

SOLAR is HERE!



MREA Overview



- RE Education and Demonstration
- 25th Annual Energy Fair (June 20-22)
- Net Zero Campus (I think)
- Accredited Certificate Training
- Midwest Solar Training Network
- Grow Solar Partnership
- Solar Powering Conference Series
- Offices in Custer and Milwaukee, WI



Source: www.midwestrenew.org, www.midwestsolartraining.org www.growsolar.org

Energy Efficiency



SAVING ENERGY *Saves Money*

Looking for ways to save energy and money at home? Check out the 8 things all homeowners should do to cost effectively lower their energy bills.

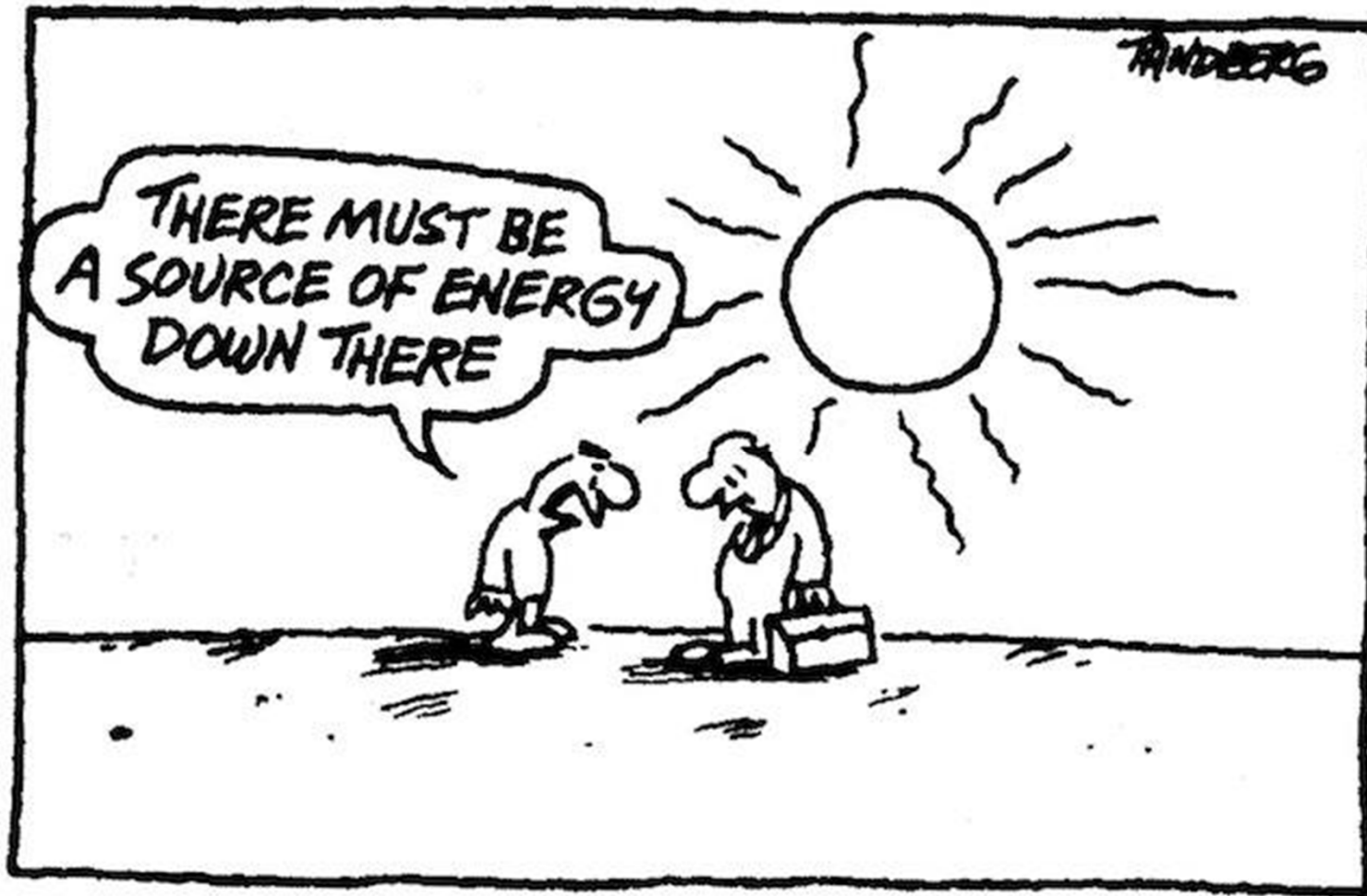
<p>Install and set a programmable thermostat. Save an estimated 10 percent per year on heating and cooling costs by using a programmable thermostat.</p>	<p>Use sunlight to your advantage. Choose window treatments that allow you to use natural light while reducing heat loss and gain.</p>	
<p>Switch to ENERGY STAR appliances, fans and electronics. Using ENERGY STAR certified products throughout your home could save nearly \$100 over the lifetime of the products.</p>	<p>Choose energy-saving lighting. Replacing 15 traditional bulbs with energy-saving bulbs will save you \$10 a year and more than \$300 in energy costs over the life of the bulbs.</p>	<p>Use an electronic power strip for your electronic equipment. Most reduce phantom loads — and can save up to \$100 a year — by plugging electronic devices into a power strip and turning it off when not in use.</p>
<p>Reduce energy for water heating. Take simple steps — like lowering your water heater's temperature and insulating hot-flow showerheads — to reduce your water-heating bills.</p>	<p>Hire a professional to maintain your heating and cooling system. Check and replace your air filters regularly and arrange for annual maintenance with a qualified technician.</p>	<p>Consult a home performance contractor to achieve large savings. These professionals do, well, do a complete energy audit of your whole house using special tools to measure home energy efficiency.</p>

★ ALWAYS FIRST!

