to the solar installation).
 - State SREC (Solar Renewable Energy Certificate) program (time sensitive!)
- Some of these could change at any time! The incentives for a new technology generally fall as the technology becomes more mainstream; i.e. credits for electric vehicles.

Tax Incentives for Going Solar

- The owner of a solar system is allowed to take a 30% federal tax credit in the year the system is put into operation. This is a **DIRECT REDUCTION** in the amount of taxes you pay, and reduces the cost of the system by 30%.
 - If you have to do expensive work to make the solar project viable like removing some trees or replacing your roof, if this is done as part of the solar project, you will be getting it done at a 30% discount!
 - The Commonwealth of MA allows taxpayers to take a 15% state tax credit in the year the system is put online, subject to a maximum of \$1000 credit.
- Net result: Out of pocket expense to purchase a \$30,000 system is \$20,000:
 $\$30,000 - 30\% \text{ Fed credit } (-\$9000) - \text{State credit } (\$-1000) = \$20,000$

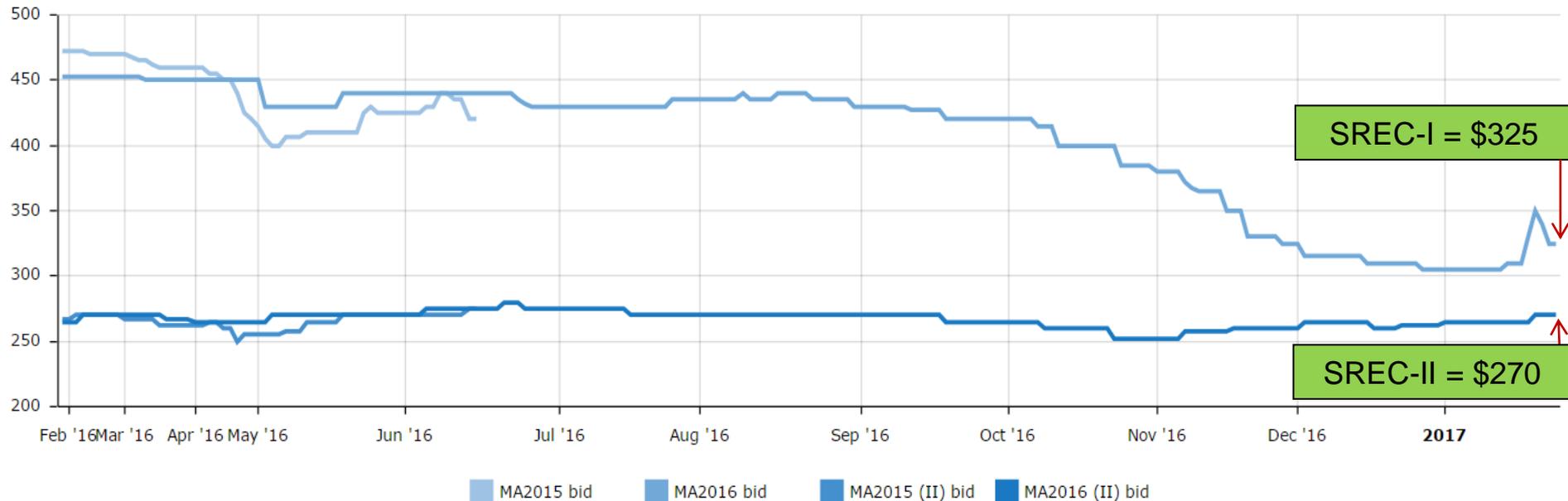
The state SREC program

- SREC = Solar Renewable Energy Certificate.
- The state builds demand for solar by requiring electric utilities to produce at least a minimum percent of their power from renewable energy sources, and a portion of that specifically from solar (solar carve-out), or else they pay a fine.
- Since electric utilities do not own large solar farms, they have to buy solar credits (SRECs) in order to meet these requirements.
- A solar system owner “mints” one SREC for each 1250 kWh that is produced from the solar system (was one SREC per 1000 kWh prior to 2017).
- SREC’s can be minted every 3 months (if you continue to produce solar).
- New solar installation owners can participate in the program for 10 years.
- The value of an SREC is subject to market forces, but values are expected to fall over time. The program has features to insure there will be a liquid market.
- Current program is called SREC-II. SREC-II is expected to **END** in 2017.

