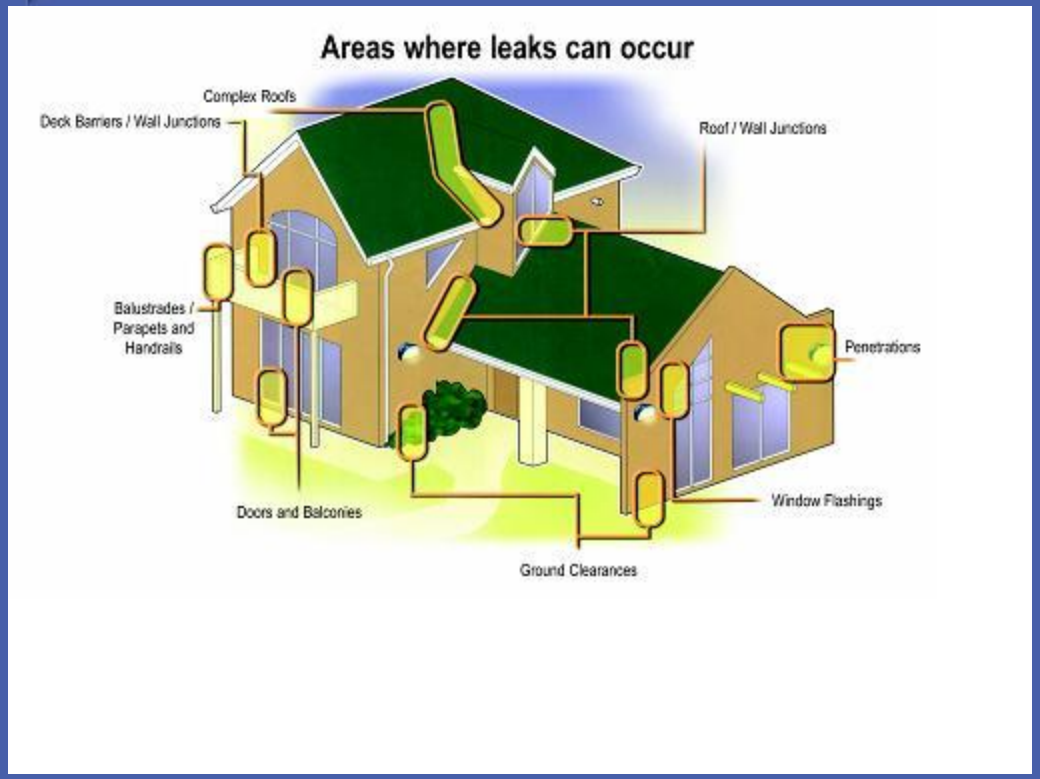
Energy Usage

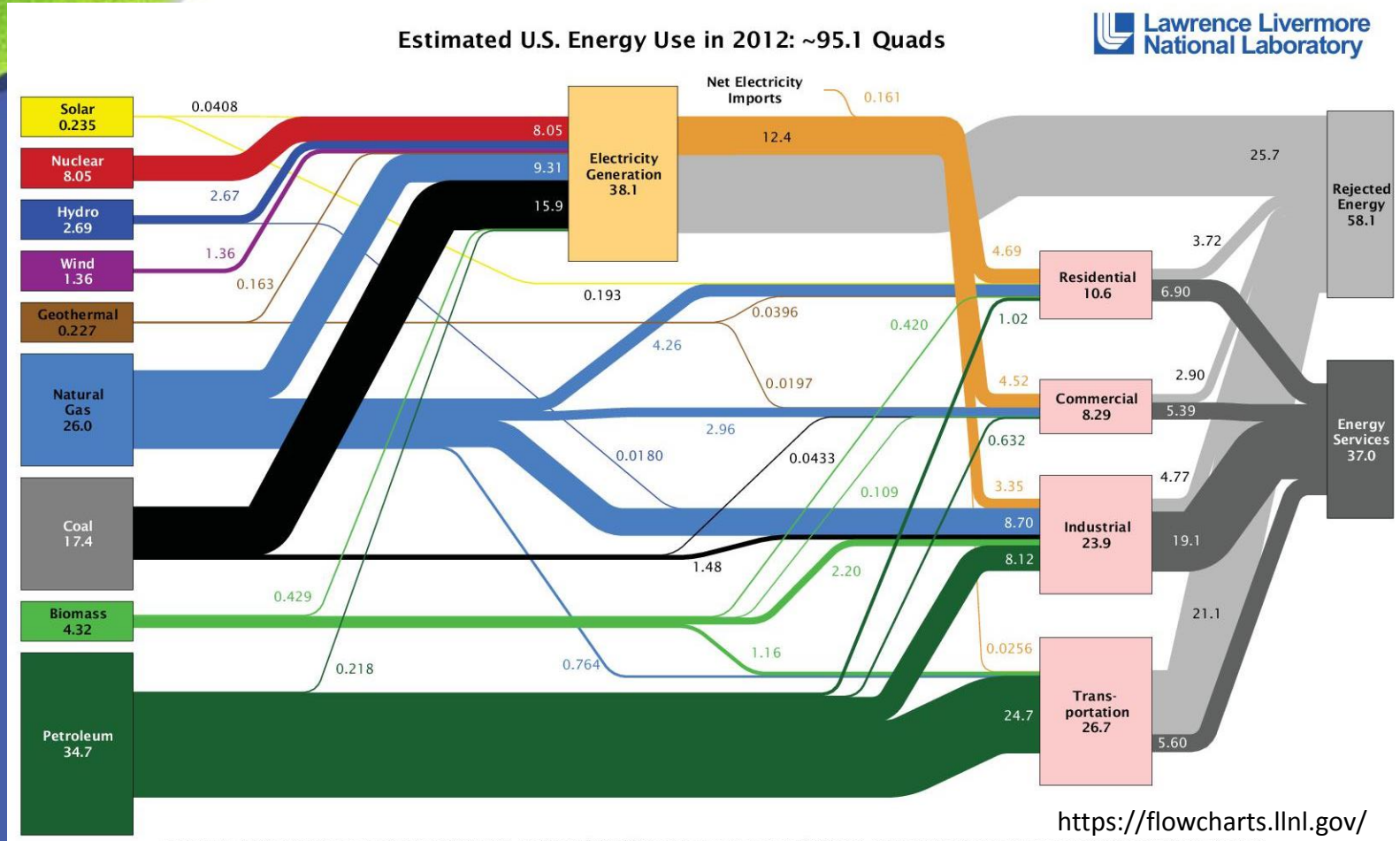


- The energy you don’t need is the most cost effective energy you can produce

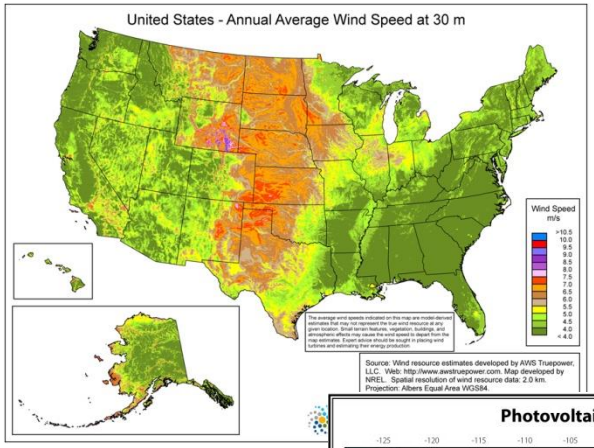
Energy Usage

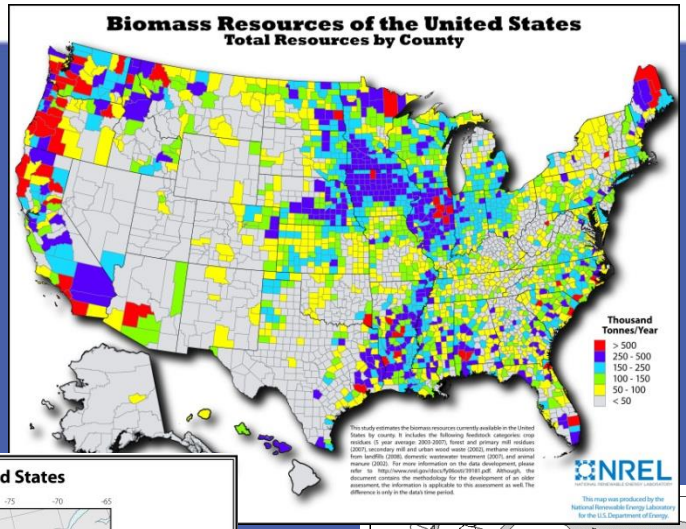
Most Efficient 2013
www.energystar.gov

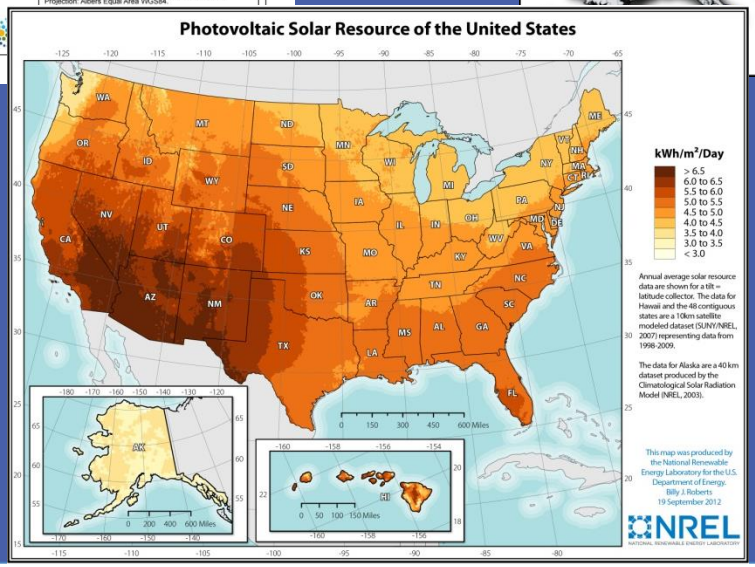
Where Does Our Energy Come From

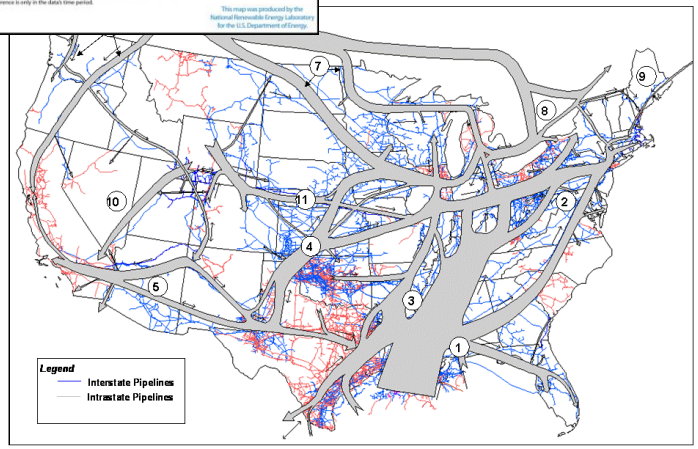


Where Does Our Energy Come From









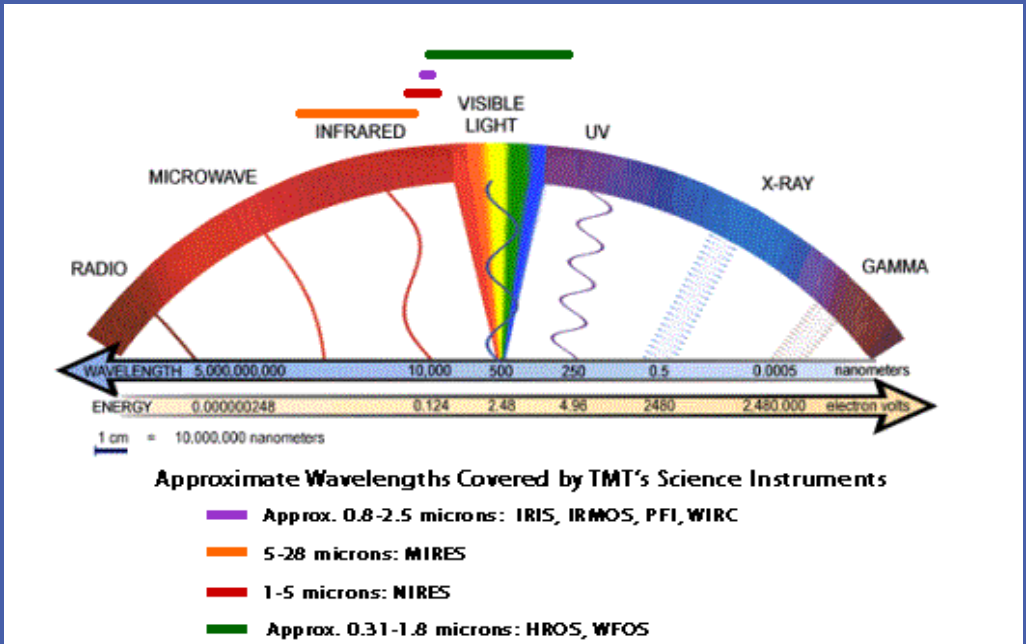
Source: Energy Information Administration, Office of Oil and Gas, Natural Gas Division, GasTran Gas Transportation Information System.

