CHAPTER 3

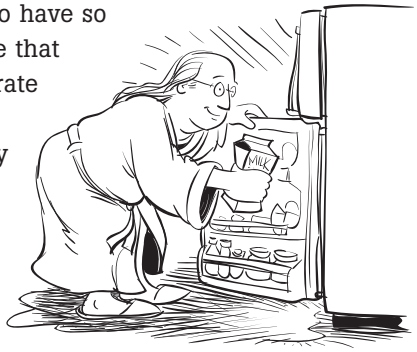
ENERGY SOURCES FOR ELECTRICITY GENERATION

How we use different energy sources to produce electricity

TERMS IN GLOSSARY

alternative energy
biomass
capacity
deplete
fossil fuels
geothermal energy
green energy
hydrogen gas
hydropower
nonrenewable energy
nuclear fuels
ocean energy
regenerate
renewable energy
solar energy
sustainable
wind energy

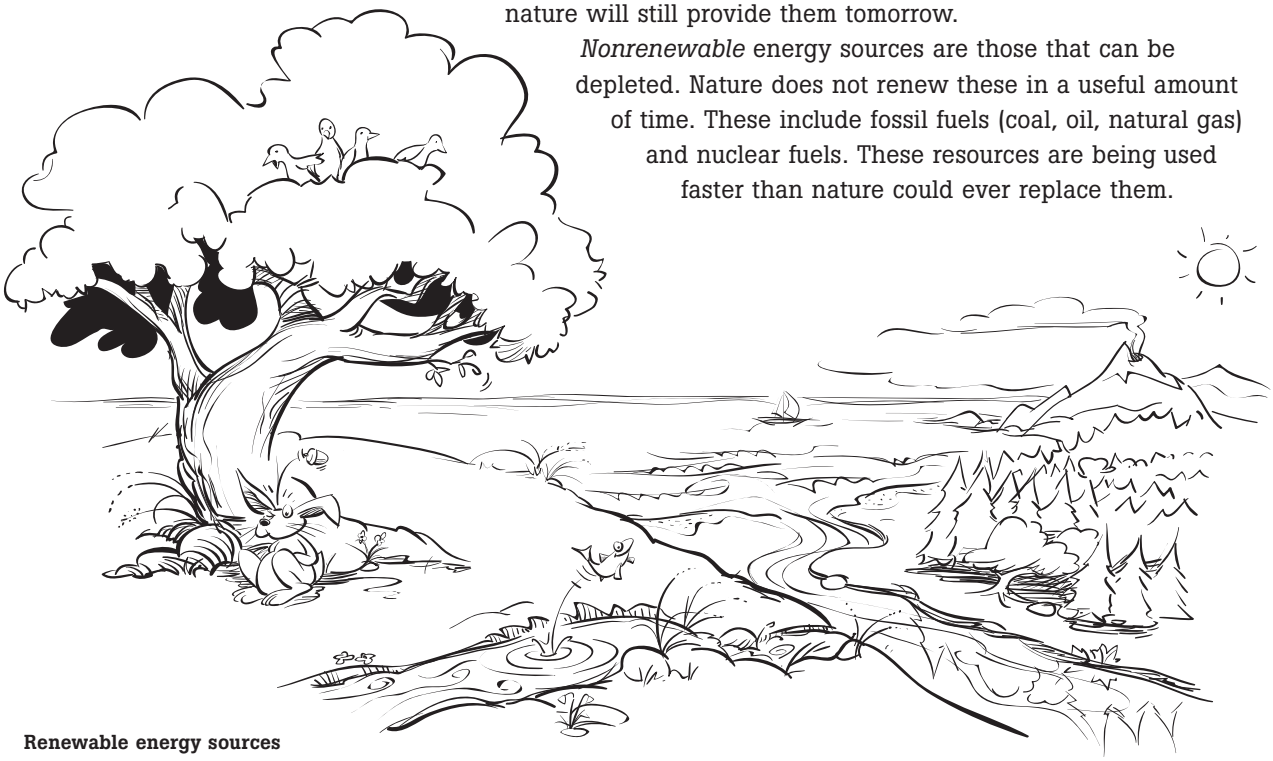
IT'S EASY TO TAKE our seemingly plentiful supply of electricity for granted, especially in the United States. We can flick on our lights or get a cold drink from our refrigerators just about anytime we want. Since we seem to have so much electricity, we might conclude that the energy sources we use to generate this electricity are also found in abundant quantities; but this is only partially true. Renewable energy sources will always be available, but others — the nonrenewables — are being used up.



RENEWABLE AND NONRENEWABLE ENERGY SOURCES

Renewable energy sources are those that are naturally regenerated, or renewed, within a useful amount of time: wood and other substances produced by living things (biomass), natural heat from the earth's interior (geothermal), streams and rivers (hydropower), the wind, the sun (solar), and the ocean. We can use these resources today, and nature will still provide them tomorrow.

Nonrenewable energy sources are those that can be depleted. Nature does not renew these in a useful amount of time. These include fossil fuels (coal, oil, natural gas) and nuclear fuels. These resources are being used faster than nature could ever replace them.



