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Solar And Storage

Helping communities go solar

SOLAR UNITED NEIGHBORS OF MARYLAND

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Helping Floridians Go Solar

Co-op/group purchase

- 50 – 100 neighbors
- Group decision process
- 6 - 8 month process
- Bulk negotiation for best pricing
- Sign individual contract
- No cost to join co-op

- LAUNCHES JUNE 2018

Individual Support

- Help reviewing up to 3 proposals
- Negotiate your own deal
- Can be faster timeline
- Ongoing advice & assistance (post install)
- $85 annual membership

Solar Technology

Solar photovoltaic (PV)

Converts solar energy to electricity

Grid-tied

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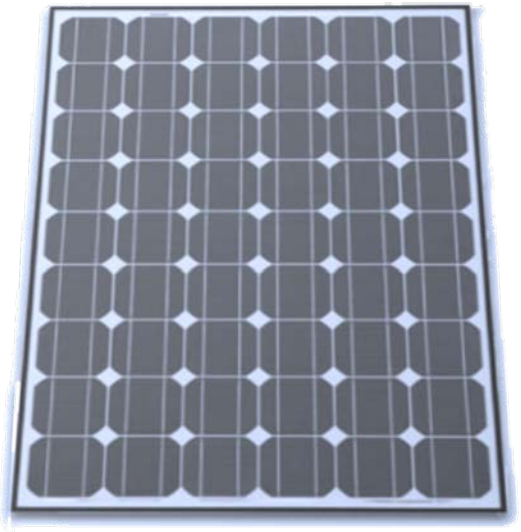
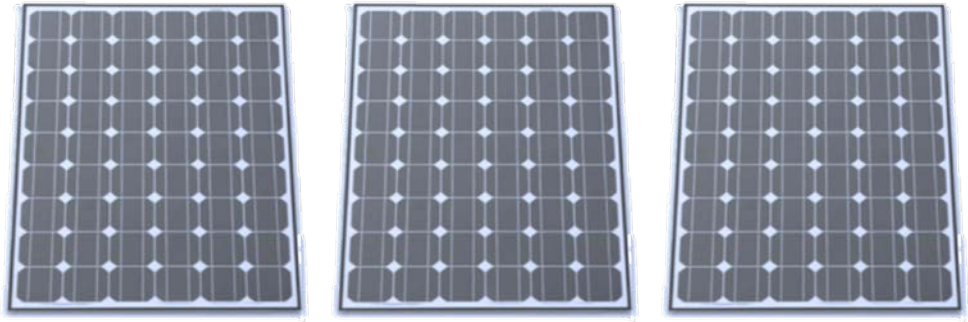
Components

System components: Panels

Cell



Panel / Module



Solar Array

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Components

System components:

Racking system

Inverter

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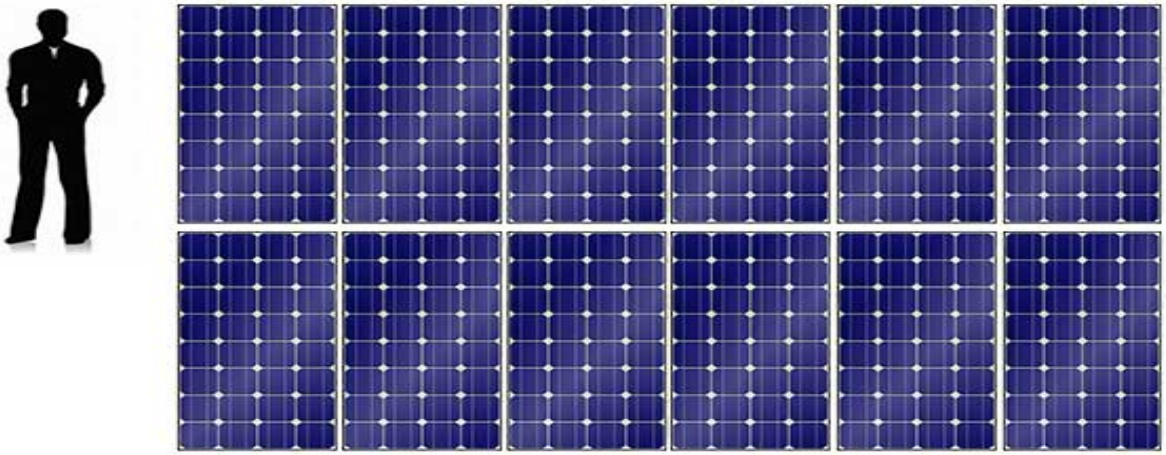
kW and kWh

