

Potential Career Paths Presented by:

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<http://www.bfenvironmental.com>

Water Research Center

<http://www.water-research.net>



Valley View High School
Junior Achievement Careers



Document

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B.F. Environmental Consultants Inc.



- Professional Consulting Services in the areas of water quality, soils, stormwater, geology, aquifer analysis, and land-development.
- Baseline – Chain-of-Custody
- Expert Testimony
- Water Treatment Process/ Product Development
- <http://www.bfenvironmental.com>



Water-Research Center

Education and Outreach Program funded by
B.F. Environmental Consultants Inc.



Outreach Programs

- Environmental and Professional Education and Training for Citizens and Local Municipalities
- Water Quality Help Guides – Information Library
- Community and Business Outreach Programs
- Low Cost – Informational Water Testing Program with National Laboratory
- Citizen Monitoring Programs- Developing Low Cost Water Quality Sensors

PACleanwater.org

Keystone Clean Water Team

Private Well Owner Education

Source Water Protection Issues

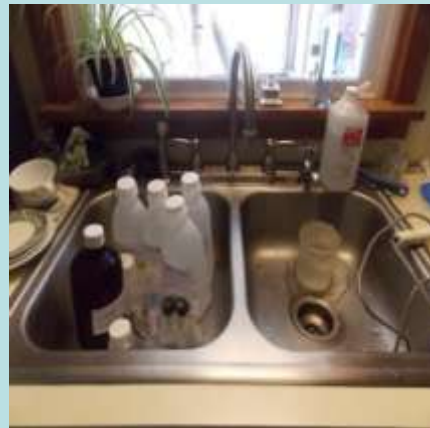
Alternative, Renewable, and Homegrown Energy Issues

Training Young Adults and Children about Energy and

The Environment

Citizen Groundwater and Surfacewater Database

Natural Gas and Baseline Water Testing – Training Professionals





Keystone Clean Water Team- pacleannwater.org

- Recycle Your Old Phones, Games Systems, small cameras, and iPods.
- Save Energy – Recycle - Support Groundwater Education
- Recycle YOUR Old Cell Phone – Fund Clean Water Education and Testing
- Bring your “Small” Devices to Riverfest 2014

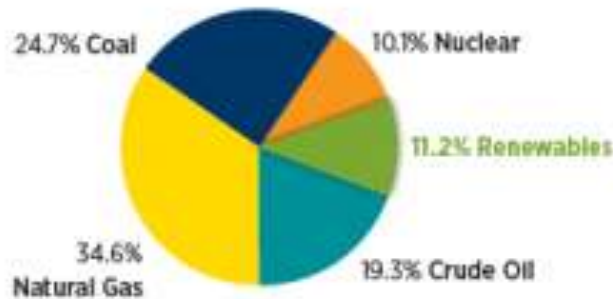


Help Provide Power to 18,500 homes each Year – In Energy Savings

U.S Energy Consumption – 2013

U.S. Energy Production and Consumption (2013)

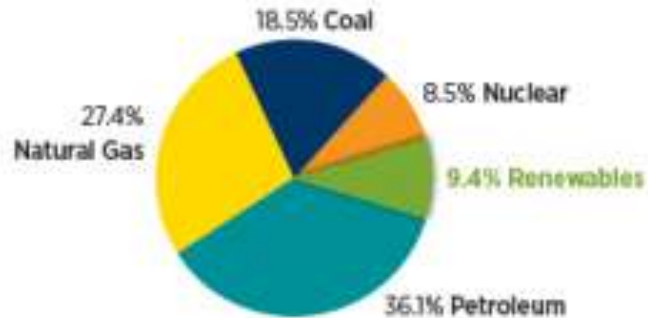
U.S. Energy Production (2013): 81.8 Quadrillion Btu



U.S. Renewable Energy Production: 9.2 Quadrillion Btu



U.S. Energy Consumption (2013): 97.3 Quadrillion Btu



U.S. Renewable Energy Consumption: 9.2 Quadrillion Btu



Source: EIA

The difference in the amount of energy consumed and produced is made up by net imports.

All data are reported as primary energy.

*Solar PV data provided includes only on-grid systems of 1MW or higher in capacity. Grid-connected distributed capacity and associated generation of 1MW or less, a rapidly growing market segment, is included in subsequent figures in later sections.

7

Import- 15.7 Quadrillion Btu (USA 20%)

U.S. Energy Background Information | December 2014

1 Quadrillion – 1,000,000,000,000,000

U.S. Wins – We Waste the Most Energy – 58 % Wasted !

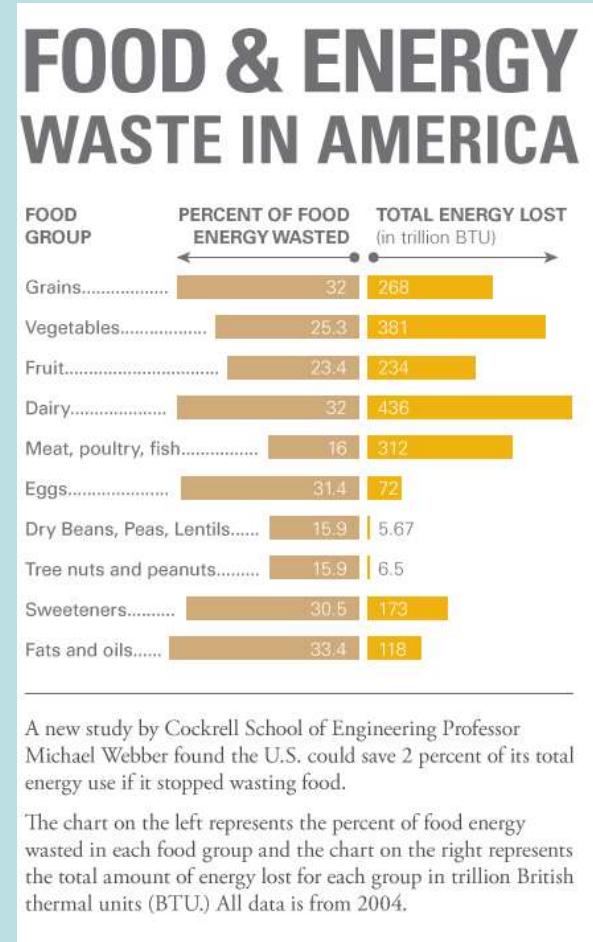
Did you know...

Energy Wasted in the U.S.

Wasted Energy Facts

- 58%** of energy produced in the U.S. is wasted.
- About 30-50% of energy and water that flows into buildings is wasted.
- Power plants only turn about 30% of their energy input into usable electricity.
- If we recycled all the cell phones people will get rid of this year, we would save enough energy to power 18,500 homes for one year.
- A typical household wastes 30% more energy each year than an efficient one does.
- The U.S. has an energy efficiency of 42%.

Who Uses the Most Energy?
The U.S. Energy Administration



This wasted energy could power the UK for 7 years.

Our Waste Power UK for 7 years !

The amount of energy **wasted** by the US economy in 2012...



could power the United Kingdom for **7 years**.