The EIA has determined that the informational map displays here do not raise security concerns, based on the application of the Federal Geographic Data Committee's *Guidelines for Providing Appropriate Access to Geospatial Data in Response to Security Concerns*.

Two Types of Solar Energy

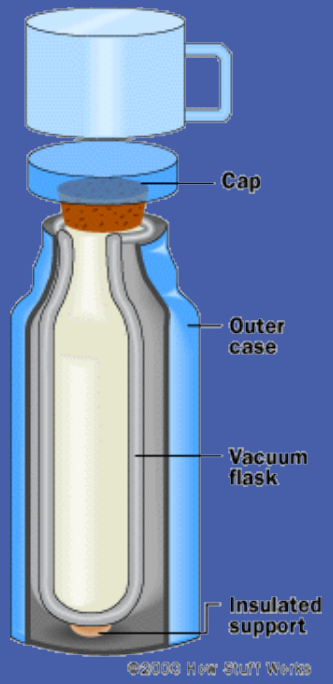
Thermal – which captures heat energy into storage directly from the sun

Photovoltaic's – which converts the rays of light from the sun into an electrical current



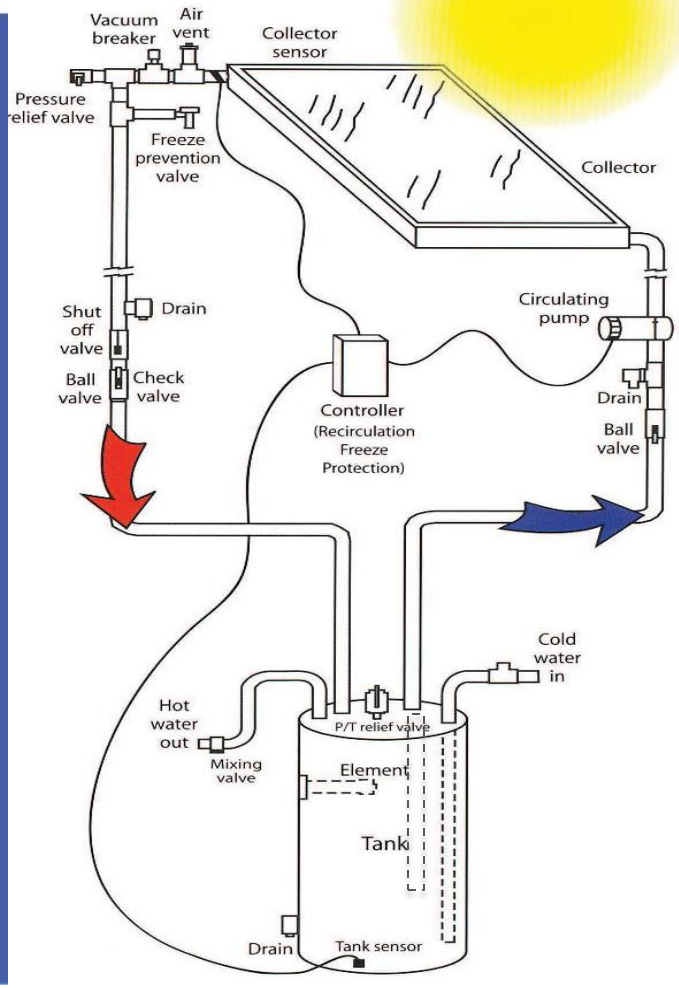
Thermal Technology

What happens when you turn on the water from a hose that has been sitting in the sun for an hour or so



