NTC

THE CONSERVATION CREW

Brought to you by DUKE ENERGY

THE CONSERVATION CREW

EDUCATIONAL CONCEPTS

- How to measure energy use
- How energy is wasted
- How we conserve energy
- What renewable resources are

The Conservation Crew **is a series of improvisational comedy sketches performed by two professional actors. It's entertaining and educational, teaching you about resources and energy conservation. By taking your suggestions, the actors allow you to help create the show!**

WORDS TO KNOW

Aerator . . . . . A small attachment on a faucet to save water in kitchens and bathrooms

Energy-Efficient Lightbulb . . . . . A lightbulb that uses less energy than an incandescent lightbulb

Conserve . . . . . To save or use wisely

Efficient . . . . . Producing very little waste

Electricity . . . . . A source of energy used in many ways

Energy . . . . . The ability to do work and the force that makes things change

Energy-Efficient Showerhead . . . . . A showerhead that saves water and energy

Hot Water Temperature Gauge . . . . . A card that shows the temperature of your water to help you save energy

Kilowatt . . . . . 1,000 watts of electricity

Kilowatt-hour . . . . . Using 1,000 watts of electricity for one hour

Resource . . . . . Things we use to make electricity, like coal, oil, natural gas, water, solar power and wind

Waste . . . . . To use more than necessary

Watt . . . . . A unit of electrical power

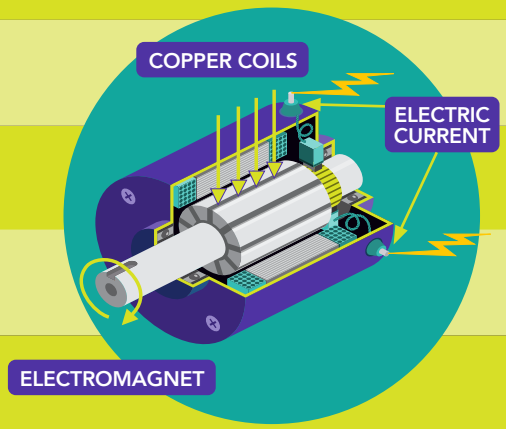
WHAT DOES IT MEAN TO CONSERVE ENERGY?

Conservation means using resources carefully so they don't run out. We've all heard about conserving water. Water is a precious natural resource upon which we all rely. But what does it mean to conserve energy?

Energy is the capacity to do work. It takes energy to walk down the street, to make a car run or to cook breakfast on your stove. The kind of energy we use to run our electronic devices is called electricity. We all use electricity every day in about a million different ways. But why do we need to save electricity? To answer that, let's talk about how electricity is generated.

Electricity can be generated in a number of ways, but the two most common are at a traditional power plant using non-renewable resources or by using renewable resources. At a traditional power plant, a fossil fuel like natural gas is burned to boil water. This boiling water then creates a very powerful steam that spins a turbine connected to a magnet surrounded by copper coils. The spinning magnet and copper coils then create electricity. So the more electricity we need, the more resources it takes to make it. By conserving electricity, we are reducing the amount of non-renewable resources it takes to make it.

There are also renewable resources like wind, solar and hydro power that we can use to make electricity. Those renewable resources are explored on pages 9 and 10.



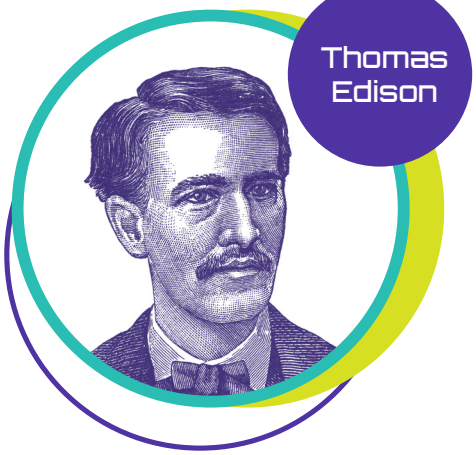
Electricity use has dramatically changed daily life

Despite electricity's great importance in daily life, few of us probably stop to think about what life would be like without it. People tend to take it for granted. However, people use electricity to do many jobs every day – from lighting lamps to heating and cooling homes to powering televisions and computers.