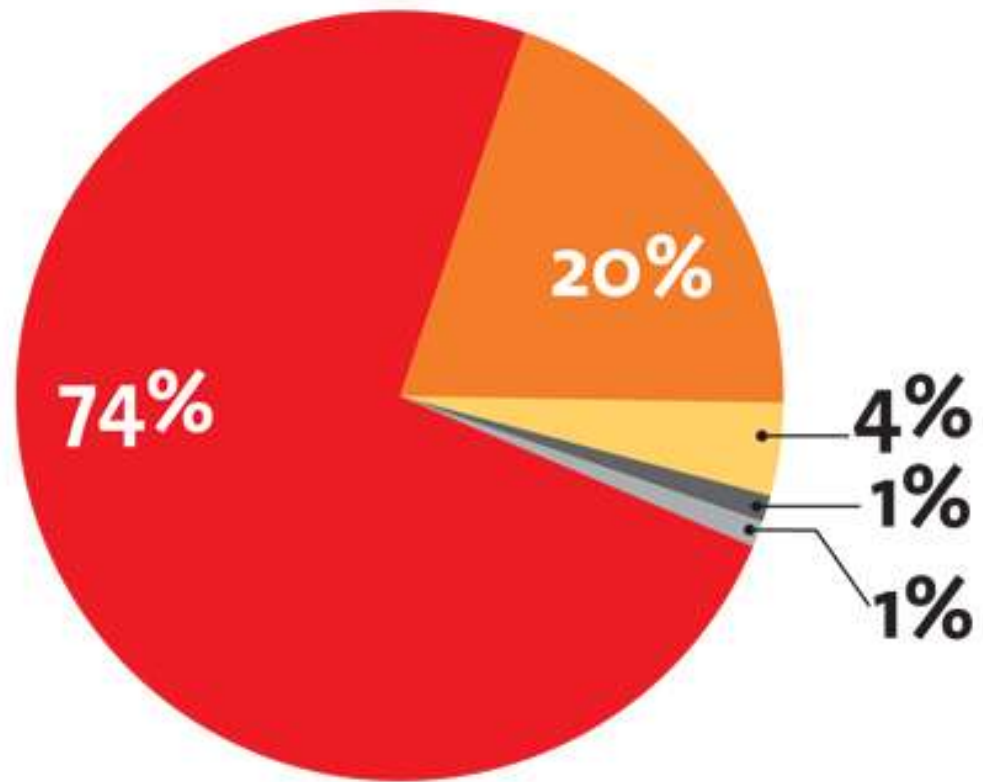
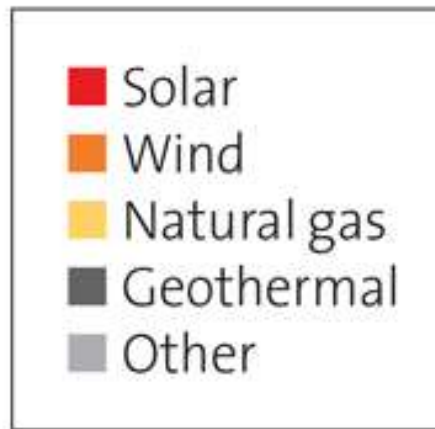
Stop Energy Waste

First Step – Conservation Use Less

- Turn Off Equipment When Not Being Used and Unplug – Energy Vampires.
- Buy Energy Efficient Appliances
- Put on a Coat before turning up the heat
- Upgrade Lighting
- Get an Energy Audit
- Switch to a Zone Heating and Cooling System
- Insulate Your Home
- Use Biomass for Supplementary Heating

Goal Use Less – Put More Money in Your Pocket

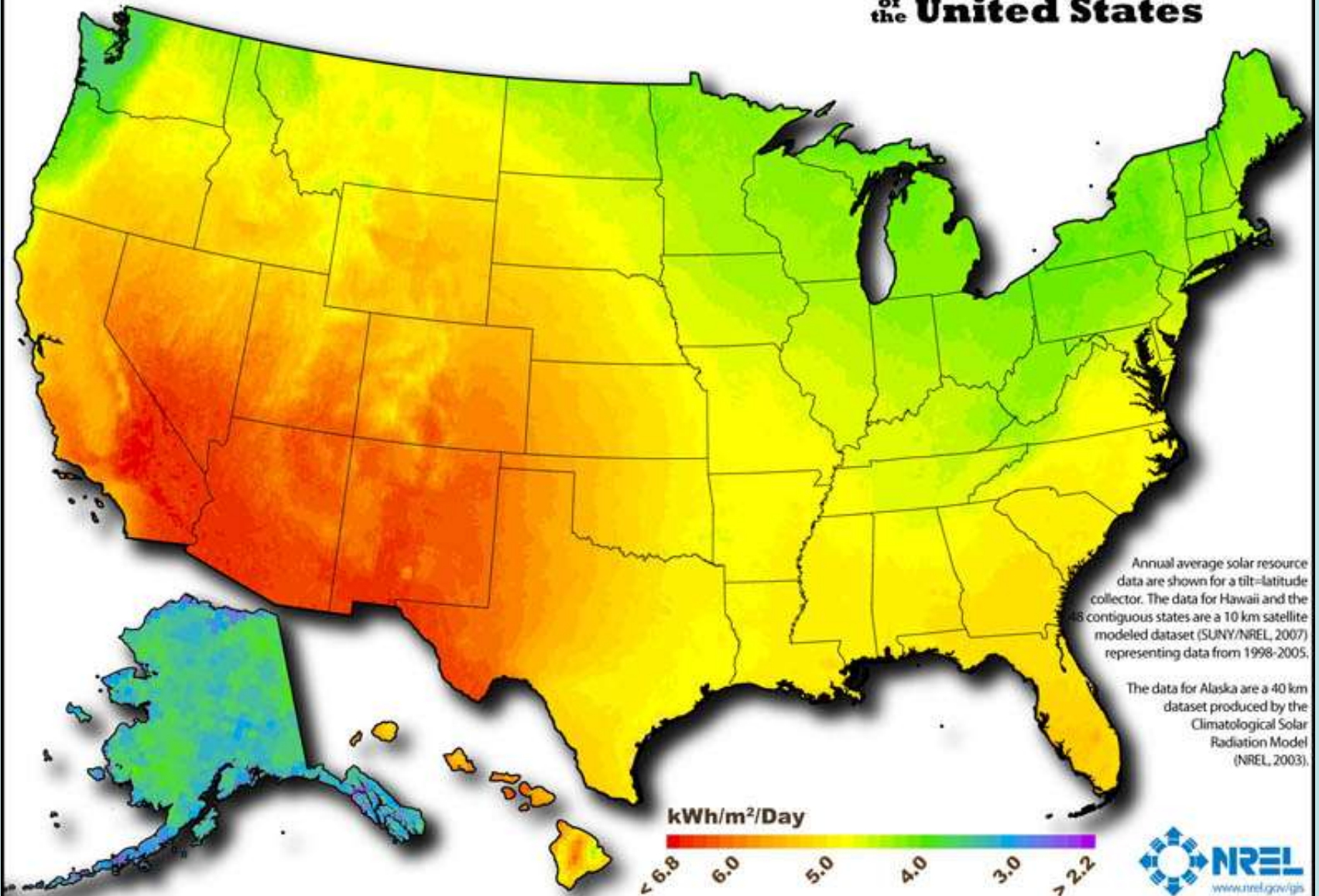
New electricity generating capacity installed in the United States, first quarter of 2014