This is thermal technology at is simplest form

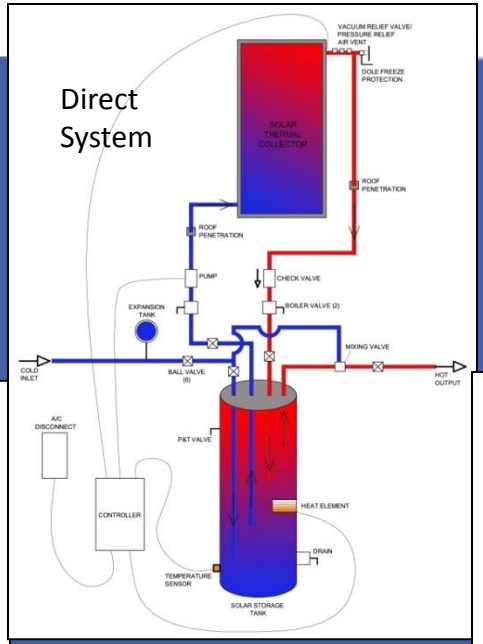
Typical Domestic Thermal System



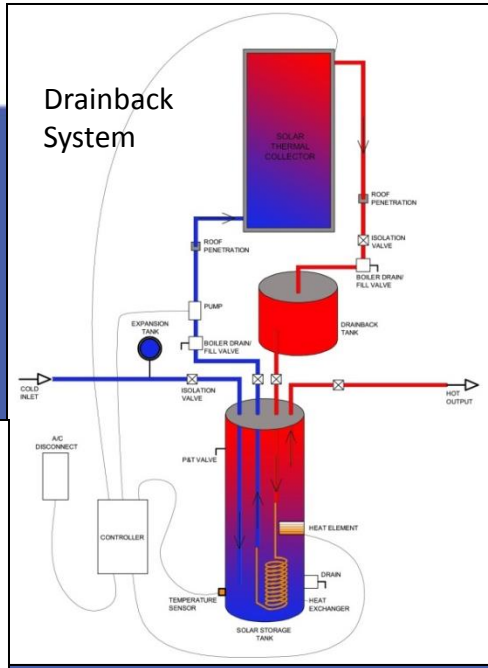
Cold water is circulated through a solar collector on the roof of a house and stored in a collection tank to be used for domestic hot water usage.

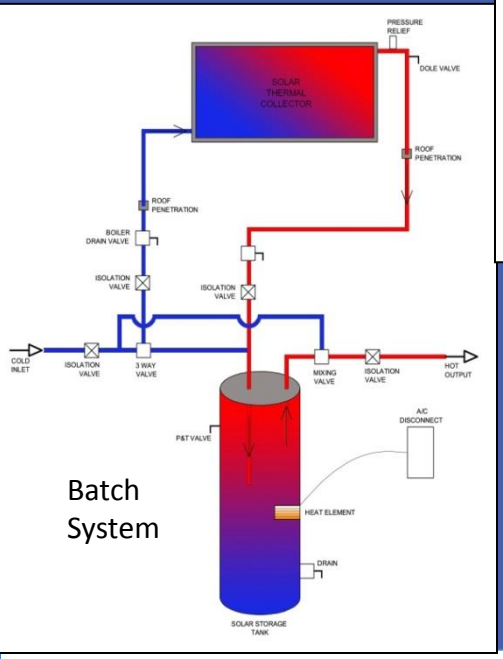
4 Thermal Systems

Direct System



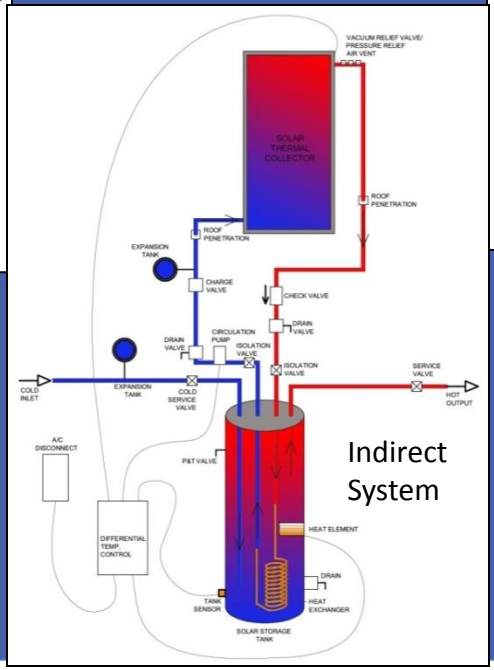
Drainback System





Batch System

Indirect System



Types of Thermal Collectors

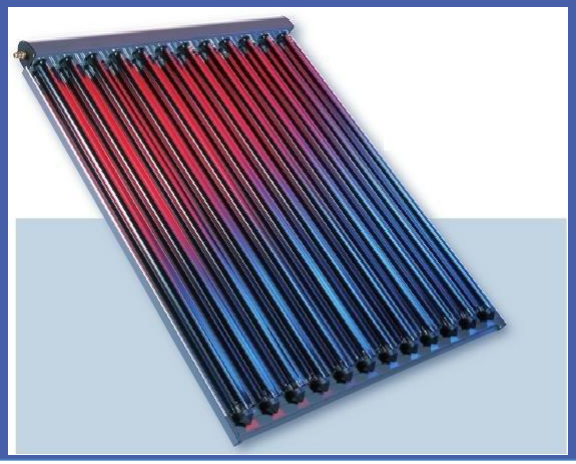
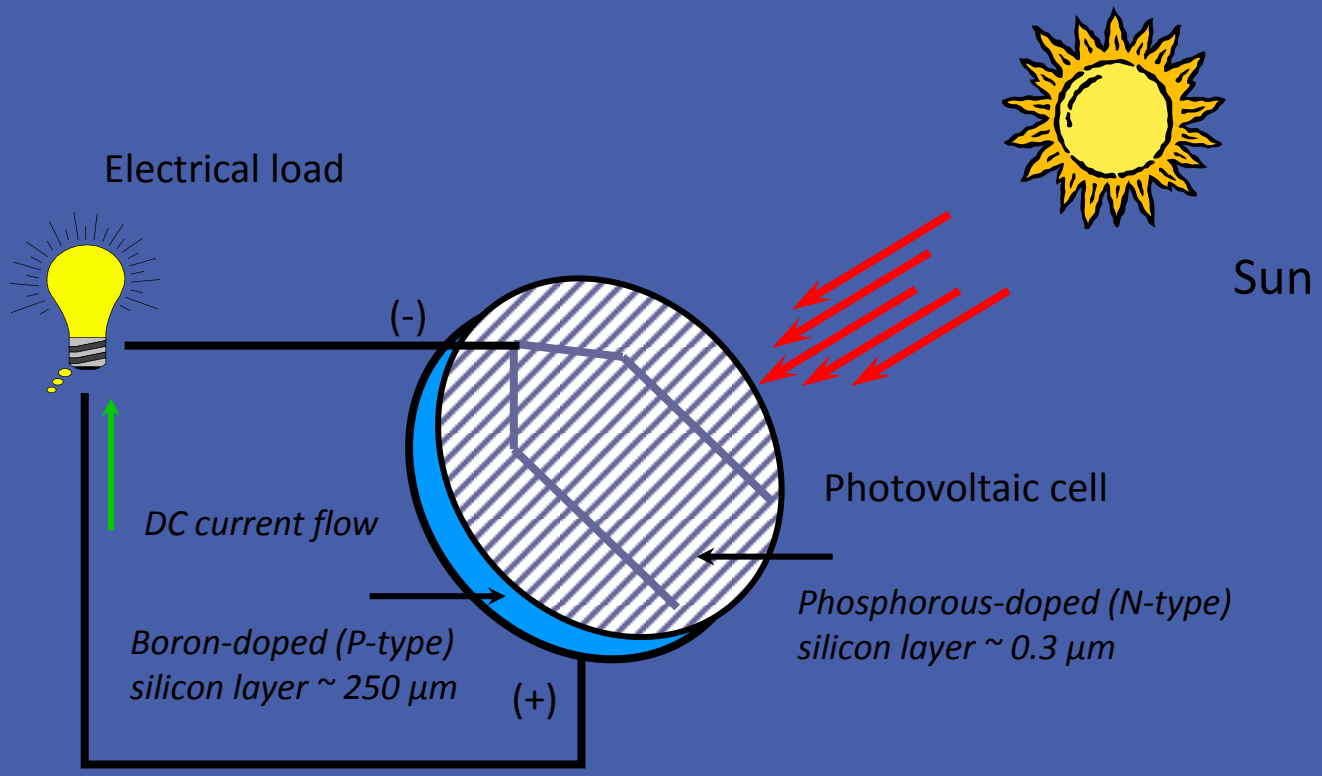
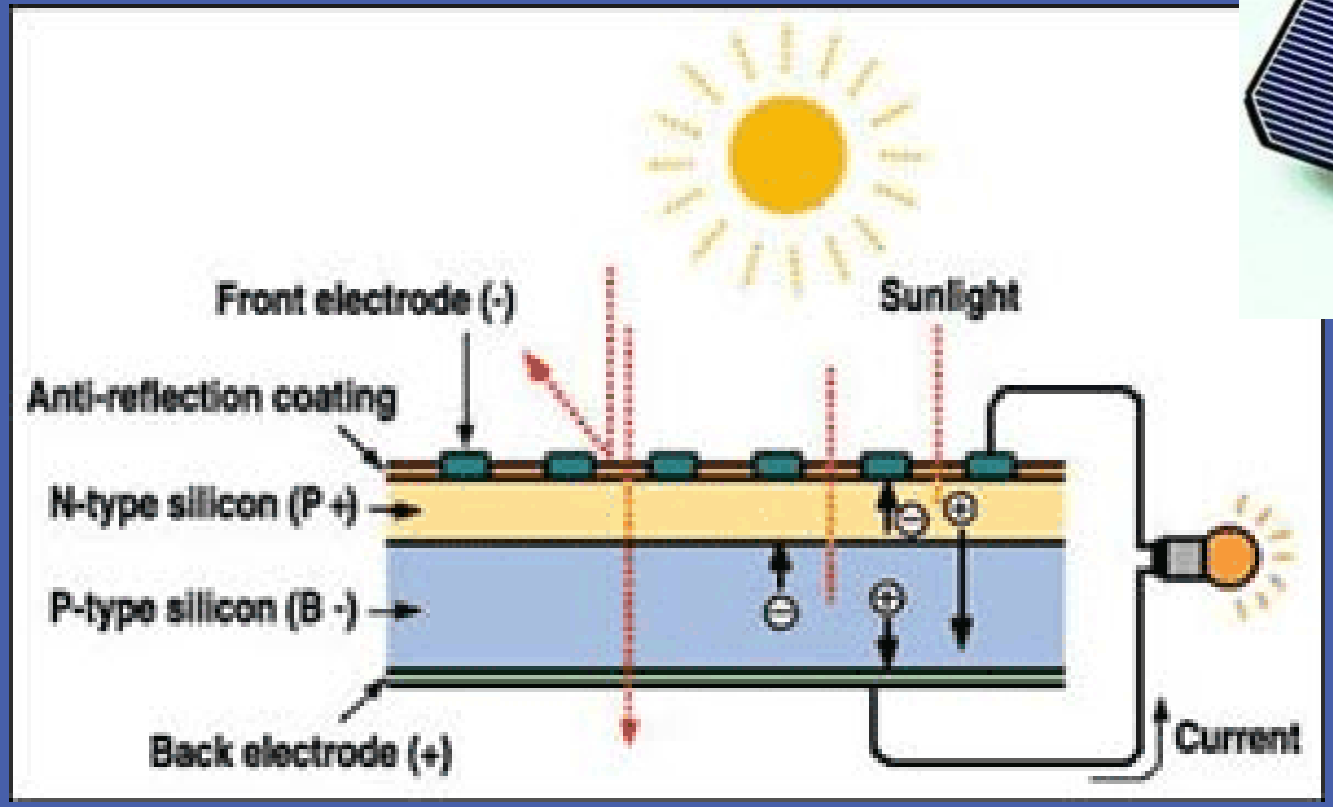


