Potential Career Paths
Presented by:
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B.F. Environmental Consultants Inc.
http://www.bfenvironmental.com

Water Research Center
http://www.water-research.net

Valley View High School
Junior Achievement Careers
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](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

Website: http://www.water-research.net
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- pacleanwater.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

Import - 15.7 Quadrillion Btu  (USA 20%)

1 Quadrillion – 1,000,000,000,000,000

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 1 MW or higher in capacity. Grid-connected distributed capacity and associated generation of 1 MW or less, a rapidly growing market segment, is included in subsequent figures in later sections.
U.S. Wins – We Waste the Most Energy – 58 % Wasted!

Did you know...

Energy Wasted in the U.S.

Wasted Energy Facts

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

FOOD & ENERGY WASTE IN AMERICA

<table>
<thead>
<tr>
<th>FOOD GROUP</th>
<th>PERCENT OF FOOD ENERGY WASTED</th>
<th>TOTAL ENERGY LOST (in trillion BTU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grains…………………</td>
<td>32</td>
<td>268</td>
</tr>
<tr>
<td>Vegetables……………</td>
<td>25.3</td>
<td>361</td>
</tr>
<tr>
<td>Fruit…………………..</td>
<td>23.4</td>
<td>234</td>
</tr>
<tr>
<td>Dairy………………….</td>
<td>32</td>
<td>438</td>
</tr>
<tr>
<td>Meat, poultry, fish</td>
<td>16</td>
<td>312</td>
</tr>
<tr>
<td>Eggs………………….</td>
<td>31.4</td>
<td>72</td>
</tr>
<tr>
<td>Dry Beans, Peas, Lentils…</td>
<td>16.9</td>
<td>5.67</td>
</tr>
<tr>
<td>Tree nuts and peanuts</td>
<td>16.9</td>
<td>6.5</td>
</tr>
<tr>
<td>Sweeteners………….</td>
<td>30.5</td>
<td>123</td>
</tr>
<tr>
<td>Fats and oils………</td>
<td>33.3</td>
<td>118</td>
</tr>
</tbody>
</table>

A new study by Cockrell School of Engineering Professor Michael Webber found the U.S. could save 2 percent of its total energy use if it stopped wasting food.

The chart on the left represents the percent of food energy wasted in each food group and the chart on the right represents the total amount of energy lost for each group in trillion British thermal units (BTU). All data is from 2004.

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

- Solar: 74%
- Wind: 20%
- Natural gas: 4%
- Geothermal: 1%
- Other: 1%

Source: Solar Energy Industries Association
Photovoltaic Solar Resource of the United States

Annual average solar resource data are shown for a tilt-latitude collector. The data for Hawaii and the 48 contiguous states are a 10 km satellite modeled dataset (SUNY/NREL, 2007) representing data from 1998-2005.

The data for Alaska are a 40 km dataset produced by the Climatological Solar Radiation Model (NREL, 2003).

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
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
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

http://www.renewableenergycenter.org
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. Distribution Issues
Geothermal Potential
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

Heating Mode

Cool In

Heat In

Heat Out

Cool Out

Cool Out

Heat In

Cool In

Heat Out

Cool In

Heat In

Heat Out

http://www.moyerwelldrilling.com

http://www.willisideandson.com
Groundsource Heating and Cooling - Heat Pump

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