Source: Solar Energy Industries Association

Mother Jones

Photovoltaic Solar Resource of the United States



Author: Billy Roberts - October 20, 2008

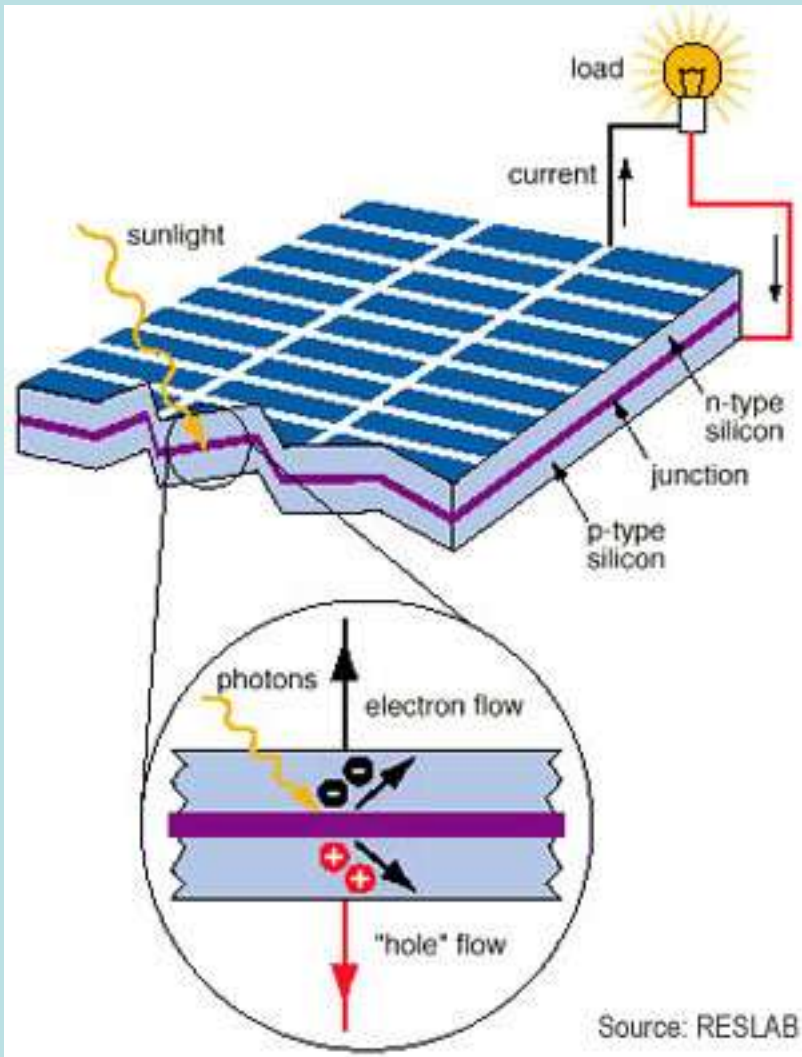
This map was produced by the National Renewable Energy Laboratory for the U.S. Department of Energy.

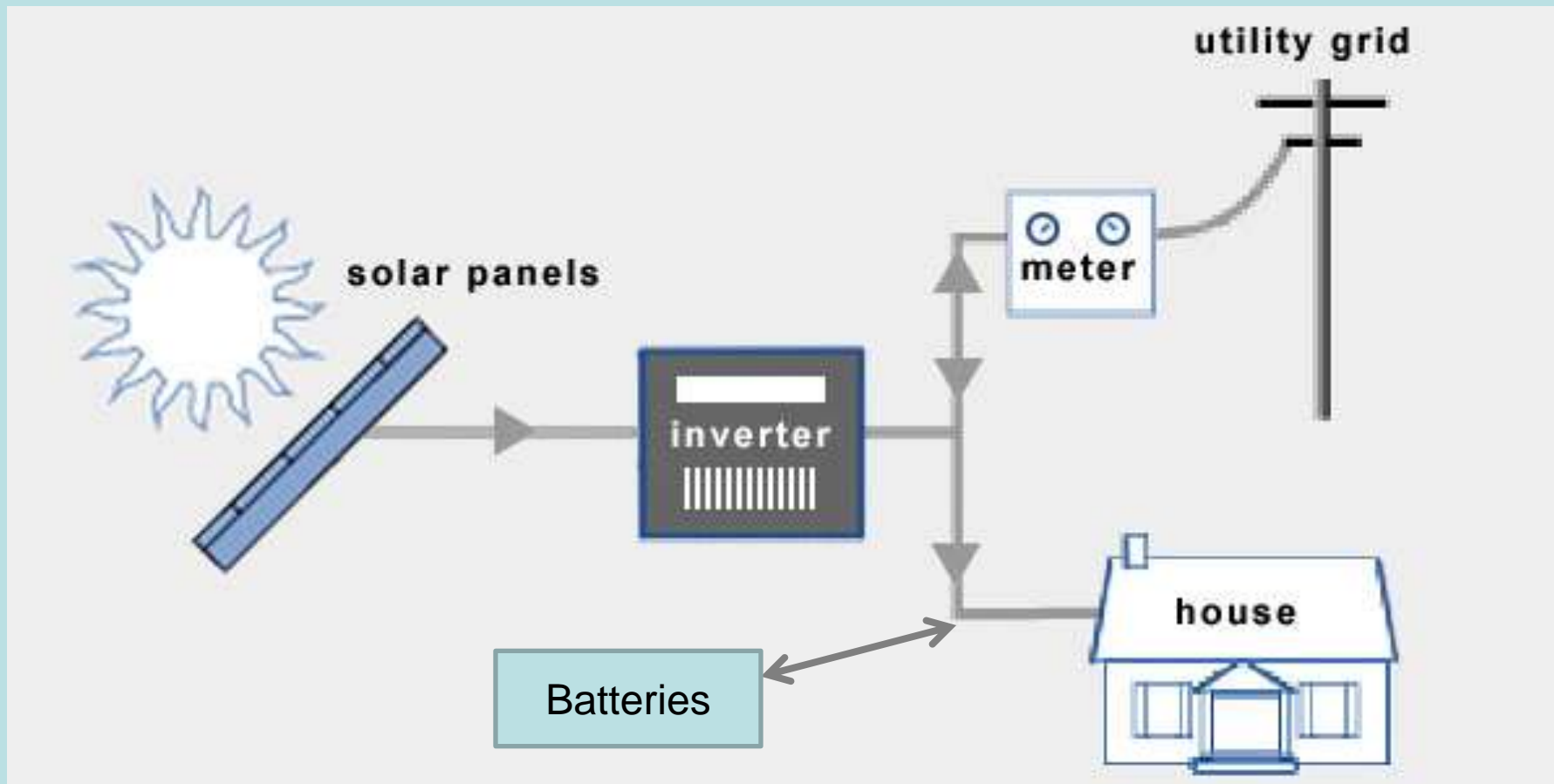
Solar

Solar Cell has a positive layer and a negative silica layer. This creates an Electric field and produces a direct current That must be converted to an alternating current

For every 10kW PV installation, 11 tonnes of CO2 is avoided. This is equivalent to :

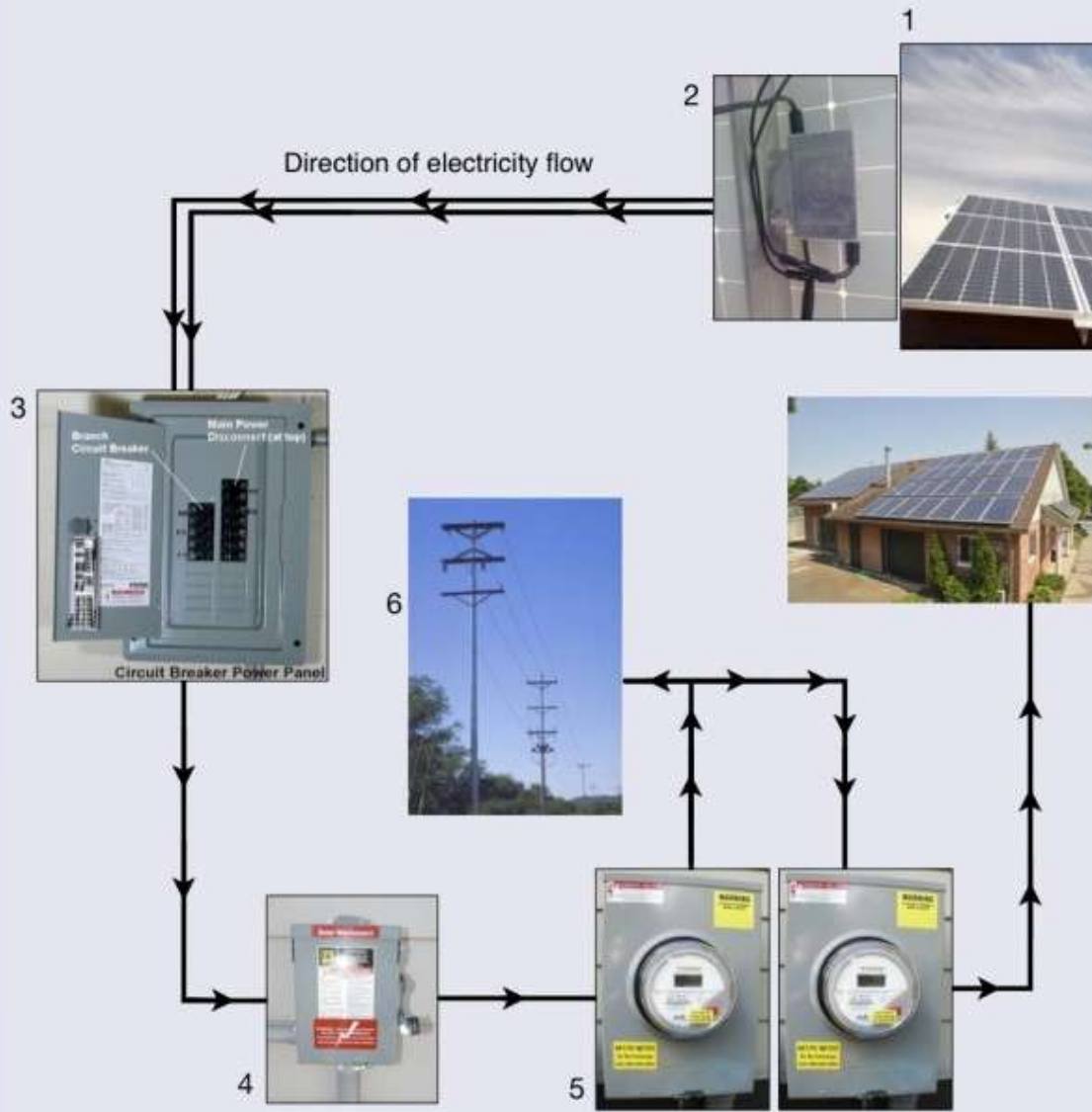
- 9 acres of carbon absorbing forest;
- 2.2 cars or light trucks taken off the road;
- 4,310 liters of gasoline not consumed;
- 22 barrels of crude oil not consumed;
- 10.6 people reducing their energy consumption by 20%
- 10kW System – Average Home