★ Spend \$1 on efficiency

★ Save \$3 on RE system

Ostrich Energy

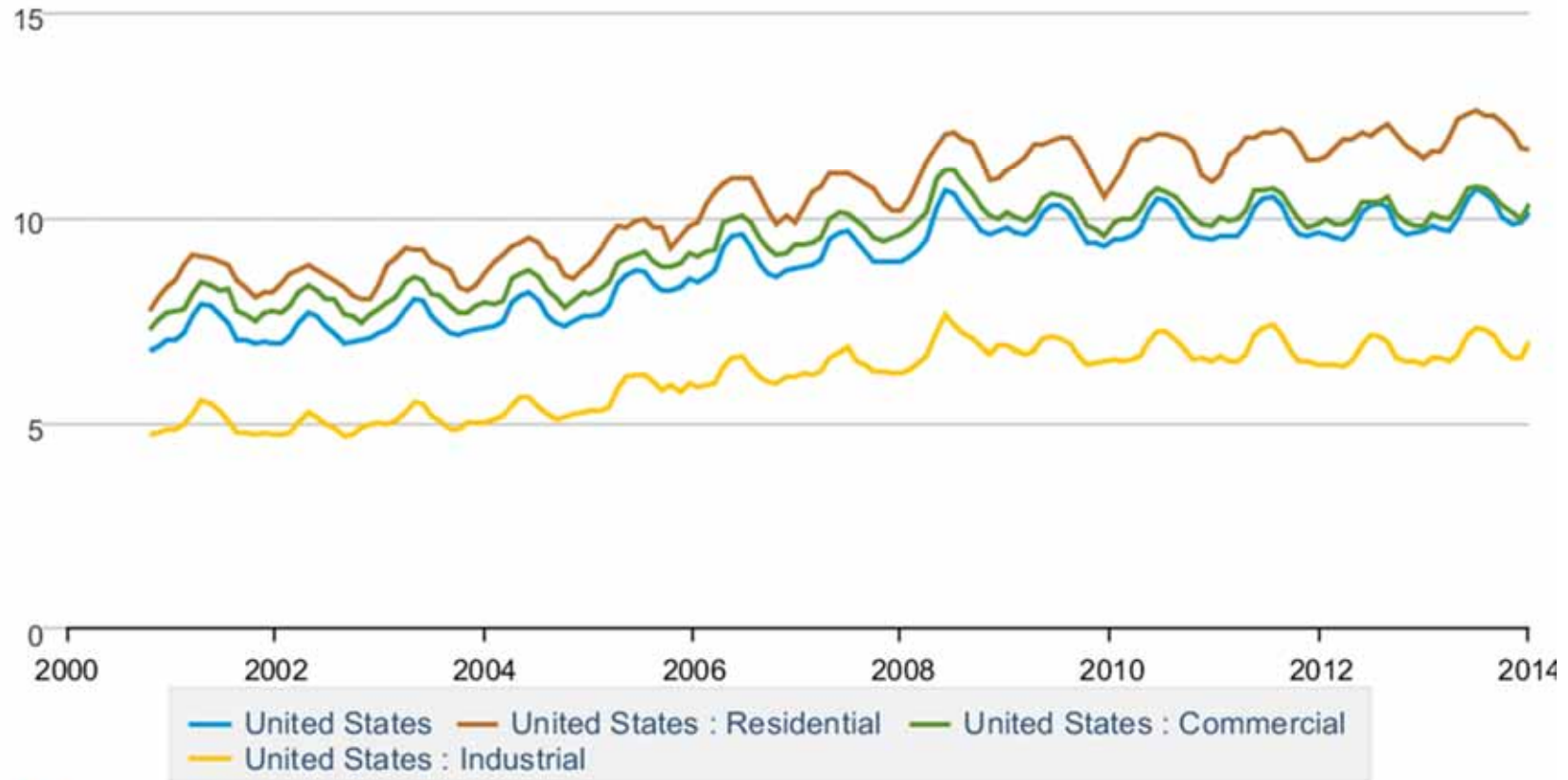


Rising Prices



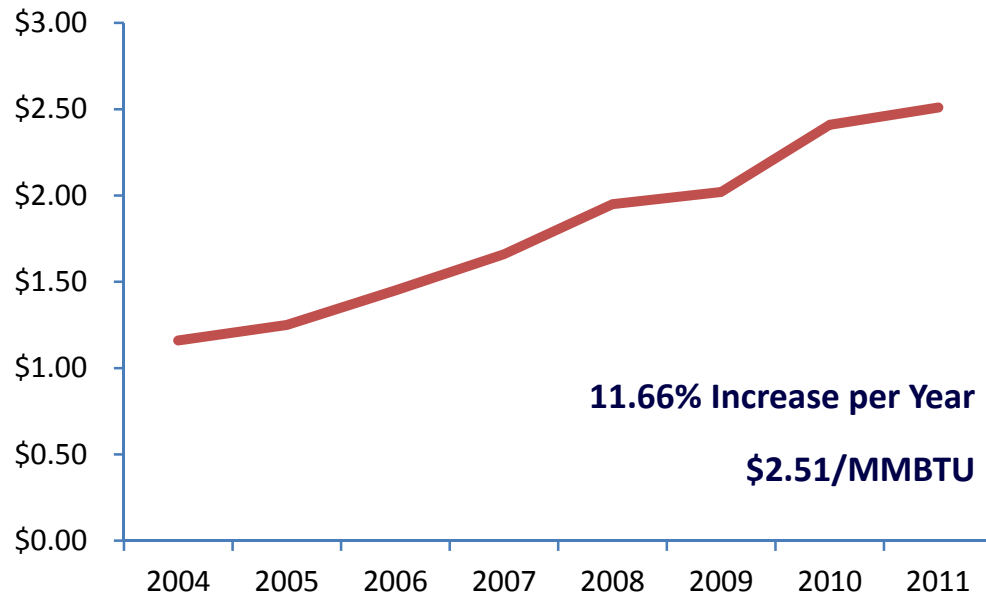
Average Retail Price of Electricity, Monthly

Cents per Kilowatthour



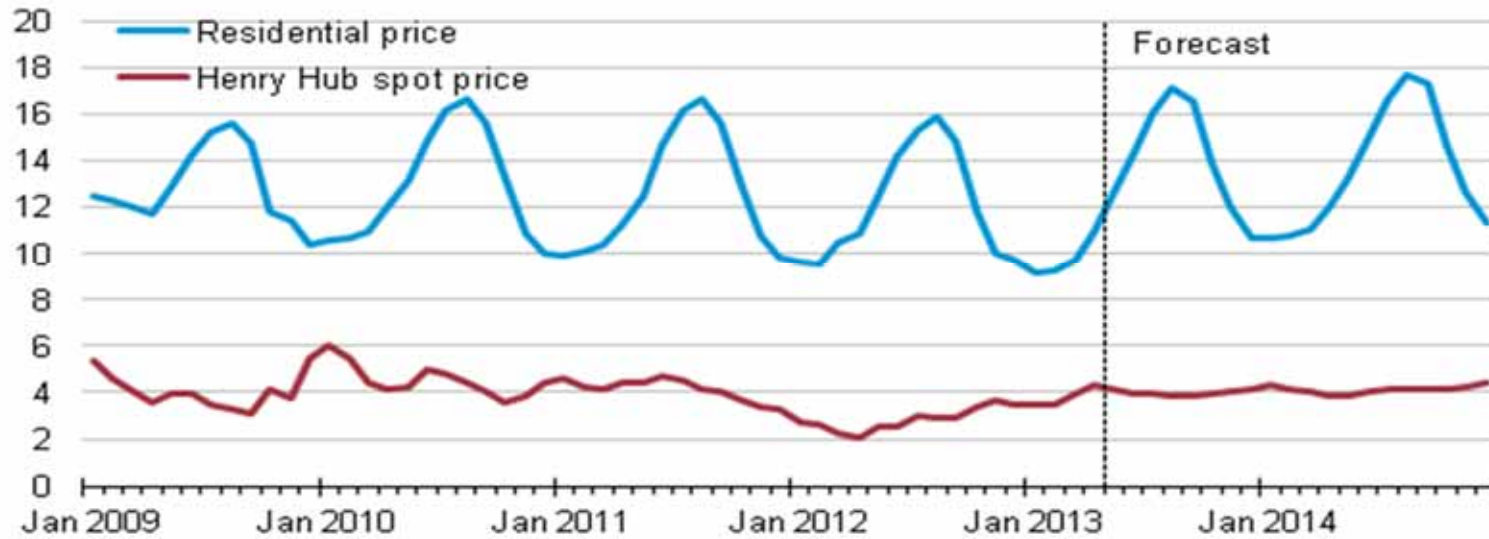
Source: U.S. Energy Information Administration

