

**Where Does Electricity
REALLY Come From and
How Is It Connected to
Water?**

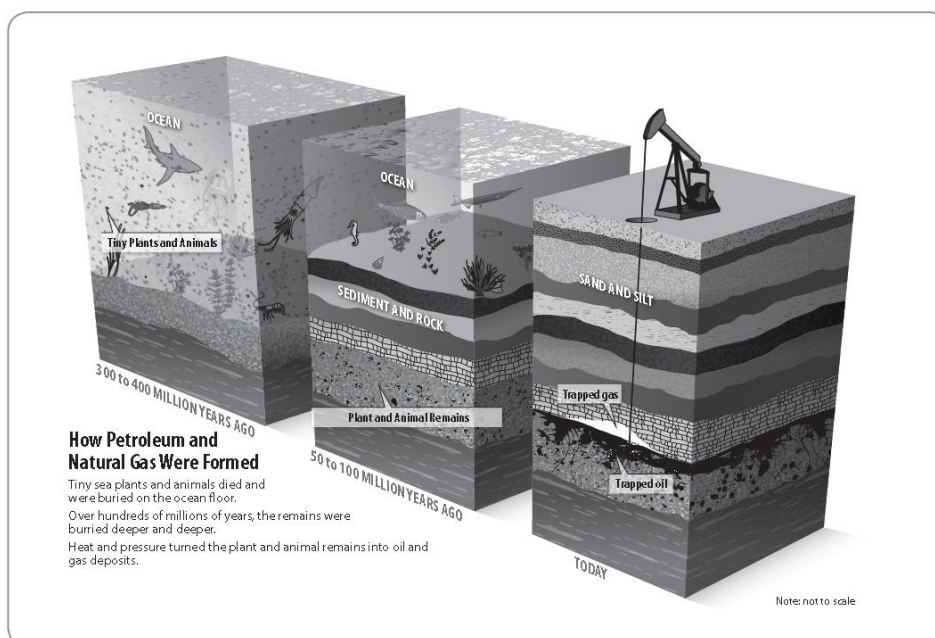
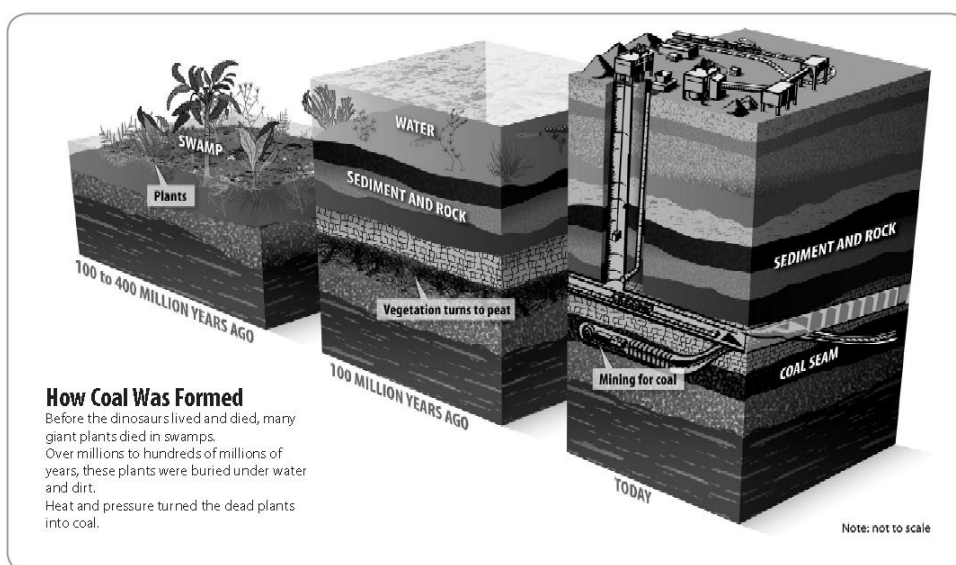
In New Mexico, most of our electricity is generated by burning fossil fuels, but what is a fossil fuel? And how can a fire make electricity?

Let's start with fossil fuels. Coal and natural gas are the fossil fuels we burn to make electricity in New Mexico. These fossil fuels are made from ancient plants. They have energy in them because of photosynthesis, the process of making food from sunlight, air and water.