BASIC ELECTRICAL DIAGRAM OF GRID-TIED SYSTEM

SOLAR ARRAY WITH MICROINVERTERS

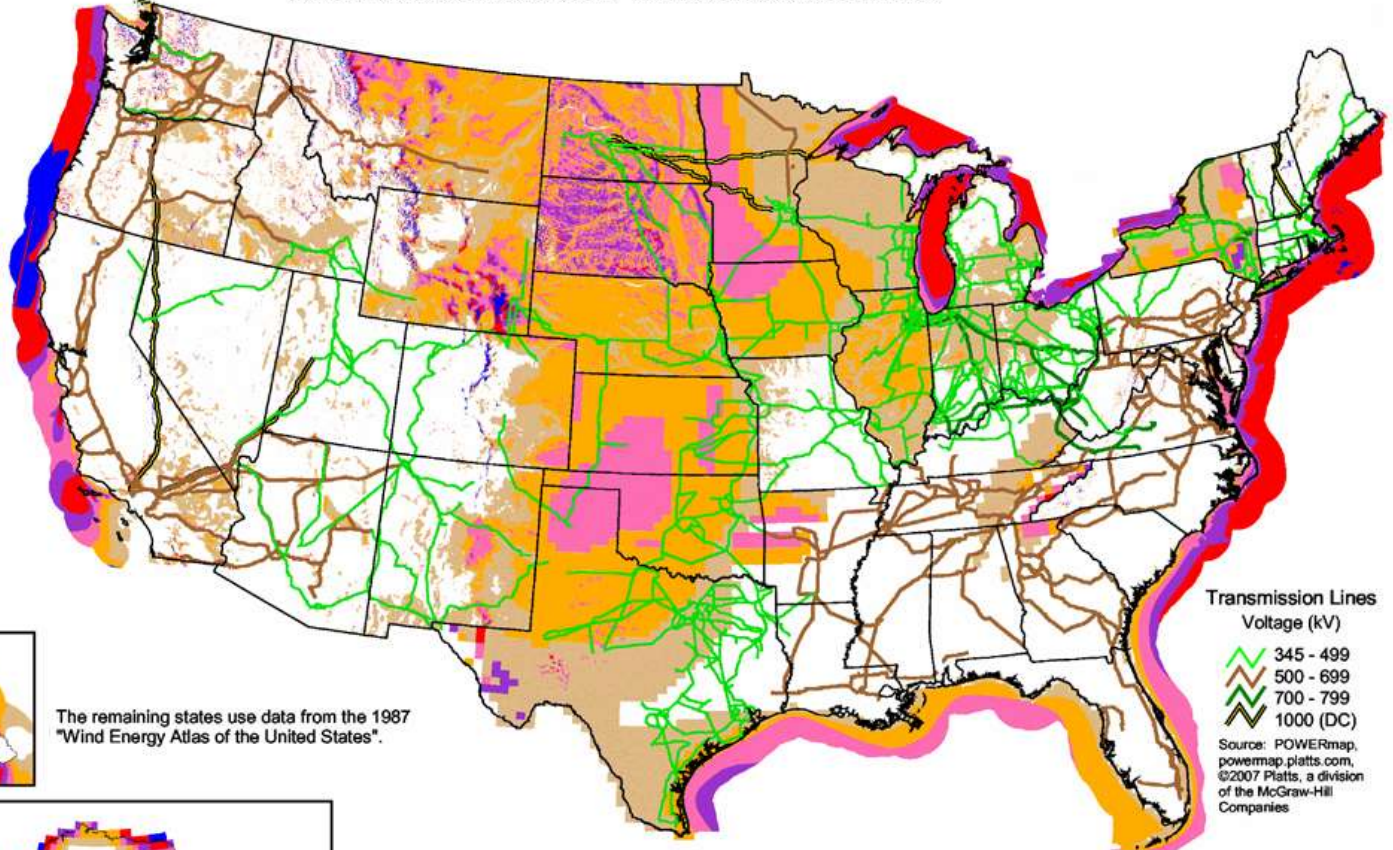


- 1) **Sun rays** excite electrons inside the solar panels which create DC electric current.
- 2) This **DC current is converted to common household AC current** by inverters (microinverters in this diagram).
- 3) All of the wiring is combined into one power line in a combiner or circuit breaker panel.
- 4) A disconnect switch isolates the generating system from the electrical grid (overhead power lines) when needed.
- 5) The **kilowatt hours generated are counted** by the local electrical utility .
- 6) **The energy is then sent to the electrical grid**, to be used by the closest electricity customers including **surrounding homes and businesses**.

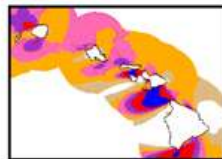
Wind Energy is Solar Energy that has been Converted to Wind

NREL Updated Maps:
 Arizona (2003)
 California (2002)
 Colorado (2004)
 Connecticut (2001)
 Delaware (2002)
 Hawaii (2004)
 Idaho (2002)
 Illinois (2001)
 Indiana (2004)
 Maine (2001)
 Maryland (2002)
 Massachusetts (2001)
 Michigan (2004)
 Missouri (2005)
 Montana (2002)
 Nebraska (2005)
 Nevada (2003)
 New Jersey (2002)
 New Hampshire (2001)
 New Mexico (2003)
 North Carolina (2002)
 North Dakota (2000)
 Ohio (2004)
 Oregon (2002)
 Pennsylvania (2002)
 Rhode Island (2001)
 South Dakota (2001)
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 Utah (2003)
 Vermont (2001)
 Virginia (2002)
 Washington (2002)
 West Virginia (2002)
 Wyoming (2002)

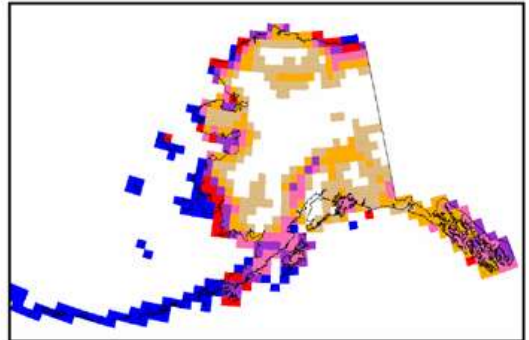
Wind Resources and Transmission Lines



Transmission Lines
 Voltage (kV)
 345 - 499
 500 - 699
 700 - 799
 1000 (DC)
 Source: POWERmap, powermap.platts.com, ©2007 Platts, a division of the McGraw-Hill Companies



The remaining states use data from the 1987 "Wind Energy Atlas of the United States".

