How Ready Are We for Extreme Weather?

SELF-RELIANCE

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WHAT MOTIVATES US TO DO THIS WORK?

- Self-Reliance recognizes the many issues facing the fragile ecosystem where air and water quality are negatively impacted by our collective energy consumption.
- We were involved in establishing two long-term regional energy goals:
  - *Develop renewable resources to meet 100% of net annual electricity needs by 2020*
  - *Reduce fossil fuel consumption for heating and transportation by 50% by 2020*

As an independent, objective authority, Self-Reliance helps members navigate energy choices and empowers them to make decisions and take actions that save money, increase comfort and reduce reliance on fossil fuels.

Our utility lines are above ground and somewhat antiquated…
We experience high wind events on a regular basis…
Our power goes out…

Getty Images

What are our current common options?

Gas generators

- Be sure that these are used outside of the home.
- Exhaust should be pointed away from the dwelling, and sited at least 15 feet from doors and windows.
- Be sure to check Carbon Monoxide alarms too.
- Never back-feed power from a generator into a plug as it can kill linemen working to restore power lines.

Permanently Installed Gas Generators

Natural gas generators may be connected through National Grid even during their moratorium on gas connections on the Cape.

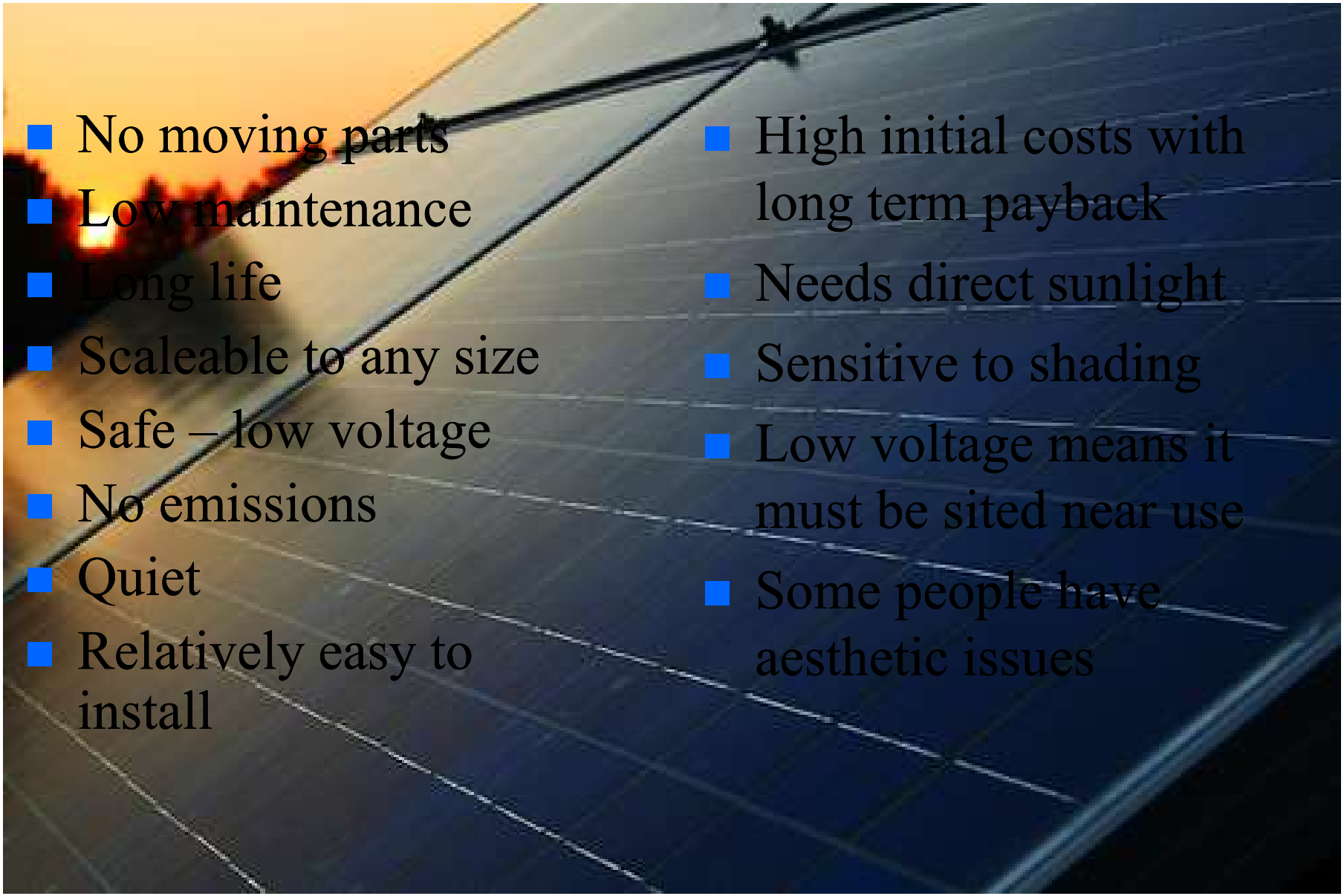
Propane or bottled gas are also options for generators.