Terminology: Kilowatts (kW) & Kilowatt-hours (kWh)



A 3kW Solar Panel Array - to scale using 250W panels

System measured in kW

Electricity production in kWh

Most Miami homeowners install between 5 kW – 12 kW

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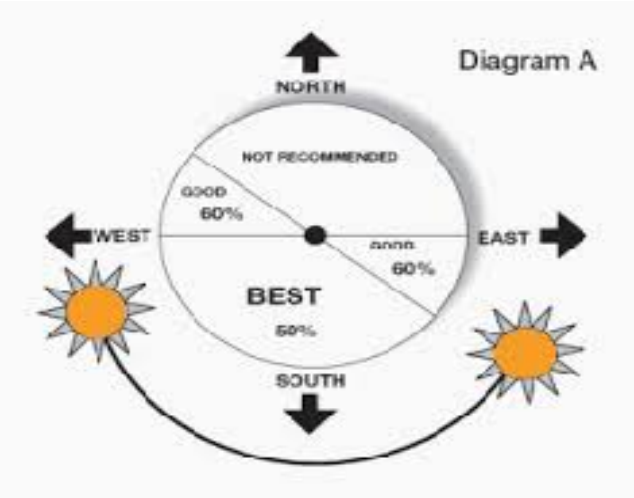
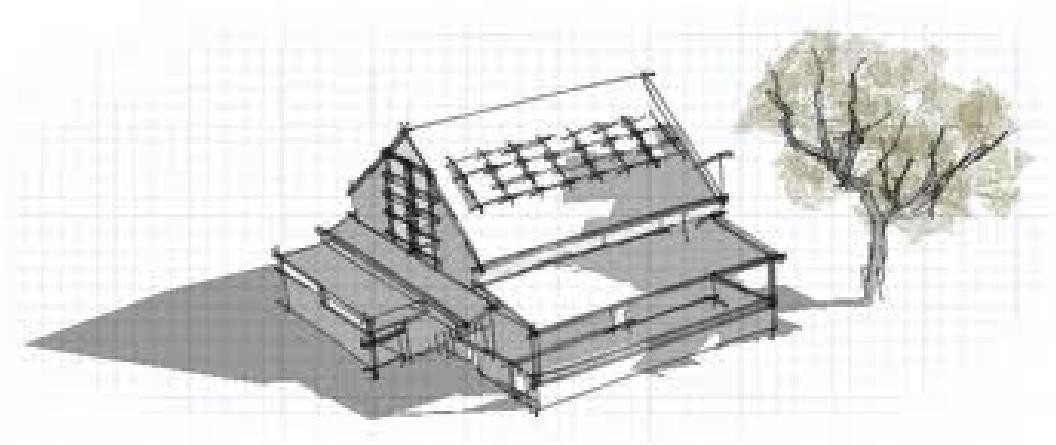
Sunny. Southerly. Spacious.

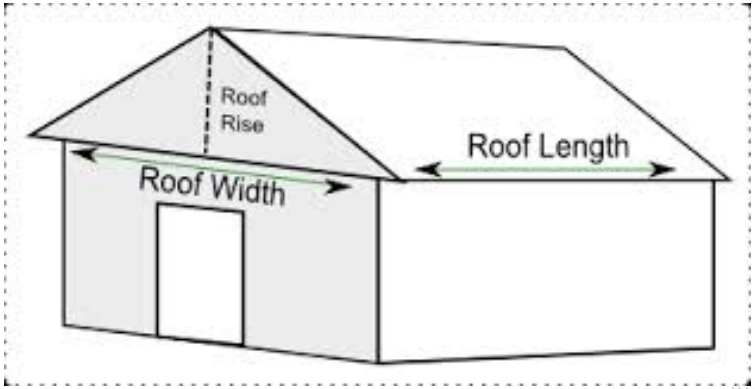
What makes a site good for solar?