Average Coal Cost Per MMBTU



U.S. Natural Gas Prices

dollars per thousand cubic feet



Source: Short-Term Energy Outlook, May 2013

WI Info



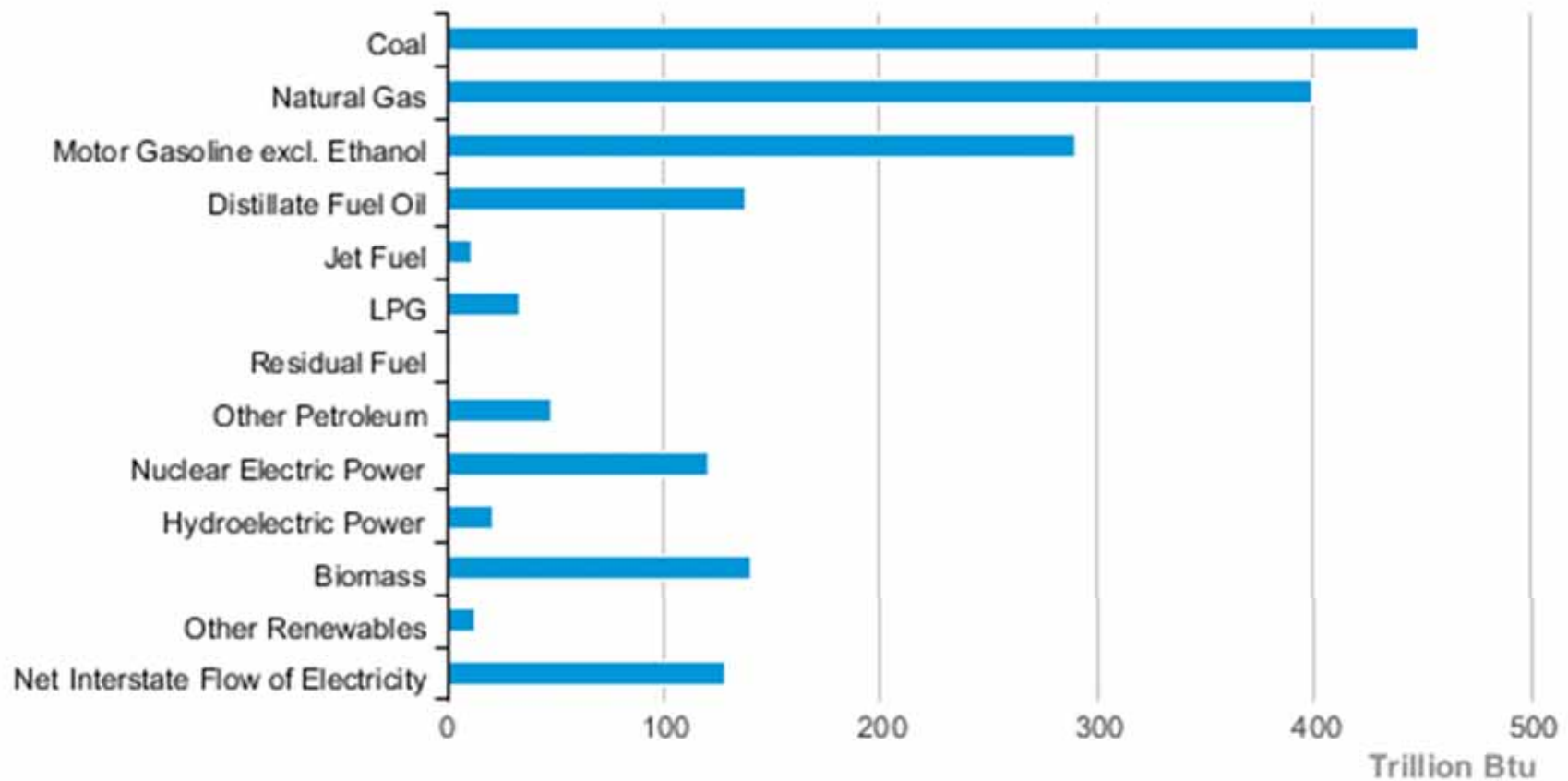
★ Wisconsin ranks 12th highest for electric costs

★ \$.1439 kWh

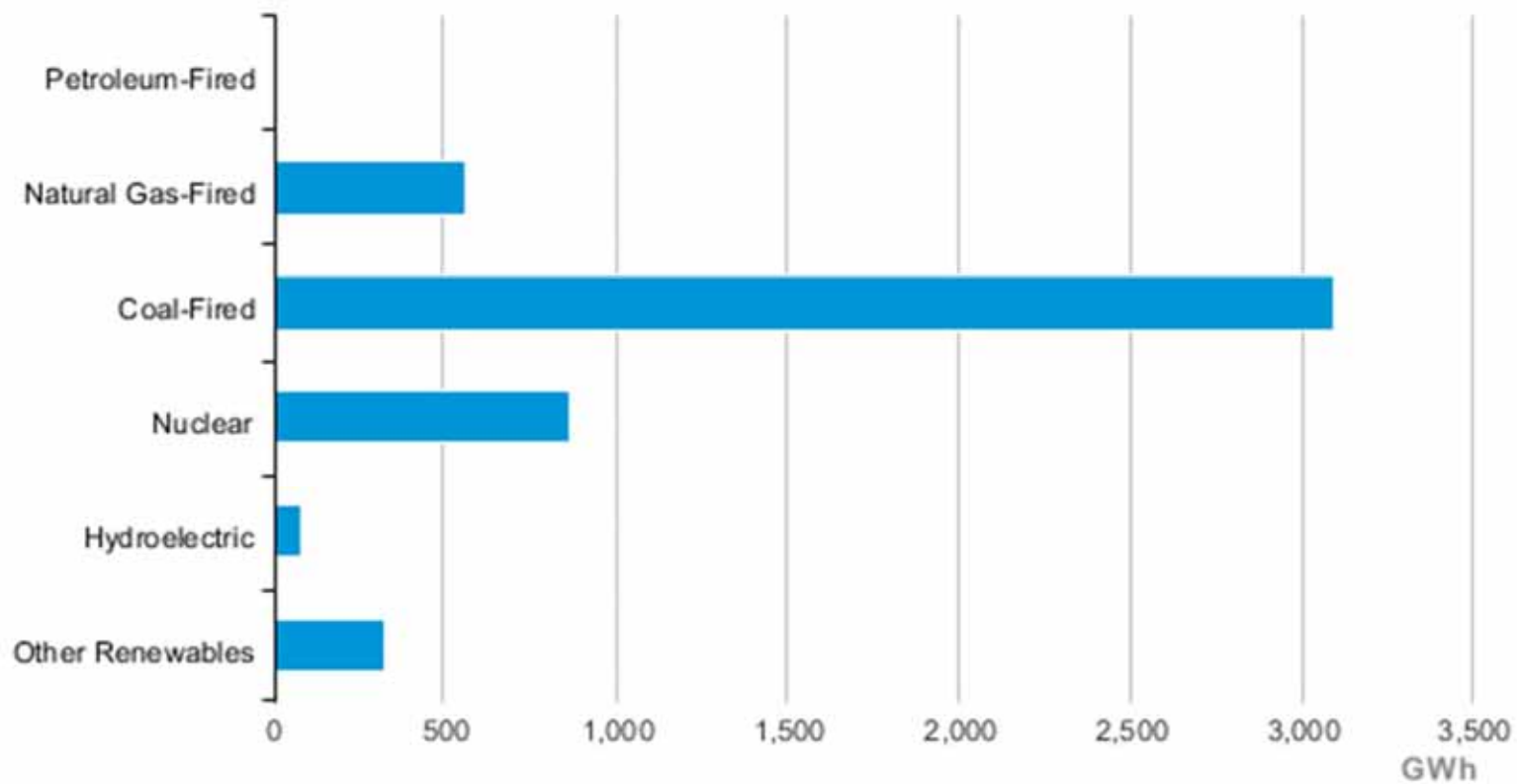
★ Rates continue to increase

★ Uncertainty in public benefits market

Wisconsin Energy Consumption Estimates, 2011



Wisconsin Net Electricity Generation by Source, Nov. 2013



Coal Costs



Money Leaving Wisconsin to Pay for Imported Coal



Compared with other states, Wisconsin:

- Is the 5th most dependent on net imports as a share of total power use: 68 percent
- Spent the 12th most on total net imports: \$853 million
- Spent the 12th most on net imports relative to gross state product: 0.35 percent
- Imported the 12th most in net weight: 25 million tons
- Spent the 13th most on net imports per person: \$152

Note: Not all these funds will necessarily land in the state or nation where the mining occurs. Mine owners may divert the profits to parent companies in other locations, for example. Amounts also include the cost of transportation.