Seamless power.

Renewable Energy Technologies Provide Energy Resiliency?

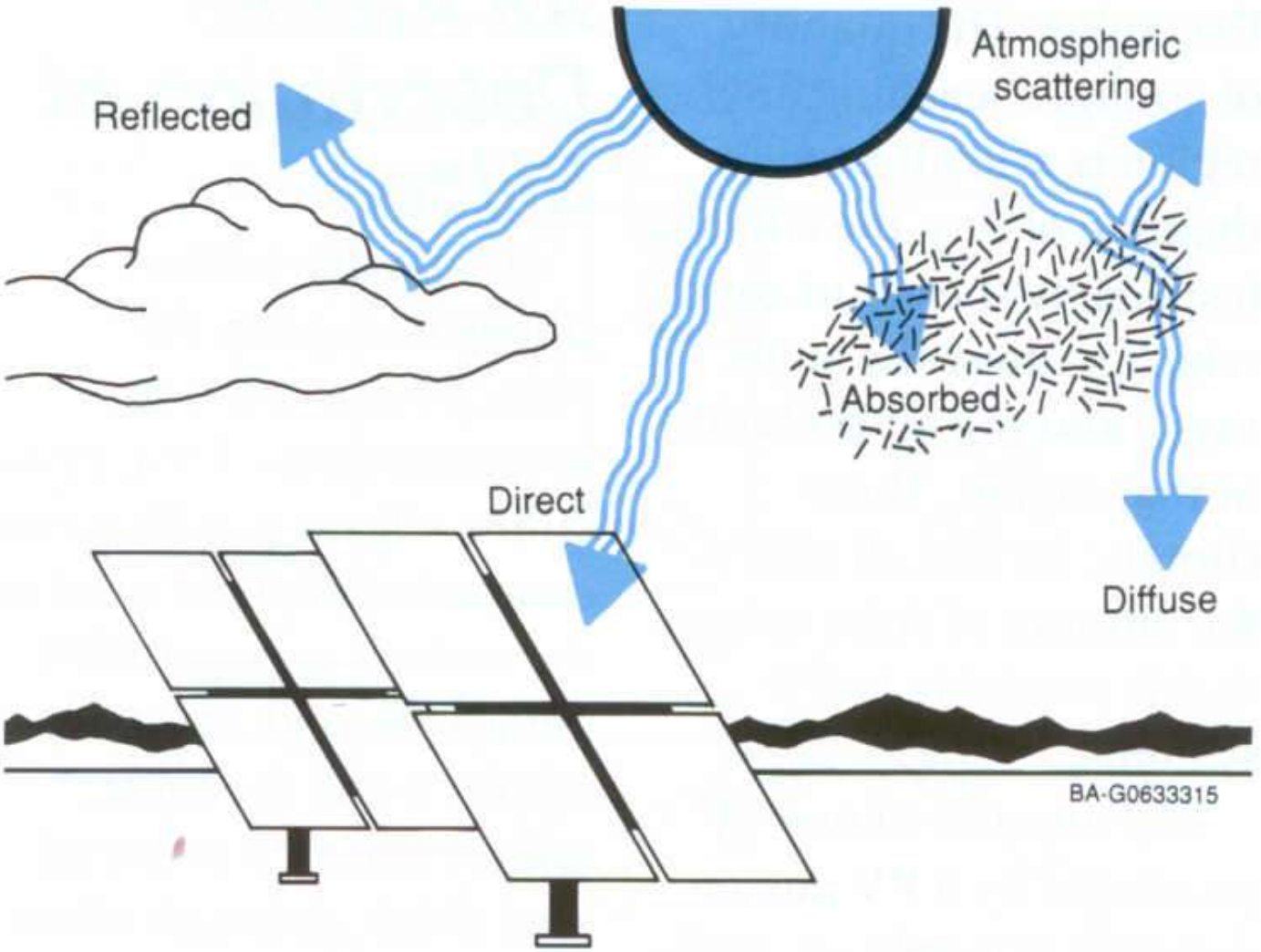
- **ENERGY EFFICIENCY FIRST!!**
- **Solar Electric with certain invertors**
- **Solar Electric coupled with batteries**
- **Solar Hot Water with storage**