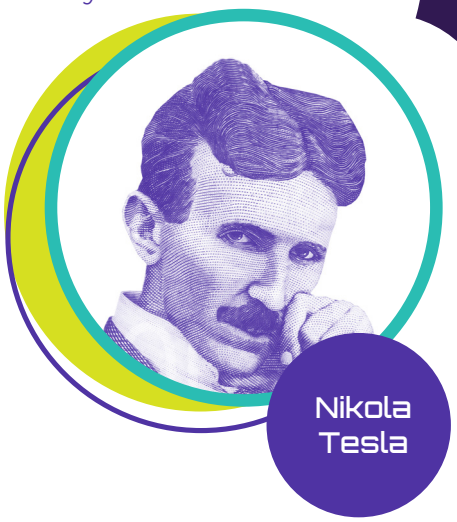
Before electricity became widely available nearly 150 years ago, candles, whale oil lamps and kerosene lamps provided light; iceboxes (literally a box with a huge chunk of ice) kept food cold; and wood-burning or coal-burning stoves provided heat.

Scientists and inventors have worked to decipher the principles of electricity since the 1600s. From the 1700s through the early 1900s, Benjamin Franklin, Thomas Edison and Nikola Tesla made notable contributions to our understanding and use of electricity.

Benjamin Franklin



Thomas Edison



Nikola Tesla

Sources: www.eia.gov/kids/energy-sources/electricity
www.eia.gov/energyexplained/electricity/measuring-electricity.php

Electricity is measured in watts and kilowatts

Electricity is measured in units of power called *watts*. One watt is a small amount of power. Some devices require only a few watts to operate, and other devices require larger amounts. The power consumption of larger devices is measured in kilowatts (kW), or thousands of watts.

The electricity made at a power plant is often measured in even bigger multiples of watts, such as megawatts (1 million watts) or gigawatts (1 BILLION watts). One MW is 1,000 kW (or 1 million watts), and one GW is 1,000 MW (or 1 billion watts).

Electricity use over time is measured in watt-hours

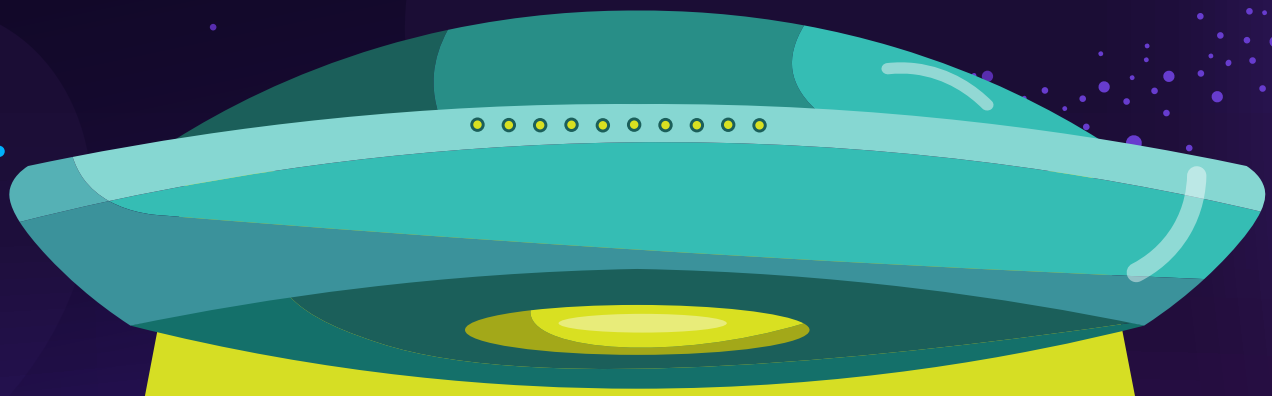
A watt-hour (Wh) is equal to the energy of 1 watt steadily supplied to an electric circuit for one hour. For example, if you use a 40-watt lightbulb for five hours, you have used 200 Wh of electrical energy (40W x five hours). The amount of electricity that a power plant generates or an electric utility customer uses is typically measured in kilowatt-hours (kWh). One kWh is 1 kilowatt consumed for one hour.

