



Energy Exploration, Hands on Activity: 45-60 minutes

Objective: Students will explore the origin and environmental impacts of key non-renewable and renewable energy resources.

ENERGY ICE-BREAKER – STUDENTS CHOOSE A LAST NAME RELATED TO ENERGY, AND EXPLAINS ITS MEANING TO THE CLASS. VOCABULARY WORDS FOUND [HERE](#).

Objectives:

- Students will assess the sources of renewable and nonrenewable resources
- Students will explore the energy transformations that occur as a function of each resource
- Students will investigate the change in electrical current with renewable energy as external conditions change (e.g. wind, solar radiation)
- Students will learn the origin nonrenewable resources, how they are extracted and refined for use.
- Students will explore the uses, distribution, and conservation for various resources

Materials:

- Turbine w/ DC motor ([here](#))
- Small solar panels ([here](#))
- Multimeter ([here](#))
- Hand sample of coal (use charcoal)
- Petroleum jolly OR molasses (purchase from local grocer)

Explanation:

Four stations will be set up for the students to explore renewable and nonrenewable energy resources. Students will be expected to discuss (5-7th grade) or record (8-12th grade) the energy transformation associated with the source (e.g. mechanical to electric energy), places where the energy sources are found/most efficient, and the pros and cons of each energy source. How are these sources captured and stored for later use? How are they distributed?

1. Station 1: Turbine and DC motor

This station will have a turbine and DC motor set up prior to class. The students will use a multimeter to record changing electrical voltage as wind direction and speed changes. Note that wind will be mimicked by a fan if this activity is done indoors, or on a day that it not windy outside. Students will calculated and track the revolutions per minute, and associated voltage.

Percent Light	Voltage
100%	
75%	
50%	
25%	
0%	



2. *Station 2: Solar panel*

The students will use a multimeter to record changing electrical voltage as the magnitude of wind velocity (e.g. blow strength) radiation changes. This station will be done outside.

Breath Strength	Voltage
100%	
75%	
50%	
25%	
0%	

3. *Station 4: Coal*

The students will explore the origin and diagenesis of coal. Hand samples of peat, lignite, and/or coal will be provided, along with a video explanation. Discuss the non-renewable aspects, and the efforts needed to obtain and combust the product. Discuss the negative effects to the environment.

4. *Station 5: Petroleum (Molasses; supplemental video [here](#) or [here](#))*

The students will explore the origin and diagenesis of petroleum. Petroleum jelly (byproduct of oil refinement process) will be provided. If permitted, flammable properties can be explored. The origin and diagenesis will be explained through a printed schematic cross section. For substitution, molasses can mimic the viscosity and color of crude oil. Discuss the non-renewable aspects, and the efforts needed to obtain and combust the product. Discuss the negative effects to the environment.

Discuss:

What is the difference between renewable and nonrenewable energy? How are these energy sources captured and stored for later use? **Conduct a list of the pros and cons of each energy resource. The list should consider effort to activate and/or obtain the resource, and environmental effects.**

What are some ways that the students work to conserve energy at home? Are there habits that can be changed at school or at home to help conserve energy?

Discuss PT2050 goals and missions with energy conservation and distribution in Texas:

Projections show that population will double in Texas by 2050. PT2050 is working to understand how we can efficiently conserve and distribute energy to the growing population, while maintaining environmental and urban resilience to climate change. How might we (as individuals) help to mitigate against future shortages in energy? How does our current energy use negatively affect the environment?



Post-Class Activity (Homework):

Option 1

Home energy audit (by NOVA), includes carbon footprint calculation for home.

Option 2 (Middle School)

Students illustrate the energy transformation of 3 machines at home through a storyboard or comic strip. The illustration should include the origination of power (e.g. power plant, oil refinery), the transportation of power to wall outlet or gas tank, the use of the machine and associated emissions. Do the students know where their power originates from, and how far it is transported for their convenience? Student should write a short paragraph about the energy transformations they discovered in their everyday lives.

Option 3 (High School; §112.37 (3))

Students are assigned a news or journal article related to energy. The students are tasked with answering these questions (minimum 1 sentence response) about the article: What was the key takeaway from the article? Did it have a positive or negative outlook on energy production and/or consumption? Did the article use scientific evidence to evaluate the topic? Describe the connection between the environment and the energy type described in your article. What is your overall opinion about the article?



Texas Assessments of Academic Readiness Resources – TEKS

§112.18. Science, Grade 6, Adopted 2017.

(b) Knowledge and skills.

(7) Matter and energy. The student knows that some of Earth's energy resources are available on a nearly perpetual basis, while others can be renewed over a relatively short period of time. Some energy resources, once depleted, are essentially nonrenewable. The student is expected to

research and discuss the advantages and disadvantages of using coal, oil, natural gas, nuclear power, biomass, wind, hydropower, geothermal, and solar resources.

(9) Force, motion, and energy. The student knows that the Law of Conservation of Energy states that energy can neither be created nor destroyed, it just changes form. The student is expected to:

(C) demonstrate energy transformations such as energy in a flashlight battery changes from chemical energy to electrical energy to light energy.

§112.35. Chemistry (One Credit), Adopted 2017.

(c) Knowledge and skills.

(11) Science concepts. The student understands the energy changes that occur in chemical reactions. The student is expected to:

(A) describe energy and its forms, including kinetic, potential, chemical, and thermal energies;

(B) describe the law of conservation of energy and the processes of heat transfer in terms of calorimetry;

§112.36. Earth and Space Science, Beginning with School Year 2010-2011 (One Credit).

(c) Knowledge and skills.

(3) Scientific processes. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:

(A) in all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student;

(B) communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials;

(C) draw inferences based on data related to promotional materials for products and services;

(D) evaluate the impact of research on scientific thought, society, and public policy;

(E) explore careers and collaboration among scientists in Earth and space sciences; and

(F) learn and understand the contributions of scientists to the historical development of Earth and space sciences.

§112.37. Environmental Systems, Beginning with School Year 2010-2011 (One Credit).

(c) Knowledge and skills.



- (5) Science concepts. The student knows the interrelationships among the resources within the local environmental system. The student is expected to:
- (C) document the use and conservation of both renewable and non-renewable resources as they pertain to sustainability;
 - (D) identify renewable and non-renewable resources that must come from outside an ecosystem such as food, water, lumber, and energy;
- (6) Science concepts. The student knows the sources and flow of energy through an environmental system. The student is expected to:
- (B) describe and compare renewable and non-renewable energy derived from natural and alternative sources such as oil, natural gas, coal, nuclear, solar, geothermal, hydroelectric, and wind;
 - (D) investigate and explain the effects of energy transformations in terms of the laws of thermodynamics within an ecosystem;
- (9) Science concepts. The student knows the impact of human activities on the environment. The student is expected to:
- (J) research the advantages and disadvantages of "going green" such as organic gardening and farming, natural methods of pest control, hydroponics, xeriscaping, energy-efficient homes and appliances, and hybrid cars;

§112.38. Integrated Physics and Chemistry (One Credit), Adopted 2017.

(c) Knowledge and skills.

- (5) Science concepts. The student recognizes multiple forms of energy and knows the impact of energy transfer and energy conservation in everyday life. The student is expected to:
- (H) analyze energy transformations of renewable and nonrenewable resources;
 - (I) critique the advantages and disadvantages of various energy sources and their impact on society and the environment.