PV Advantages &Disadvntages



- No moving parts
- Low maintenance
- Long life
- Scaleable to any size
- Safe – low voltage
- No emissions
- Quiet
- Relatively easy to install

- High initial costs with long term payback
- Needs direct sunlight
- Sensitive to shading
- Low voltage means it must be sited near use
- Some people have aesthetic issues

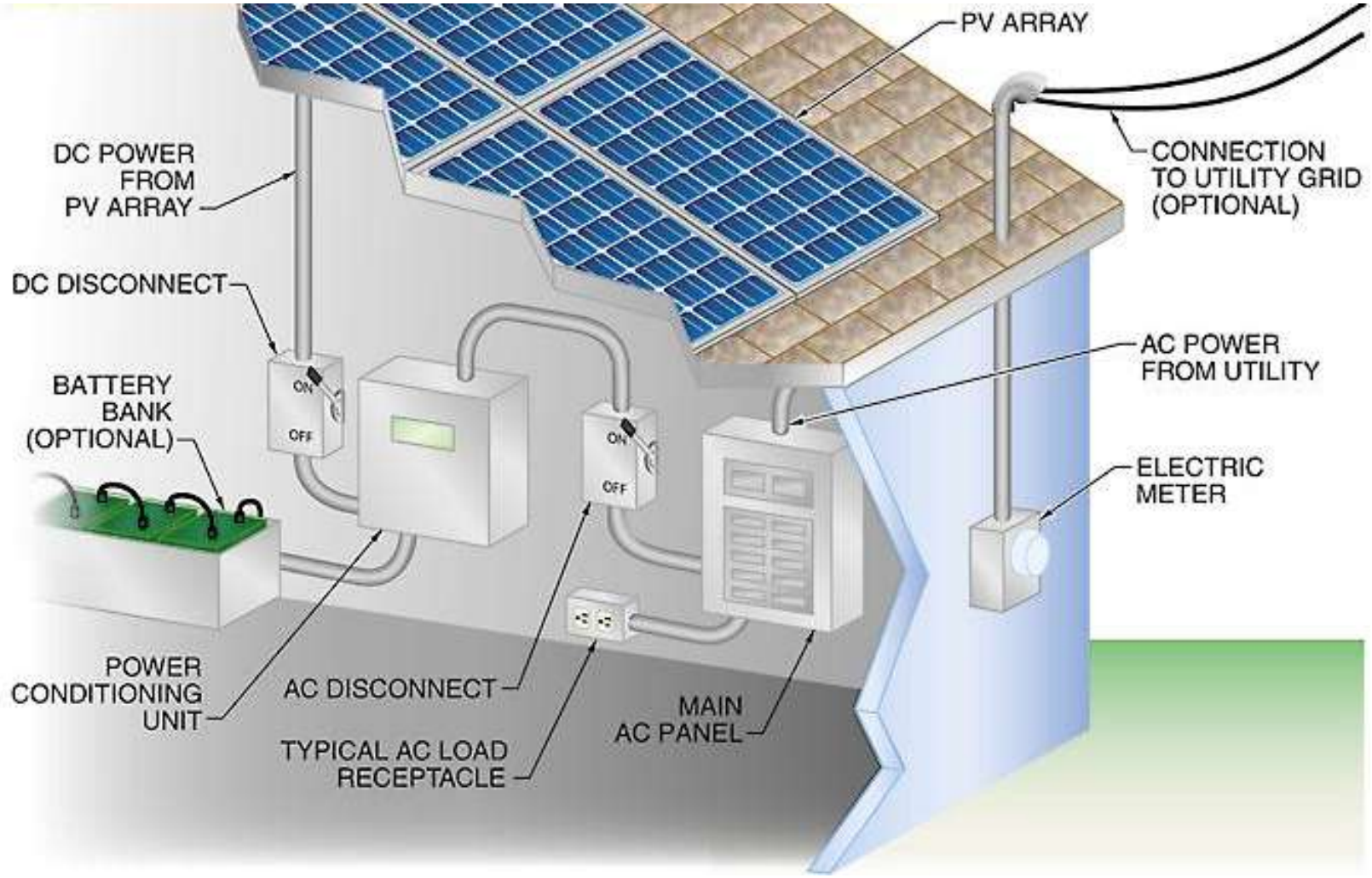

Atmospheric
scattering
Reflected
Absorbed
Direct
Diffuse
BA-G0633315


UTILITY
POLE
SOLAR CELLS
CIRCUIT
PANEL
INVERTER
METER
LOADS

What about power outages?

