ENERGY SOURCES of the WORLD

Although oil, natural gas, and coal will remain the primary energy sources for the foreseeable future, a variety of resources will be needed to meet the world's growing demand. All energy sources have benefits, as well as challenges to produce, deliver, and use on a wide-scale and efficient basis.

RENEWABLE energy: Renewable energy is derived from resources like the sun and the wind that can easily be replenished.

NONRENEWABLE energy: Nonrenewable resources are energy sources like petroleum, natural gas, coal, and nuclear energy that take millions of years to form. They cannot be recreated over a short period of time.

SOLAR ENERGY

RENEWABLE

ADVANTAGES
- Nonpolluting
- Most abundant energy source available
- Systems last 15–30 years

DISADVANTAGES
- High initial investment
- Dependent on sunny weather
- Supplemental energy may be needed in low sunlight areas
- Requires large physical space for PV cell panels

WIND POWER

RENEWABLE

ADVANTAGES
- No emissions
- Affordable
- Little disruption of ecosystems
- Relatively high output

DISADVANTAGES
- Output is proportional to wind speed
- Not feasible for all geographical locations
- High initial investment
- Extensive land use

PETROLEUM/ OIL

NONRENEWABLE

ADVANTAGES
- Transportation fuel for the world
- Basis of many products, from prescription drugs to plastics
- Economical to produce, easy to transport

DISADVANTAGES
- High CO_2 emissions
- Found in limited areas
- Supply may be exhausted before natural gas and coal resources
- Possible environmental impact from drilling and transporting

NATURAL GAS

NONRENEWABLE

ADVANTAGES
- Widely available
- Burns more cleanly than coal or oil
- Often used in combination with other fuels to decrease pollution in electricity generation
- Added artificial odor so that people can easily smell the gas in case of a leak

DISADVANTAGES
- Transportation costs are high
- Burns cleanly, but still has emissions
- Pipelines impact ecosystems

BIOMASS

RENEWABLE

ADVANTAGES
- Abundant supply
- Fewer emissions than fossil fuel sources
- Can be used in diesel engines
- Auto engines can easily be converted to run on biomass fuel

DISADVANTAGES
- Source must be near usage to reduce transportation costs
- Emits some pollution
- Increases emission of nitrogen oxides, an air pollutant
- Uses some fossil fuels in conversion

HYDROELECTRIC POWER

RENEWABLE

ADVANTAGES
- No emissions
- Reliable
- Capable of generating large amounts of power
- Output can be regulated to meet demand

DISADVANTAGES
- Environmental impact by changing the environment
- Hydroelectric dams are expensive to build
- Dams may be affected by drought
- Potential for floods

COAL

NONRENEWABLE

ADVANTAGES
- Abundant supply
- Currently inexpensive to extract
- Reliable and capable of generating large amounts of power

DISADVANTAGES
- Emits major greenhouse gases and acid rain
- High environmental impact from mining and burning
- Mining can be dangerous for miners

NUCLEAR ENERGY

NONRENEWABLE

ADVANTAGES
- No greenhouse gases or CO_2 emissions
- Efficiently transforms energy into electricity
- Uranium reserves are abundant
- Refueled yearly

DISADVANTAGES
- Higher capital costs
- Problems with long-term storage of radioactive waste
- Heated waste water from nuclear plants harms aquatic life
- Potential nuclear proliferation issue

GEOTHERMAL ENERGY

RENEWABLE & NONRENEWABLE*

ADVANTAGES
- Transportation fuel for the world
- Basis of many products, from prescription drugs to plastics
- Economical to produce, easy to transport

DISADVANTAGES
- High CO_2 emissions
- Found in limited areas
- Supply may be exhausted before natural gas and coal resources
- Possible environmental impact from drilling and transporting

* There is global debate if geothermal energy is renewable or nonrenewable.

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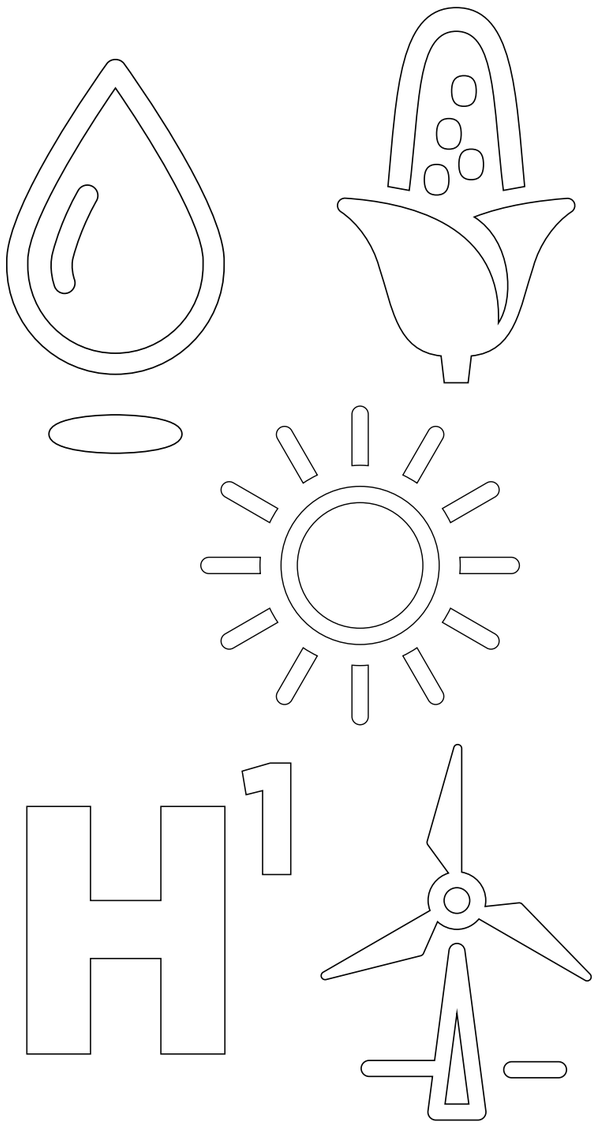
Energy Sources