Utility companies measure electricity use with meters

Electric utilities measure the electricity consumption of their customers with devices called electrical meters. These meters periodically report electricity use to utilities with an electronic signal.

Now many utilities use electronic smart meters. Some smart meters can even measure the electricity use of individual devices and allow the customer to control electricity use remotely.

HOW ENERGY IS WASTED



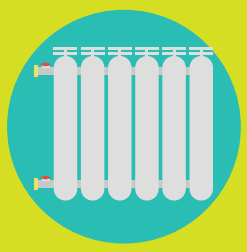
Electricity on demand

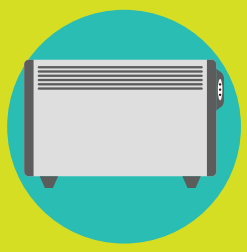
The amount of electricity used in homes and businesses depends on the day, the time and the weather. For the most part, electricity must be generated at the time it is used. Electric utility companies and grid operators must work together to generate the right amount of electricity to meet demand. When demand increases, operators can respond by increasing production from power plants that are already operating, generating electricity from power plants that are already running at a low level or are on standby, importing electricity from distant sources, or calling on customers who agreed to consume less electricity.

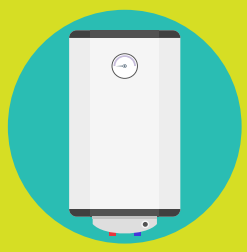
How electrical waste happens

Electricity is wasted every day. We can waste electricity when we leave lights, appliances and other electronic devices running when we are not using them. We can also waste energy by leaving homes too warm in the winter. Air conditioners can be set too cool in the summer, resulting in wasted electricity as well. Electric water heaters can also have the temperature set improperly.

Lighting, space heating and cooling, and water heating are the three biggest culprits when it comes to wasted electricity. There are some other ways that electricity gets wasted that you may not have thought of, though, like standby power and phantom energy.







Source: www.eia.gov/energyexplained/use-of-energy/electricity-use-in-homes.php

Standby power

A surprisingly large number of electrical products – from TVs to microwave ovens to air conditioners – cannot be switched off completely without being unplugged. These products draw power 24 hours a day, often without the knowledge of the consumer. We call this power consumption "standby power." An individual product draws relatively little standby power but a typical American home has 40 products constantly drawing power. Together these amount to almost 10% of residential electricity use. Items that have remotes, internal clocks, or are always on will often use standby power.

Sources: www.energy.gov/eere/articles/warding-energy-vampires-and-phantom-loadsstandby.lbl.gov/
www.epa.gov/energy/about-us-electricity-system-and-its-impact-environment

Phantom energy

Phantom energy refers to appliances or other plugged-in devices that draw energy, or phantom loads, when they are plugged in but not in use. These can be things like phone chargers or devices with red "off" lights. These vampires are wicked and wasteful, costing U.S. households an average of $100 per year!

HOW WE CONSERVE ENERGY

- Turn off lights and appliances when you are not using them. This is one of the best ways to save electricity and reduce the amount of resources it takes to make it.
- Switch to energy-efficient lighting to cut your energy bills. By replacing your home's five most frequently used light fixtures or bulbs with models that have earned the ENERGY STAR® label, you can save up to $45 each year.
- Use a programmable thermostat to adjust the heating or air conditioning according to a pre-set schedule.
- You can easily save energy in the winter by setting the thermostat to 68°F while you're awake and setting it lower while you're asleep or away from home.
- In the summer, you can follow the same strategy with central air conditioning by keeping your house warmer than normal when you are away, and setting the thermostat to 78°F only when you are at home and need cooling.
- Wash your clothes in cold water using cold water detergents whenever possible.