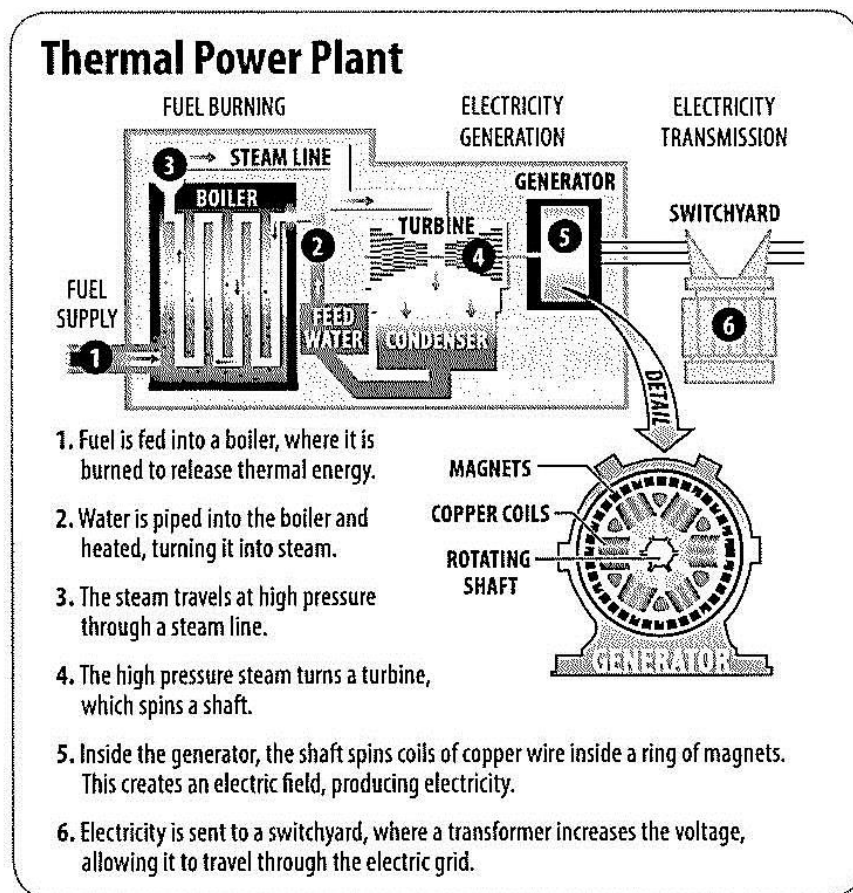
Only plants can photosynthesize. They take in carbon dioxide molecules from the air and hydrogen atoms from water. Plants then weave these gases together to grow and make food. Photosynthesis runs on energy from the sun. When you eat food, you feel energy. That's the sun's energy the plant used to make food. When we burn wood or ancient plants, we also get back the energy from the sun.

It takes a long time to turn plants into fossil fuels, as you can see in the diagrams below.

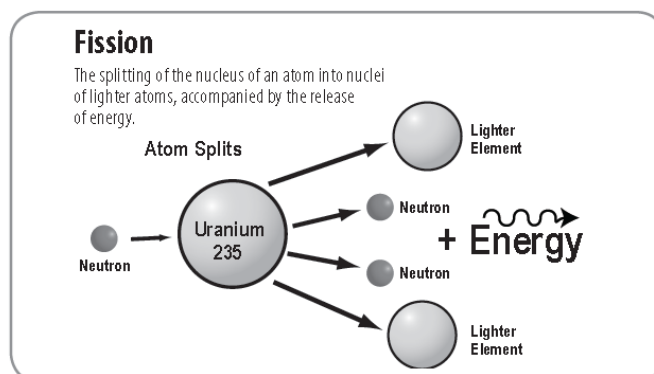
(All diagrams in this article come from <http://www.need.org/content.asp?contentid=197> unless otherwise specified)



Fossil fuels hold the sun's energy that fell on earth hundreds of millions of years ago. When we burn them, we feel the sun's heat and see its light from hundreds of millions of years ago. Most power plants burn fossil fuels. They use that heat to boil water and make steam. As the water goes from liquid to gas, it takes up more space. That expansion turns a turbine. It's like blowing on a pinwheel to make it spin. The turbine spins copper wires that are inside a ring of magnets. The spinning copper wire and magnets make electricity flow through the wire. It seems like magic, but it works like this:

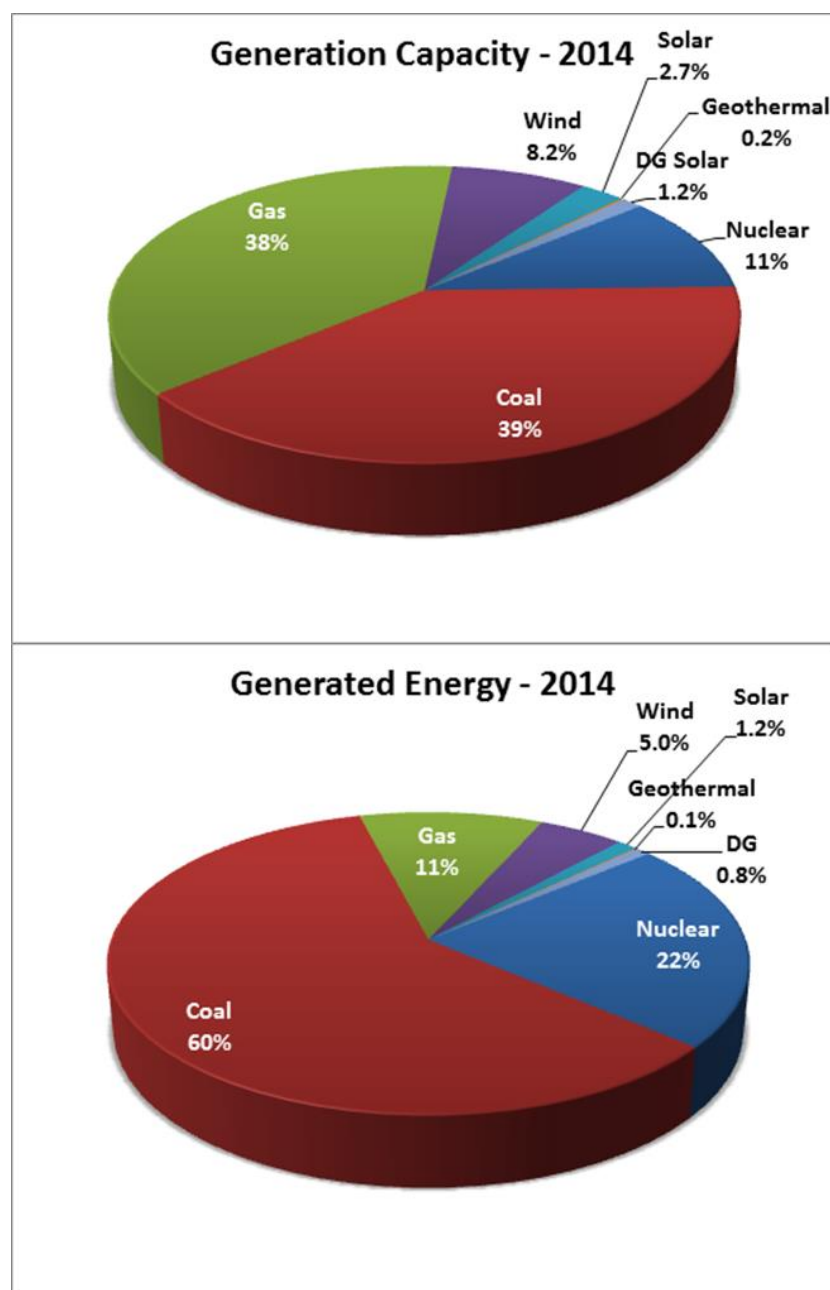


Thermal power plants can also use uranium to heat the water that makes steam that spins the copper wires. Uranium does not have energy from the sun. It is a radioactive metal found in the earth's crust. The nucleus of uranium is so large that it can be split into lighter elements, a process called fission. Fission gives off heat and other energy. The heat is used to boil water.



The Public Service Company of New Mexico (PNM) delivers electricity made at power plants in New Mexico or nearby states. Electricity flows through wires to Albuquerque. Much of our electricity comes from the San Juan Power Plant. It is a coal-fired power plant in northeastern New Mexico, near Farmington. Some of the electricity we use in Albuquerque comes from the Palo Verde Power Plant near Phoenix, AZ. This power plant uses uranium to heat water to make steam.

To understand where your electricity comes from, it is important to understand the difference between capacity and actual use. Visit <https://www.pnm.com/generation-portfolio> for more info.



Fossil Fuels:

- Coal
- Gas

Nonrenewable Fuels:

- Coal
- Gas
- Nuclear

Renewable Fuels:

- Solar (Solar electricity panels need no water to run)
- DG (Solar panels that create electricity near where it is used, for example, solar panels on rooftops)
- Wind (Windmills need no water to run)
- Geothermal (Underground steam, usually found near volcanic activity, is renewable because rain replaces the water used)

Note: Solar thermal electricity focuses the sun's rays to boil water. We don't have any of these power plants.

Capacity describes how much electricity PNM could make using each of the sources. However, wind does not always blow. The sun goes down at night. We need to invest in battery technology that will store electricity on a large scale so we can use these fuel sources efficiently. Natural gas is expensive. Most of your electricity comes from coal and nuclear, unless you have solar panels on your roof.