Photo Electric or Photovoltaic

The PV Magic

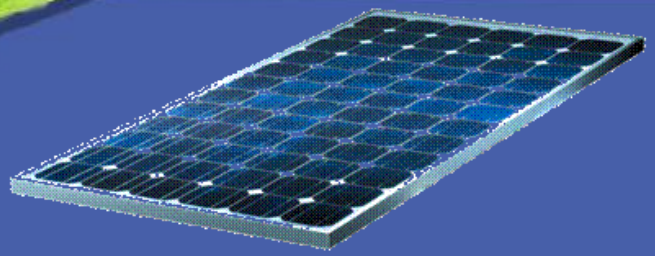

Electrical load
Sun
(-)
Photovoltaic cell
DC current flow
Phosphorous-doped (N-type)
silicon layer ~ 0.3 µm
Boron-doped (P-type)
silicon layer ~ 250 µm
(+)

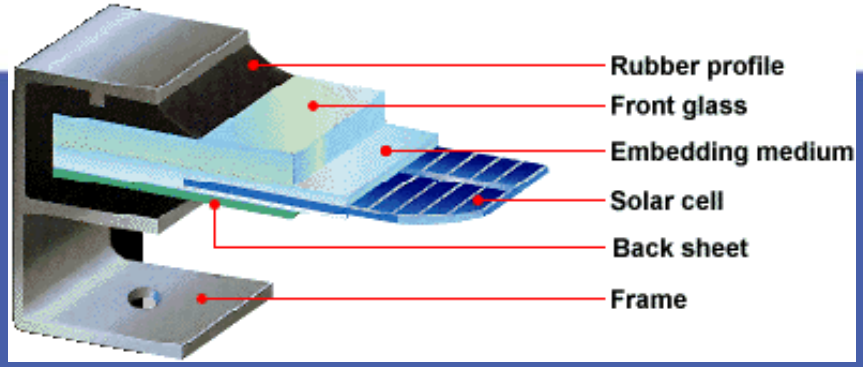
The Solar PV Solution
How it Works



The average cell produces ~1 – 4 watts of power per cell depending on quality

The Solar PV Solution
How it's made





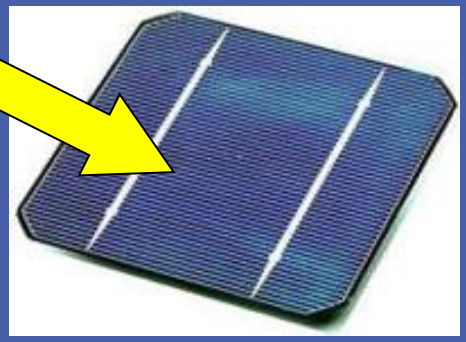
- Low iron, water tight tempered glass front
- EVA encapsulated layer
- Solar cell circuit
- Vinyl encapsulated layer
- Tedlar back sheet
- Power Tolerance +/- 3%

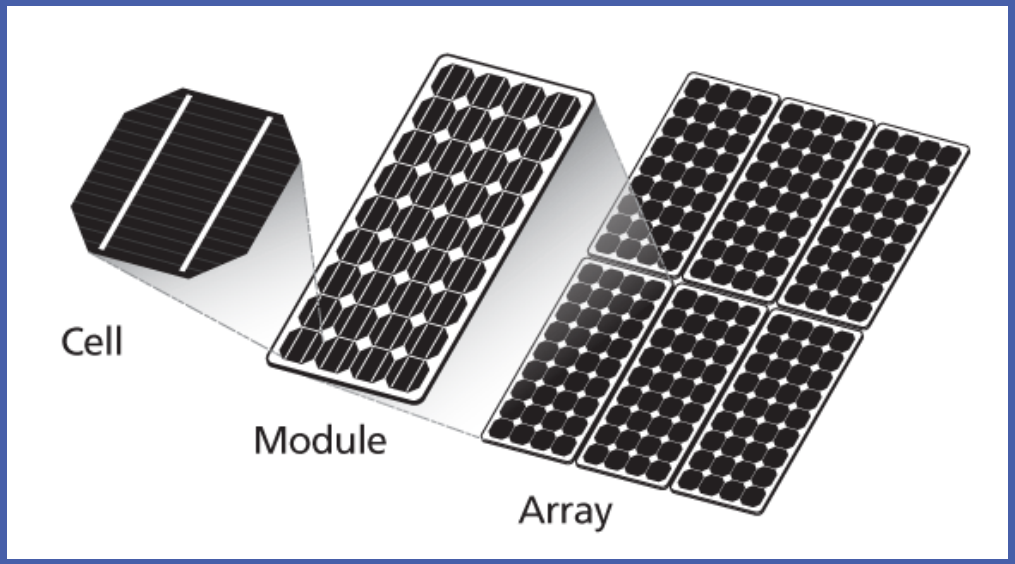
- Anodized aluminum frame
- Cable Connectors
- 25 Year Manufacturer's Warranty
- Wind Load Designs available up to 180 mph
- UL, CEC, IEC, FSEC certified

Solar Modules

Sun Light

PV Solar Cell





- A single Photoelectric cell is made of a special silicon.
- As light hits the cell an electrical current is created.
- A group of cells are combined to create a solar module