Roof faces southerly direction



No shading



Enough space to mount panels

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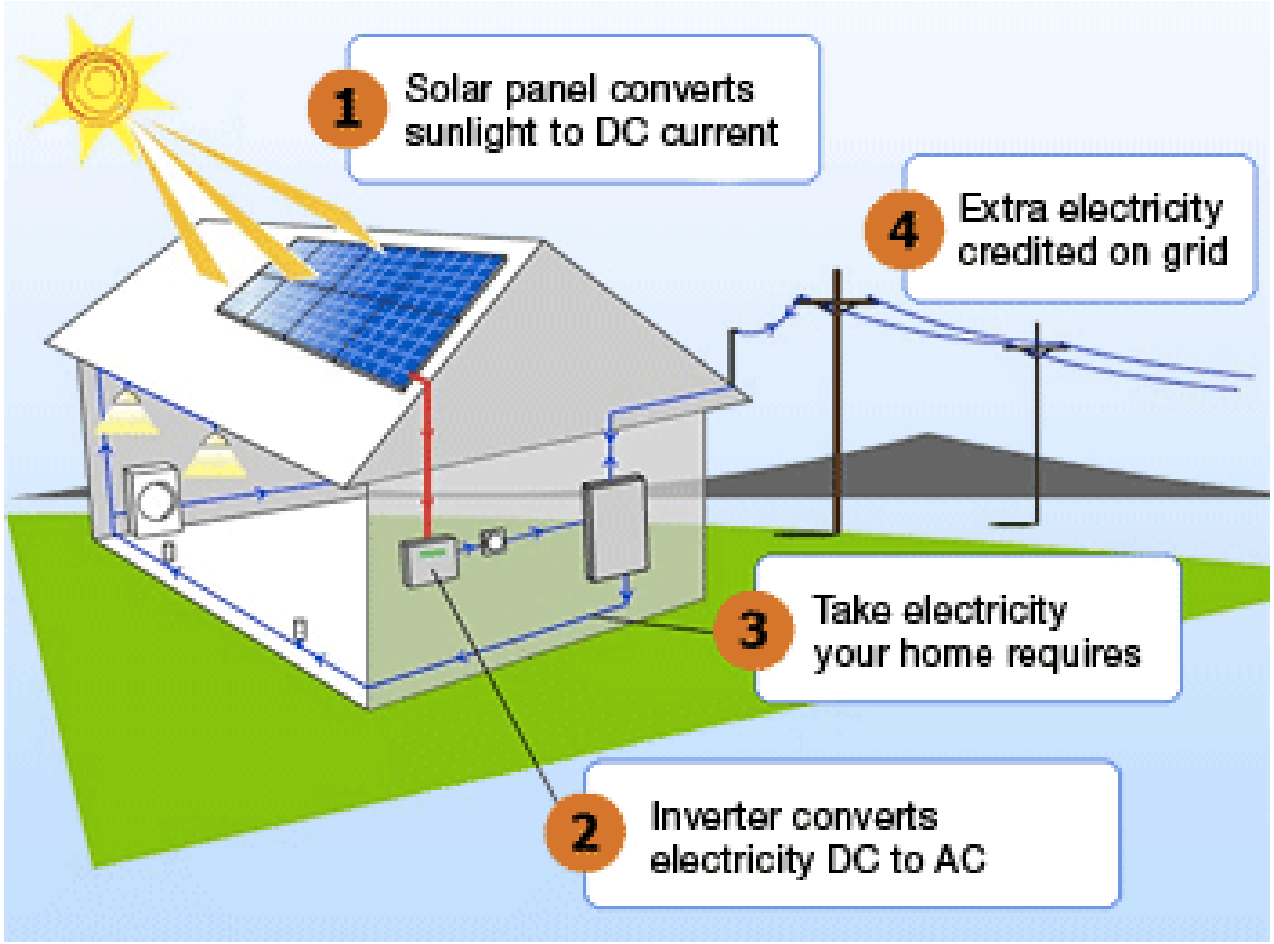
How it works

How a grid-tied solar PV system works



VIA WATTPATROL.COM

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Keeping Track

What is NET METERING?