Value of SREC's

- Note that SREC-I's are selling for ~ \$325, but SREC-II's are only ~ \$270.
- SREC-II is expected to end in 2017.

Bid Prices for MA - Last Twelve Months (LTM)



Source: SREC Trade

Getting paid for your SRECs

- Once your system is running, you can begin participating in the SREC program.
- You register your system with a 3rd party reseller in the SREC market.
- Your solar production number is reported monthly on a state gov't web site.
- You pay a small commission to buy/sell through the 3rd party (5% - 7%). They may give you the choice to sell the SRECs as soon as they are minted, or to keep them to sell later (like stock).
- SREC income is a HUGE part of making your solar system cost effective. A typical installation might mint 5-7 SRECs per year, netting you \$1K to \$1.5K/year avg. over 10 years. That's a big impact on system financial viability!
- I suggest that for new systems, you should use \$200 as a target average SREC value over the 10-year period that you can sell your SRECs.

The NEW state solar incentive program

- The MA DOER has stated that the SREC-II program will end in 2017.
- People who are already in the SREC system stay in the SREC system.
- The current plan is to replace it with a tariff-based incentive system called the SMART (Solar Massachusetts Renewable Target).
- The details of the new system are not finalized, but we know that it will be tied to the cost of electricity.
- We do know that the financial incentives for residential solar will be less than they are with the current SREC-II system.
- You must have your solar system OPERATIONAL before the SREC-II program ends in order to participate in it for the next 10 years.

➤ **DO NOT DELAY** – If you are considering a solar project, complete it in 2017!

Purchase vs. Lease vs. PPA

	Customer Owned Solar System	Solar System Lease	PPA - Purchase Power Agreement
Summary	Resident buys solar system and pays for it, often financed by a loan. All electricity produced is available to use at no cost.	Resident leases solar system (monthly payments), but doesn't own the system. All electricity produced is available to use at no cost.	Resident pays nothing for and does not own the system. Electricity produced from solar system is purchased from owner at cost savings.
System Ownership	Resident Owns System	Solar Provider Owns System	Solar Provider Owns System
Maintenance Responsibility	Solar Provider (during warranty period)	Solar Provider (for duration of lease)	Solar Provider (for duration of PPA)
Source Of Capital	Resident (savings) or Bank Loan	Solar Provider	Solar Provider

Leasing and PPAs

- You need to have a roof that is fairly well suited for solar in order to get a lease or a PPA, and you will need decent credit.
- PPAs typically require no cost outlay, and will get you up to a 25% reduction in your electricity bill.
- Leases will get you a larger reduction in electricity costs than a PPA, but you have monthly leasing fees to pay.
- With leases and PPAs, you get an immediate reduction in electricity costs, but no other financial incentives since you don't own the system.
- Most leases and PPAs allow you to purchase the system at a future date (buyout), but you won't get the financial incentives available for new purchases.
- If you sell the property or want to terminate the lease/PPA, you either ask the buyer to assume the lease/PPA terms, or you buy out the balance of the contract at fair market value and pay to have the system removed.

Which is best for me: Customer Ownership or PPA?

- It may make sense to do a PPA if you cannot or do not want to take on debt to finance the system until it reaches breakeven, or if your income tax liability is so low that it would take many years to use the tax benefits that you would get for purchasing the system, or if you just want to take advantage of an immediate reduction in electricity costs with no cash outlay.
- Customer Ownership programs allow you to achieve a greater reduction in your electric utility bills, sometimes even eliminating them completely. They allow you to take advantage of all financial incentives. Some Customer Ownership financing programs can allow the system owner to purchase the system with no money down. This depends on the company you work with and the financing programs that are available.

The solar system financial plan

- Usually, the financial plan looks at revenue and costs for the first 20 years.
- Revenue = Offset of electricity costs + SREC income (if customer owned).
- Costs include after-tax purchase price + interest on capital used for customer owned systems, but zero cost for the PPA.
- If customer owned, look to see (based on your assumptions) when your system is expected to “pay for itself”. That is the system breakeven point. After that point in time, all further electricity produced is free.
- With the current incentives in place, you will see typical breakeven around 5 to 8 years for most customer owned systems.
- Run projections with 2%, 4%, and 6% projected yearly increase in electricity costs, because we do not know what they will actually be.