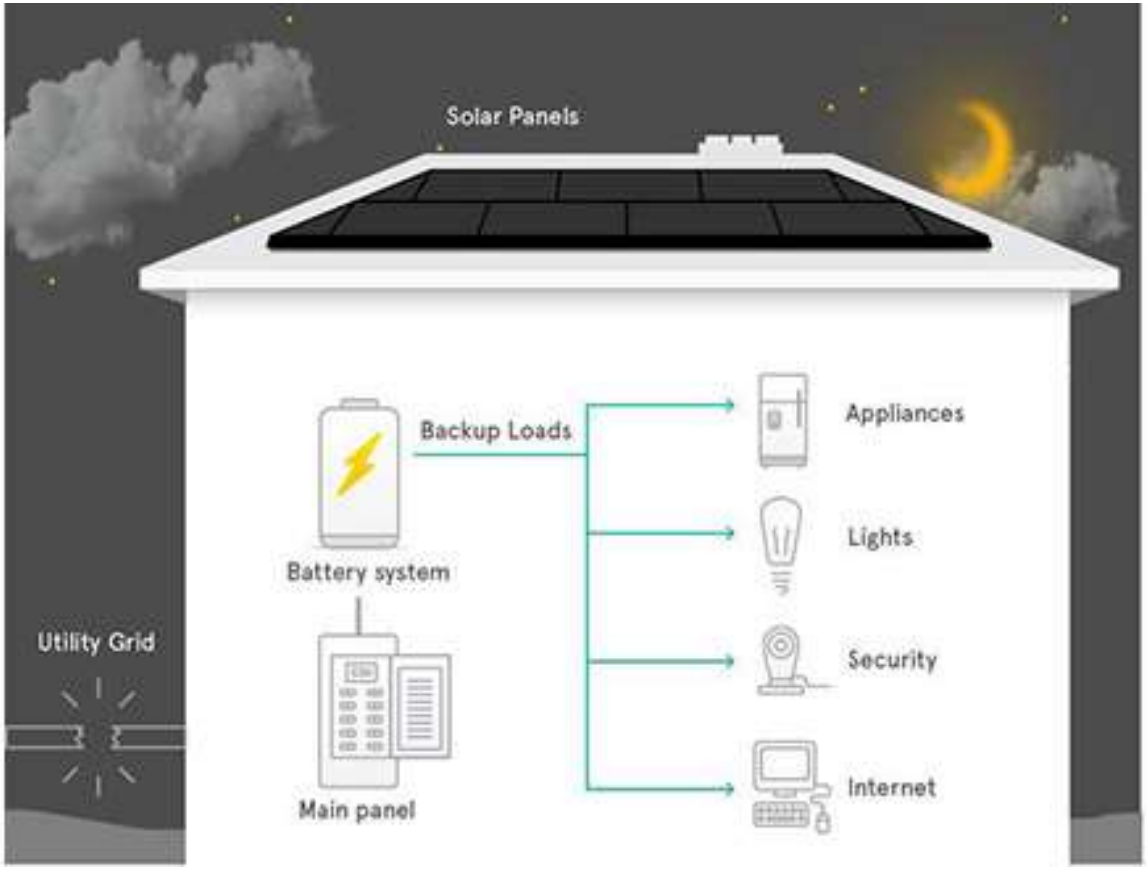
- SunnyBoy TL inverter is one option.
- This inverter allows for a circuit to be powered when grid power is down and the sun is out.
- No batteries required

