WESTFORD CLIMATE ACTION

Solar 101

J.V. Fletcher Library

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Typical Residential Systems

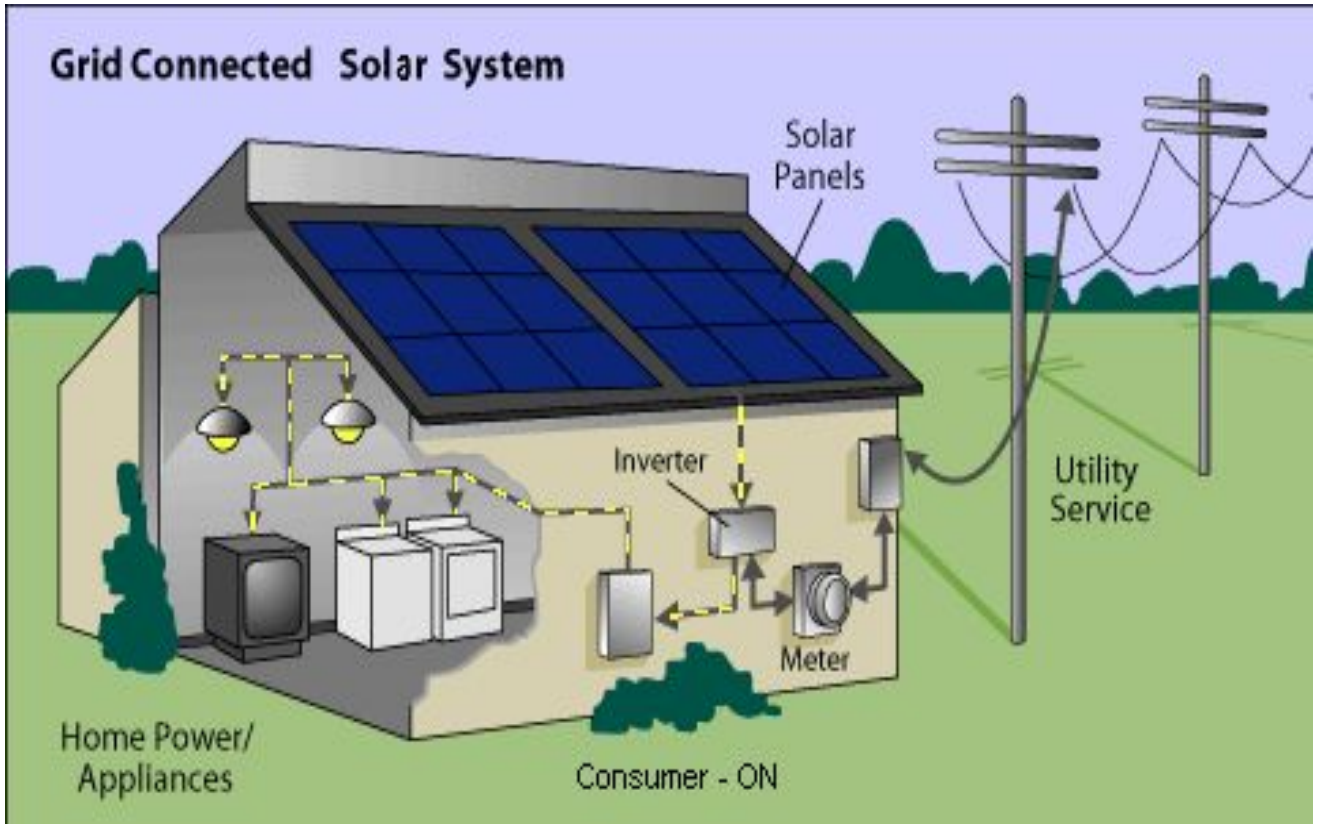
Why Solar?

- Reduce your carbon footprint
  - **First step**! Lower your energy use with weatherization improvements via Mass Save
  - Get a free home energy audit from Mass Save
- Lower electric bills
  - Additional savings from **net metering** mean $0 electric bills possible
- Owned System payoff is typically 7 – 10 years
- Solar panel warranties are typically 25 years or longer
- Federal and State tax credits reduce cost of owned systems
- No MA sales tax or property tax on solar and battery backup systems
- Low to no maintenance (no moving parts)

Is Your Home Suitable for Solar?