Financing your Customer Owned solar system

- Most solar sales companies have teamed up with a bank to offer attractive financing for customer owned solar systems.
- Some companies offer 0% tax loans with no payments due for up to 18 months to finance the federal and state tax refunds. So you can get your 30% tax refund in April of the year following your purchase, and you may not have to pay back the finance company until up to 18 months after your purchase. Talk about a great deal! Just don't forget to pay off the loan when the 0% goes away, because they will start charging you interest. If your sales person doesn't offer this, ask about it, because it is common in the industry.
- Purchase price is usually paid in installments; typically \$1000 deposit when contract signed, 1/2 after site survey, and, and 1/2 after system operational.
- The sales company will offer you financing, but if you need it, you'll probably get a much better rate if you can access a home equity line of credit.

MA Solar Loan Program

- Mass Solar Loan offers a “buydown” in interest rates for solar loans.
- The current buydown is -1.5% for everyone, regardless of income.
- Low to moderate income residents can get a reduction in loan principal.
- LTM income residents can get an additional 20% or 30% reduction in principal.
- There is a list of participating lenders at ***masssolarloan.com***.

Income-based Thresholds by Household Size

Household Size	Category 1	Category 2
	Below 80% of State Median Income (Eligible for 30% reduction of loan principal)	Below 120% of State Median Income (Eligible for 20% reduction of loan principal)
1	\$44,168	\$66,252
2	\$57,759	\$86,638
3	\$71,348	\$107,022
4	\$84,939	\$127,408
5	\$98,529	\$147,794

Getting quotations for Customer Owned systems

- There are many companies doing business in MA in the solar space.
- Several different models exist for how systems are sold, installed, and serviced.
- You should be an educated consumer in order to find a company that has a solution that is a good fit for you. Consider getting multiple quotes.
- Your system's ability to produce electricity depends largely on physical features that you cannot change:
 - What direction is your roof facing?
 - What is the tilt of your roof?
 - How much clear roof area do you have available for solar panels?
 - Do you have issues with shading from buildings, trees, chimneys, etc?
 - Are you willing to put panels on the front of your house, the back, or both?
- No installation is a perfect candidate. A good salesperson will help you understand what you are likely able to achieve from your solar system.
- A reasonable price target in MA would be around \$4.00 per watt DC installed.

Who do you work with when you get a solar system?

- The Sales Consultant

This is the entity that makes the sales call, gives you an initial quote, and answers all your questions about solar. Try to work with someone who can answer your questions and whom you are comfortable working with. Make sure that they can offer you the features that you want in your solar installation.

- Engineering Design and Installation

This is the entity that will be doing the site survey, the engineering study, the detailed system design, ordering all the materials, obtaining all necessary permits, completing the installation, and coordinating all inspections.

- Project Management and Ownership

This is the entity will monitor your system remotely by computer, and will contact you if a problem is detected. They are responsible for making good on any warranty claims.

✓ I prefer working with one solar company that does all three functions.