Typical Residential PV System



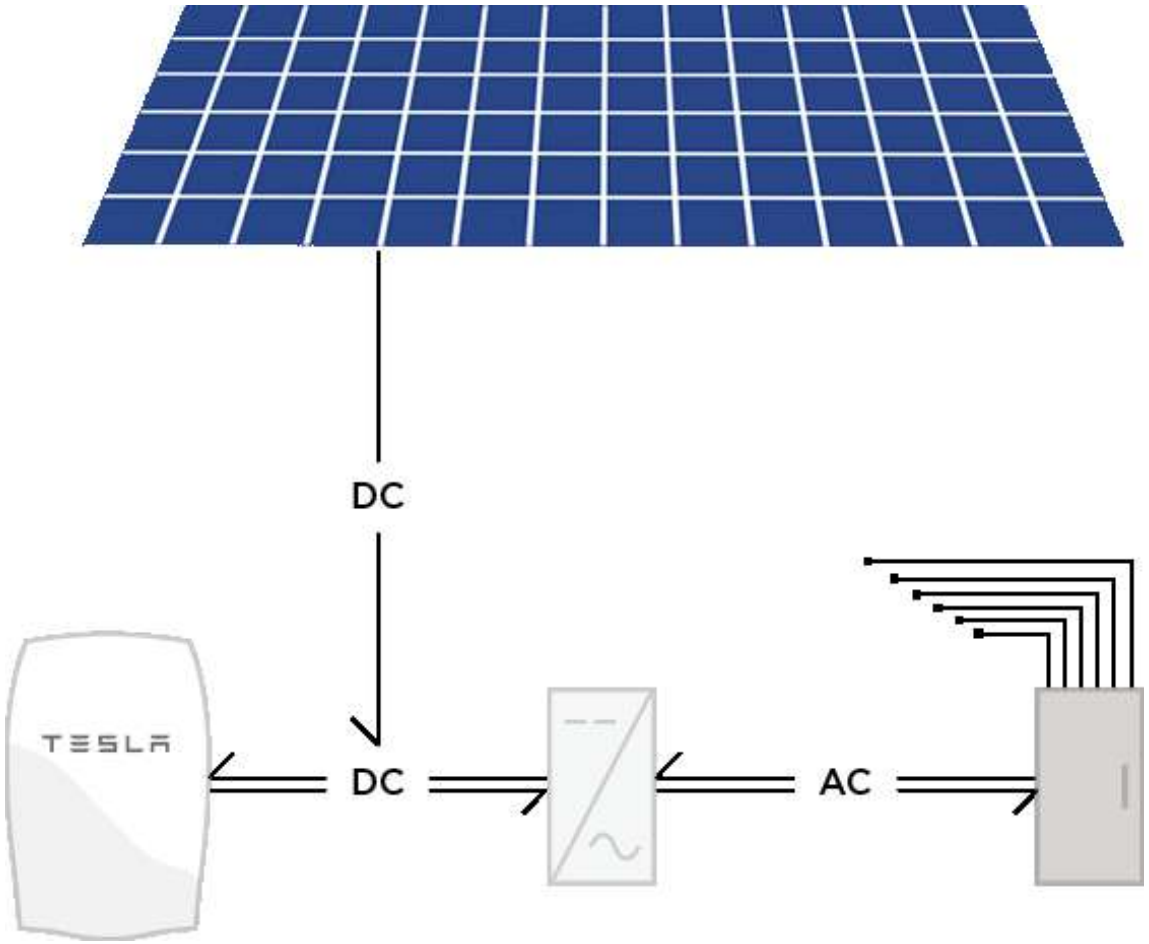
Traditional Battery Back-up

Tesla PowerWall Battery System



Tesla's PowerWall

6.4 kW Battery: $3,000: For back-up power applications

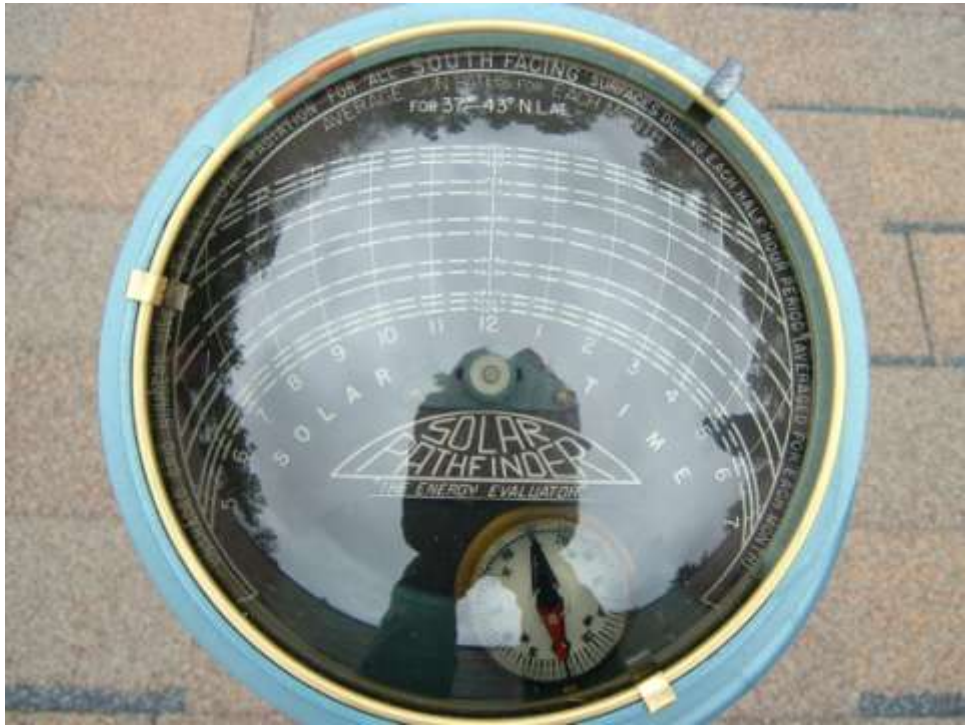



©Solarquest

Hmmmm…

Siting Considerations

- South facing
- No shading during most of the day
- Angle is important
- Fixed, adjustable, or tracking mount
- Must be close to loads
- Should have airflow behind panels



Residential PV System - Microinverters

Example Cost of Residential Photovoltaic Installation

Example 5 kilowatt System

- 5kW Capacity (approx. 480ft^2 of roof space)
- Installed Cost : $16,750 ($3.35*/Watt)
- 30% Federal tax credit: $5,020
- $1,000 State tax credit in MA
- Annual production ~ 6,500 kWh
- Minimum SREC value in yr 1: (~.20/kWh) $1
- Electricity value in yr 1: $1,495
- $?+/- year savings on Electricity & REC sales $2,795
- Payback in 4 years
- Solar Loan through the Mass Clean Energy Center
- * Price per watt through Self-Reliance's Clean Energy Community Challenge

Net Metering

What is net metering?

Net metering enables a renewable energy system to feed back to the grid and give the system owner credit for that power.

Massachusetts allows net metering for a name plate rating of 2 megawatts and under. Whether one gets retail credit or wholesale varies state to state and utility to utility.

Renewable Energy Credits



- Solar RECs in Massachusetts are worth a guaranteed price per MWh. The market may bear a higher price, but it is MARKET driven.

- There are a number of new aggregators coming into the marketplace that broker SRECs. Be very careful when choosing one. Ask A LOT of questions before you or your clients sign a contract with them.
- The big question is what is their fee (in %).