- You own the property
  - Most condo associations don’t allow solar panels
- A fairly new roof that can support the weight of solar panels
- Ideal roof is south-facing
- East or West facing roof can also support solar
- Roof has minimal tree shading
- Use Google’s “Project Sunroof” as a basic check for roof suitability
- Some might not like the look of panels on their roof

Typical Home Solar System



Best Solar Panels*

Solar Panel Maker	Efficiency	Panel Type	Warranty	Cost
Q Cells	18.9 – 21.4%	All black	**12- 25 years	Best Value
Silfab (made in US)	18.9 – 21.4%	All black	**30 years	
Panasonic	21.6 – 22.2%	Black or mostly black	**25 years	Higher price point
Canadian Solar	15.88 – 21%	Black or mostly black	**25 years	Lowest price points
REC	20.3 – 22.3%	Black or mostly black	**25 years	Various price points

*Ratings from Energy Sage, Forbes & This Old House

**Guaranteed output at 25 years varies

Solar Shingles and Solar Roof Options

Solar roof shingles

Tesla solar roof

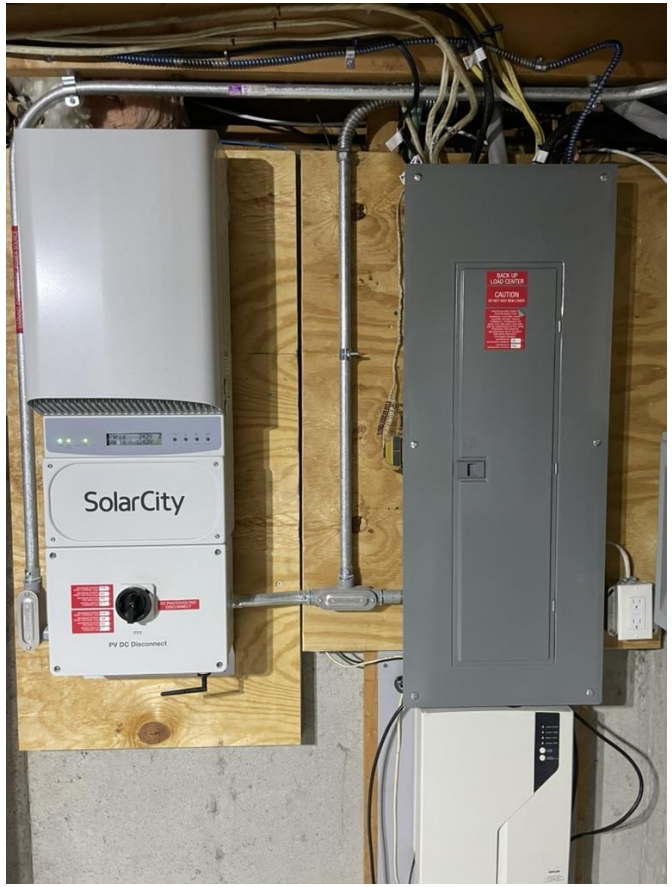
Solar Panels vs Solar Shingles

- Solar Shingles
  - Longevity unknown
  - Higher cost and more labor intensive to install
  - Less efficient and produce less power
  - Can make sense if you are replacing your roof shingles
    - Better appearance than solar panels

String Inverters vs Micro - Inverters

- Single string inverter converts entire system DC output to AC
  - Most common installation
  - Mount inverter indoors or outdoors
  - Easier to maintain
- Micro inverters
  - Mounted outdoors under the module
  - Each inverter converts DC to AC
  - One per module (more complicated maintenance)
  - Higher cost system than string inverter system
  - Less shading effects
  - Performance of each panel can be viewed by an App