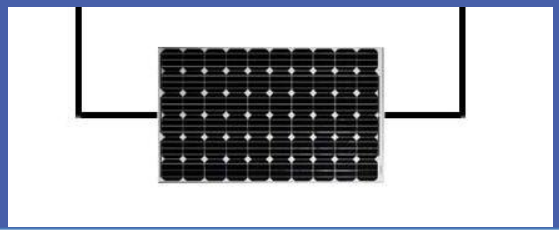
PV Cell Ratings

PV Panels create Direct Current (DC) Electricity

PV Panels are rated by Wattage
150W, 200W, 240W, 260W

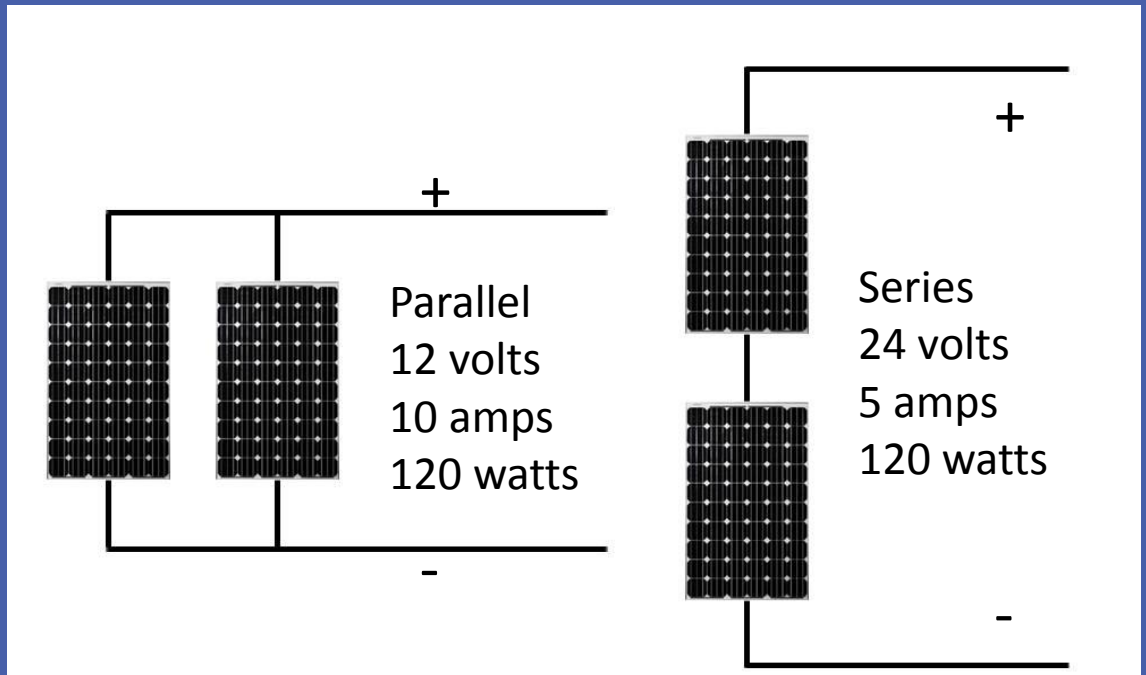
Wattage is a function of
Amperage X Voltage = Wattage (E=IR)

5 amps x 12 volts = 60 Watts



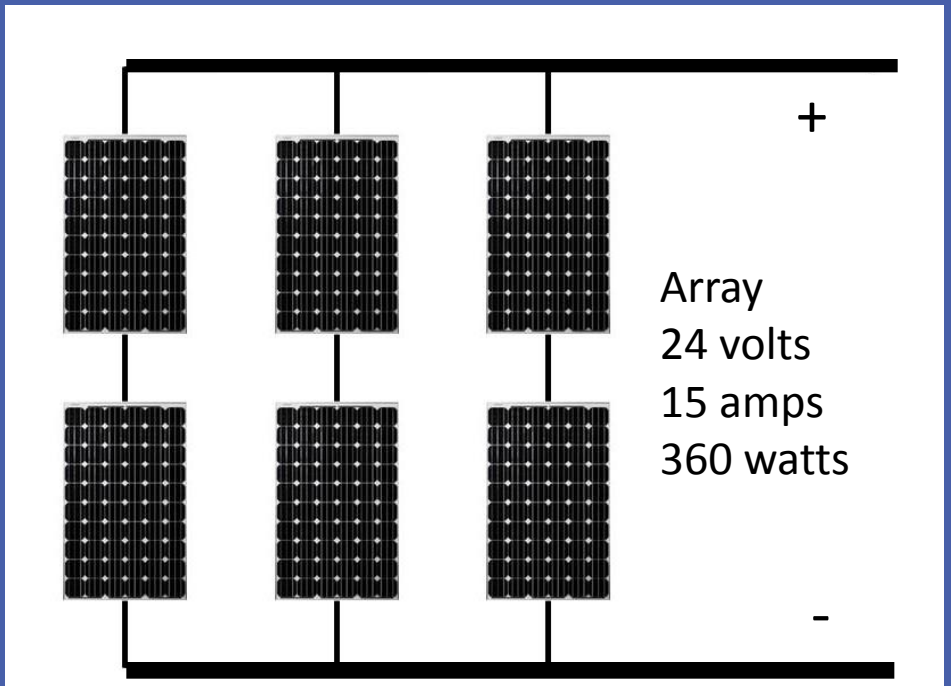
PV Cell Ratings

When you string panels in Parallel you increase Amperage
When you string panels in Series you increase Voltage



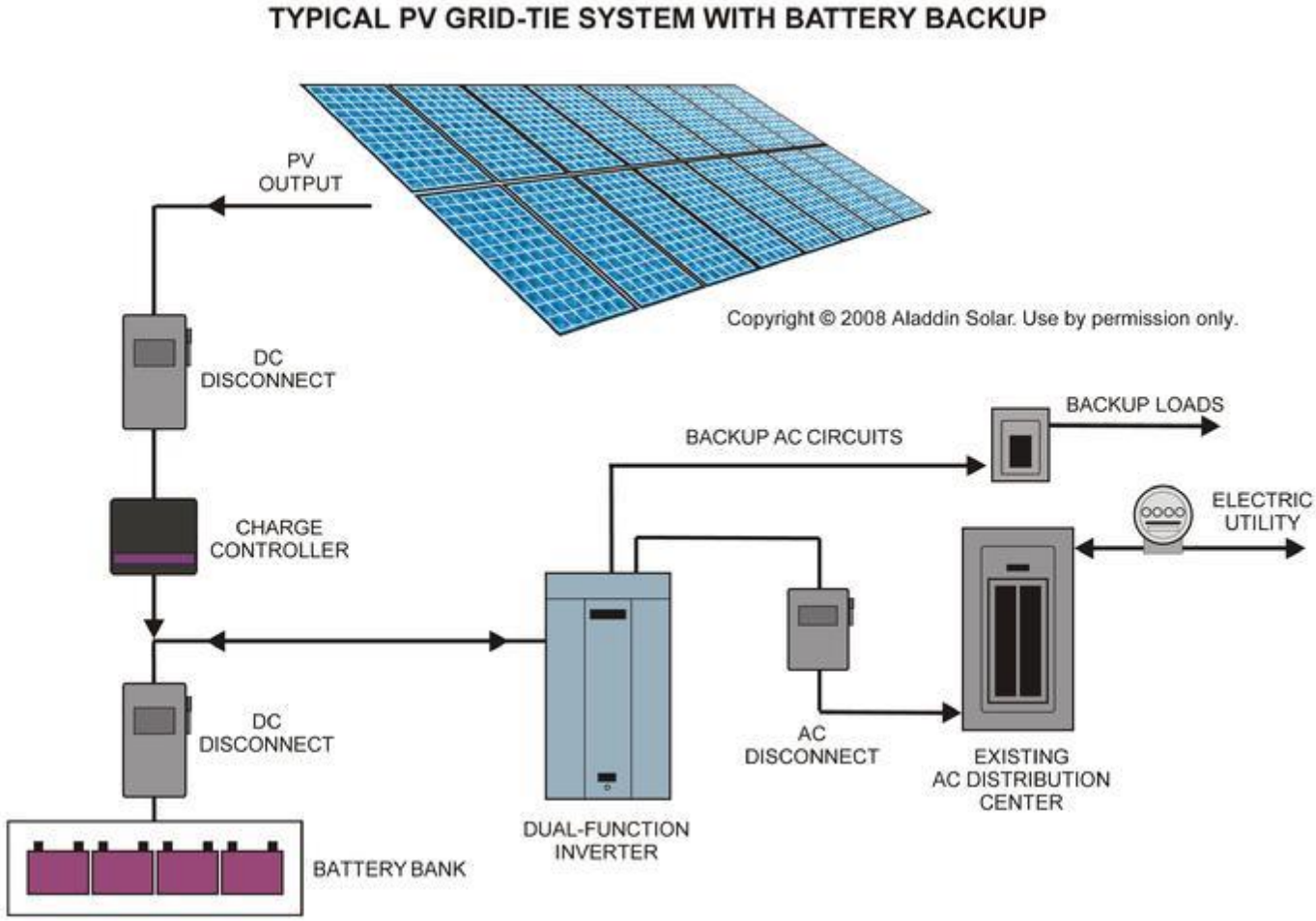
PV Cell Ratings

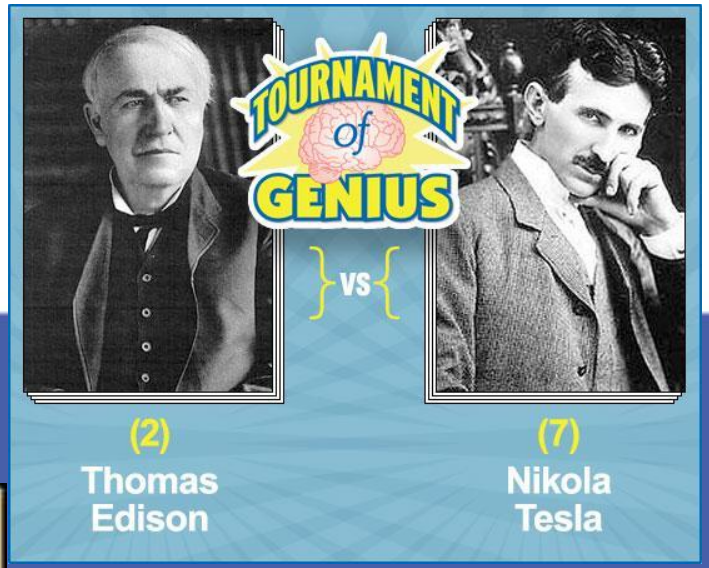
When you Series and Parallel panels you can increase Wattage

