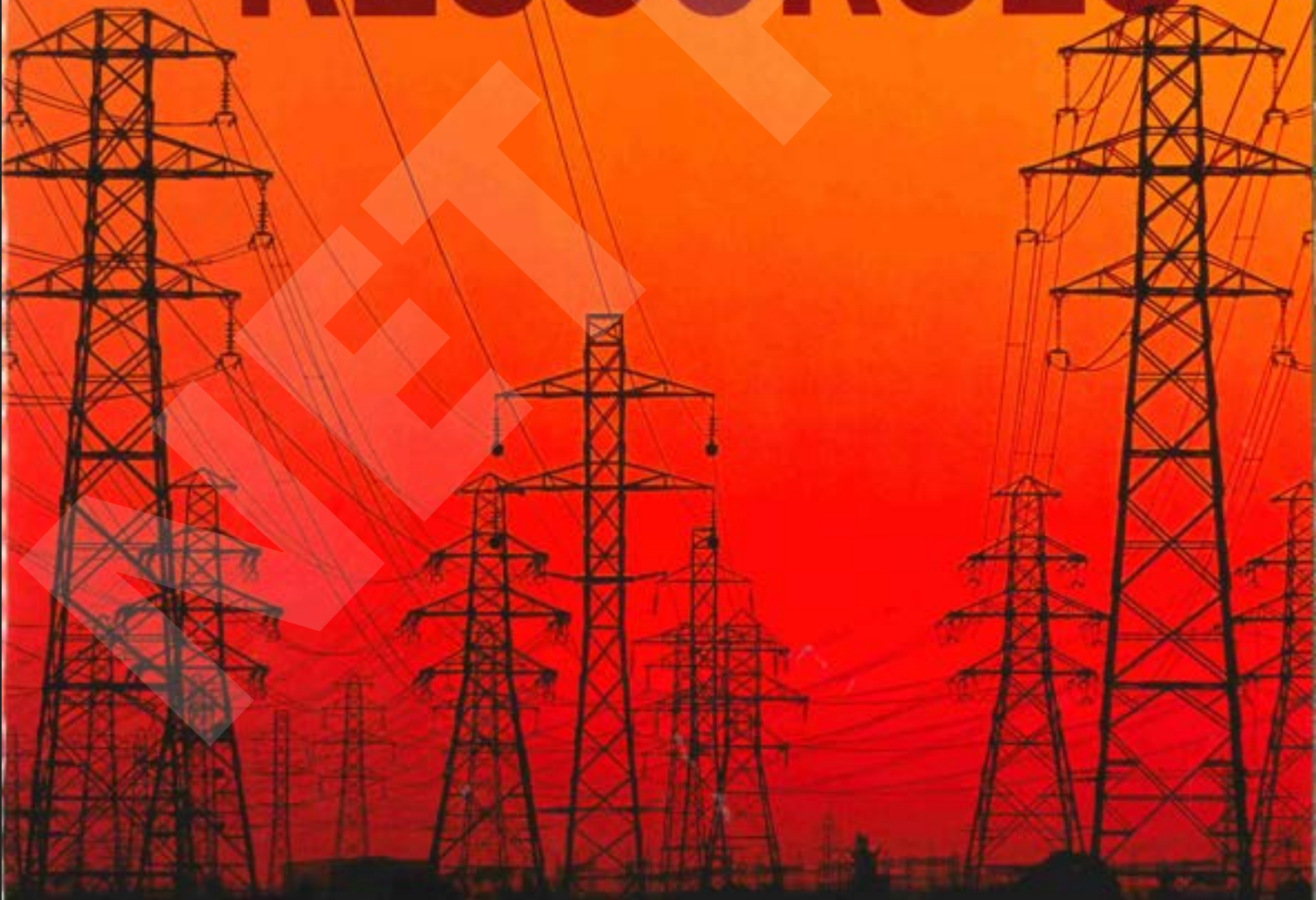


NATIONAL
GEOGRAPHIC

GLOBAL ISSUES

ENERGY RESOURCES



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HOW ETHANOL IS PRODUCED

Ethanol is a renewable fuel. It is made by breaking down sugarcane and fermenting it. It is an efficient way to produce fuel; little energy is lost in the process.

1. After harvesting, sugarcane is brought to the mill.



2. It is crushed to extract cane juice made of a simple sugar (sucrose).



3. The leftover fiber, called *bagasse*, is used to power the mill.



4. The juice is fermented to produce alcohol and then distilled for purity.



5. Ethanol is mixed with gasoline to make the fuel that powers engines.



Source: Sugarcane Industry Association of Brazil

THE ROLE OF BIOFUEL

Brazil's pioneering efforts made it the world leader in producing and exporting ethanol for decades. Although it is still the leading exporter, the United States moved ahead in production in 2005. However, about 17 percent of Brazil's total energy comes from this sugarcane-based fuel. Less than 2 percent of the energy in the United States comes from biofuels.

