

Section 2: Energy and Resources

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Key Ideas

- › What kinds of benefits do people get from natural resources?
- › Why should energy consumers use alternative energy resources?
- › Why is energy conversion never completely efficient?

Bellringer

1. List the different kinds of fuel used to heat a home.
2. Are there commonalities among items on your list of fuels used to heat a home? If so, what are they?
3. What do living organisms use as an energy source?

The Search for Resources

- › What kinds of benefits do people get from natural resources?
- › We depend on natural resources to meet our basic needs for food and shelter. We also depend on natural resources to provide the energy and raw materials needed at home, at work, and for growing food.

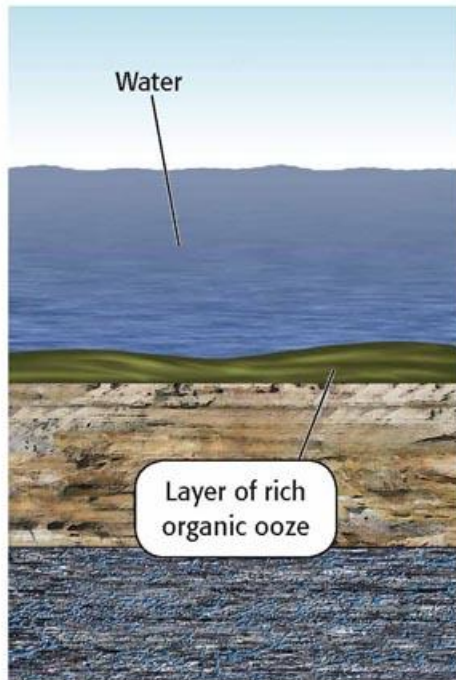
The Search for Resources, *continued*

- Plants convert solar energy into chemical energy.
 - The sun sends out energy as radiation.
 - Almost all energy comes from the sun.
 - Plants use a process known as *photosynthesis* to change the sun's energy into stored chemical energy.
 - Animals eat plants to obtain energy.

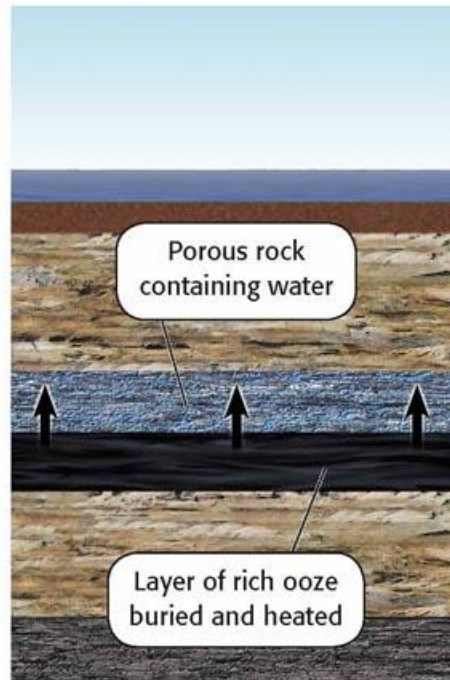
The Search for Resources, *continued*

- Fossil fuels form deep underground.
 - Even after plants and animals die, they still contain stored energy.
 - Intense heat and pressure within the Earth turn decaying organic matter into fossil fuels.
 - Fossil fuels take millions of years to form.
- **fossil fuel:** a nonrenewable energy resource formed from the remains of organisms that lived long ago; examples include oil, coal, and natural gas

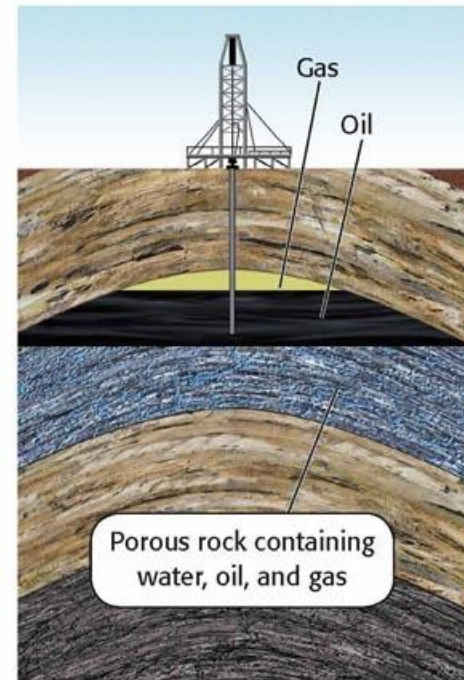
Making Oil



Microscopic plants and animals collect in layers of mud and form a rich organic ooze.