- You can significantly reduce hot water use by simply repairing leaks in fixtures or pipes. A leak of one drip per second wastes 1,661 gallons of water and can cost up to $35 per year.
- For maximum water efficiency, select a showerhead with a flow rate of less than 2.5 gallons per minute.
- Use faucet aerators. For maximum water efficiency, purchase aerators that have flow rates of no more than 1 gallon per minute.
- Wash and dry full loads of laundry. If you are washing a small load, use the appropriate water-level setting.
- Dry towels and heavier cottons in a separate load from lighter-weight clothes.
- Don't over-dry your clothes. If your machine has a moisture sensor, use it.
- Use the cool-down cycle to allow clothes to finish drying with the heat remaining in the dryer.
- Consider air drying clothes on clotheslines or drying racks. Air drying is recommended by clothing manufacturers for some fabrics.

Sources: www.energy.gov/energysaver/save-electricity-and-fuel/lighting-choices-save-you-money
www.energy.gov/energysaver/thermostats
www.energy.gov/energysaver/water-heating/reduce-hot-water-use-energy-savings
www.energy.gov/energysaver/appliances-and-electronics/laundry

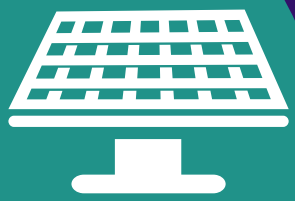
WHAT RENEWABLE RESOURCES ARE

Renewable energy is electricity generated by fuel sources that restore themselves over a short period of time and do not diminish. Renewables are considered environmentally preferable to conventional sources and, when replacing fossil fuels, have significant potential to reduce greenhouse gas emissions.

Here are the three main renewable resources:

Solar Power

Solar photovoltaic (PV) devices, or solar cells, change sunlight directly into electricity. Small PV cells can power calculators, watches and other small electronic devices. Arrangements of many solar cells in PV panels can produce electricity for an entire house. Some PV power plants have large arrays that cover many acres to produce electricity for thousands of homes.



An example of an early solar energy collection device is the solar oven (a box for collecting and absorbing sunlight). In the 1830s, British astronomer John Herschel used a solar oven to cook food during an expedition to Africa. People now use many different technologies for collecting and converting solar radiation into useful heat energy for a variety of purposes.

Sources: www.epa.gov/statelocalenergy/state-renewable-energy-resources
www.eia.gov/energyexplained/solar
www.eia.gov/energyexplained/hydropower
www.eia.gov/energyexplained/wind

Wind Power

Wind is caused by uneven heating of the Earth's surface by the sun. Because the Earth's surface is made up of different types of land and water, it absorbs the sun's heat at different rates. One example of this uneven heating is the daily wind cycle.

During the day, air above the land heats up faster than air over water. Warm air over land expands and rises, and heavier, cooler air rushes in to take its place, creating wind. At night, the winds are reversed because air cools more rapidly over land than it does over water. Utilities use the power of the wind to spin a wind turbine. Just as in a traditional power plant, the turbine spins to create electricity.

Hydro Power

Because the source of hydroelectric power is water, hydroelectric power plants are usually located on or near a water source. The volume of the water flow and the change in elevation (or fall) from one point to another determine the amount of available energy in moving water. Swiftly flowing water in a big river, such as the Columbia River, carries a great deal of energy in its flow. Water descending rapidly from a high point, such as Niagara Falls in New York, also has substantial energy in its flow. At both Niagara Falls and the Grand Coulee Dam on the Columbia River, water flows through a pipe, or penstock, then pushes against and turns blades in a turbine to spin a generator to produce electricity.