Photos (top to bottom): Thinkstock; iStockphoto.com; Photodisc

Coal Mining



Surface coal mining DuQuoin- IL State Geological Survey

Mountain Top Removal



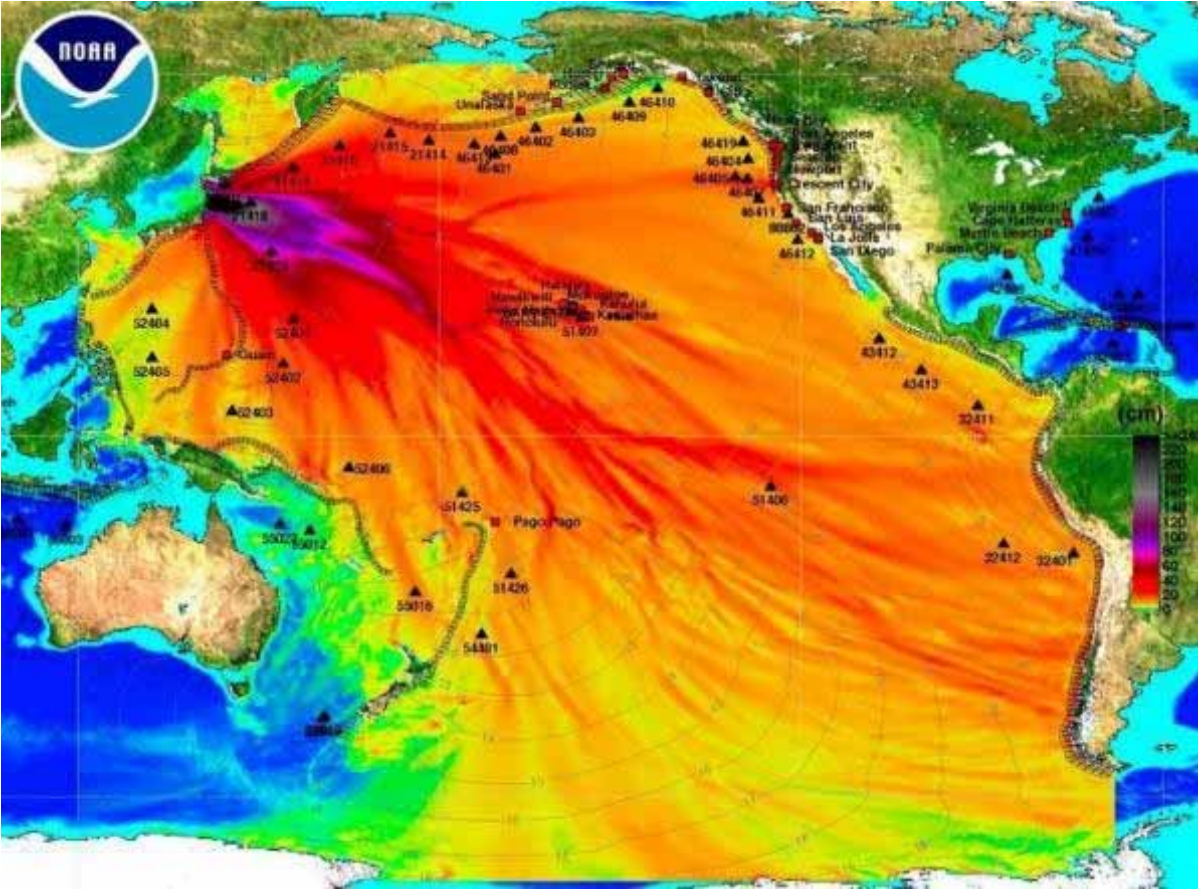
Photo Credit: Appvoices.org

Fracking



Scene from Gasland

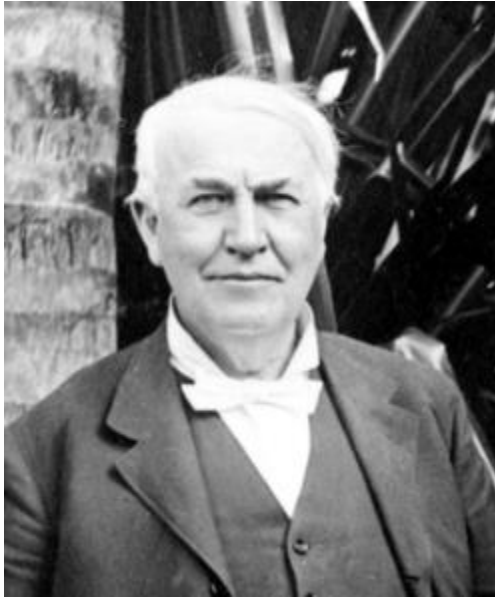
Radioactive Fallout



Solar Spill



Why Choose Solar?



“I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait until oil and coal run out before we tackle that.”



Why Choose Solar?



- ★ It is a profitable long term investment!
- ★ Predictable home energy prices for 25+ years
- ★ Impactful environmental benefits
- ★ Clean Energy Independence



Solar Success



★ Solar power is an American Success Story

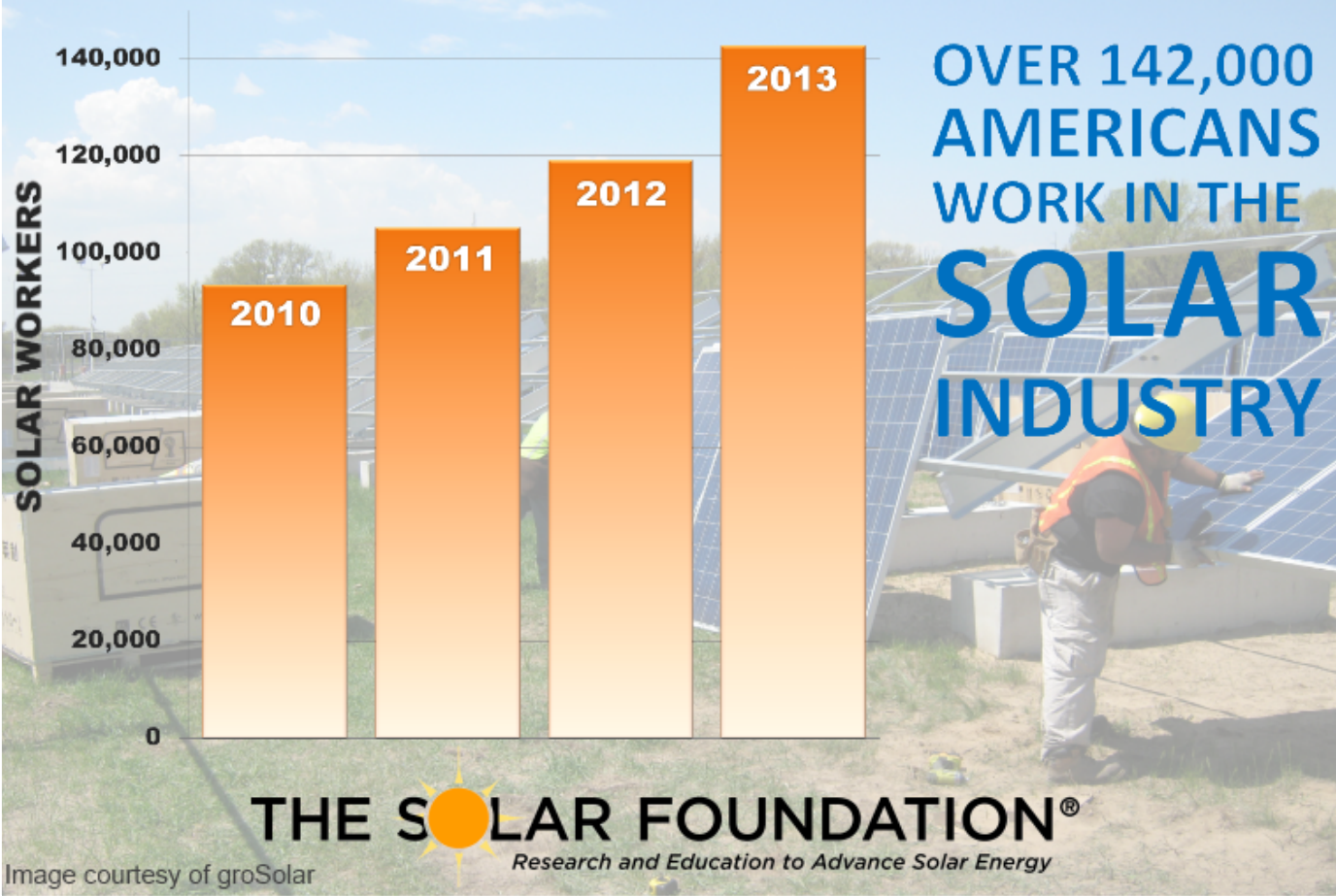
★ Bell Labs invents the modern silicon solar cell in 1954