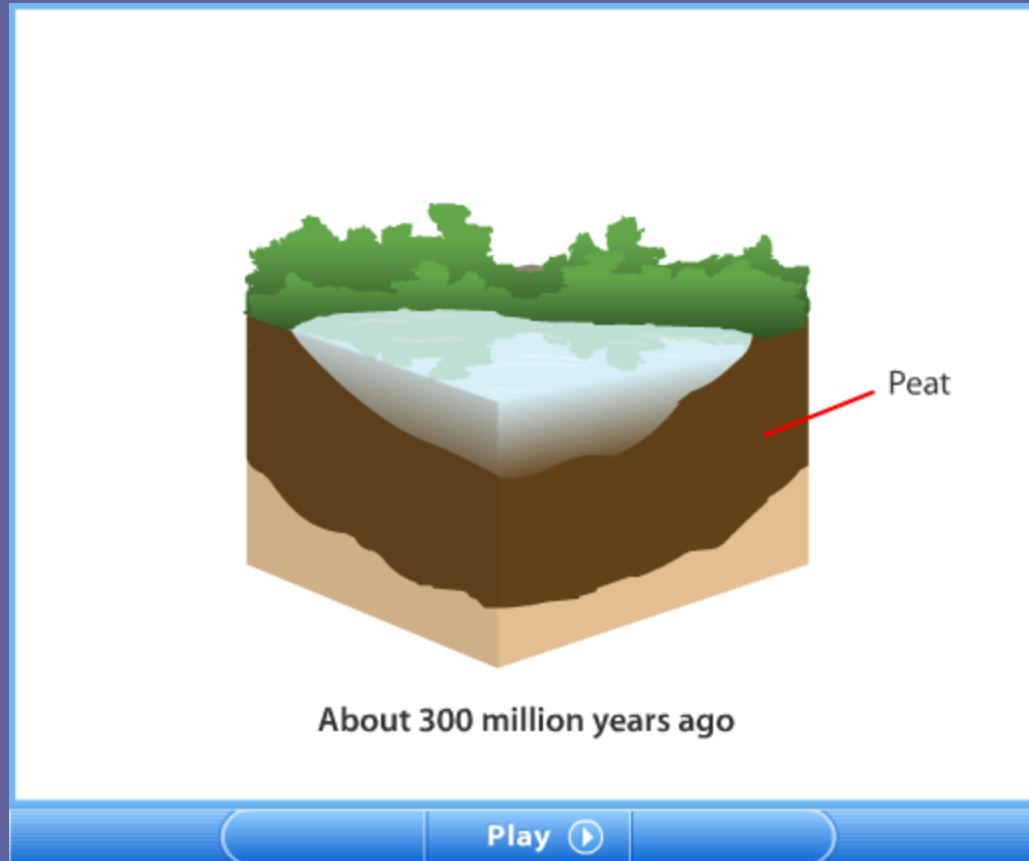


This organic layer is surrounded by sedimentary rock. Heat and pressure "cook" the ooze and transform biological debris into crude oil.