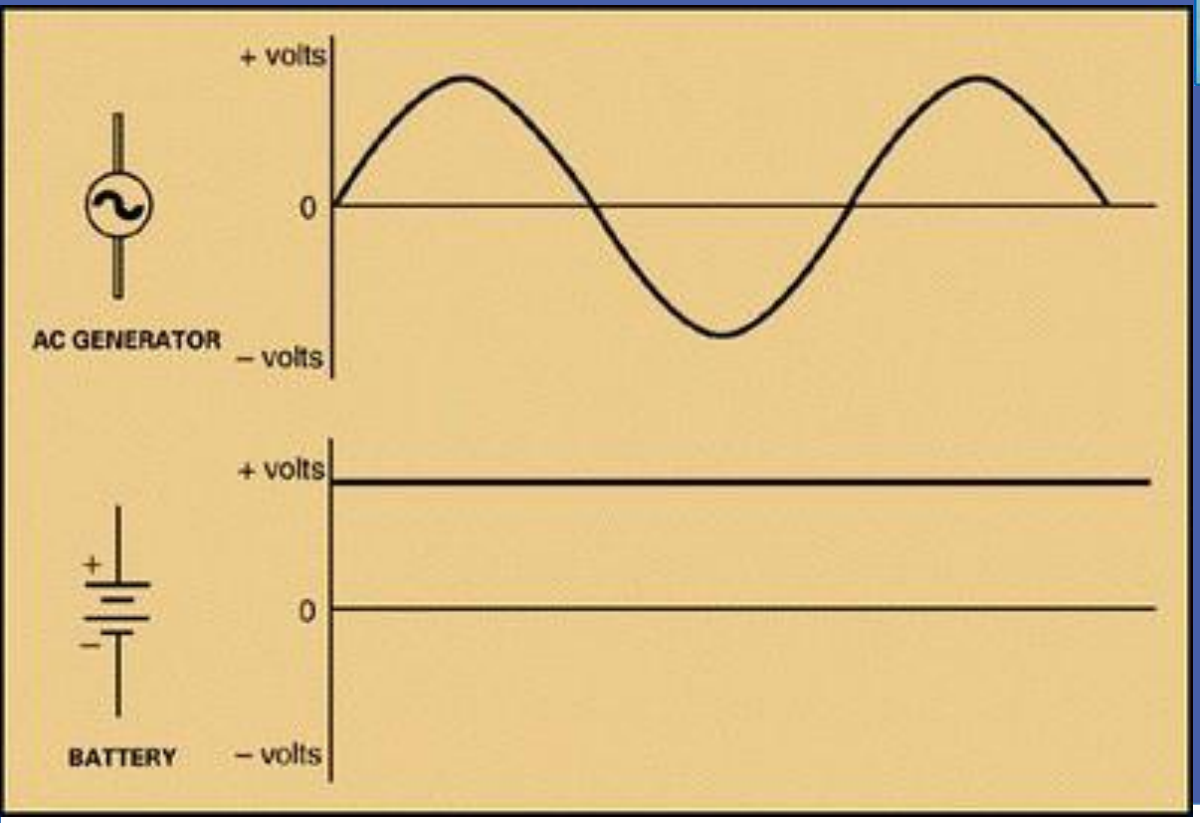


PV Cell Ratings

Typical Solar PV Solution





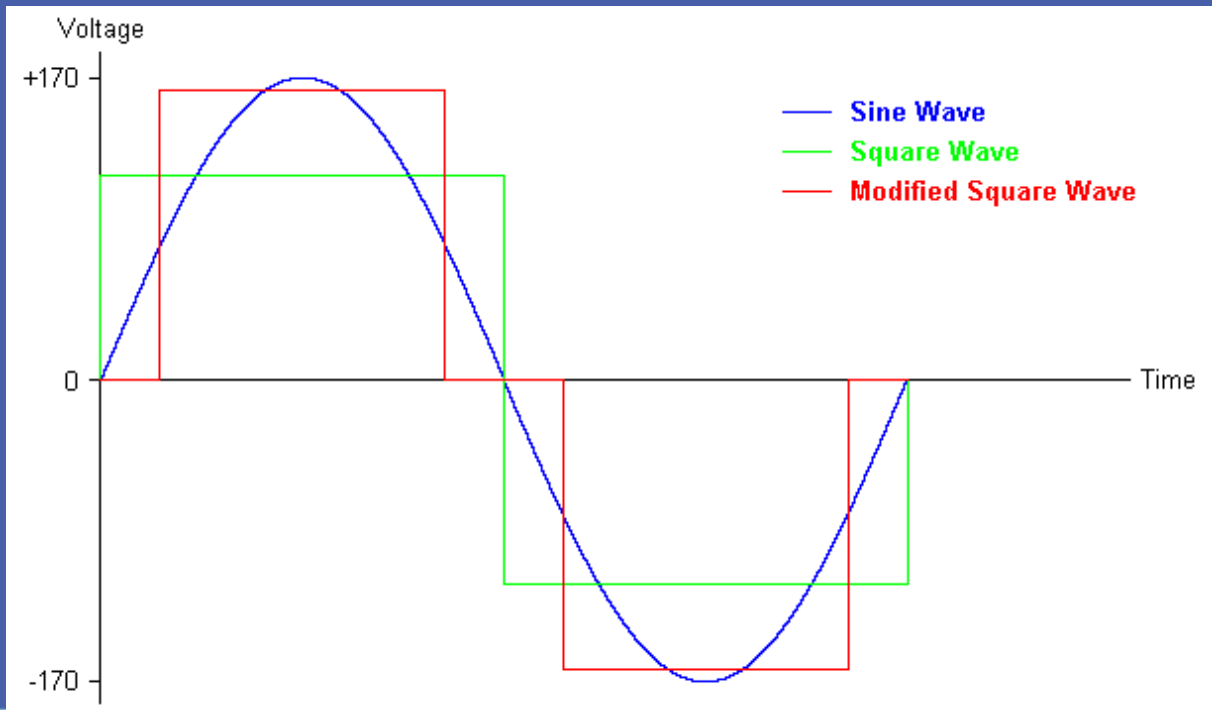


Alternate Current

Direct Current

Inverters

- True sine wave output
- Ability to match frequency
- Clean consistent power

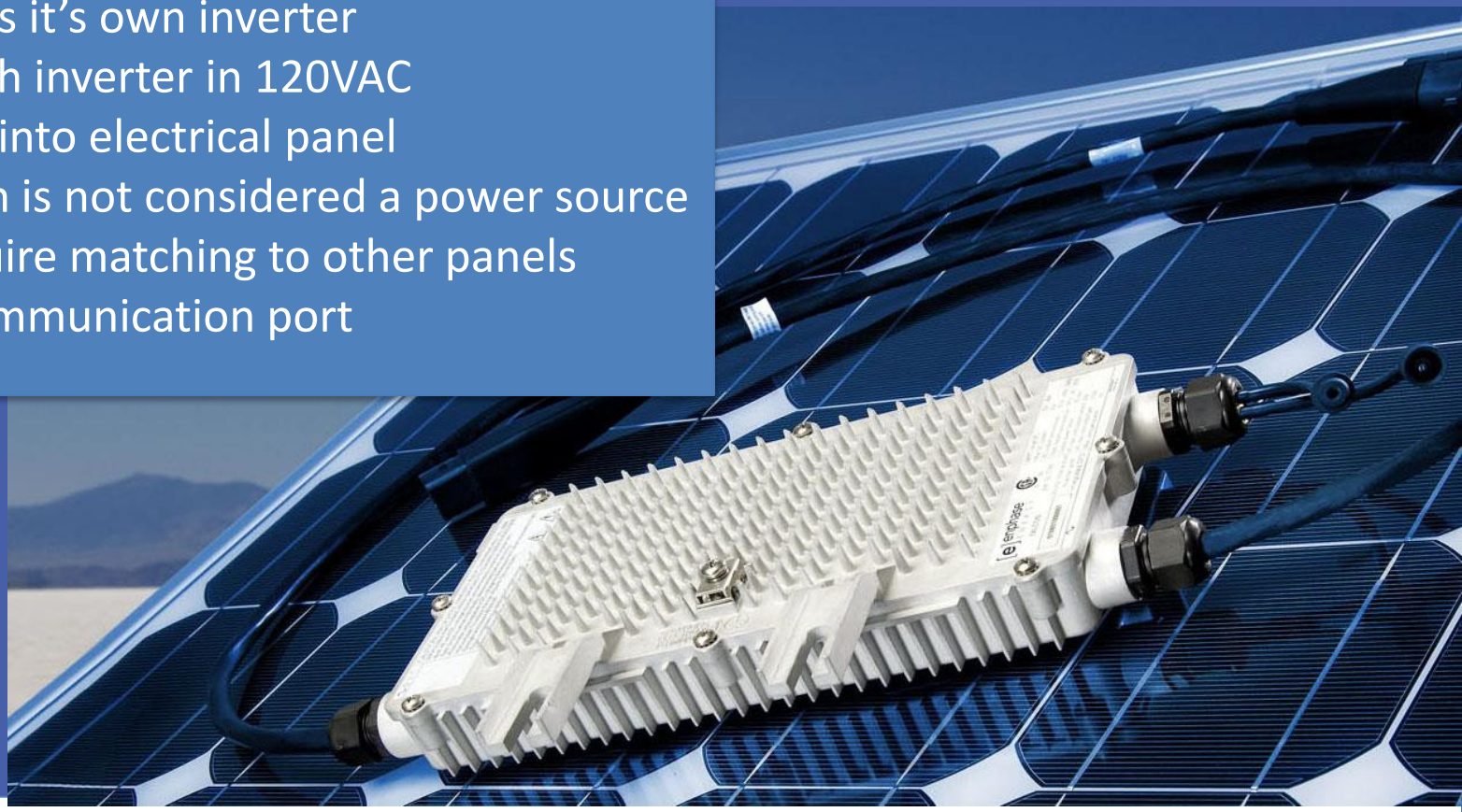


Inverters are sized to the power source

FGBC FLORIDA GREEN BUILDING COALITION

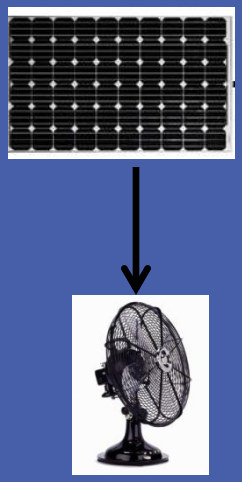
Micro-Inverters

- Each panel has it's own inverter
- Output of each inverter in 120VAC
- Hook directly into electrical panel
- AC connection is not considered a power source
- Does not require matching to other panels
- Contains a communication port