Allows flow of electricity to AND from customer.

1kWh produced = 1kWh consumed

When you generate more than use, extra electricity flows back through meter and you receive a credit on your power bill for that excess production. That credit can rollover month to month. At the end of the year, any surplus energy is purchased at wholesale rate.

Before and After

Before Solar

Amount of your last bill		104.44
Payment received - Thank you		−104.44
Balance before new charges		**$0.00**
NEW CHARGES		
Rate: RS-1 RESIDENTIAL SERVICE		
Customer charge:	$7.57	
Non-fuel: (First 1000 kWh at $0.057690) (Over 1000 kWh at $0.068510)	$57.35	
Fuel: (First 1000 kWh at $0.028020) (Over 1000 kWh at $0.038020)	$27.85	
Electric service amount	**92.77**	
Storm charge	1.39	
Gross receipts tax	2.41	
Franchise charge	5.60	
Utility tax	8.12	
Taxes and charges	**17.52**	
Total new charges		**$110.29**
Total amount you owe		**$110.29**

After Solar. 😁

Amount of your last bill		9.42
Payment received - Thank you		−9.42
Balance before new charges		**$0.00**
NEW CHARGES		
Rate: RS-1 RESIDENTIAL SERVICE		
Customer charge:	$7.87	
Non-fuel energy charge:		
First 1000 Kwh	$0.065950 per kWh	
Over 1000 kWh	$0.075950 per kWh	
Fuel charge:		
First 1000 kWh	$0.024910 per kWh	
Over 1000 kWh	$0.034910 per kWh	
Electric service amount	**7.87**	
Gross receipts tax	0.20	
Franchise charge	0.49	
Utility tax	0.86	
Taxes and charges	**1.55**	
Total new charges		**$9.42**
Total amount you owe		**$9.42**

Results vary based on roof size, electrical use, and budget.

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Safety first

What happens when the power goes out?

When grid is down, solar shuts off (safety mechanism)

Need batteries or special inverter if you want you want power during outages.

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How to keep array working in outage

Two Options to Keep Panels working:

1. Sunny Boy Inverter with Secure Power Supply – allows homeowner to use up to 2kW of solar – ONLY WHILE SUN IS SHINING. Meant for tablets, fans, mini-fridge. It will not power a well pump.

2. Battery back-up

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Energy Storage for Homeowners

You might want storage if…

- Frequent utility outages
- Critical loads at home (ex. well pumps, medical equipment)
- Emergency/disaster preparedness – IRMA!

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Energy Vs Power

Energy vs Power

Source: SimpliPhi

Energy

- Amount of work the battery can do <u>over time</u>
- Measured in kWh

Power

- Maximum work it can do <u>at any given time</u>
- Measured in kW

Your storage system will be custom for you:

- How much energy do you consume?
- What do you need to power during an outage?
- Available space for storage?

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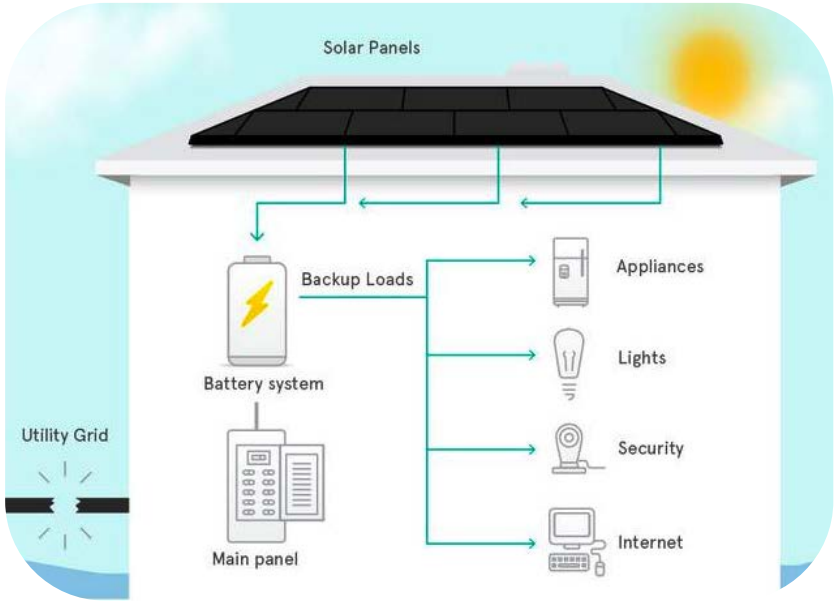
What can batteries power?

