

WATT'S UP?

ELECTRICITY AT WORK

by Jenny Mason

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Words in **bold** are in the glossary.

INTRODUCTION

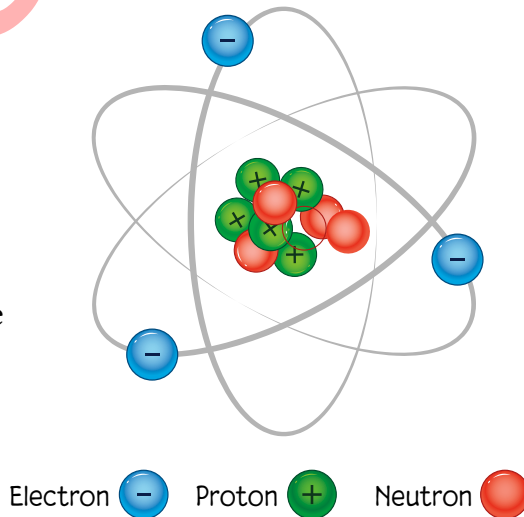
HIDDEN POWERS

Zip. Blip. The power's out! Suddenly, you have no lights, TV, or Internet. And there's no hot water for a shower! Traffic lights wink off. Subway trains stop. Businesses shut down.

Your home, restaurants, schools, hospitals, and transportation rely on electricity. Electricity is a natural energy people first harnessed about 200 years ago. Since then, people have come up with clever ways to transport and use electricity to power our world.

Subatomic Charges

Protons have a positive charge. Electrons have a negative charge. And neutrons are neutral. Like charges repel each other, while opposite charges attract each other.



WHAT'S THE BUZZ ON ELECTRICITY?

What is electricity?

Electricity is a natural force. It can be used to make light and heat or to make machines work.

Where does electricity come from?

Everything in the universe is made of super-tiny building blocks called **atoms**. Each atom has **protons**, **neutrons**, and **electrons**. Sometimes, electrons can move from one atom to the next. That movement creates electricity.

What's the difference between a conductor and insulator?

Electricity moves through **conductors**. Conductors are materials that help electrons flow easily. Water and certain metals are conductors. **Insulators** slow or stop the flow of electrons. Wood, plastic, and rubber are insulators.

How is electricity measured?

Amps tell you how quickly the electrons are moving. Volts tell you how much pressure there is on the electrons. The energy of electricity can be put to work. The difficulty of the work is measured in watts.

$$\text{Watts} = \text{Amps} \times \text{Volts}$$

POWER SUPPLY

When you flip a light switch, a bulb shines instantly. Electricity is the energy feeding that light. The electricity that helps power your home comes from a power station. Power stations “wake up” electricity and get it moving. They use special machines called **turbine generators** to get electrical energy moving.

Generating Electricity

Turbine generators rely on a simple idea—changing the energy of movement into electrical energy. But it requires a lot of steps and parts.

Boiler: Fuels are burned to boil water. Smoke from the burnt fuel is released through a smokestack.

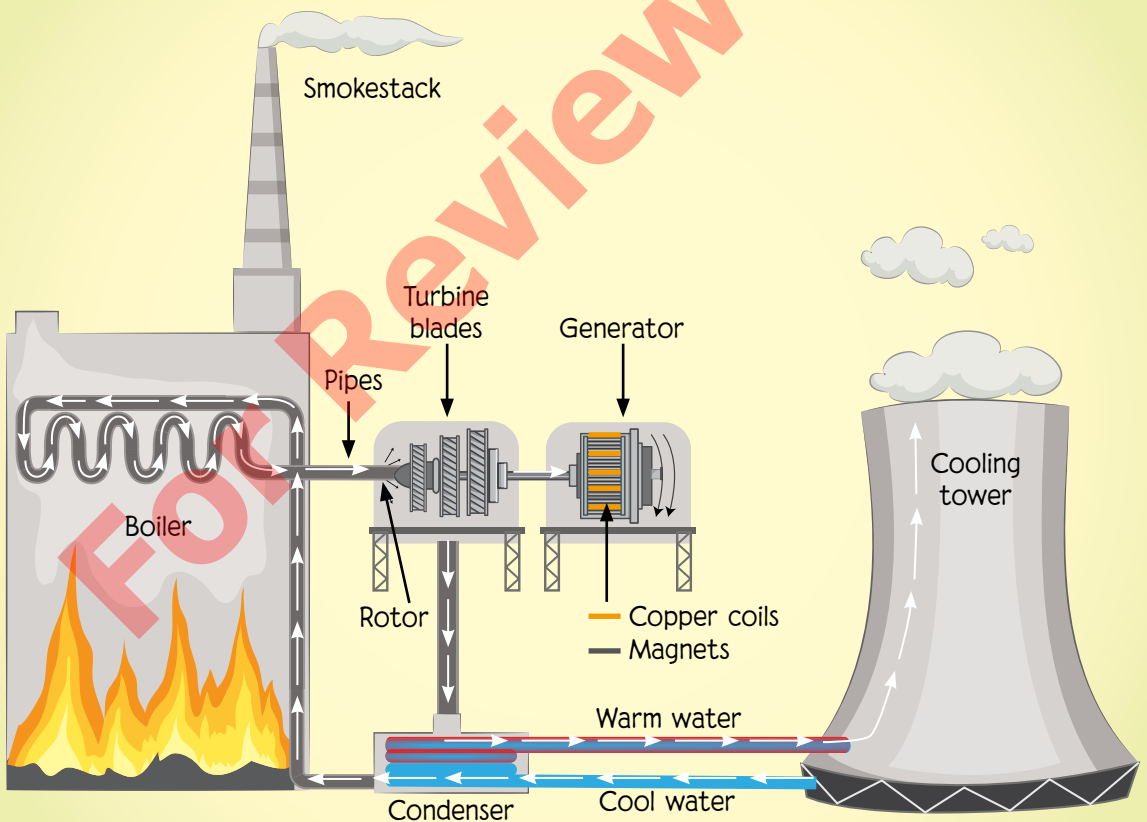
Pipes: Steam from the boiling water moves through pipes at high speeds.

Turbine: The steam whooshes through turbines, which are made of many fan blades. The blades whirl around. The steam condenses to warm water and falls into a condenser.

Rotor: The blades are attached to a long rod or rotor. The rotor spins too.

Generator: Magnets attached to the rotor whirl round and round. This motion creates a magnetic field of energy.

Electrical Power Plant



Coils: Wreaths of coiled copper wire surround the spinning magnets. The electrons in the copper are excited by the magnetic field. They flow through the wire. This flow is an electrical current that will pass along huge wires to towns and cities.

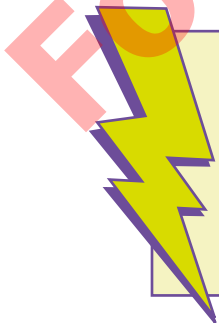
Cooling Tower: After moving the turbine blades, the steam moves to a cooling tower. When it cools, it changes back to water. That water is recycled back to the boiler.

A generator in a power station lights up with power.





Steam escapes from cooling towers at a power plant.



FACT

Besides burning fuels, power stations can also use fast-flowing water to spin turbines, or they can capture energy from the sun or wind.