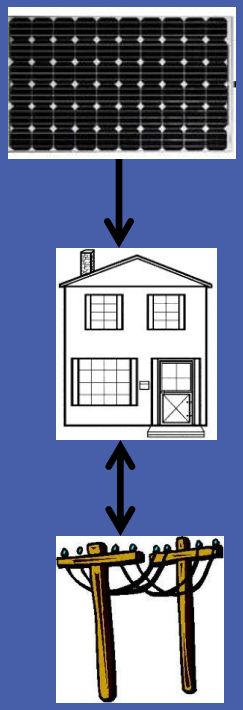
Types of Distributive Systems

PV-Direct

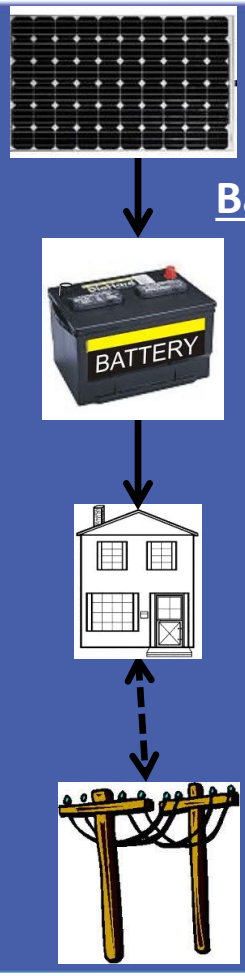


Stand-Alone Systems

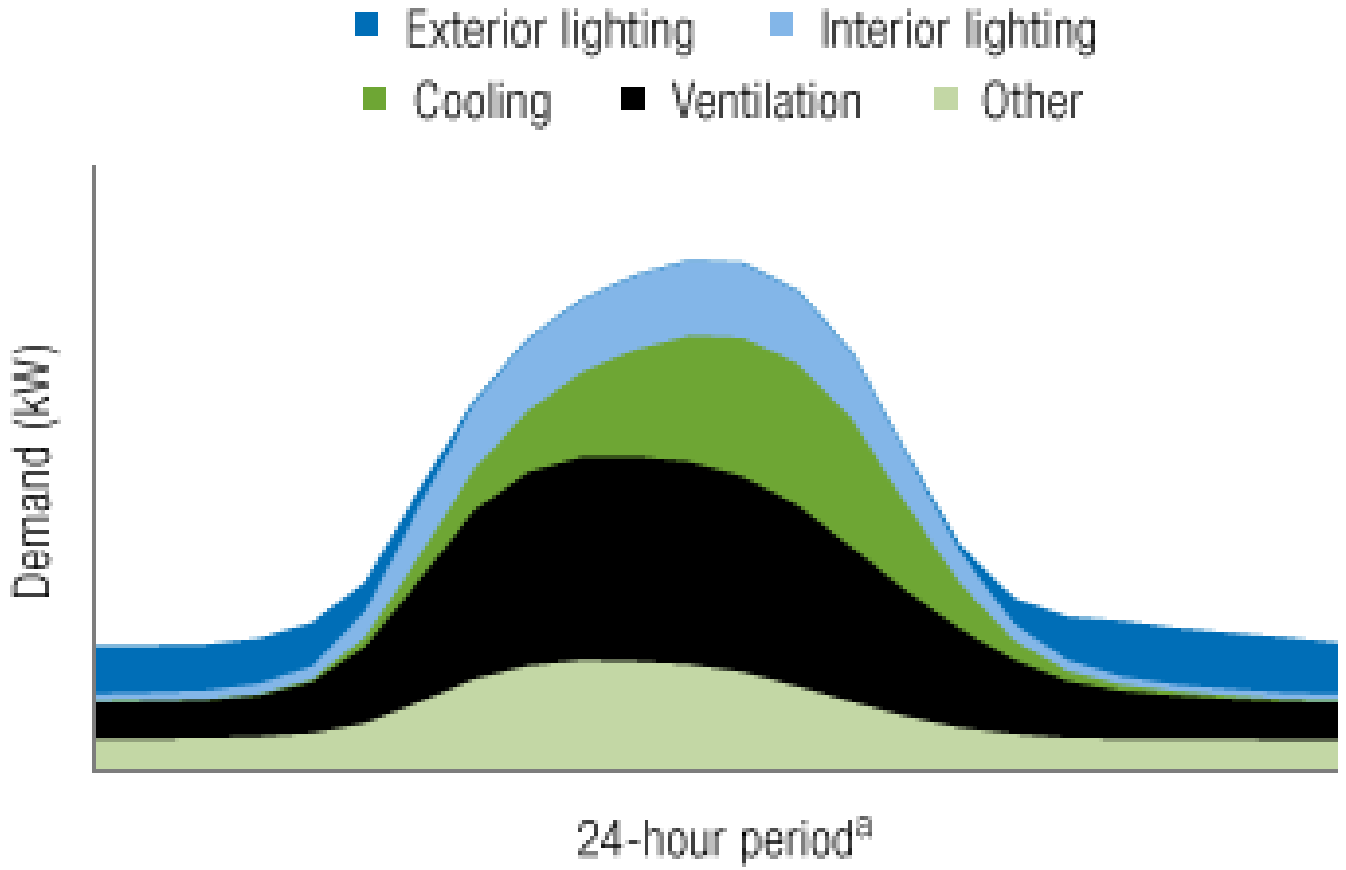
Battery-less Grid-Tied Systems



Battery Based Grid-Tied Systems



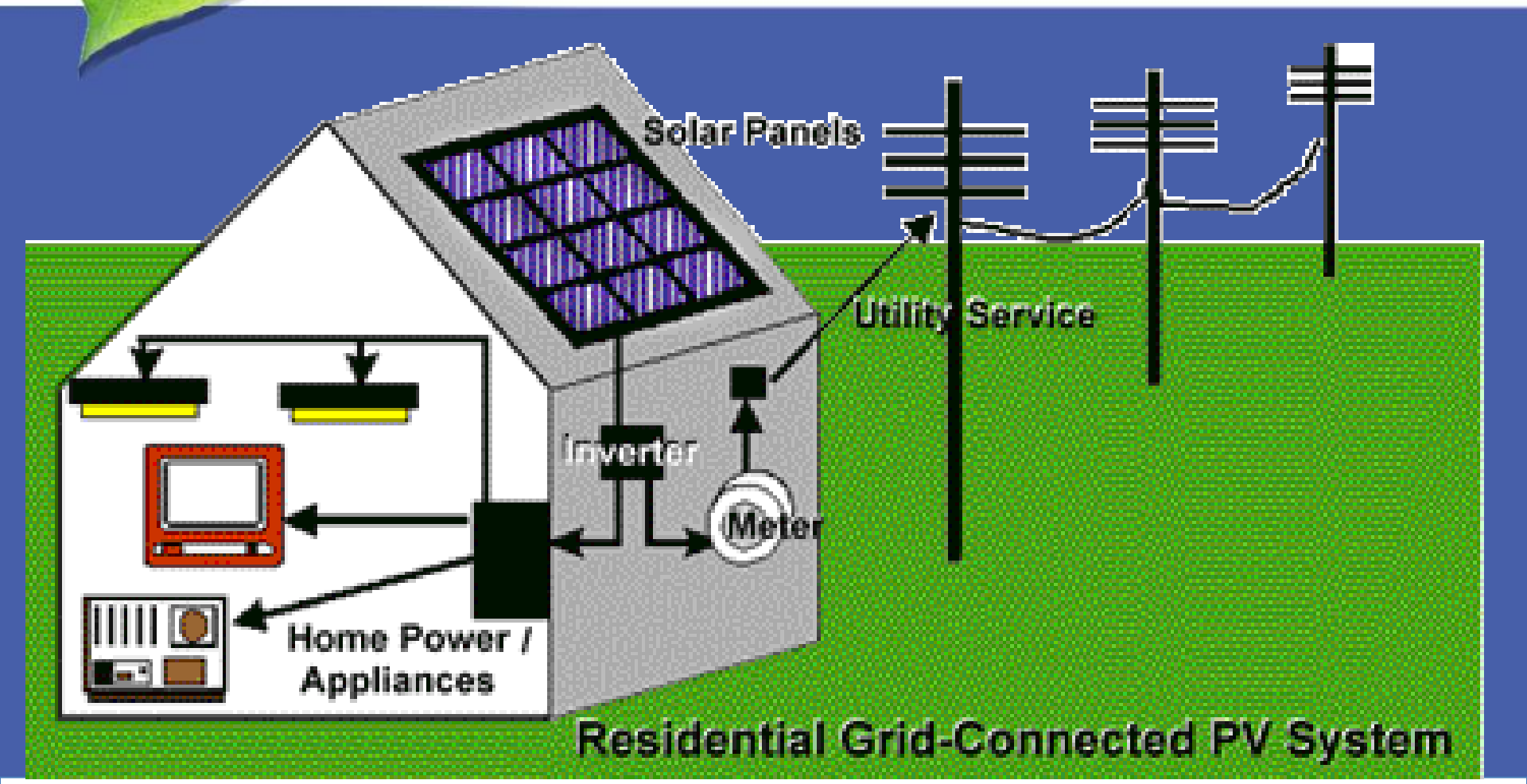
Electrical Storage



Notes: kW = kilowatt.
a. 24-hour period = midnight to midnight.

© E Source; data from ITRON

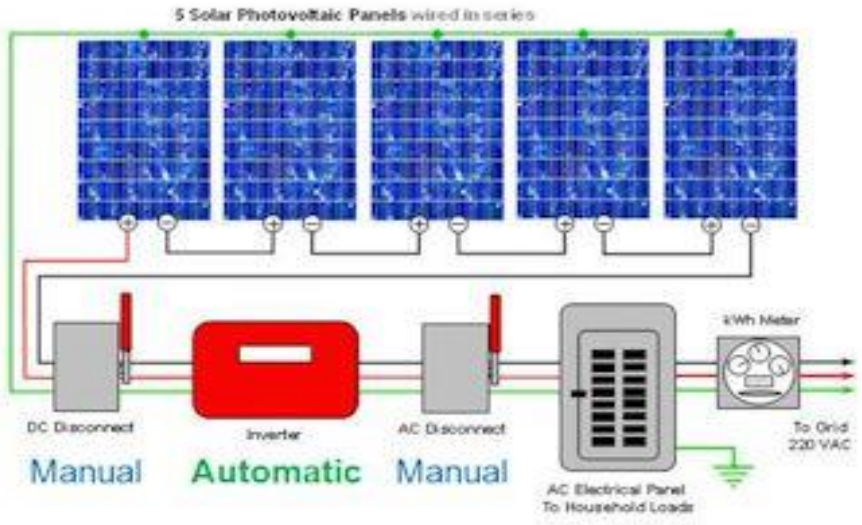
Grid Storage