Solar Success



NATIONAL SOLAR JOBS CENSUS 2013



Solar Success



Solar Success

- ★ Now 10,250 MW of solar installed in US
- ★ Enough to power 1.7 million homes
- ★ Residential solar had it's best quarter in Q3 2013 installing 186 MW



Power Supply

An infographic with a light blue sky and green grass background. It features two large circles: a dark grey one on the left and a yellow one on the right. The grey circle contains text about fossil fuels, and the yellow circle contains text about solar energy. At the bottom, it says 'It's time for a ROOFTOP REVOLUTION'. A small source credit is in the bottom left corner.

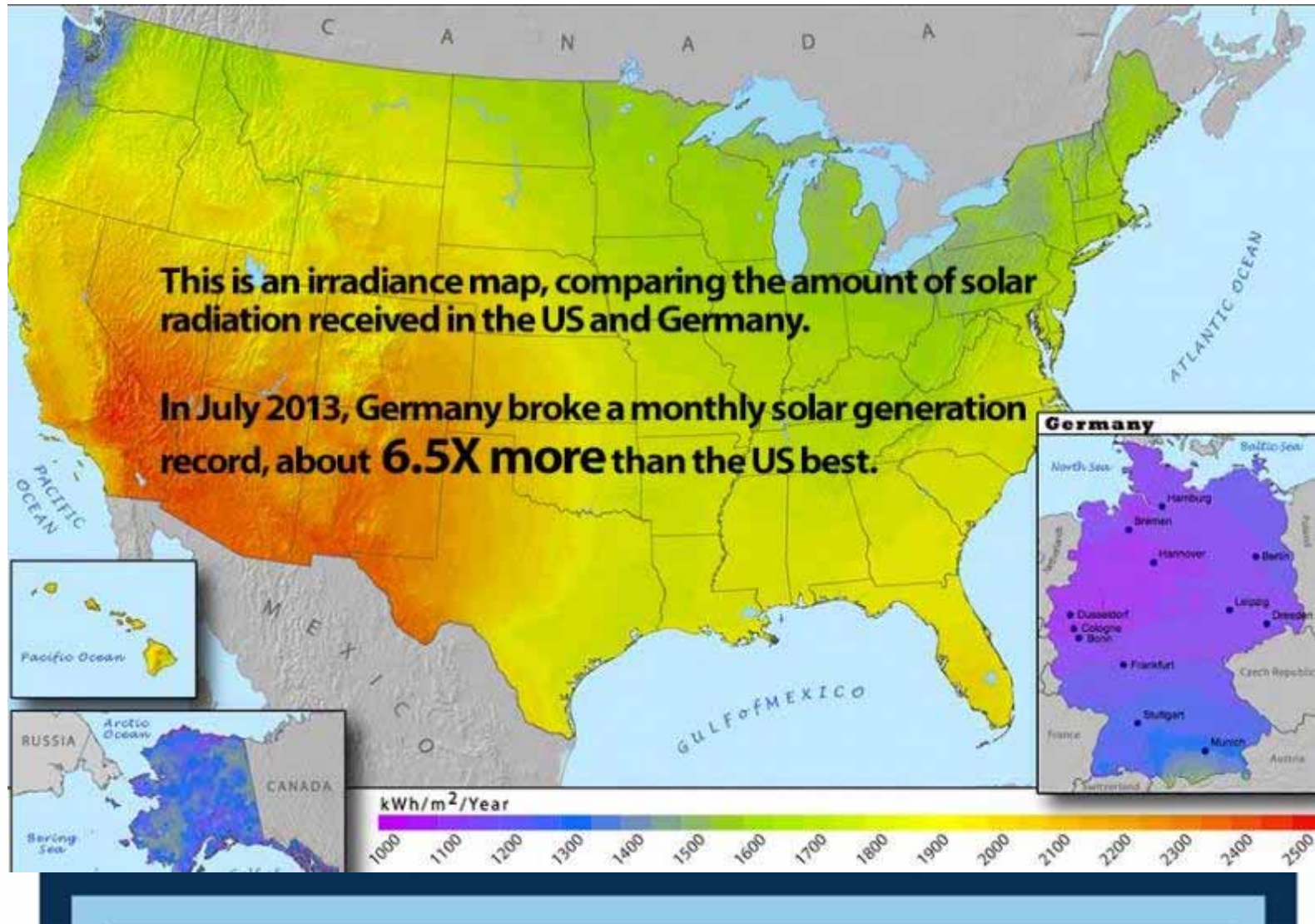
ALL
of the
COAL, OIL AND GAS
known to humans