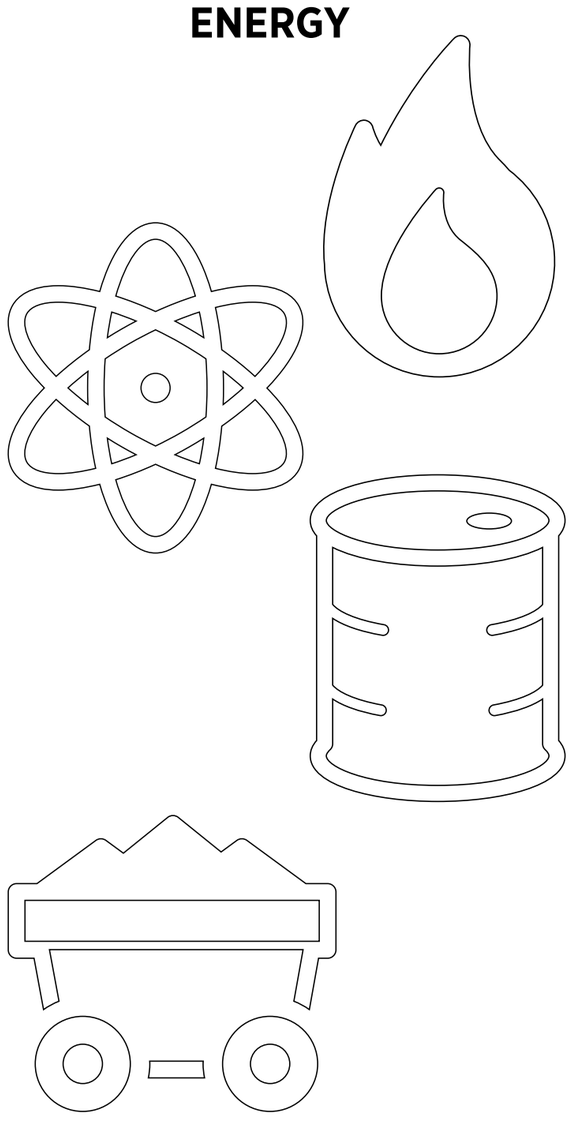
PRIMARY STUDENTS

Color these renewable and nonrenewable energy sources.

RENEWABLE ENERGY



NONRENEWABLE ENERGY



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Renewable or Nonrenewable?

INTERMEDIATE STUDENTS

Draw a circle around the renewable energy sources and a square around the nonrenewable energy sources.

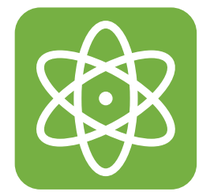
Oil/Petroleum

Coal

Solar

Wind Power

Natural Gas



Nuclear

Biomass

Hydroelectric Power

Hydrogen

Geothermal

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The Great Energy Hunt

SECONDARY STUDENTS

Choose an energy source and create a report answering these questions.

Oil/Petroleum

Solar Energy

Nuclear Energy

Coal

Natural Gas

Wind Power

Hydroelectric Power

Biomass

Geothermal Energy

Hydrogen

1) Describe the energy source. (What is it? How does it work?)
2) Is the energy source considered renewable or nonrenewable?
3) What is the history of the energy source?
4) Where is the energy source found?
5) How is the energy source recovered?
6) How is the energy source stored once it is recovered?
7) How is the energy source used today?
8) Is the energy source "efficient?" (production costs compared to energy production)
9) What are the capital costs or setup costs involved in using the energy source?
10) Are there ongoing operating costs involved when using the energy source?
11) What are the advantages of the energy source?
12) What are the disadvantages of the energy source? (finding, extracting, manufacturing, using)
13) What is the economic impact of the energy source?
14) What is the environmental impact of the energy source?
15) Is there a high cost to the consumer in using the energy source?
16) Are there any other interesting facts about the energy source?
17) What is the future of the energy source?
18) What were the sources of your information?

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Energy Sources Match Game

SECONDARY STUDENTS

Match the name and definition with the correct energy source icon.

	Energy Source	Definition
1.	 _____	_____
2.	 _____	_____
3.	 _____	_____
4.	 _____	_____
5.	 _____	_____
6.	 _____	_____
7.	 _____	_____
8.	 _____	_____
9.	 _____	_____
10.	 _____	_____

Petroleum	Solar	Black rock burned to make electricity	Energy from splitting atoms
Wind	Geothermal	Energy from heat inside the earth	Portable fossil fuel used in grills
Biomass	Hydroelectric	Energy from flowing water	Fossil fuels for cars, trucks, and jets
Nuclear	Coal	Energy from wood, waste, and garbage	Fossil fuel gas moved by pipeline
Hydrogen	Natural Gas	Energy from moving air	Energy in rays from the sun

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