Inverters



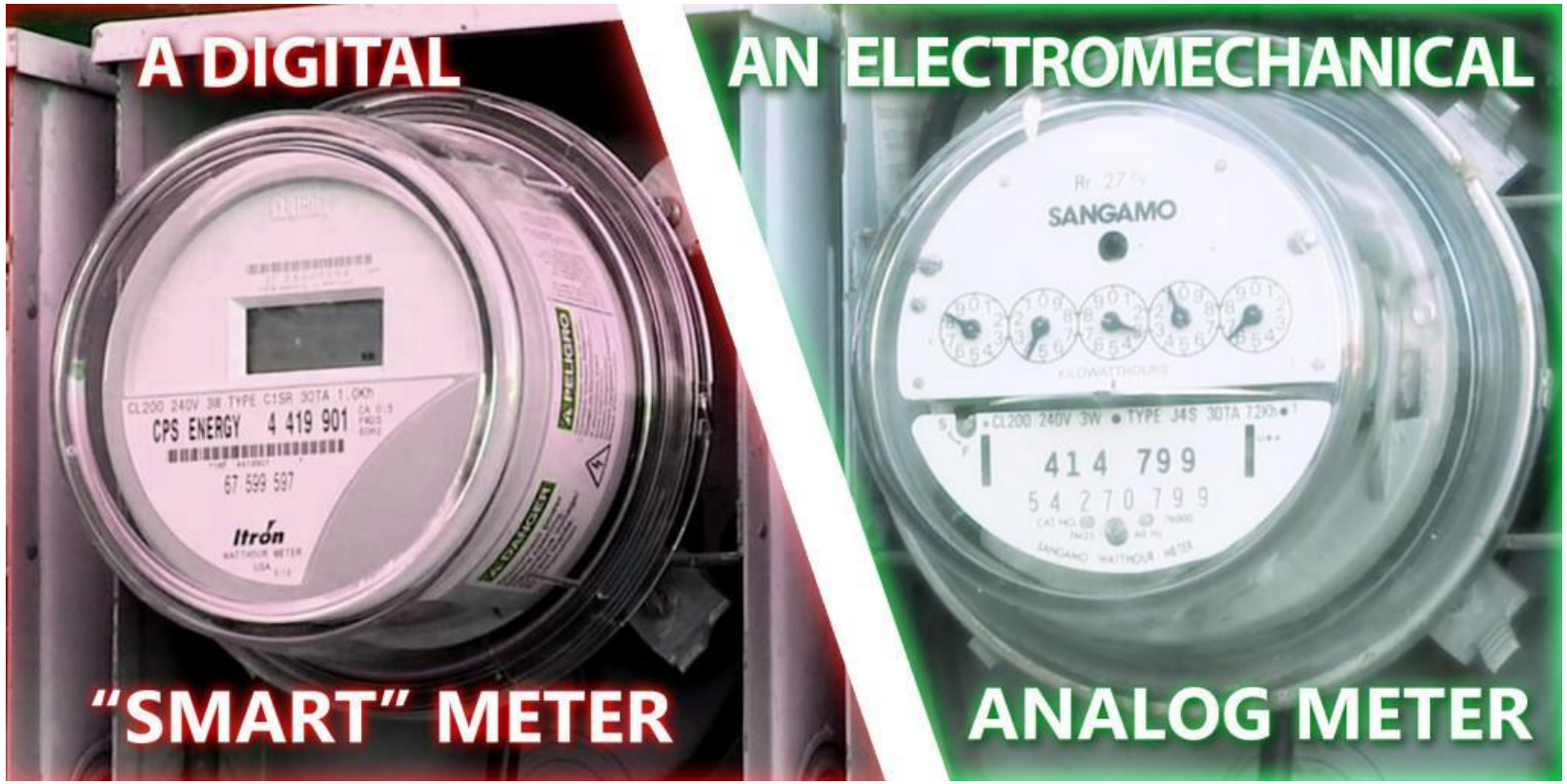
Indoor mounting example

String Inverter
(1 per solar *system*)

or

Micro-inverter
(1 per solar *panel*)