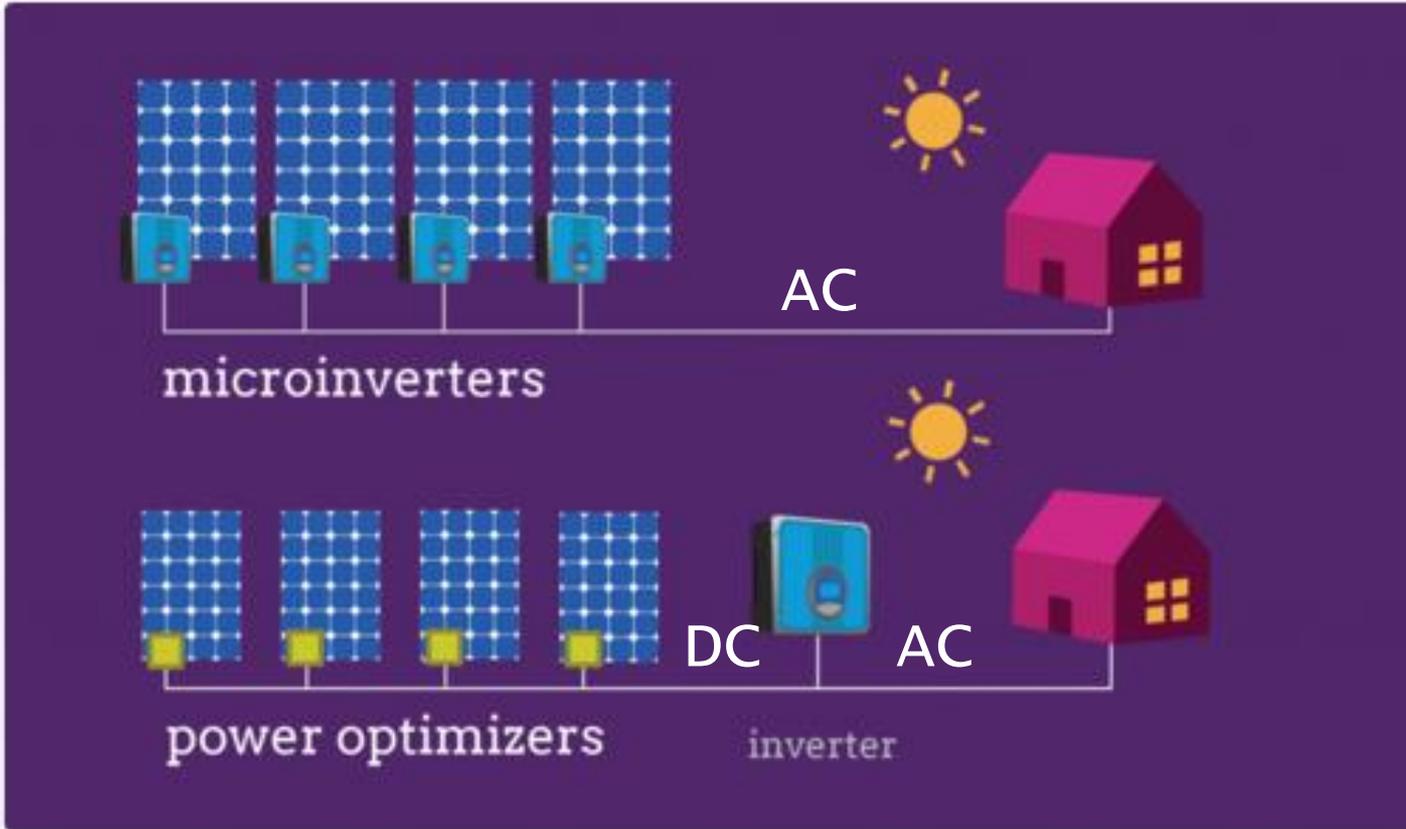
Technical Stuff – What are all the pieces?

- The solar panels – You will have many of these in your system.
- The electronics package:
 - MicroInverters (1 per panel) from Enphase Systems
 - or...**
 - Power Optimizers (1 per panel) and Central Inverter from SolarEdge.
- External Breaker Box (mounted outside, allows system to be shut down in case of a fire to cut all electricity to rooftop panels.
- Net Meter – provided by utility company, replaces your standard meter, but can run forwards and backwards.
- Solar Production Meter – mounted inside or outside where solar production is recorded in order to track production for your SRECs, but some companies now use a cell-phone reporting system in place of this meter.

The solar panel

- Solar panels are made in the USA, Korea, and China.
- Ask about the rated wattage; “sweet spot” is in the 270W to 300W range.
- Higher wattage (more efficient) panels will cost more.
- You may get a choice of several panels. They may be black or dark blue.
- Ask what the panel will look like (or go see a house with that panel).
- Most panels are configured as 60 cells in a 10 x 6 configuration and are a standard size (around 65.3” x 39”).
- Beware of getting a non-standard panel – it could be difficult to replace.
- Ask about the power production warranty (look for 20 or 25 years).

Electronics Package-Two ways to convert DC to AC



MicroInverters vs. Power Optimizers

- Both micro-inverters and power optimizers are located on the roof, below the solar panels; one per panel.
- Together, Enphase and SolarEdge control 93% of the US solar module electronics market (source: PV Pulse).
- Try to make sure that your supplier is using one of these two solutions.



