Science of Energy, Fossil Fuels to Products, and a little Nuclear
Energy Literacy

- Seven Essential Principles supported by six to eight Fundamental Concepts
- Concepts you would understand and apply to make informed energy decisions

- Intended uses by educators K–Gray
  - Guide development of energy curriculum, activities and programs
  - Improve existing curriculum, activities and programs to more broadly cover Fundamental Concepts

For more Information Contact: DaNel Hogan at lenad.nagoh@gmail.com

http://eere.energy.gov/education/energy_literacy.html
What is energy?

• Ability to do work or cause change
• Produces Warmth
• Produces Light
• Produces Sound
• Produces Movement
• Produces Growth
• Powers Technology
Classes of Energy

POTENTIAL
- Stored energy or energy of position
  - Gravitational, Elastic, Nuclear, Chemical

KINETIC
- Energy of motion
  - Motion, Electrical, Sound, Radiant, Thermal
Transition: Forms to Sources

- Forms - How Scientists Classify Energy
- Sources - Where We Get the Energy To Make Our Lives More Comfortable, Convenient, & Enjoyable

1. Using the information from the Forms of Energy chart on page 20 and the graphic below, determine how energy is stored or delivered in each of the sources of energy. Remember, if the source of energy must be burned, the energy is stored as chemical energy.

<table>
<thead>
<tr>
<th>Nonrenewable</th>
<th>Renewable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical</td>
<td>Chemical</td>
</tr>
<tr>
<td>Coal</td>
<td>Motion</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>Motion</td>
</tr>
<tr>
<td>Uranium</td>
<td>Thermal</td>
</tr>
<tr>
<td>Propane</td>
<td>Radiant</td>
</tr>
</tbody>
</table>

2. Look at the U.S. Energy Consumption by Source graphic below and calculate the percentage of the nation's energy use that each form of energy provides.

- Chemical: 87.2%
- Nuclear: 8.8%
- Motion: 3.5%
- Thermal: 0.4%
- Radiant: 0.1%

- Natural Gas: 24.7%
- Hydropower: 2.8%
- Coal: 20.9%
- Wind: 0.7%
- Uranium: 8.8%
- Geothermal: 0.4%
- Propane: 1.0%
- Solar: 0.1%

What percentage of the nation's energy is provided by each form of energy?

- By renewables: 8.1%
- By nonrenewables: 91.9%
Most of the energy consumed in the U.S. is stored in the form of chemical energy!
Biomass provides us with the greatest amount of energy when considering renewable energy sources.
Petroleum provides us with the greatest amount of energy when considering nonrenewable energy sources.
Canada provides the largest portion of imported oil to the United States.
The **top five sources of energy** used in the U.S. are petroleum, natural gas, coal, uranium, and biomass.
Nonrenewable sources of energy make up over 90% of U.S. energy consumption.
U.S. Primary Energy Flow by Source and Sector, 2010

(Quadrillion Btu)

http://www.eia.doe.gov/emeu/aer/pecss_diagram.html
Coal is the energy source used to generate approximately 50% of electricity in the United States.
Wyoming is the state that mines the most coal. (HINT: Powder River Basin)
Hydropower is the renewable source of energy used to generate more electricity than any other renewable source in the United States.
The national average cost of a residential kWh of electricity is 12 cents.
Lumens are the unit of measure used to compare how much light is produced by different types of light bulbs.
Phantom or vampire load refers to the electricity consumed by an appliance or device that is plugged into an outlet but not currently “on”.
1 – Energy cannot be created or destroyed, only changed or transformed.
   • Law of Conservation of Energy
   • First Law of Thermodynamics

2 – Energy will always transfer from high to low.

3 – No energy transfer is 100% efficient.
Electricity was not listed as a primary source of energy. It is a secondary source – some other source of energy must be converted into electricity.
Take note...

A majority of electricity is generated by moving coils of wire through magnetic fields.

Just like the shake light!
Chemical Kinetic

Name the Transfer
Radiant Chemical

Name the Transfer
Electrical  →  Thermal

Name the Transfer
Name the Transfer of Chemical Kinetic
All energy flows begin with nuclear energy if you trace them back far enough!
In Review

• Energy does work or causes change.
• Two main classes of energy: potential and kinetic.
Potential Energy – stored energy or energy of position
  Gravitational, Elastic, Nuclear, Chemical

Kinetic Energy – energy of motion
  Mechanical Kinetic (Motion), Electrical, Sound, Radiant, Thermal
In Review

• Energy cannot be created or destroyed, only changed or transformed.

• Energy always transfers from low to high, high to low.

• Energy transfers are never 100% efficient.
Station Rules and Hints

READ the directions.
FOLLOW the directions.
READ the “What the heck?”
CLEAN up and reset before moving on.
BE CAREFUL!

- Hot lights and griddle.
- Fire!
- Hot water
- Projectiles
Irradiated salt station in room 116!

- It is NOT radioactive!

REUSE plastic bags and materials.
USE water bottles.
Lab coats and goggles!!!

Do NOT be a Carol!

Carol never wore her safety goggles.

Now she doesn’t need them.
Free Stuff

For Students:
• Oil and Natural Gas Book
• Secondary Energy Infobook
• Thermo-sensitive pencil

For Teachers: (all of the above and…)
• Irradiated salt for classroom use
• NEED Project 2012 Annual Report
• NEED Project Curriculum Packet
Each group must have:

- At least one teacher and one student
- At least two different group colors
Contact Info

DaNel Hogan

- [lenad.nagoh@gmail.com](mailto:lenad.nagoh@gmail.com)

The NEED Project

- [www.need.org](http://www.need.org)

energy4me

- [www.energy4me.org](http://www.energy4me.org)

Health Physics Society

- [www.hps.org](http://www.hps.org)

Thanks to Shell Energy!