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Student Notes
Science on Saturday
Lawrence Livermore National Laboratory
March 24, 2007

Energy Crisis: Will Technology Save Us?

Presenters:

Dr. John Ziagos	Mr. Ken Wedel
Scientist	Earth & Environmental
Lawrence Livermore	Science Teacher Tracy
National Laboratory	High School

Goals:
Students will learn about Earth's energy sources and how they are being used. They will also explore how energy is converted and what alternative energy sources are available when fossil fuels are exhausted.

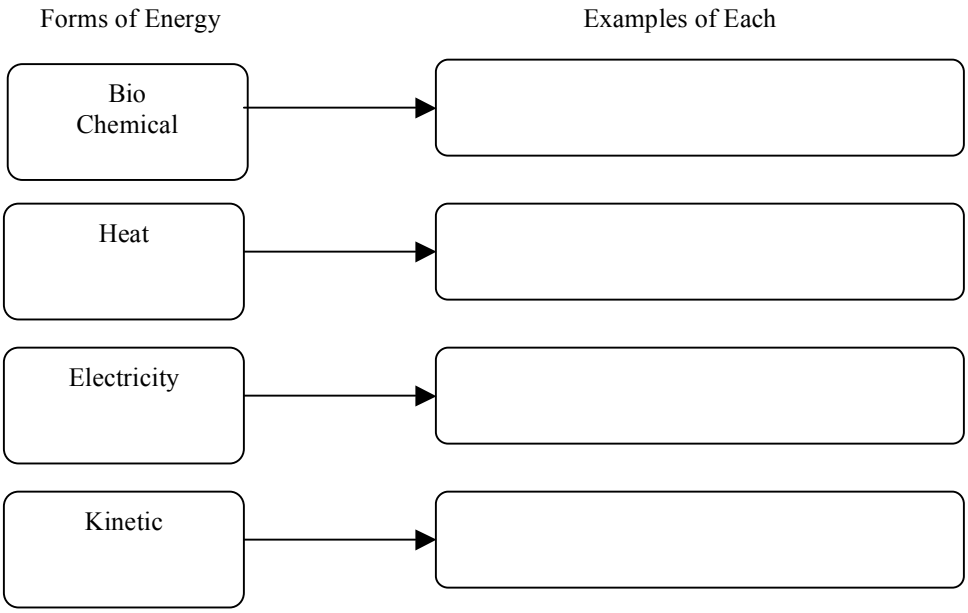
Questions:

You will be able to answer the following questions at the end of this presentation:

- Is there an energy crisis?
- How much do we have?
- How fast are we using it?
- When are we going to run out?

Listen carefully to the presentation to answer the questions during the talk. You will need these answers to get credit from your teacher.

ENERGY TYPES AND CONVERSION



Which form of energy costs the most? _____

Which form of energy do humans use the most of? _____

What type of energy comes from the following chains?

Gravity to Kinetic to Electricity = _____

Chemical to Thermal to Pneumatic to Kinetic = _____

Electricity to Radiation = _____

How many energy conversions are shown in the video? _____

How much fossil fuel does the world have left?

- Coal _____ Natural Gas _____ Oil _____

Are YOU going to run out of energy? _____

What are other potential sources of energy? _____

_____

What type of 'energy' future do you envision?

For transportation: _____

For homes: _____

For industry: _____

Science Content Standards covered in this presentation:
Grades Six and Nine Through Twelve, Earth Sciences and Physics

Sixth Grade:

3. a. *Students know* energy can be carried from one place to another by heat flow or by waves, including water, light and sound waves, or by moving objects.
3. b. *Students know* that when fuel is consumed, most of the energy released becomes heat energy.
3. d. *Students know* heat energy is also transferred between objects by radiation (radiation can travel through space).
4. a. *Students know* the sun is the major source of energy for phenomena on Earth's surface; it powers winds, ocean currents, and the water cycle.