In New Mexico, our thermal power plants use nonrenewable fuels to boil water to make steam. Nonrenewable means that when we have used what is in the ground, it is gone. Coal is a nonrenewable, Natural gas is nonrenewable. Uranium is nonrenewable. Over 85% of the electricity you use comes from nonrenewable energy sources. [To learn more about other kinds of energy sources like wind, solar, and geothermal, visit <http://www.need.org/content.asp?contentid=197>]

Much of the electricity you use is made by burning coal at the San Juan Power Plant. The plant uses water from the San Juan River to make steam. San Juan River water is important to Albuquerque in another way. More than half of our drinking water comes from that river. The map below shows how some San Juan River water flows through a 26 mile long tunnel and ends up in the Rio Grande. We share this source of water with the San Juan Power Plant. When we waste electricity, we are wasting the San Juan River water that it took to make the electricity. When we conserve electricity we are saving San Juan River water.



http://www.abcwua.org/San_Juan_Chama_Project.aspx

It works the other way around too. When we waste water, we are wasting electricity. That's because it takes so much electricity to deliver clean water to homes, schools, malls, and soccer fields. Almost half of our water comes from our underground aquifer. The wells use a lot of electricity to pump that water up 600 feet. The rest of our water comes from the river. It takes a lot of electricity to clean river water. Then we use a lot electricity to pump the water to people who need it. If we waste water, we are wasting the electricity it took to clean and pump it. When we conserve water we are conserving electricity.

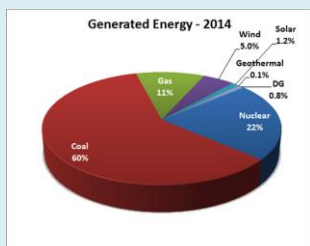
Our water is limited. The fuel sources we use to make electricity are limited. Both water and electricity are connected to each other. It makes sense to conserve them both.

Vocabulary

1. Fossil fuels
2. Photosynthesis
3. Carbon dioxide
4. Hydrogens (in water)
5. Turbine
6. Magnets
7. Nonrenewable resources
8. aquifer

Questions

1. What does photosynthesis have to do with fossil fuels?
2. How does making a fire help to make electricity?
3. What is one central idea of this article? What information is given to help readers understand that central idea?
4. Based upon the pie chart entitled "Generated Energy in 2014," what percentage of our electricity came from burning fossil fuels?
5. Observe the two pie charts on page 4. What are some of the biggest differences between the percent of fuel we could use (capacity) and the percent we actually did use (generated) in 2014?
6. Explain why you are wasting water if you waste electricity.
7. Explain why you are wasting electricity if you waste water.
8. List 10 ways you can save water AND electricity.



New Mexico Water Electricity Info Text



Summary: Students read about how the electricity they use is generated from fossil fuels and uranium. They learn about nonrenewable resources. They learn that it takes water to make electricity and it takes electricity to clean and deliver water.

Grade: Six

Subject Areas: Science, Social Studies

Common Core Standards and Benchmarks

Key Ideas and Details:

[CCSS.ELA-Literacy.RI.6.1](#)

Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

Craft and Structure:

[CCSS.ELA-Literacy.RI.6.4](#)

Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.

[CCSS.ELA-Literacy.RI.6.2](#)

Determine a central idea of a text and how it is conveyed through particular details; provide a summary of the text distinct from personal opinions or judgments.

NextGen Science Standards and Benchmarks

ESS2.A: Earth's Materials and Systems

- All Earth processes are the result of energy flowing and matter cycling within and among the planet's systems. This energy is derived from the sun and Earth's hot interior. The energy that flows and matter that cycles produce chemical and physical changes in Earth's materials and living organisms. (MS-ESS2-1)
- The planet's systems interact over scales that range from microscopic to global in size, and they operate over fractions of a second to billions of years. These interactions have shaped Earth's history and will determine its future. (MS-ESS2-2)

LS1.C: Organization for Matter and Energy Flow in Organisms

- Plants, algae (including phytoplankton), and many microorganisms use the energy from light to make sugars (food) from carbon dioxide from the atmosphere and water through the process of photosynthesis, which also releases oxygen. These sugars can be used immediately or stored for growth or later use. (MS-LS1-6)

NM Science Standards and Benchmarks

II.II.III. Structure and Function of Cells

- 6.1. Explain how fossil fuels were formed from animal and plant cells.
- 6.2. Describe the differences between substances that were produced by living organisms (e.g., fossil fuels) and substances that result from nonliving processes (e.g., igneous rocks)