

# Lesson Plan: Energy Sources and Systems

## Concepts

1. Most of our energy is derived from the sun.
2. Sources of energy can be used for purposes other than electrical energy consumption.
3. Environmental impacts differ depending upon the energy source and conversion process.
4. Different energy sources have different costs.
5. A system is made up of a sequence of conversions.
6. In the conversion of energy a significant fraction of that energy can be lost from the system (in the form of heat, sound, vibration, etc).
7. Systems can be divided into inputs, processes, outputs, and feedback.
8. The components of an energy system must work together to transform energy into a form that can be used in our society.

## Key Questions

1. Where does energy come from?
2. What are the most significant environmental impacts associated with our most widely used energy sources?
3. What is the input and output of each energy system?
4. What forms of energy losses can occur during an energy conversion?

Student Learning Objectives	Standards	
	National	NYS
Students will be able to identify at least five sources of energy.	<b>Sci:</b> B3d, B3h <b>Tech:</b> 16	5-2
Students will be able to explain why an increased dependence on renewable energy sources is an inevitable part of our future.	<b>Sci:</b> F3b, F4d, F5c <b>Tech:</b> 4, 5,16	5-2
Students will be able to identify and describe the parts of an energy system.	<b>Sci:</b> B3d, B3h, F5c <b>Tech:</b> 16	5-2

## Anticipatory Set

- Students have learned about energy, work and power.
- They have examined the power consumption in their homes and discussed how to conserve energy in the home.

- They will start with a power point presentation on energy sources and learn about (or review) the difference between renewable and non-renewable energy sources.
- Renewable resources that will be introduced include solar, wind (including offshore), hydro (including micro-hydro), geothermal and biomass.
- Non-renewable sources that will be introduced through pictures include nuclear energy and fossil fuels.
- A basic description of an energy conversion is: Energy from a source provides input to another system component, which converts the form and/or state of energy and provides output to another system component.
- A basic description of an energy system is a sequence of energy conversions.

## Key Terms

Solar Energy	Biomass	Uranium
Geothermal Energy	Fossil Fuels	Hydropower
Wind	Energy System	System Component
Input	Output	

## Teaching Plan:

### Day 1:

- Sources Brainstorm
  - “Where does energy come from?”
  - Lead them into saying the obvious: “Energy comes from an energy source.”
  - Write a heading of “Sources” on the board and brainstorm with the class for examples of energy sources. As this is occurring, pass out the worksheet.
- Worksheet and Presentation
  - Begin the PowerPoint presentation on energy sources.
  - As each source’s slide is presented, have the students record the source’s name in the appropriate spot on the worksheet
  - For each source, have a student try to briefly explain what they think it is and how it works. Correct accordingly and complete the picture of what each source is (very briefly, they’ll be doing source research later) before moving on to the next.
  - Emphasize that many of our energy sources were originally derived from solar energy.
- Review the Forms and States

- Go over the forms and states of energy again. Have the students fill these in on the worksheet
- Go over what form of each source
  - Fossil Fuels – Chemical
  - Uranium – Nuclear
  - Biomass –Chemical
  - Geothermal –Heat
  - Hydropower –Motion
  - Wind –Motion
  - Solar Power -Electromagnetic
- Can we use this energy in its form? For example, can sunlight be directly used to power a radio? No, a solar panel needs to be used for energy conversion. What form is most of our energy in? (Electromagnetic as electricity)
- Ask, “So How do we convert energy?” State that we use an **energy system**. Reiterate that energy can neither be created nor destroyed; it can only be converted from one form to another. Close the class by saying that we’ll explore sources and system in the next classes.

Day 2 (3):

- Energy Sources Research Activity
  - Hand out the research packets and activity sheets
  - The research packets consist of each energy sources fact sheet
  - Split the students into small groups (3 or 4 students)
  - Assign each group one of the 7 research questions ( If there are less than 7 groups choose just a few questions, preferably how it works, one economic question, one environmental question, etc.)
  - Each group will answer that one question for all 7 energy sources
  - Explain to the students that they will become experts on the specific aspect of energy sources (for example, they will be experts on the environmental effects of energy sources)
  - Each group will make a decision based on the specific aspect they researched, as to which source is best.
  - This may take more than one day, students who finish early can move on to the next step outlined in the following day

Day 3 (4):

- Energy Sources Research Handouts
  - Give each group a blank piece of regular printer paper and markers
  - Have each group make a handout including the information they researched. They should include the most important or interesting facts, the ones they made their decision based on, for each energy source.

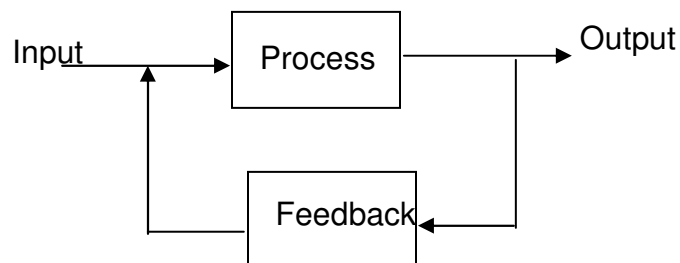
- When the students have finished the handouts make copies for each student of the entire classes handouts.

Day 4 (5):

- Energy Sources Research Handout Presentations
  - Have each group present their handout to the class.
  - Write on the board which energy source each group felt was best.
  - Discuss the pros and cons as a class and decide which ones are most feasible for a home.
  - Lead the students to Wind, Solar, and Hydro
  - Tell them that in the next class we will look at the systems for those sources.
  - If there is extra time you can use the Energy Trivia PowerPoint to review the facts they researched.

Day 5 (6):

- Review Energy Systems
  - Explain that all system have an input, process, output, and possibly feedback. Draw the following flowchart on the board to illustrate that concept.



- Energy System Diagram Activity
  - Go over the system diagram for one of the systems the class will not be doing.
  - Explain that the students will have to match the system component and its description with its location on the diagram
  - They will also have to draw a block diagram for their system, identifying the starting and ending form and state for each system component,
  - Divide the class into groups of 3-5 students
  - In most classes we only used the Wind, Solar, and Hydro Diagrams but other diagrams can also be used.
  - Go around and assist each group as needed.
  - Once all the students have figured out their diagrams have each group present it to the class. They can do the block diagram on the board.

- Pass out the handouts for each system.

Day 6(7):

- Energy Sources, Systems, and Conversions Assessment

## **Resources**

Sources and Conversions Worksheet

Energy Sources Power Point

ACT-Energy Sources Research

Energy Sources Fact Sheets

ACT-Energy System Diagrams

Energy System Diagram Handouts

Energy Sources, Systems, and Conversions Assessment

Energy Sources, Systems, and Conversions Assessment Solutions