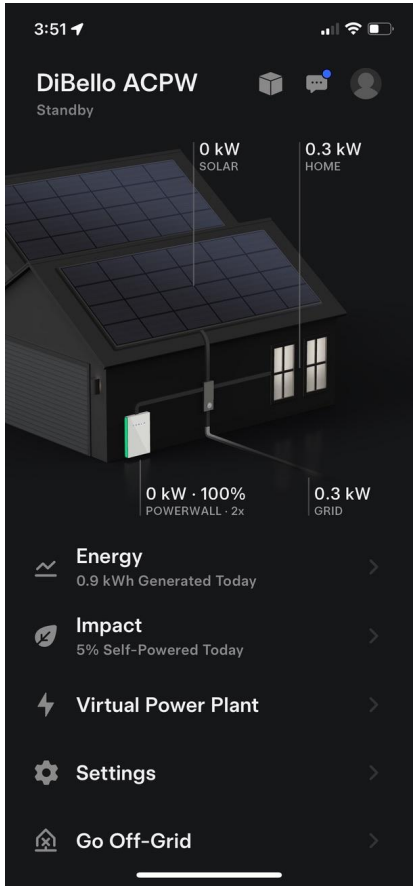
Smart Meter vs. Analog Meter



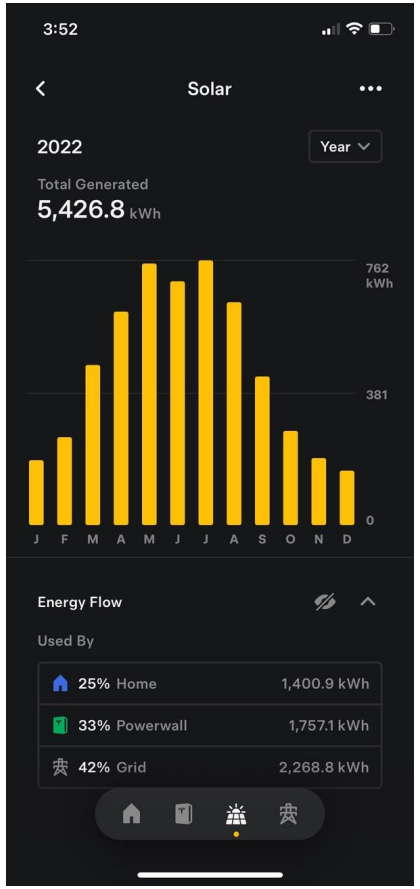
Can record power sent back to grid – Remote reading by NG

Old style –Typically replaced when solar is added to the home

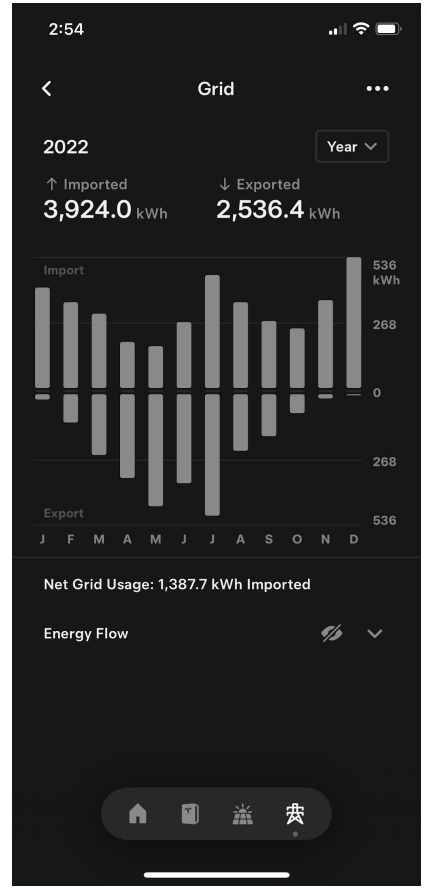
Solar System Status App - Tesla



Current status



Panel output by month



Yearly import & export to / from grid

Ownership Models

- Outright cash purchase
- Lease
- Power Purchase agreement




Go Solar – Cash or Finance Option

1. Get quotes and site visit from potential installer
   - A new electrical panel may be required.
   - Roof bracing may be required
   - Is your house suitable for solar panels?
2. After quote evaluation choose an installer and pay deposit
3. Schedule the installation
   - Installation typically takes one to two days
   - Installer will get applicable town permits
4. Town inspections – arranged by installer
5. Final payment for owned system – cash or loan