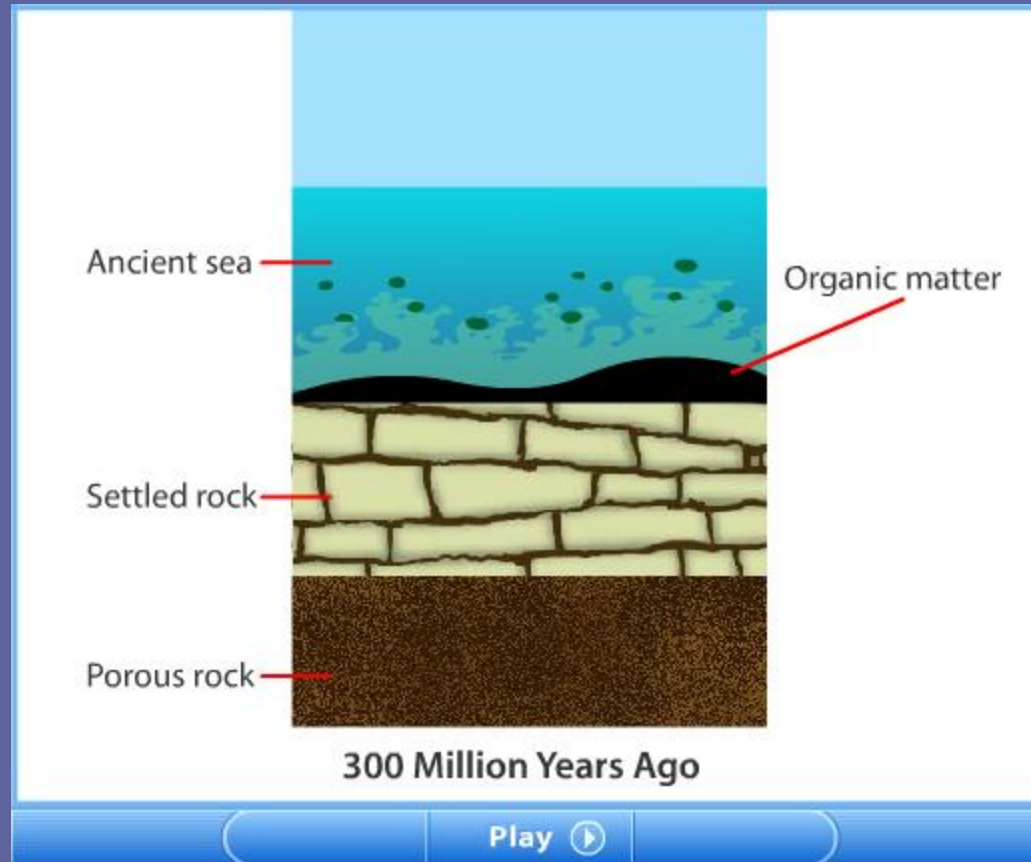


If geologic forces cause the rock layers to bend, the oil is forced out of its original layer. The oil migrates into porous rocks and is trapped.

Visual Concept: Coal Formation



Visual Concept: Petroleum and Gas Formation



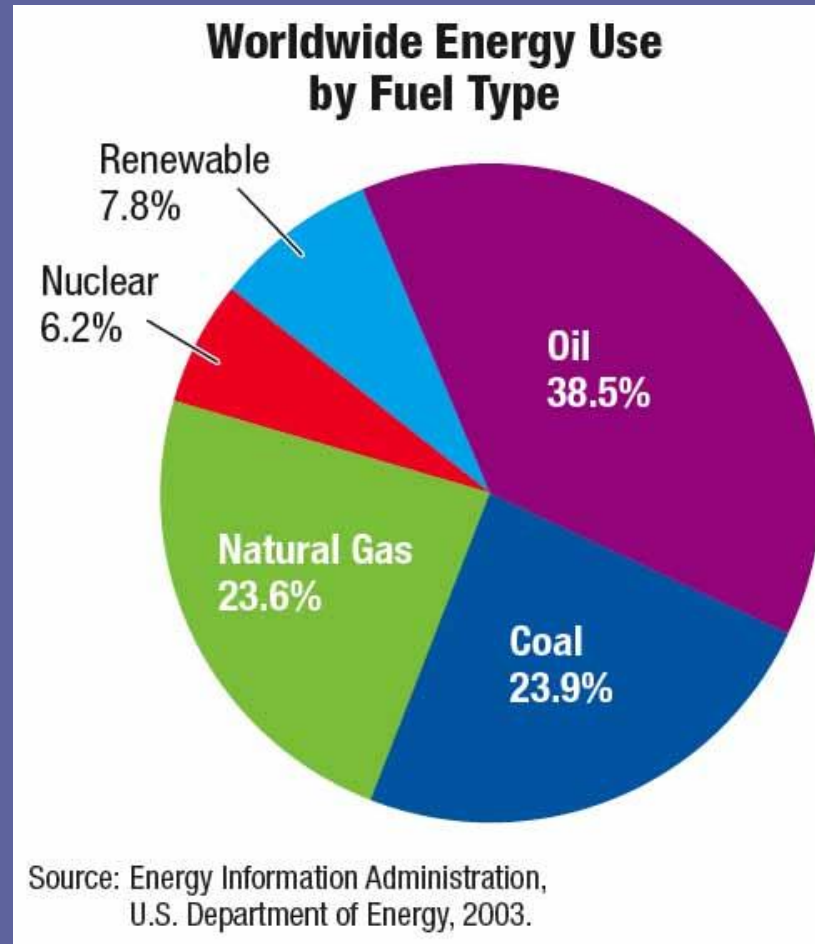
The Search for Resources, *continued*

- Fossil fuels can be solids, liquids, or gases.
 - Fossil fuels are made of carbon and hydrogen molecules.
 - There are three basic types of fossil fuels:
 - Oil
 - Coal
 - Natural gas