Remote monitoring of your solar system

- All systems sold today include the capability for monitoring remotely via internet.
- You can monitor the system yourself, and the company that provides the system warranty will remotely monitor the system to spot problems.
- Both solutions allow you to see power and energy production, and highlights any modules that are not working properly.



Enphase Envoy

SolarEdge Home Gateway



Enlighten Manager (Enphase) Daily Production Overview

Overview

Production

◀ 📅 Tue, Jun 21, 2016 ▶

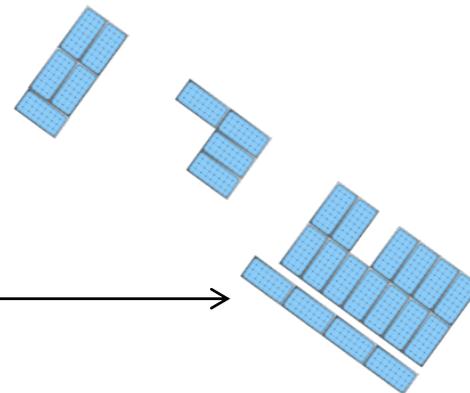


36.5 kilowatt-hours produced

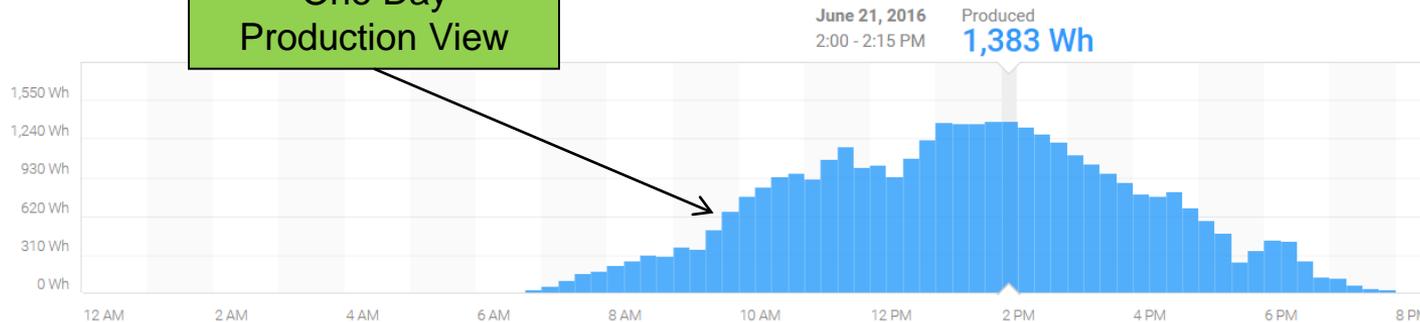


5.53 kilowatts peak power
2:15 PM

My solar panel configuration



One Day Production View



My system photos



Start of installation



Most rails in place on roof

My system photos



Rails and MicroInverters installed



PV panels waiting to be carried up

My system photos



Carrying a panel up the ladder



PV panels being put on rails

My system photos



Rear of my house, before solar



Rear of my house, after solar

Review Quiz and Giveaways



Newton Goes Solar Program

- Official launch in mid-March, 2017.
- Open to residents of Newton and all nearby communities.
- Go to www.newtongoessolar.org to see a list of over 50 FAQ's about the program.
- We have two solar partners, a PPA provider and a Customer Owned system provider.
- For both, the company does everything; sales, design & installation, warranty.
- Both companies have tons of experience in working with solar customers, and are very highly rated by their customers (see www.solarreviews.com).
- Green Newton has selected these companies because they know their business, they understand their customers, and they can offer you a great value as part of the Newton Goes Solar Program.
- If interested: See www.newtongoessolar.org or
Call the Newton Goes Solar hotline at 617-614-7892.

Introducing our Solar Partners



- Level Solar offers PPA solar with zero cost to install your solar system.
 - Immediately start saving up to 25% on all electricity that you produce.
 - Additional incentive for Newton Goes Solar customers.
- Direct Energy Solar offers Customer Owned systems.
 - Group pricing is well below \$4 per watt for most configurations.
 - Two panel options (standard and high efficiency).
 - Great warranties, several financing options, including no money down.
 - 0% tax loan program, 3% cash discount (if you finance yourself).
 - Early bird discount for the first 20 Newton Goes Solar customers.