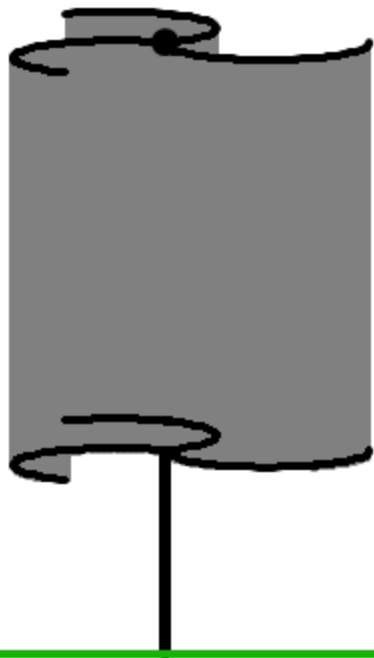


Wind Power Classification				
Wind Power Class	Resource Potential	Wind Power Density at 50 m W/m ²	Wind Speed at 50 m m/s	Wind Speed at 50 m mph
2	Marginal	200 - 300	5.6 - 6.4	12.5 - 14.3
3	Fair	300 - 400	6.4 - 7.0	14.3 - 15.7
4	Good	400 - 500	7.0 - 7.5	15.7 - 16.8
5	Excellent	500 - 600	7.5 - 8.0	16.8 - 17.9
6	Outstanding	600 - 800	8.0 - 8.8	17.9 - 19.7
7	Superb	800 - 1600	8.8 - 11.1	19.7 - 24.8

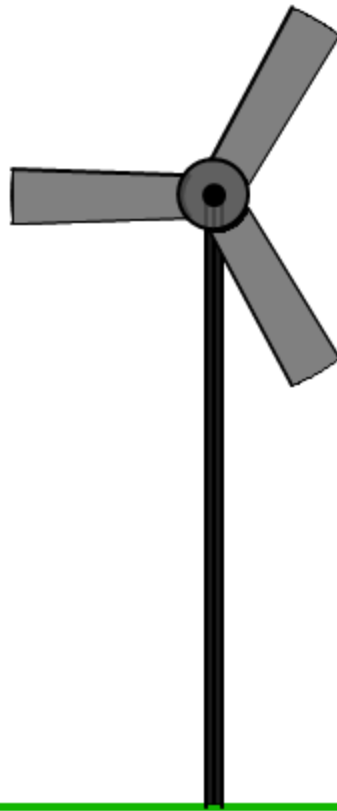
^a Wind speeds are based on a Weibull k value of 2.0

U.S. Department of Energy
 National Renewable Energy Laboratory

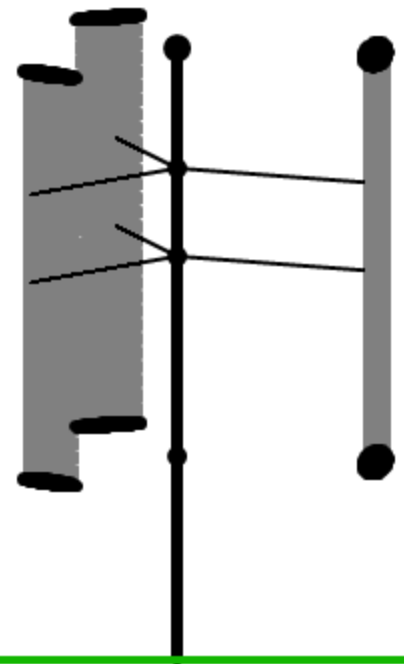




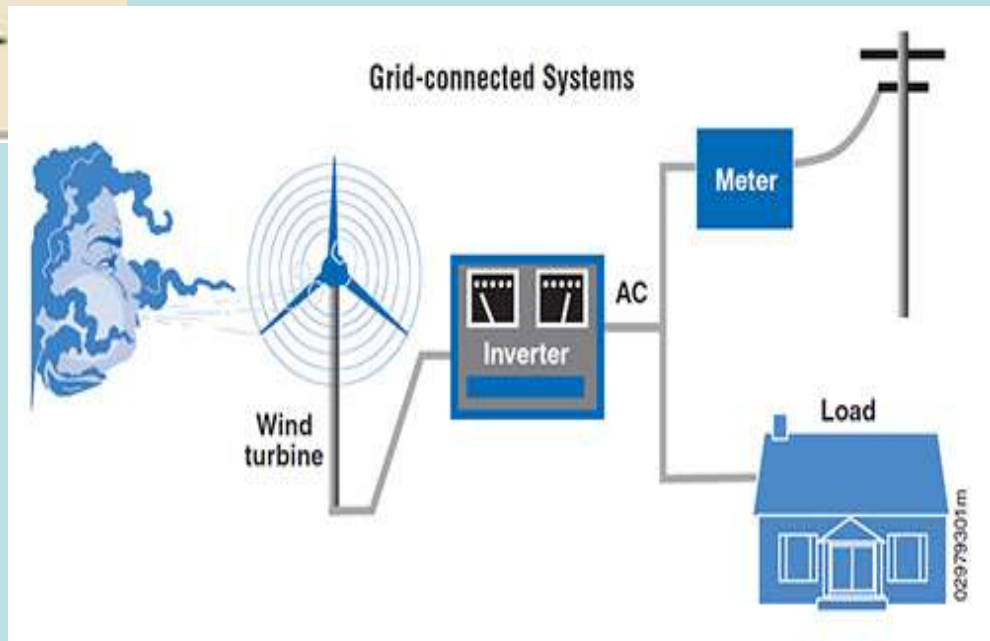
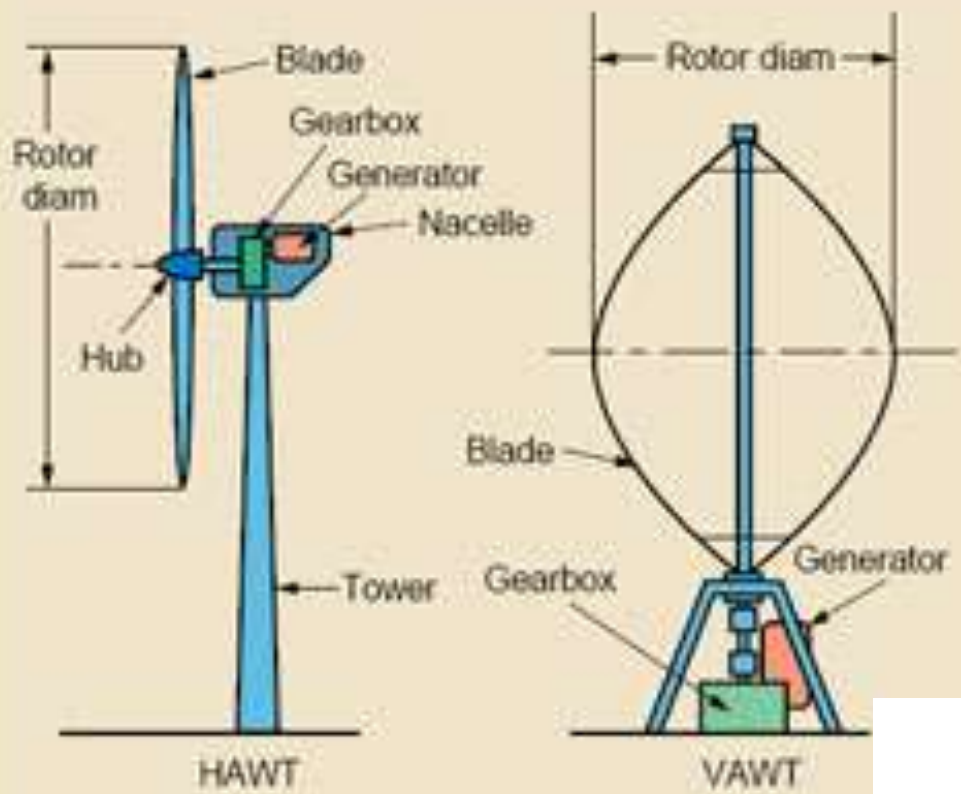
Savonius VAWT



Modern HAWT



Giromill/Darrieus VAWT



1 Quadrillion Btus per year = 2,739,730,000,000 BTUs/day

Solar (100 % Efficiency) - 433 Btu/hr per square foot

Available 24 hours per day

Need 6100 acres of Solar Panels

Wait?