Critical home loads



Source: SolarCity

Storage during a utility outage

- Seamless backup power
- Typically only power critical loads
  - Matched to battery size/amount
  - "Critical loads sub-panel"

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Critical Load Examples

The Johnsons lose power from the utility several times of year.
Each time the power is out for the entire day.

A 6 kWh Battery Bank

- Fully re-charged by solar (5.6 kW system) daily
- NOTE: No solar = 1 day only

What will run when the power is out:

- Refrigerator; small microwave
- Some lights; Some outlets
- cable modem

What they chose not to power:

- Central AC; clothes dryer; hot water heater

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Choose Wisely

A home battery is like your phone.

The heavier the load the faster a battery drains. Texting occasionally uses less energy than streaming all three seasons of “El Ministerio Del Tiempo” or puppy rescue videos.

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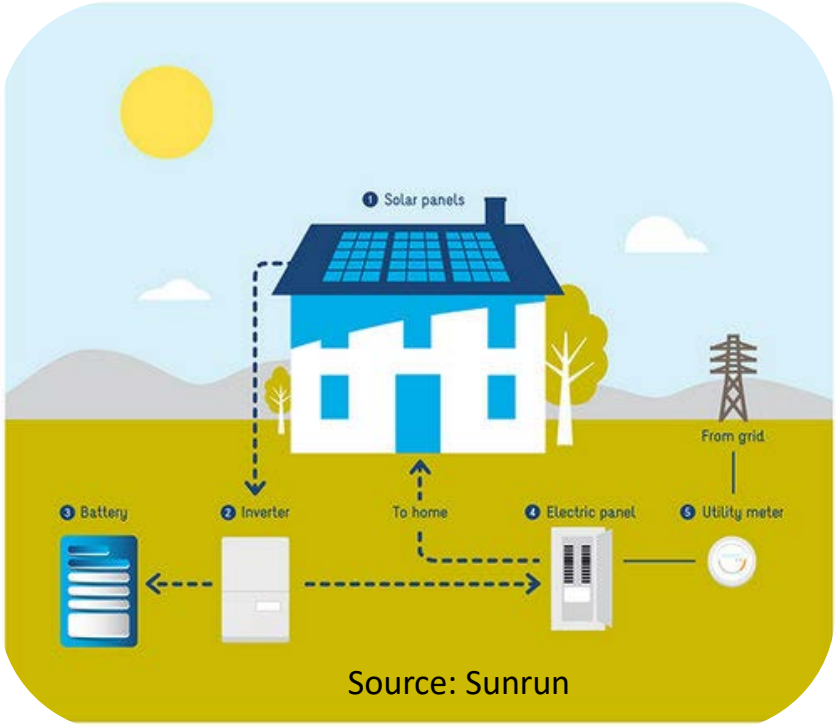
How does storage work with solar?