has the same
ENERGY
as the
SUN
shines on us
IN 20 DAYS

It's time for a
ROOFTOP REVOLUTION

Source: ucjusa.org

Solar Resources

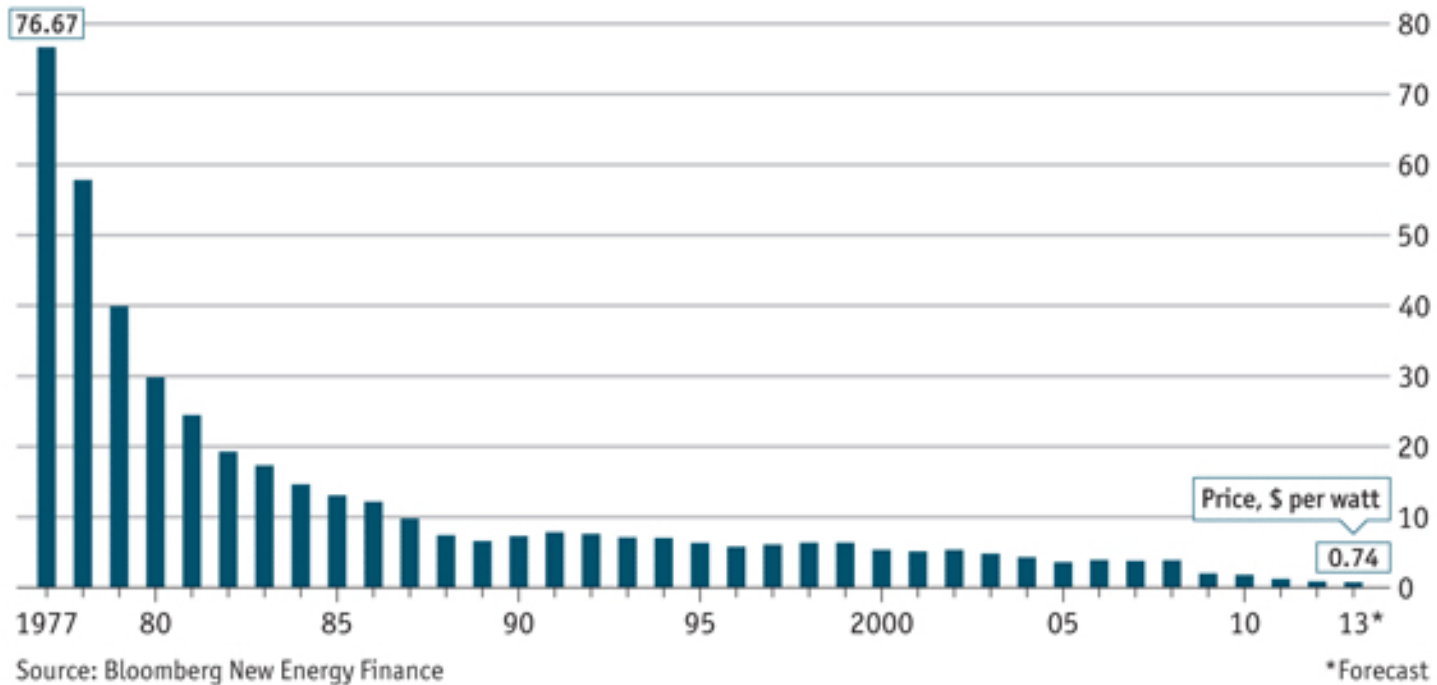


Solar Pricing



The Swanson effect

Price of crystalline silicon photovoltaic cells, \$ per watt



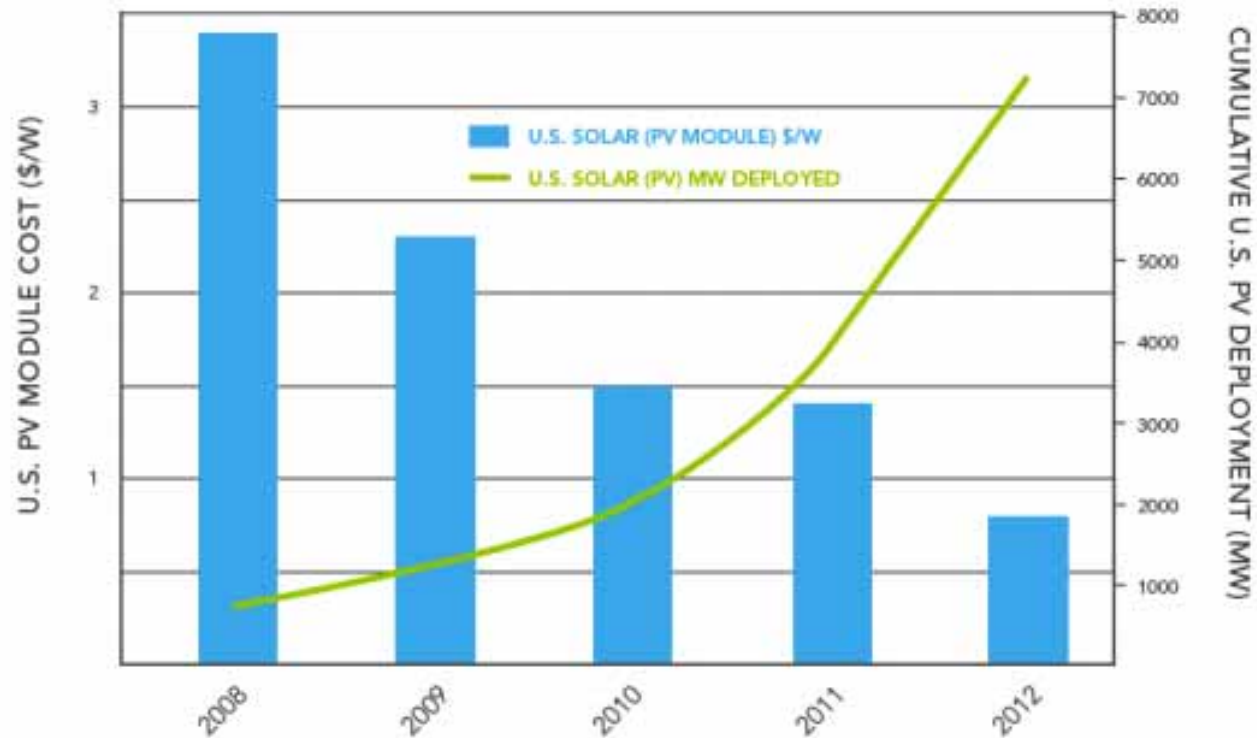
Economist.com/graphicdetail



Solar Pricing



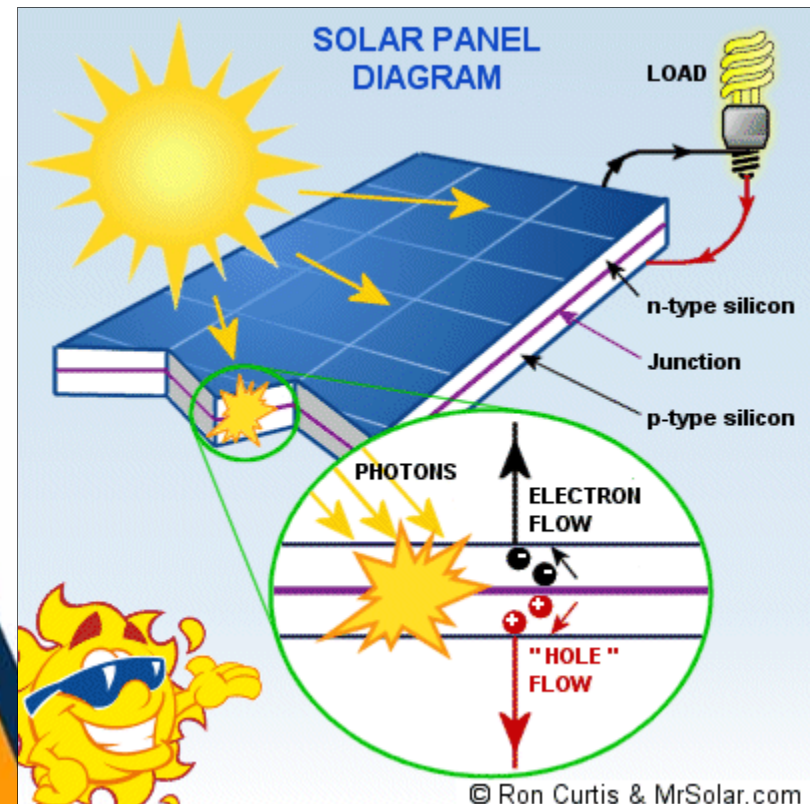
U.S. Deployment and Cost for Solar PV Modules
2008-2012