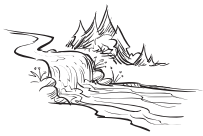
Renewable energy sources

Energy Resources for Electricity Generation

Renewable Energy Resources

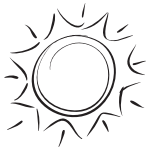
Biomass: Plant material (including wood) or organic waste

Geothermal: The natural heat in the earth



Hydropower: The force of moving water from streams, rivers or storage reservoirs

Ocean: The mechanical energy of ocean tides, currents, and waves, and the sun's heat energy stored in the ocean



Solar: The radiant energy from the sun

Wind: The force of moving air

The Renewable and Nonrenewable Resource

Hydrogen: Hydrogen gas produced from other energy resources; an energy carrier

Nonrenewable Energy Resources

Fossil Fuels: Coal, oil (petroleum), and natural gas

Nuclear Fuels: Elements with unstable nuclei, such as uranium

RENEWABLE? CLEAN? GREEN?

We sometimes read or hear the terms "clean energy," "green energy," "sustainable energy," and "alternative energy," along with the term "renewable energy." Some people use these terms interchangeably, which can be confusing.

Clean or *green* energy usually refers to energy that is environmentally friendly. When we generate electricity with these resources, very few pollutants, if any, enter our air or water.

Sustainable energy usually refers to a process, system, or technology that does not deplete resources or cause environmental damage. Sustainable energy practices preserve meaningful natural resource choices for future generations.

When people use the term *alternative* energy, they are usually speaking of alternatives to the conventional energy sources, which are fossil fuels, "large" hydropower, and nuclear. Alternative energy definitely includes renewables. More often, though, the term "alternative" is applied to certain transportation fuels — those other than gasoline and diesel, such as ethanol, biodiesel, and hydrogen.

ENERGY AWARENESS, ENERGY CHOICES

Electricity has contributed greatly to our comfort and to our society's development, but we are using up valuable and finite energy resources. Since the beginning of the Industrial Revolution our use of energy sources, particularly fossil fuels, has increased with each passing year. In the last 30 years alone, their use has tripled. Some worldwide experts believe that our ability to produce oil has peaked and that current rates of production cannot be sustained.

We are indeed fortunate to have other energy options. In the pages that follow you will find a comprehensive explanation of the energy resources and technologies we use to make electricity.

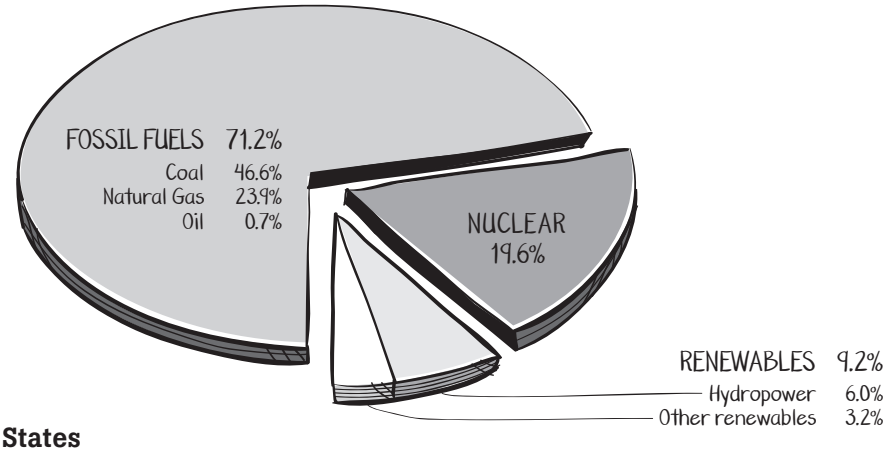
SIZING IT UP

In this chapter, power plant sizes (in kilowatts and megawatts) are given for each energy resource. A power plant's size is the amount of electricity it can produce at any one time. This is known as a plant's "capacity." But power plants do not always operate at full capacity. The amount of electricity actually produced over time depends on many factors. Some of these factors are addressed in the "Considerations" at the end of each resource section.

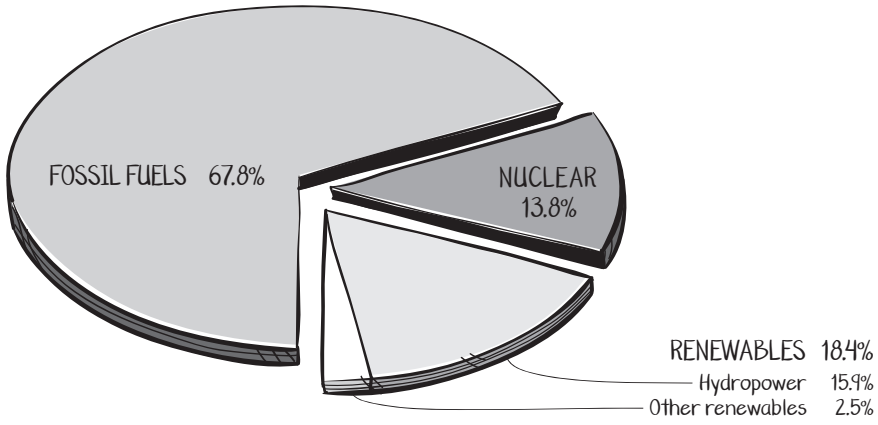
The percentages given in the pie charts on the next page are from actual electricity produced.

RESOURCES BEING USED TO GENERATE ELECTRICITY

These charts show the percentages of electricity produced from different energy resources in the United States and around the world.



United States
Year 2008



World
Year 2007

Source: U.S. Energy Information Administration, 2010

Renewable Energy Sources