Earth Science:

4. a. *Students know* the relative amount of incoming solar energy compared with Earth's internal energy and the energy used by society.
4. c. *Students know* the different atmospheric gases that absorb the Earth's thermal radiation and the mechanism and significance of the greenhouse effect.
7. b. *Students know* the global carbon cycle: the different physical and chemical forms of carbon in the atmosphere, oceans, biomass, fossil fuels, and the movement of carbon among these reservoirs.
7. c. *Students know* the movement of matter among reservoirs is driven by Earth's internal and external sources of energy.
7. d. *Students know* the relative residence times and flow characteristics of carbon in and out of its different reservoirs.

Physics:

Energy cannot be created or destroyed, although in many processes energy is transferred to the environment as heat.

Dr. John Ziagos

Geophysics PhD, Deputy Department Head for Atmospheric, Earth, and Energy.
Lawrence Livermore National Laboratory

Dr. Ziagos is the Deputy Department Head for the Atmospheric, Earth, and Energy Department at Lawrence Livermore National Laboratory (LLNL). He is responsible for achieving a vigorous energy and environment research portfolio through the technical and business leadership of 200 scientists, engineers, technicians and administrative staff. John has been at LLNL since 1990. Prior to becoming the Deputy Department Head, he was the Superfund manager for 10 years at the Laboratory's main Livermore Site and the Site 300 high explosives test facility, successfully negotiating Record of Decisions with the U.S. Environmental Protection Agency (EPA)

Ken Wedel

Earth and Environmental Science Teacher
Tracy High School - Tracy, California

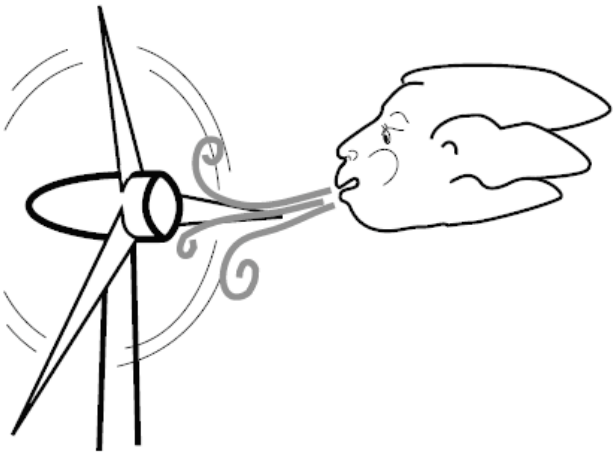
Ken Wedel teaches Earth Science and Earth Science for English Language Learners at Tracy High School in Tracy, California. He developed the Earth Science program at Tracy High School, and has worked on curriculum mapping and curriculum alignment to the California State Standards for both high schools in Tracy. Ken has been involved with the Science Olympiad competition at the regional level for four years and enjoys advising the Tracy High School Team. Ken also works with Action Learning Systems creating California Earth Science Standards based benchmark tests. He has his Bachelor of Science Degree in Geology California State University, Stanislaus.

Kids Coloring Page:

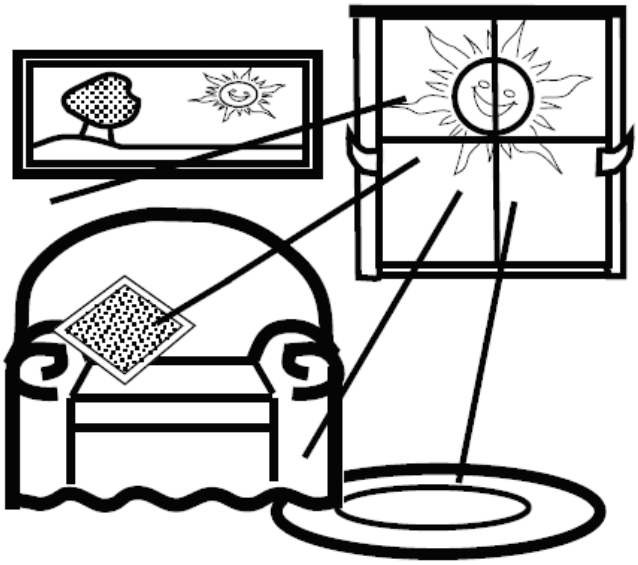
MIGHTY MATCH UP

(match the picture with the type of power)

SIMPLE SOLAR
(passive solar power)



SUPER SOLAR
(active solar power)



WONDERFUL WIND
(wind powered turbine)