The Search for Resources, *continued*

- The supply of fossil fuels is limited.
 - Because fossil fuels take so long to form, they are considered nonrenewable resources.
 - Only 16% of the energy used in the world is supplied by sources other than fossil fuels.
 - We do not know how long fossil fuel reserves will last, but oil and natural gas may run out in your lifetime.
- **nonrenewable resource**: a resource that forms at a rate that is much slower than the rate at which the resource is consumed

Worldwide Energy Use by Fuel Type



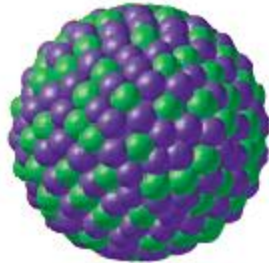
Alternative Sources of Energy

- › Why should energy consumers use alternative energy resources?
- › The more alternative sources of energy are used, the less we will rely on fossil fuels.
- **renewable resource**: a natural resource that can be replaced at the same rate at which is it consumed

Alternative Sources of Energy, *continued*

- Atoms produce nuclear energy.
 - Chain reactions involving fission (splitting of atoms) produce energy.
 - This energy can be used to heat water.
 - Steam can be used to turn a turbine and generate electricity.
 - Nuclear energy does not release pollutants into the air, but it does produce highly radioactive waste.

Visual Concept: Nuclear Energy



Uranium-235

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Preview 🏠

Main 🏠

Alternative Sources of Energy, *continued*

- Solar power plants and solar cells can make electricity from sunlight.
 - Every day, Earth receives more energy from the sun than the United States uses in an entire year.
 - Solar panels can store the sun's heat and use it for energy.
 - Solar cells are able to produce electricity from sunlight.

Alternative Sources of Energy, *continued*

- The energy in wind can be harnessed by windmills.
 - Wind has been used as a source of renewable energy by humans for thousands of years.
 - Windmills can be used to make electricity.
 - Wind energy can be unreliable. Wind doesn't blow steadily all the time.
 - Variations in the amount of wind can cause differences in the amount of power generated.

Alternative Sources of Energy, *continued*

- Geothermal energy taps Earth's warmth.
 - Under Earth's crust, reservoirs of steam are heated by beds of magma.
 - Wells drilled into the steam reservoirs cause the steam to rise to the surface.
 - The steam is used to turn turbines to generate electrical energy.
 - Geothermal energy is a major source of energy in volcanically active areas.
- **geothermal energy**: the energy produced by heat within the Earth

Alternative Sources of Energy, *continued*

- Moving water produces hydroelectric energy.
 - Hydroelectric power plants use dams built on fast moving rivers.
 - Stored water pours through turbines, making them spin.
 - Turbines are connected to generators that produce electricity.
 - Dams have already been built on most of the world's big rivers, so potential for increasing energy from this source is limited.

Visual Concept: Renewable Energy Resources



The Efficiency of Energy Conversion

- › Why is energy conversion never completely efficient?
- › Regardless of which energy resource is used, some energy is lost each time energy is converted from one form to another.

The Efficiency of Energy Conversion, *continued*

- Energy is wasted when input is greater than output.
 - When energy is converted or transferred, some energy is lost.
 - Most power stations that use fossil fuels for energy are only 30 to 40% efficient.
 - Newer power stations recycle waste heat to increase efficiency.

The Efficiency of Energy Conversion, *continued*

- Wasted energy can be used.
 - Waste heat can be used for other purposes, for example:
 - Hot water from power stations can be used to heat homes.
 - The recycling of waste heat conserves energy and makes electricity less expensive.
- Energy conversion sometimes produces physical waste.
 - Nuclear stations produce toxic waste.
 - Coal plants produce smoke and air particulates.