Go Solar – Third Party Ownership Types

- Third party installs, owns, operates and maintains system
- Solar Lease (low or no upfront cost)
  - Monthly payment to company for a 20 – 25 year term
  - A third-party sells electricity to homeowner at predetermined monthly rate
  - At end of lease: purchase system outright - or - have company remove the system
- Power Purchase Agreement (PPA) no down payment
  - Homeowner agrees to pay a set rate for each kilowatt-hour panels generate
  - PPA charges vary monthly (bills based on panel production)
  - If panels don’t produce enough to cover your electrical use – also get electric bill
  - Higher payments winter and summer
  - Note! Pay close attention to conditions for agreement termination

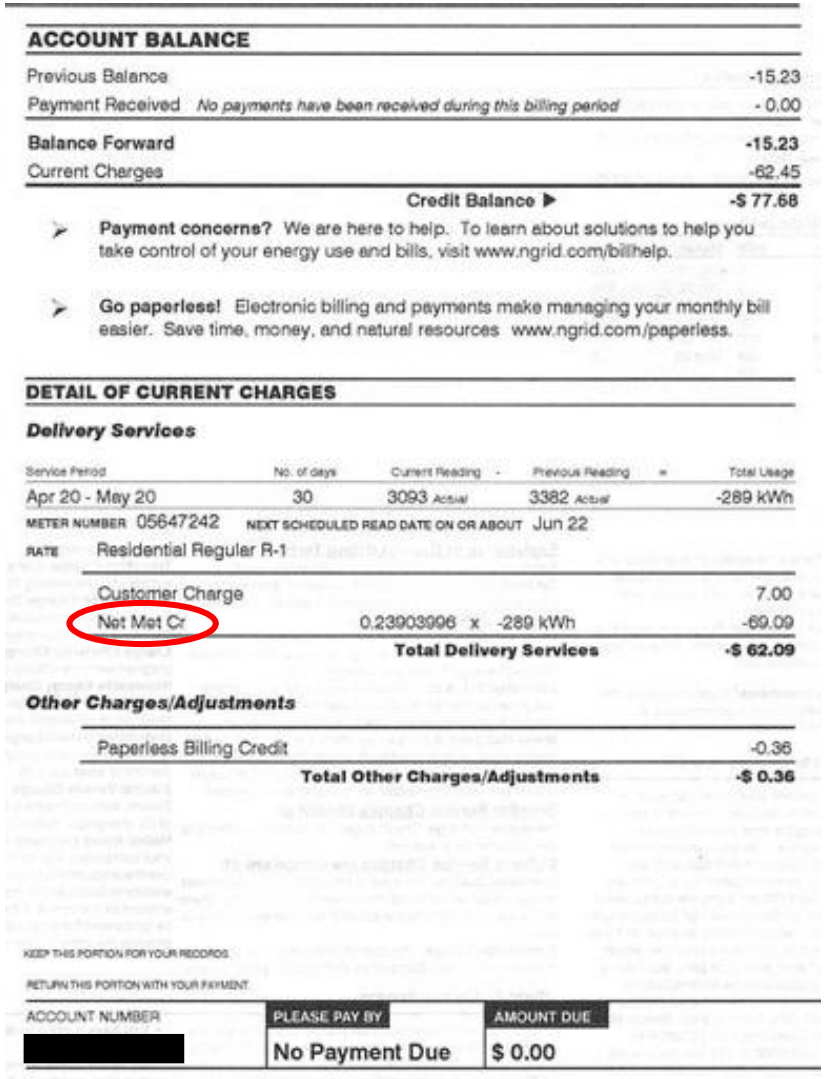
Go Solar – Community Solar

- An option for:
  - Condo owners
  - Homeowners that cannot install solar (shading, home orientation, other)
- Power produced by large shared solar farms
- After enrollment you receive energy credits on supply part of electric bill
  - Save 5% - 20% per year
- Beware of long term contracts with large cancellation fees