Solar Thermal

SHW installation workshop at WBNERR

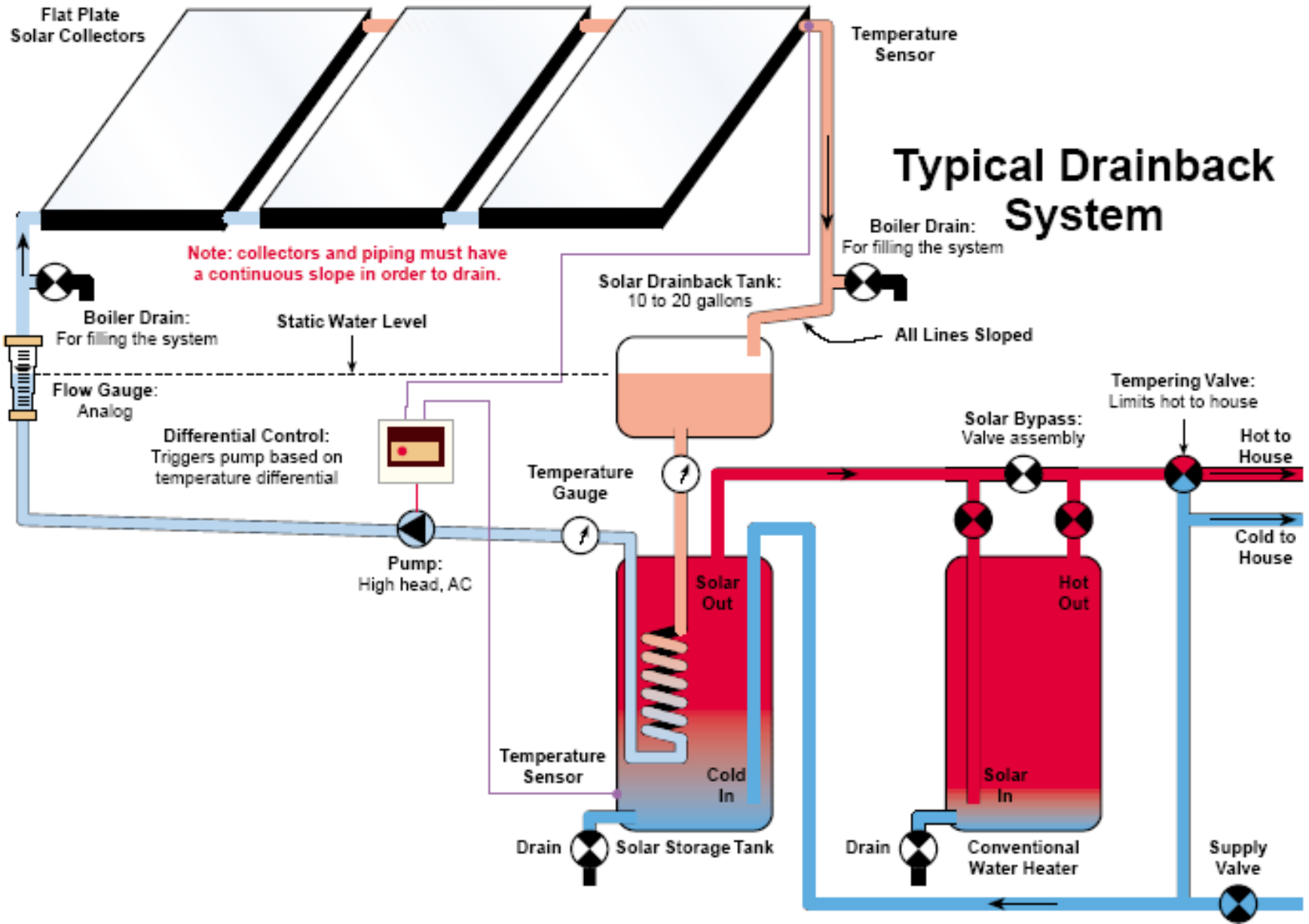
- ✓Every home has a need for hot water.
- ✓Solar Thermal provides thermal energy that preheats water to reduce the amount of fossil fuel needed to raise the temperature to appropriate temperature.
- ✓Rebates available from The Mass Clean Energy Center and state and federal tax credits are also available.