Anti-Islanding

PV Anti-Islanding

- All utility-interactive systems use a safety feature known as "anti-islanding" to prevent the solar array from remaining connected to the electric utility when the grid is down

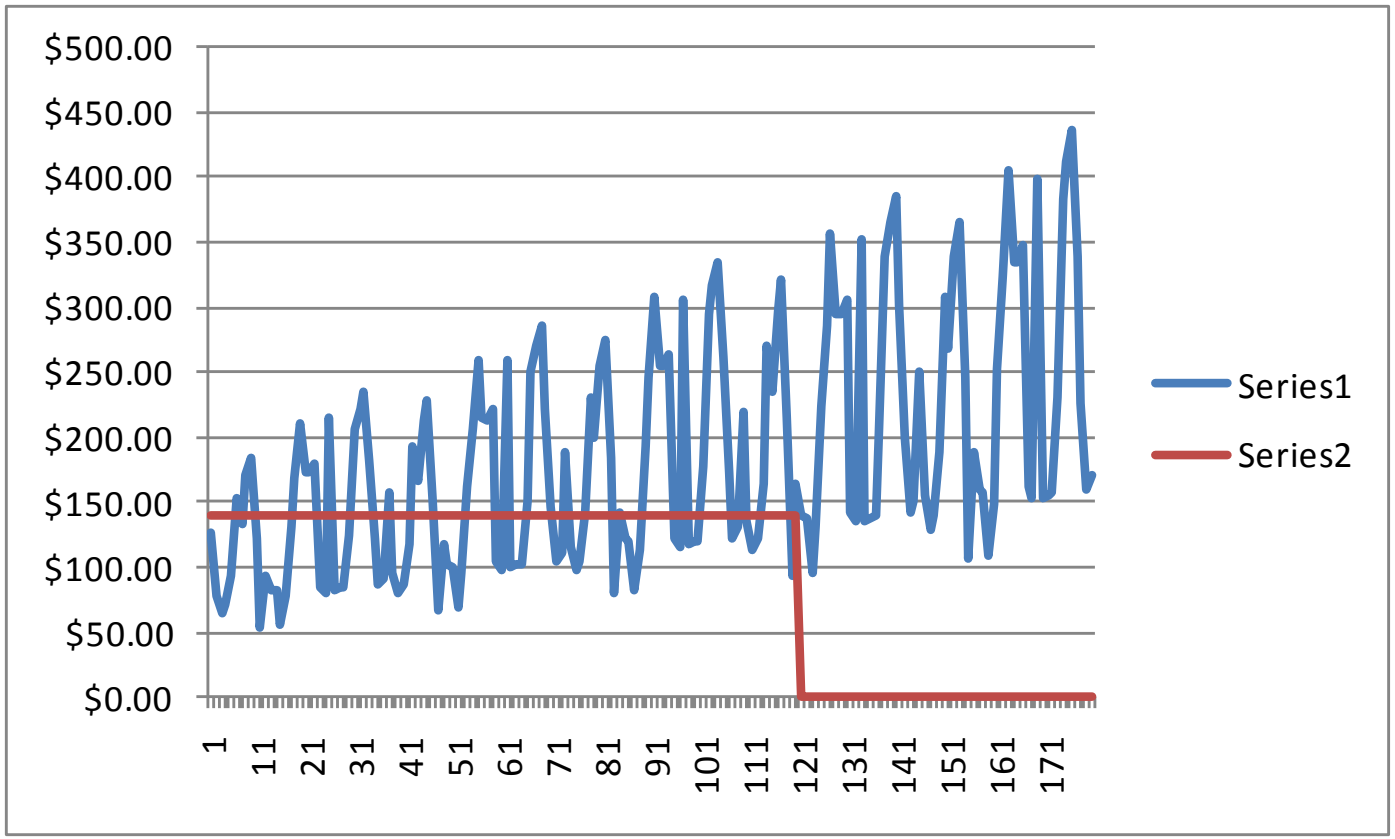


Becoming your own Utility
Investment of energy generation

When you install solar on your home

You become your own utility

Cost of Fuel
vs.
Cost of Money



The cost of home ownership

Thank You

Where Does Our Energy Come From