Solar Electric Basics



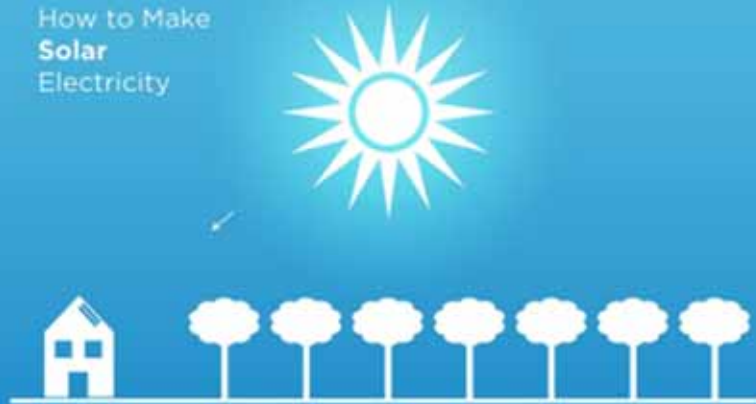
- ★ Photovoltaics
- ★ No moving parts
- ★ DC Electricity
- ★ Magic



How to Make
Fossil Fuel
Electricity



How to Make
Solar
Electricity

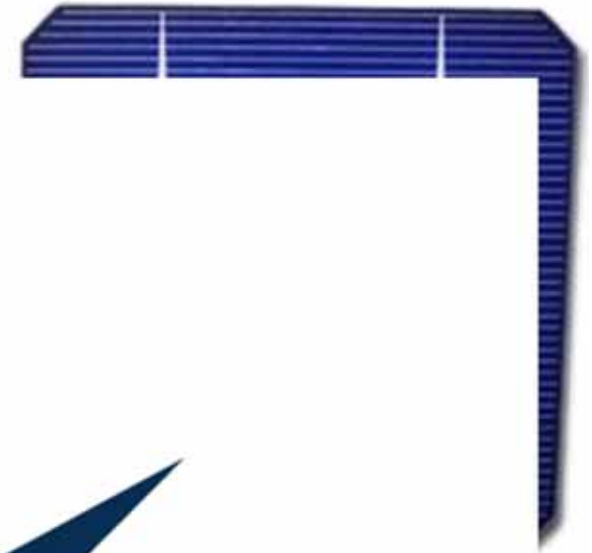


www.RooftopRevolutionBook.com

Solar Electric Basics



- ★ Mono-Crystalline
- ★ Two Silicon wafers (1mm thick)
- ★ Amorphous or CIGS



Solar Electric Basics



- ★ Module - collection of solar cells
- ★ Array- collection of modules sized to meet energy demands



Mounting Options

- ★ Roof mount is most common
- ★ Need good solar window
- ★ Concerns
 - Snow
 - Wind Loading
 - Roof Condition



Mounting Options

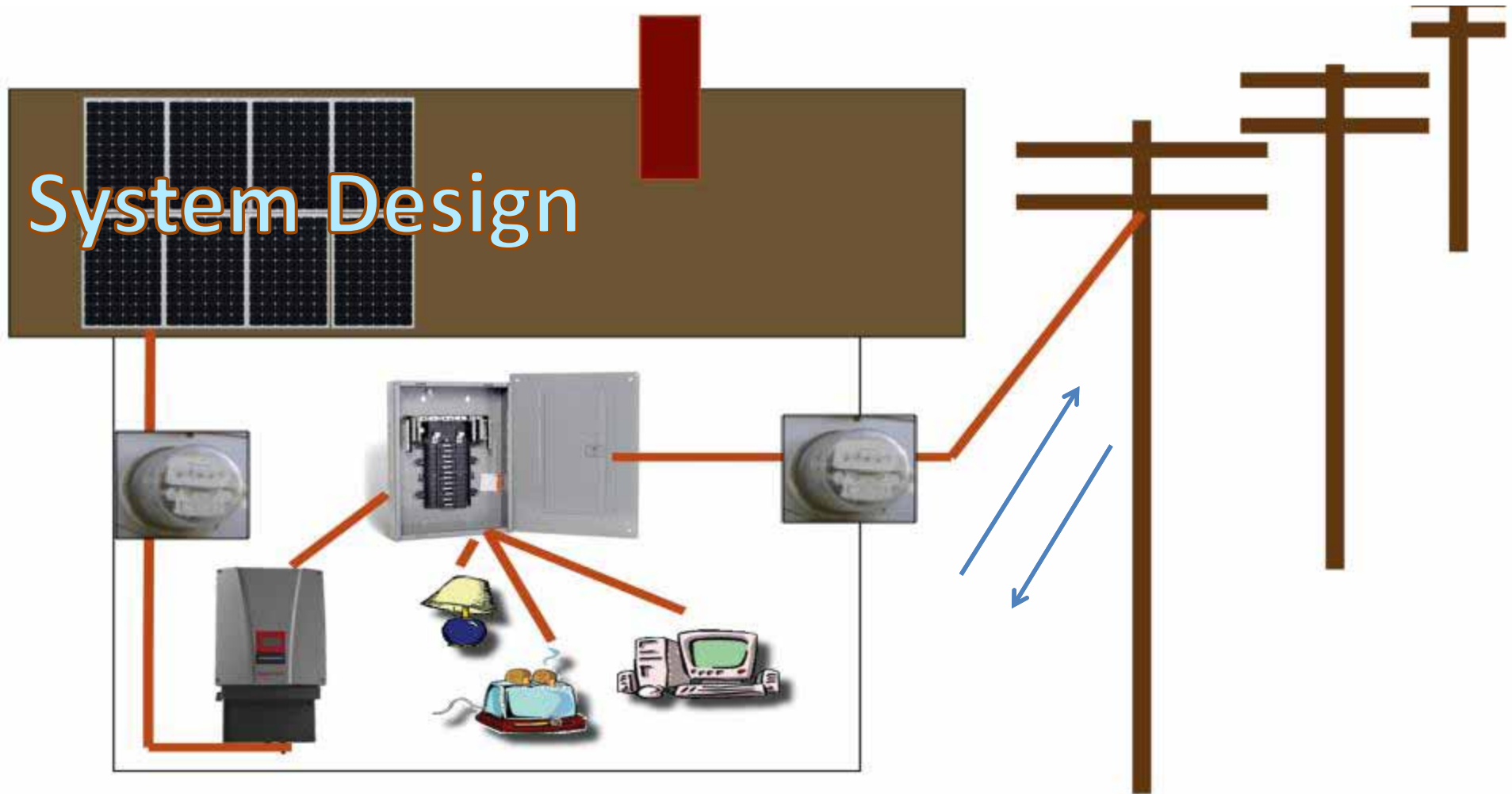


Tracking Systems

- ★ More Generation
- ★ More Expensive
- ★ Moving Parts

Awning Mount





Grid Tied System

- ★ Simple system
- ★ Least expensive
- ★ Net metered (under 2mW)

System Design

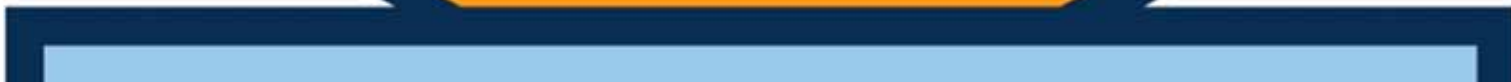
- **Utility Inter-Tied**
 - PV system connected to the utility grid. Uses utility to supply electricity above the system output.
- **Utility Inter-Tied With Batteries**
 - PV system connected to the utility grid. Has battery storage to supply power during utility outages.
- **Off Grid or Standalone System**
 - System not connected to utility grid