Installation:

- Same time as solar or retrofitted
- May require additional hardware

Solar + Storage:

- Solar charges batteries for later use
- Grid energy can charge batteries too
- Small amounts of energy keep batteries “topped off”
- Batteries only kick in (automatically!) when power is out



Source: Sunrun

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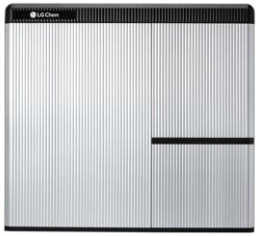
Most common home batteries

Lead-acid

Pros:
- Lower upfront cost
- Tried and true

Cons:
- Maintenance requirement
- Slow energy discharge (power)
- High space requirement
- Shorter lifespan
- Less usable energy per cycle

Lithium Ion



Pros:
- High energy density
- Lower lifetime costs
- Longer lifespan
- Small space requirement
- More usable energy per cycle

Cons:
- Higher upfront cost
- Newer to market

There are other chemistries used in battery applications, but their deployment is **much less common**

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Operations and Maintenance

Space Requirements

Source: Fire Mountain Solar

Lead Acid

- Small, shoe box-sized battery
- Wired together in a group
- Can sit directly on floor or shelf
- Requires more space

Source: Clean Technica

Lithium Ion

- Single, larger box
- Wall-mounted or floor-mounted
- Can often also be wired together

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Operations and Maintenance

Placement Considerations

- Batteries function best in **controlled environments**
- Specific conditions depends on chemistry:
  - Lead-acid
    - Stable temperatures (ideal: 50°F – 80°F)
    - No extreme heat
    - Often installed indoors (garage)
    - Special ventilation required for unsealed batteries
  - Lithium Ion
    - Wider temperature range (~32°F - 100°F)
    - Some can be installed outdoors in stable climates

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Basic cost estimates (example)

Hardware cost (examples) +

Equipment	Cost	Size
Powerwall 2 (Li-ion)	$6,200	13.5 kWh
Powerwall 1 (Li-ion)	$3,000	6.4 kWh
LG Chem (Li-ion)	$6,000	6.6 kWh
Sonnen Eco 4 (Li-ion)	$10,000	4 kWh
Sealed Lead Acid	$5,200	12 kWh

Installation costs +

$3,000 - $5,000 for standalone installation and additional equipment

Maintenance costs

Varies between installers and battery chemistries

Pricing for our small 6 kWh battery example:

~$6,000 + $4,000 + $1,000

= ~$11,000

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Operations and Maintenance

Warranties

- Two common warranty types:
  - Specific time period (**years**) OR duration of use (**cycles**)

- Typical Li-ion warranty: 10 years
- Examples:
  - Sonnen: 70% of max. capacity for 10,000 cycles (or 10 years)
  - Tesla: Free of defects for 10 years with unlimited cycles
- Typical lead acid warranty: 2 to 5 years
- Installer's labor should be warranted (wiring)

Note: Solar panels are warranted for 25 years

Source: https://blog.pickmysolar.com/home-battery-backup-comparison-tesla-sonnenbatterie

Federal Tax Credit for Storage

30% federal tax credit available for storage systems that are 100% charged by solar

- Value: **30% of the total system cost** (hardware + installation) for fully solar-charged batteries
- Storage systems that are **at least 75%** charged by solar are eligible for a portion of the full tax credit
- Storage system that are **less than 75%** charged by solar are ineligible for the tax credit

IRS
Department of the Treasury
Internal Revenue Service

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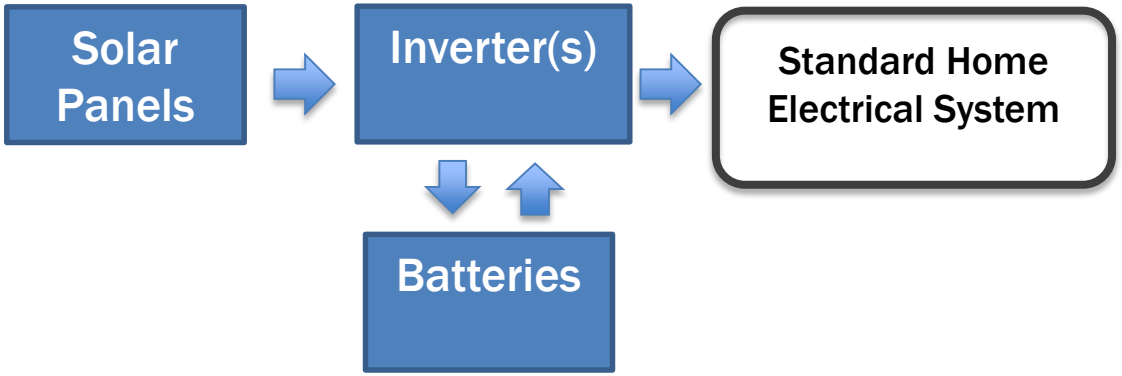
Connecting to your home

With DC coupled, your solar and your batteries hold hands.
With AC coupled, they just wave at each other from across the hall.