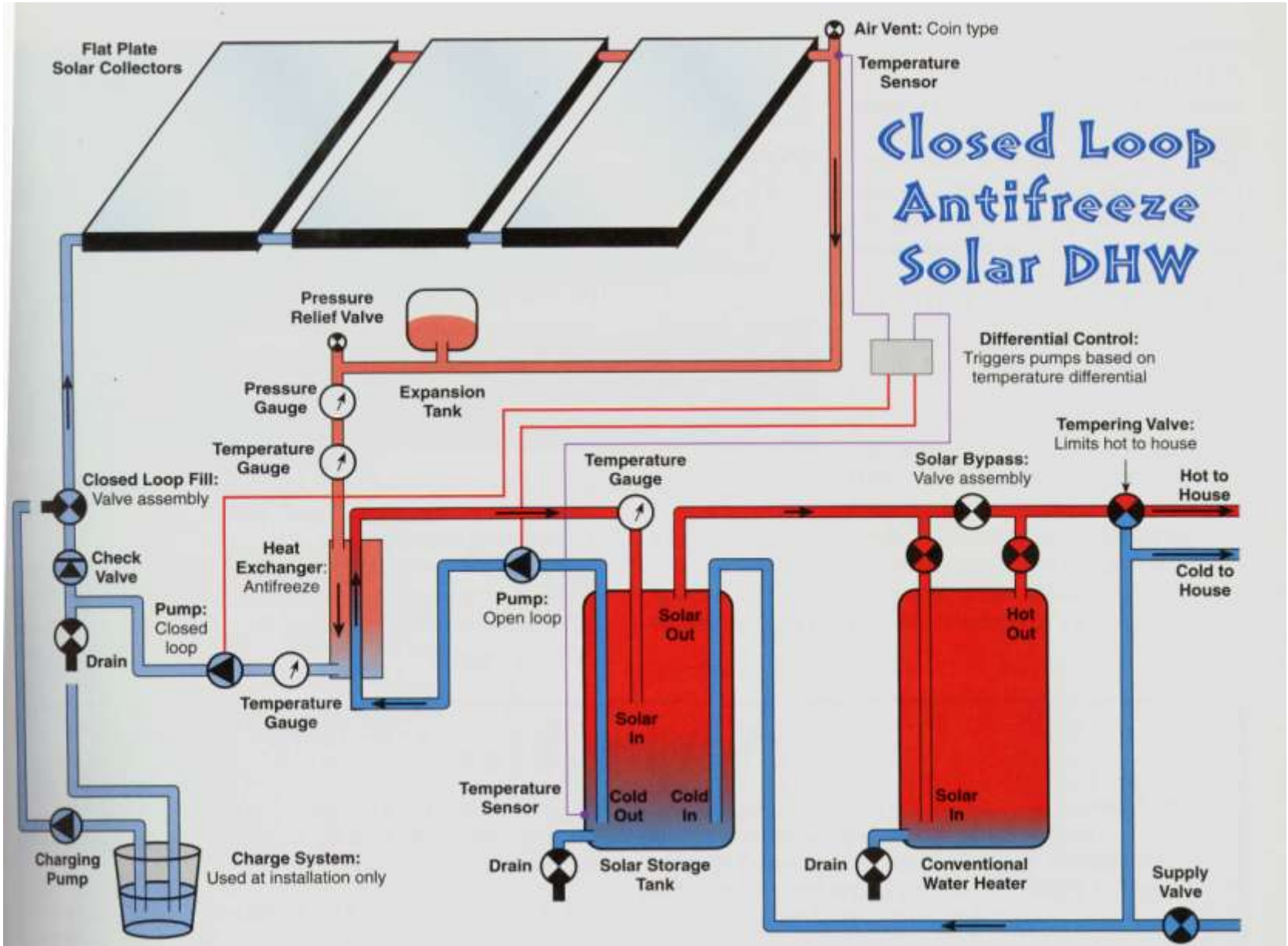
Solar Hot Water Basics

Sunlight enters collector through glazing, strikes dark surface in collector trapping its heat.

Fluid either flows or is pumped through collector so as to cool collector and heat water in storage tank.

At the end of a sunny day the tank is hot for later use. The bigger the tank the more hot water storage you have.


Typical Drainback System
Flat Plate Solar Collectors
Temperature Sensor
Note: collectors and piping must have a continuous slope in order to drain.
Boiler Drain: For filling the system
Solar Drainback Tank: 10 to 20 gallons
All Lines Sloped
Boiler Drain: For filling the system
Static Water Level
Flow Gauge: Analog
Differential Control: Triggers pump based on temperature differential
Tempering Valve: Limits hot to house
Solar Bypass: Valve assembly
Hot to House
Temperature Gauge
Cold to House
Pump: High head, AC
Solar Out
Hot Out
Temperature Sensor
Cold In
Solar In
Drain
Solar Storage Tank
Drain
Conventional Water Heater
Supply Valve


Flat Plate
Solar Collectors
Air Vent: Coin type
Temperature
Sensor
Closed Loop
Antifreeze
Solar DHW
Pressure
Relief Valve
Pressure
Gauge
Expansion
Tank
Differential Control:
Triggers pumps based on
temperature differential
Temperature
Gauge
Tempering Valve:
Limits hot to house
Closed Loop Fill:
Valve assembly
Temperature
Gauge
Solar Bypass:
Valve assembly
Hot to
House
Check
Valve
Heat
Exchanger:
Antifreeze
Pump:
Open loop
Cold to
House
Pump:
Closed
loop
Solar
Out
Hot
Out
Drain
Solar
In
Temperature
Gauge
Temperature
Sensor
Cold
Out
Cold
In
Solar
In
Charging
Pump
Charge System:
Used at installation only
Drain
Solar Storage
Tank
Drain
Conventional
Water Heater
Supply
Valve

Drainback Domestic Hot Water and Space Heating

It isn’t all about the money

People decide to invest in solar for many different reasons.

Climate change, rising energy costs, war in unstable countries where our interest in fossil fuel is high, doing the right thing, leaving a better place for future generations, setting a good example today and a vague sense of responsibility for one’s carbon footprint has helped people make the the investment in renewable energy systems.

Wrap-up

Solar electric and solar hot water are viable systems here in New England.

The technology is mature and ready to be installed.

Energy efficiency and renewable energy technologies are effective ways that reduce costs, increase comfort and help us be more resilient when storms knock out services.

QUESTIONS?