Solar Rebates & Incentives - Owned System - 1

- Solar System Federal investment tax credit (ITC)
  - Apply 30% of system cost as a credit towards your federal tax bill till 2033
  - Claim on IRS form 5695
- New electrical panel needed?
  - 200 amp or larger eligible for Inflation Reduction Act (IRA) up to $600 tax credit
  - Claim on **IRS form 5695**
- State Solar System Tax Credit
  - 15% of system cost up to a maximum of $1000
  - Claim on **Schedule EC**
- Net Metering reduces electricity bill

Net Metering Example



ACCOUNT BALANCE

Previous Balance		-15.23
Payment Received	*No payments have been received during this billing period*	- 0.00
Balance Forward		**-15.23**
Current Charges		-62.45
	Credit Balance ▶	**-$ 77.68**

➢ **Payment concerns?** We are here to help. To learn about solutions to help you take control of your energy use and bills, visit www.ngrid.com/billhelp.

➢ **Go paperless!** Electronic billing and payments make managing your monthly bill easier. Save time, money, and natural resources www.ngrid.com/paperless.

DETAIL OF CURRENT CHARGES

Delivery Services

Service Period	No. of days	Current Reading -	Previous Reading =	Total Usage
Apr 20 - May 20	30	3093 Actual	3382 Actual	-289 kWh

METER NUMBER 05647242 NEXT SCHEDULED READ DATE ON OR ABOUT Jun 22

RATE Residential Regular R-1

Customer Charge		7.00
Net Met Cr	0.23903996 x -289 kWh	-69.09
	Total Delivery Services	**-$ 62.09**

Other Charges/Adjustments

Paperless Billing Credit		-0.36
	Total Other Charges/Adjustments	**-$ 0.36**

KEEP THIS PORTION FOR YOUR RECORDS.

RETURN THIS PORTION WITH YOUR PAYMENT.

ACCOUNT NUMBER	PLEASE PAY BY	AMOUNT DUE
[redacted]	No Payment Due	$ 0.00

Solar Rebates & Incentives - Owned System - 2

- SMART solar incentive program (replaced SREC - 2 incentive)
  - A program to encourage solar installs in the state
  - Your installer should help with application process
  - If you qualify for program, Nat Grid pays you fix rate per kWh produced for 10 years
  - Fixed SMART program capacity – once filled limits payouts
  - A calculation determines your compensation
  - As electricity costs rise your savings decrease
  - See detailed article on WCA website – click on Solar 101 event notice

Battery Backup

- Batteries Charged by Solar System
- Sizing
  - Depends on your home power needs
  - Could be set up to power only essentials (heat, refrigeration, lighting etc.) or whole house
- Cost
  - Comparable cost of permanently installed propane or natural gas generator
  - No sales or property tax
  - Qualifies for 30% Federal tax credit of total installed cost (Form 5695)
- Advantages
  - No emissions. low to no maintenance, can be mounted inside, sign up for Nat Grid ConnectedSolutions program payments for summer months

Battery Backup Installations

Resources

- WCA website Neighbor-Neighbor Event Notice
  - Click on “Find Out More” to get
    - *Residential Guide to Solar Power*
    - SMART Program details

My Thoughts on Installers

- Choose an installer that does not use subcontractors
- Should have a local office with local install crew
- Tesla is good but timely service may be a problem
- Ensure the installer:
  - Gets a building permit and arranges Town inspections
  - Uses safety measures on roof (safety straps)
  - Does clean and neat work
  - A guarantee is only as good as the longevity of the installer

My Solar Panel Experience

- My 7.2 kW system installed by Tesla Solar
  - 24 panels Installed in one day March 2018
  - Connect in April 2018
  - System cost $21,571
    - 30% tax credit of $6471
    - MA $1000 tax credit
    - First year electric savings $1429 compared to 2017
    - Qualified for 10 years of SREC-2 payments