Efficiency only 10 %

Only Available about 6 hours per day

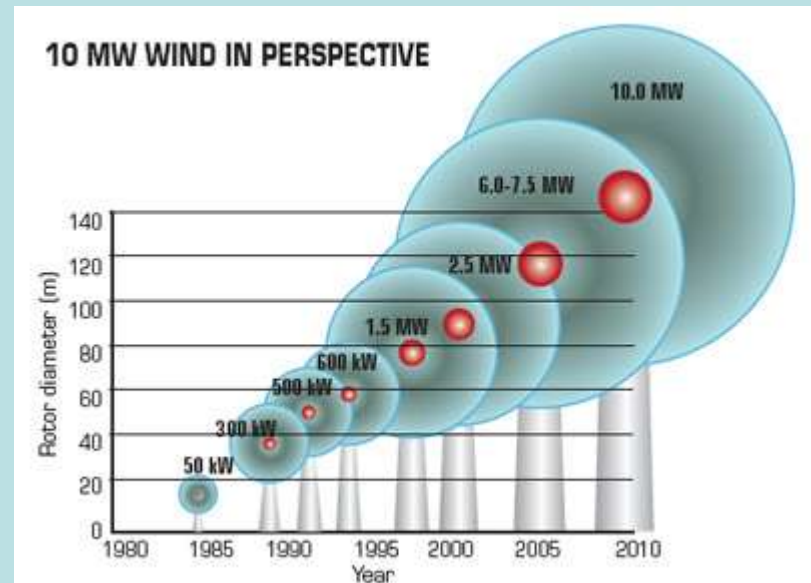
Need 181,569 acres of Solar Panels, plus storage and duplicate capacity

Wind- 25 % Conversion

Need about 270,000 10 MW Turbines, plus storage and duplicate capacity.



3500 acres only 140,000 homes per day



Biomass Energy System Going Back in Time, but High Tech.

- Switchgrass
(Grass Energy)
- Waste Wood
- Wood Chips
- Crop Residues
- Animal Waste



Locally Produced Fuel – Can be
Carbon Neutral

Renewable Energy Center

<http://www.renewableenergycenter.org>

U.S. Geothermal Potential



- Direct Uses
- Power Plants and Direct Uses



- Geothermal Heat Pumps

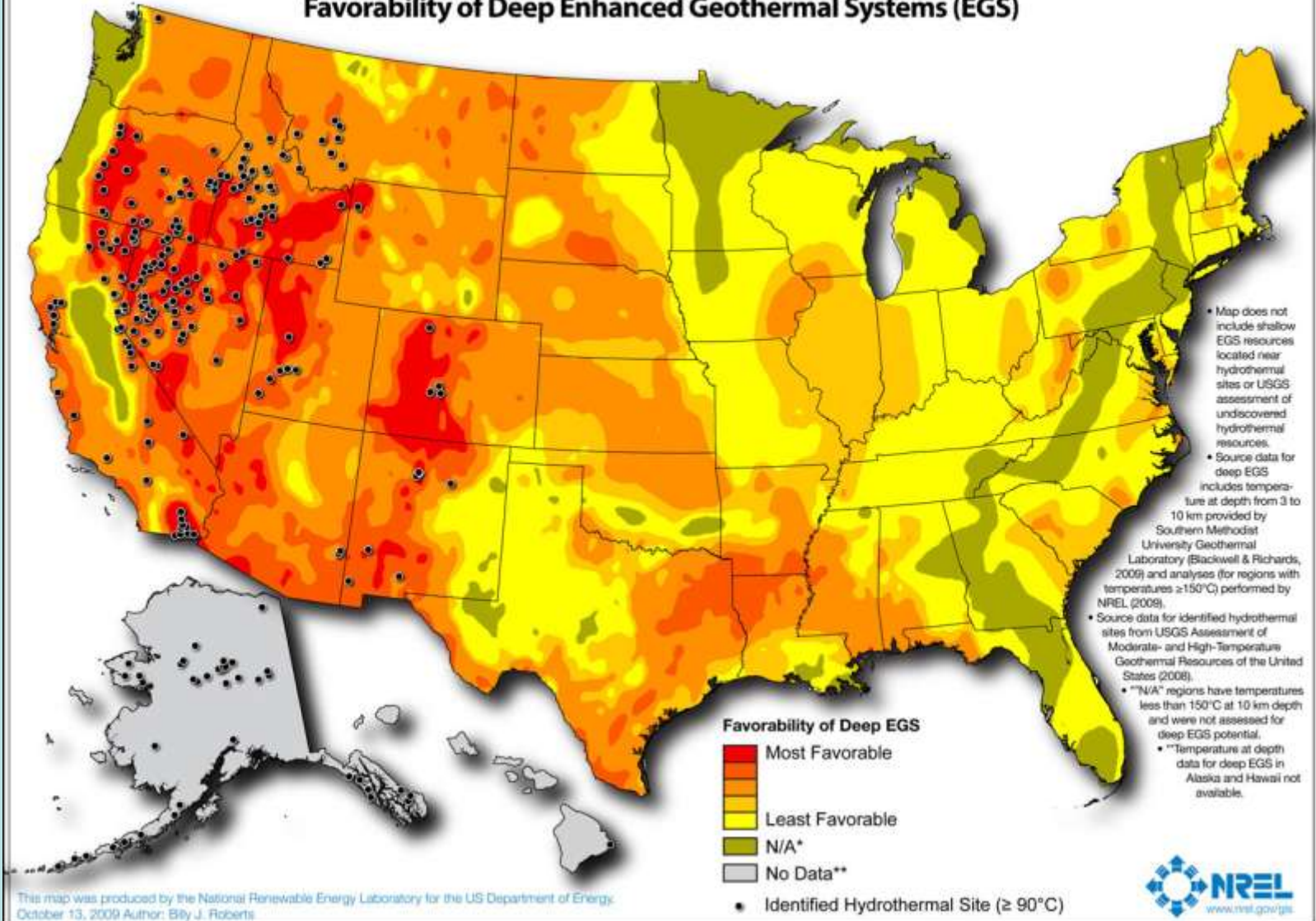
Cheap – 80% Cheaper than Fossil Fuels
50% more efficient than gas
75 % more efficient than oil