In the transportation sector, ethanol has become Brazil's major energy source. Brazil is among the top ten countries in the world for the number of automobiles on the road. Now more than half of the gasoline these vehicles use has been replaced by ethanol. In Brazil, all gasoline blends contain at least 20 percent ethanol, and some contain 85 percent ethanol. Almost all the new cars in Brazil are **flex-fuel vehicles**. That means they can run on gasoline, pure ethanol, or any mixture of the two.

HOW SUGARCANE BECOMES ETHANOL

During the process of photosynthesis, green plants convert the sun's energy into chemical energy. This energy is in the form of a sugar called sucrose. Sugarcane stores the energy as sucrose in the plant's stalks.

Sugarcane can be harvested annually for six or seven years without being replanted. The tops and leaves of the plant are left in the field. They may be collected and used as feed for animals.

After the cane is harvested, it is taken to a mill that produces sugar, ethanol, or both. (See the diagram above.) There the sugarcane stalks are chopped, shredded, and crushed to draw out the sucrose. The sucrose is then fermented to turn it into ethanol. In addition to the ethanol, the process produces leftover plant waste called *bagasse*. This waste is burned to produce electricity to run the ethanol processing plant.

Introducing
the **ISSUE**

ENERGY TO POWER

THE NO

Energy production in Hamburg, Germany,
has filled the skies with air pollution.



WHY ARE COUNTRIES AROUND THE WORLD LOOKING FOR NEW ENERGY RESOURCES?

Did you know that decayed plants and tiny creatures from millions of years ago provide most of the energy we use today? These types of **fossil fuels** include oil, coal, and natural gas. They provide energy to run everything from computers to jet airplanes to electric power plants. However, fossil fuels are **nonrenewable energy** and eventually will be used up. Fossil fuels also cause air, land, and water pollution and add to global climate change. As a result, scientists are looking for alternative energy sources.

What Can I DO?

Go on an Energy DIET

—and report your findings

You don't have to be an inventor to use energy wisely, as long as you care—and get involved. You can identify several ways to save energy at home and at school. By going on an energy diet and taking steps to use less energy, you can make a big difference.

IDENTIFY

- Create a list of all the ways you use energy at home and at school.
- Brainstorm with your family and classmates to generate ideas for ways to save energy.
- Conduct research on the Internet to learn about steps you can take to use less energy.
- Check with your local government or power company to see if they have ideas for saving energy.

ORGANIZE

- Assemble a team of 3 to 5 classmates and review National Geographic's Great Energy Challenge.
- Decide what energy-saving measures you will add to your diet every week.
- Check in every week and decide which actions you actually completed.

High school students work on a project to create a solar car.

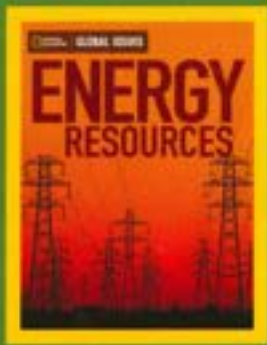


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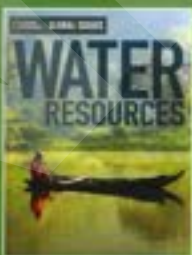
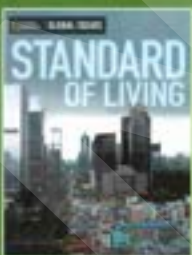
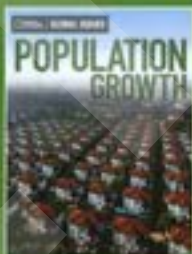
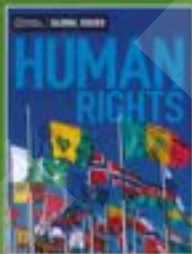
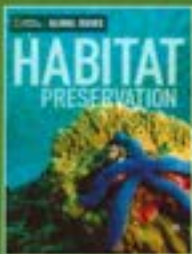
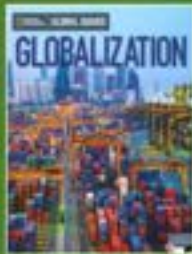
- Create a list of energy uses at the beginning of the diet and changes you will make to use less energy.
- Check the boxes of the actions you have completed on the Great Energy Challenge worksheet.
- Make video or audio recordings of members of your team discussing their experiences on the energy diet.

SHARE

- Use your photos and recordings to create a multimedia presentation about your energy diet and share it with your class.
- Write and perform a skit to present to your class or a school assembly about ways to save energy.
- Create Public Service Announcements for your school or a local radio station to encourage others to take specific steps to save energy.



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