Portable Options



- ★ Emergency power
- ★ Some have storage
- ★ Variable sizing

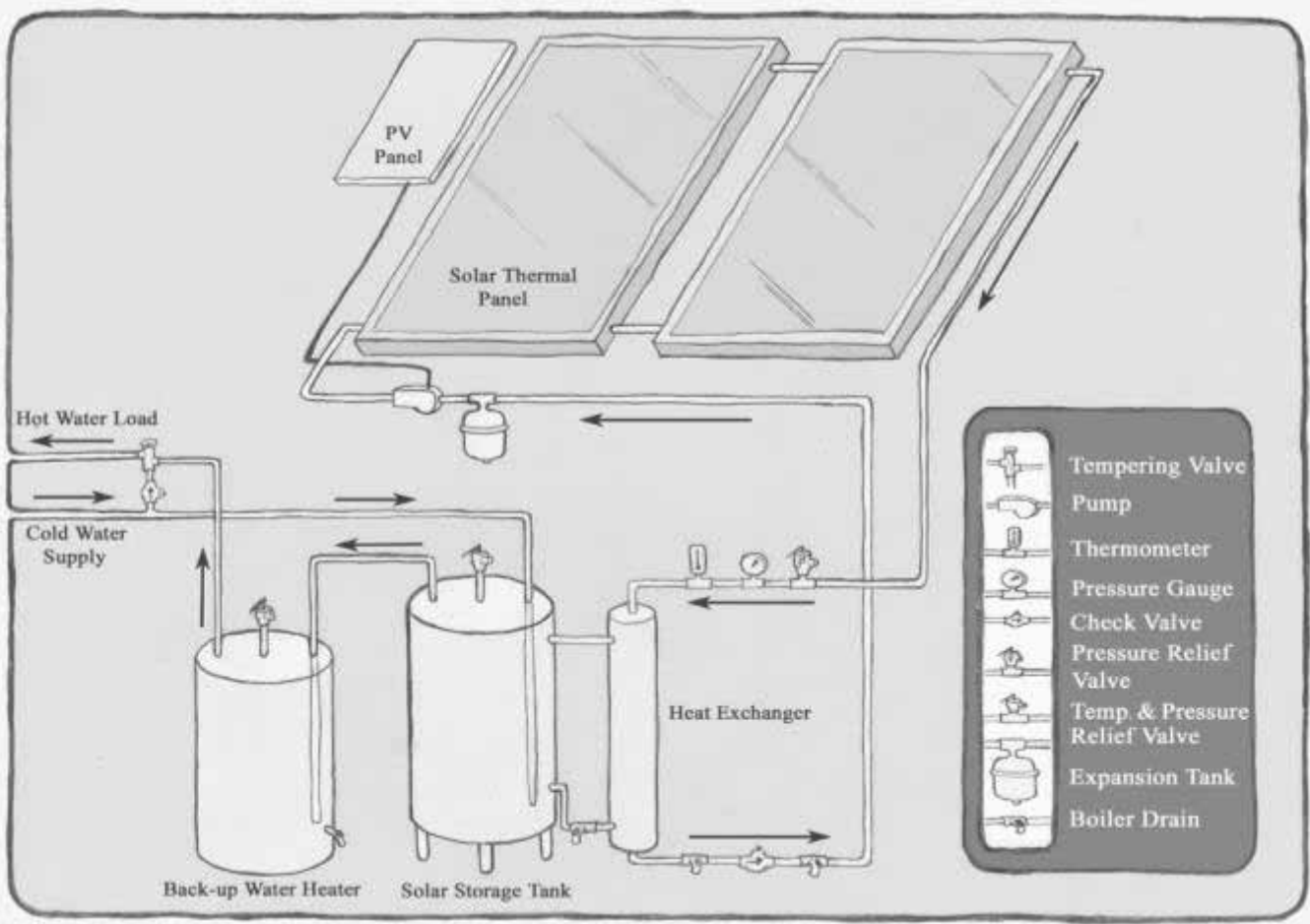


Solar Thermal Systems

- Heat water for household uses
- Space heating
- Business use as well



System Configuration



Source: Solar Water Heating, Ramlow & Nusz



Space Heating

- Expanded systems are used to provide heat for homes and businesses
- Works with radiant floor heating systems, or pre-heating for forced air furnaces
- Not compatible with baseboard or cast iron radiators.



Wind Power



Tower Types



Guyed Lattice



Tilt Up

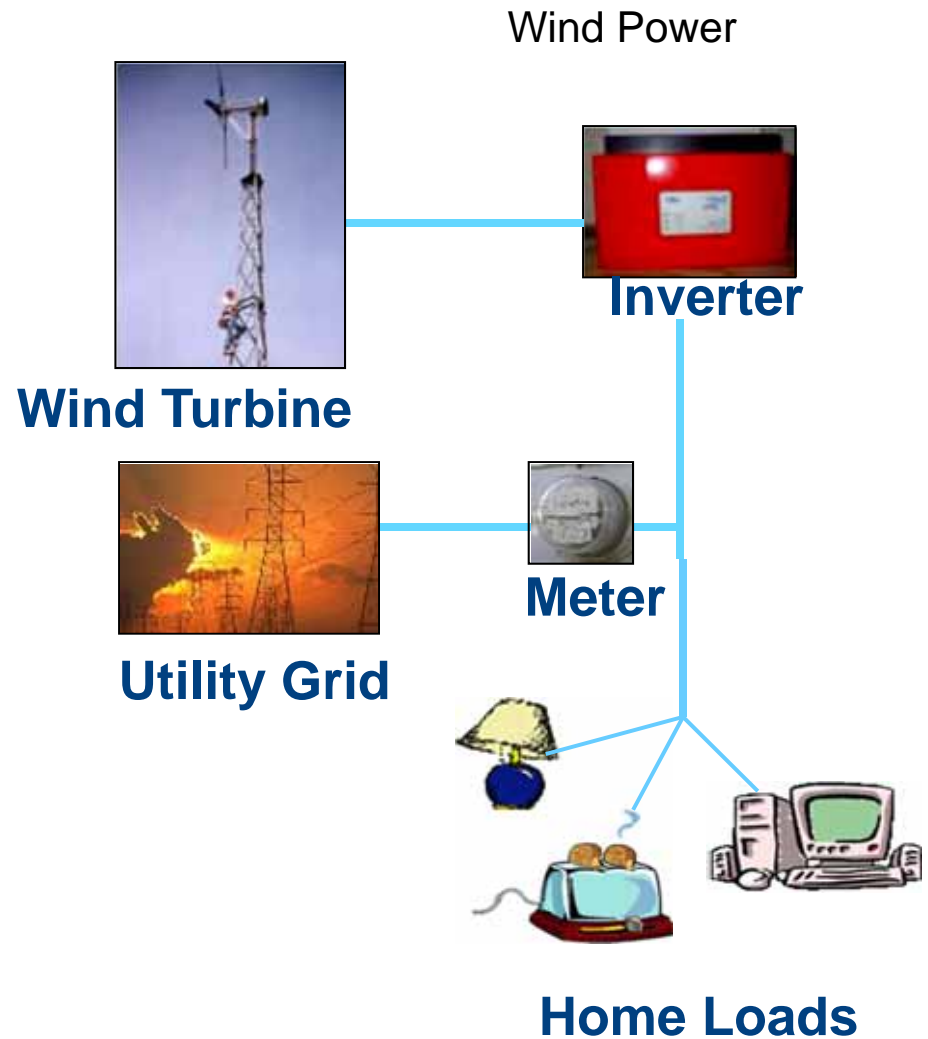


Free Standing



Balance of System

- Utility Intertied Without Batteries
- Most new wind systems above 1kW
 - + Easy to maintain, least expensive, net metered
 - When the grid goes down, your power is out



Thank You!



www.midwestrenew.org

MIDWEST RENEWABLE ENERGY ASSOCIATION

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