Downsides

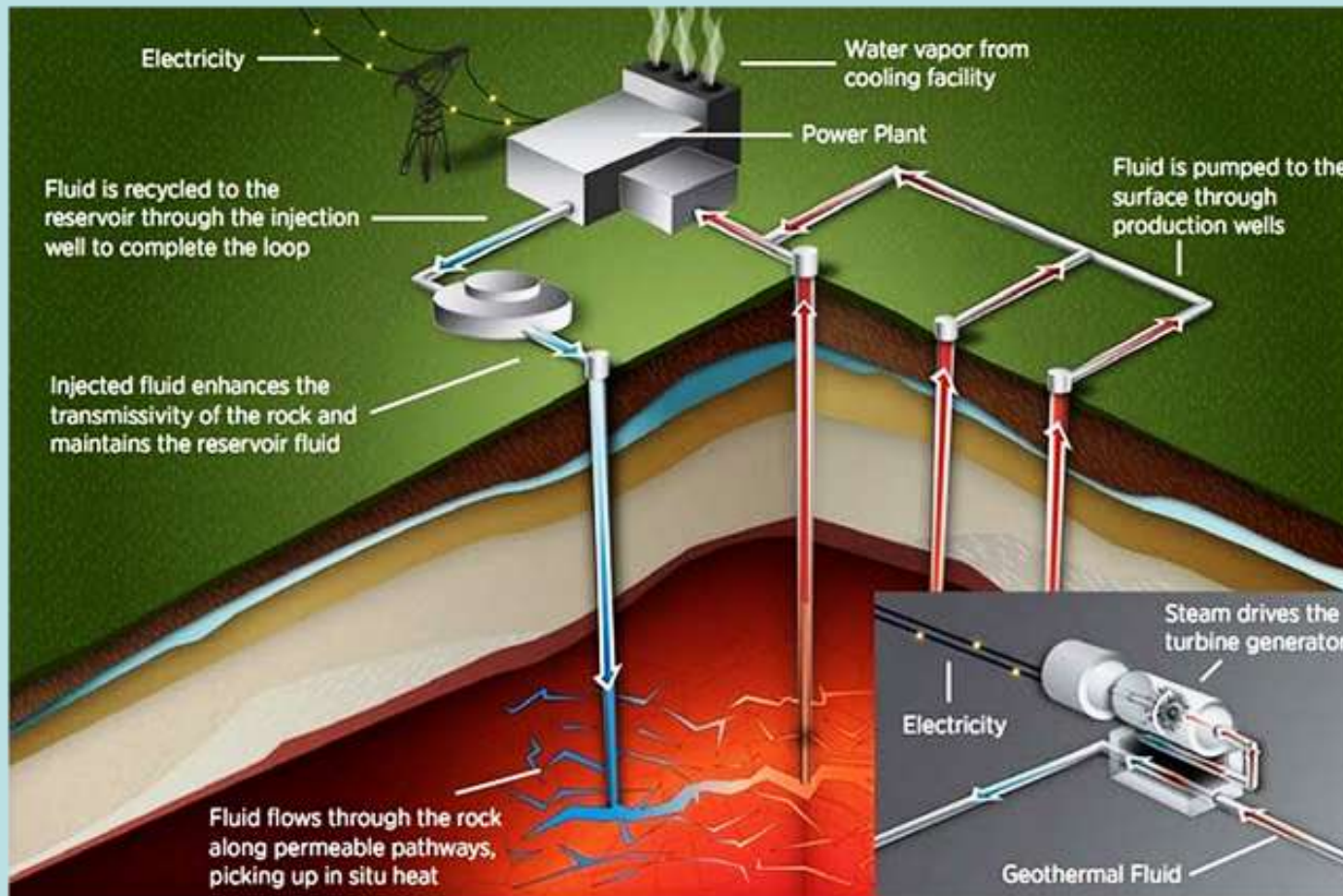
1. High Installation and Retrofit Costs
2. Magma Based Systems – earthquakes
3. 3. Distribution Issues

Geothermal Potential

Geothermal Resource of the United States Locations of Identified Hydrothermal Sites and Favorability of Deep Enhanced Geothermal Systems (EGS)