"DC Coupled"



"AC Coupled"

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AC/DC Coupling and the Tax Credit

DC COUPLING

- Easier to prove your battery is only charged by solar electricity (as opposed to utility electricity from the grid) which makes it **easier to qualify for 30% Federal Tax Credit**

AC COUPLING

- **More challenging to guarantee your battery is exclusively charged by solar which is an important factor for federal tax credit eligibility.**

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Batteries similar to generator

Source: Sonnen

Source: alarmcentralsecurity.com

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Things to consider:

- Batteries are silent and do not off-gas. The emit no noise or air pollution.
- Batteries do not use fossil fuels or require pipelines.
- Homeowners typically install a smaller battery bank to power select critical loads.
- A battery backup system does not require you to pay for and store any fuel on site or to rely on the delivery of fuel to keep it running during an outage.
- When paired with a solar array, the battery will charge and recharge from the solar electricity you produce. With a battery the sun is the fuel.

What to look for

What should be included in your proposal:

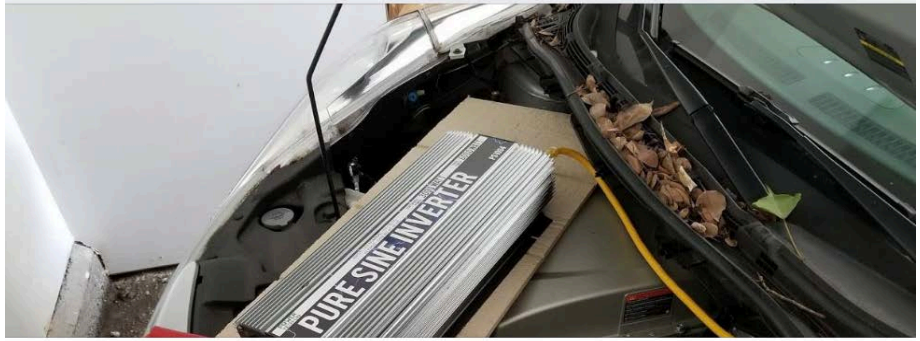
- Full cost of the storage system, installation, and additional equipment
- Payment milestones
- Equipment details
  - Battery size (kW and kWh)
  - Battery model and manufacturer
  - Inverter model and manufacturer (if separate from battery)
  - Battery management system (if used)
- List of all warranties (battery, inverter, installer workmanship)
- Details of additional work needed (electrical work, inverter swap, etc.)
- Pricing guarantee for all equipment
- Installer information (office location, point of contact, contact information)

PV 4 MY EV

Auto manufacturers are entering Vehicle-to-Home Market - systems which will provide home energy generation, management and storage.

Your electric vehicle can power critical loads during an outage (check your car warranty). It requires an inverter. You use the 12V DC system of your EV to power a 110V AC inverter. Run an extension cord to your fans, tablet or even a fridge.

https://www.facebook.com/notes/charlie-behrens/how-to-use-an-electric-vehicle-for-emergency-power/1571597529564391/



How to use an Electric Vehicle for Emergency Power

CHARLIE BEHRENS · FRIDAY, SEPTEMBER 15, 2017

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The value of resiliency

Losing power does have a cost

Power the refrigerator vs.

- Food loss – Ice, Ice Baby ($)
- New refrigerator ($$)

Staying at home vs.

- hotel ($$)

Keep well pump operating vs.

- No water ($$$)

Home medical equipment working vs.

- Hospital visit (????)

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Become resilient

Go solar now or join the

SUMMER SOLARSTICE CO-OP

Coming in June!

Join the listerv

Thanks a million kilowatt hours!

Jody Finver
South Florida Program Coordinator
jody@solarunitedneighbors.org