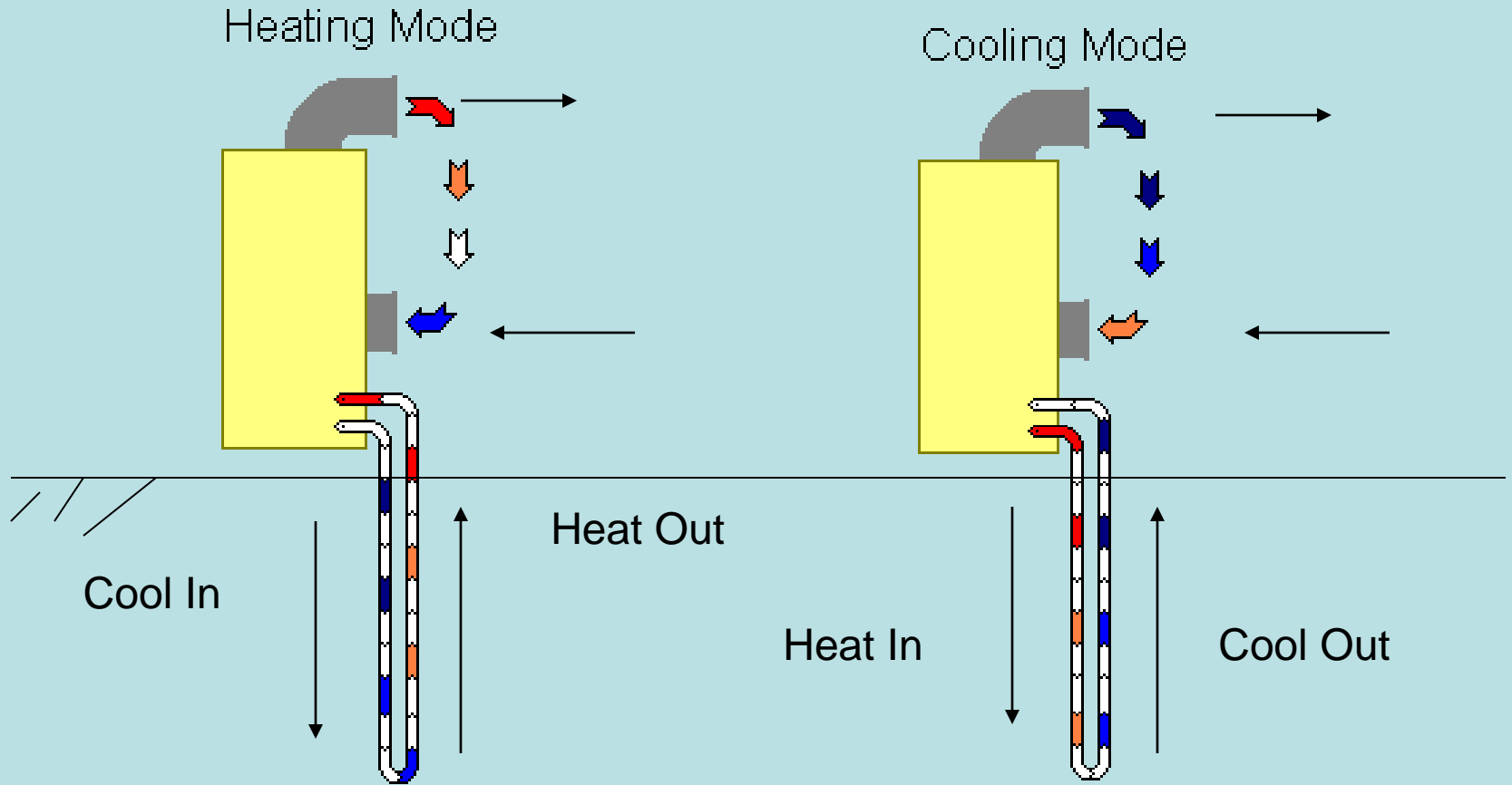


Geothermal Energy



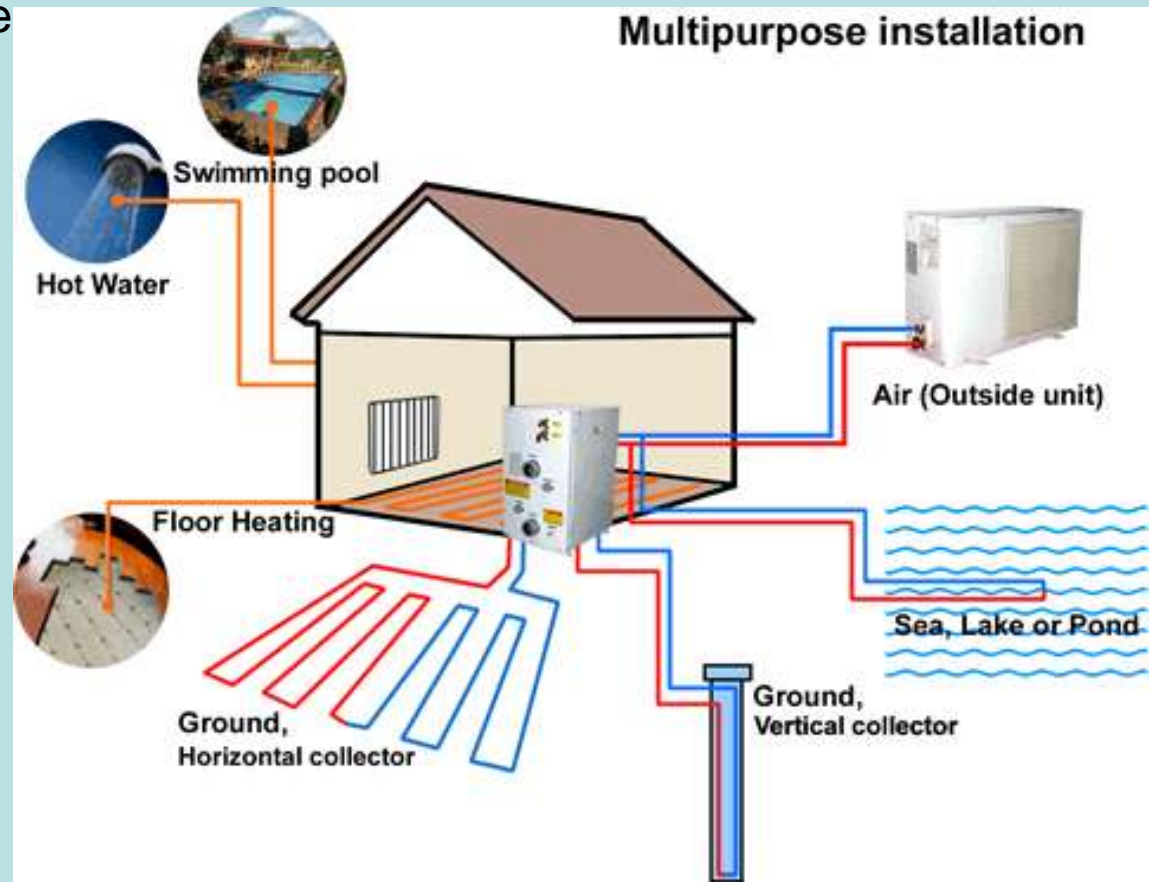
The U.S. produces more than 100,000 gigawatt-hours per year of geothermal electricity already, but it could produce as much as 3.2 trillion gigawatt-hours. 1 GW = Powers 220,000 homes

Geothermal Modes



Groundsource Heating and Cooling- Heat Pump

Use the Constant Temperature
Of the Earth to Generate
Energy
Efficiencies of 300 to 500 %



SORBER WELL DRILLING

Rotary Drilling
Geo-Thermal Drilling
Pump Sales And Service

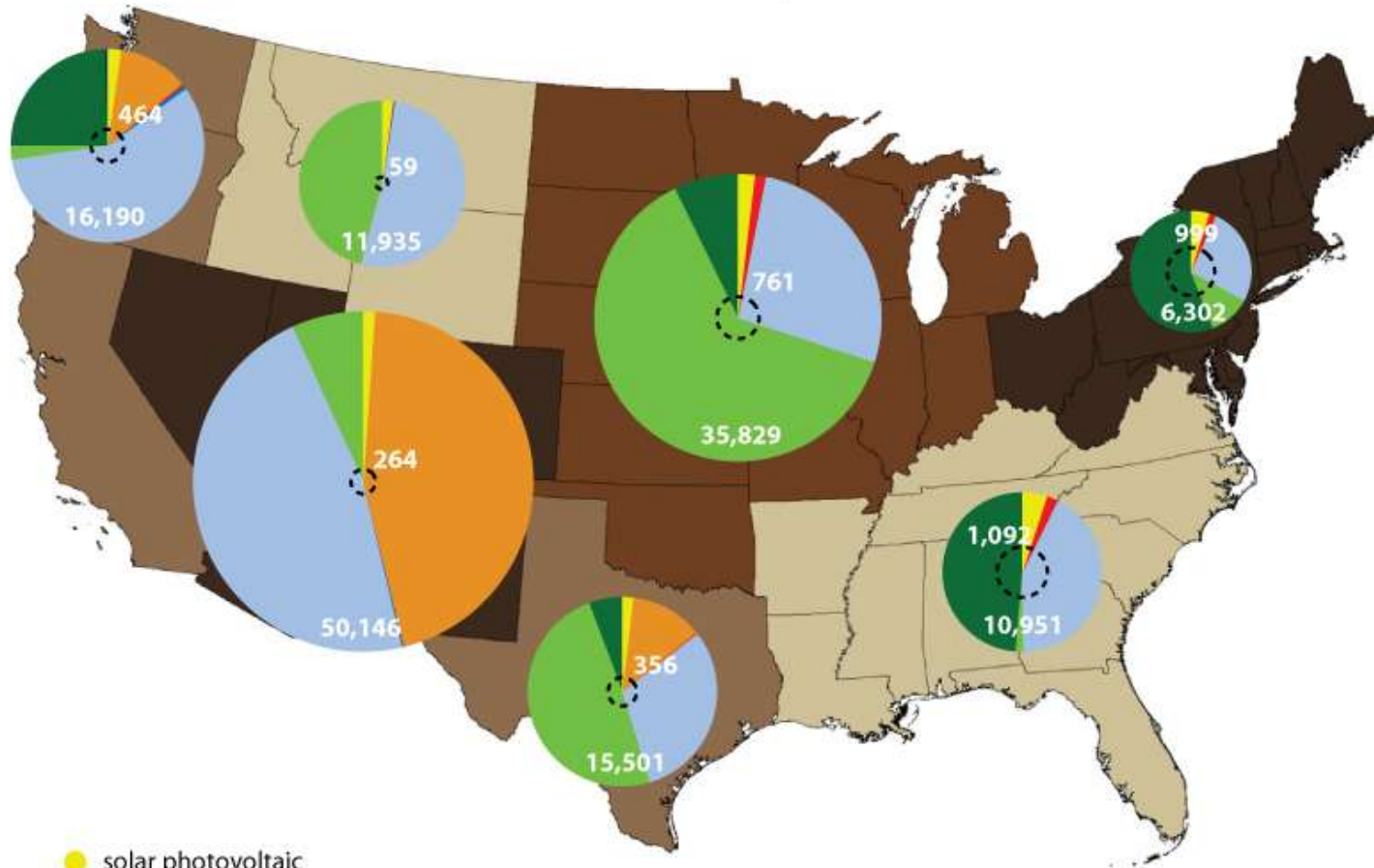
Free
Estimates

Greg Sorber, Proprietor



570-477-5393
570-675-9355



U.S. renewable energy potential



- solar photovoltaic
- concentrating solar power
- biomass
- geothermal: hydrothermal
- geothermal: EGS
- wind: onshore
- wind: offshore
- ocean: wave and tidal

-  renewable energy potential, TWh/y
-  size of demand in 2050, TWh/y (without efficiency improvements)

Future Jobs

- Skilled Trades
 - Electrical and Electronics
 - Computer Controlled Machinery
 - Boiler Systems
 - Nuclear
- White Collar
 - Project Managers
 - Health Care
- Professional Track
 - Engineering
 - Biology, Hydrology and Geology (Earth Sciences)
 - Energy (efficiency to innovative sources to bioelectrical sources, such as algae, biological fuel cells, battery technology)
 - Biomedical Fields
 - Nuclear



Action as a Student

- Learn about How Your Family Use Energy
- Implement Energy Conservation – Switch Bulbs, Close the Door – Turn the Lights Out- Unplug Your Charger
- Put a Coat On, Put on Some Soaks, Where a Sweater – Anything But Turning Up the Heat or the AC on.
- Help to Educate the Community.
- Be an example - Conserve Energy, Recycle, Reuse- Get the Facts.
- Get a Good Education and Make a Difference in Your Community
(Fact Based – Not Fear Based)



Careers in Energy !

Lackawanna College

Natural Gas Program and Many Others

Keystone College

Gas and Alternative Energy Program

Wilkes University

Engineering, Environmental, Sustainability Program

B.F. Environmental Consultants

**Multiple Certificate Training Programs in
Green Building, Energy Fields, Renewables, and other
Careers Paths**

<http://www.bfenvironmental.com>



Thanks

