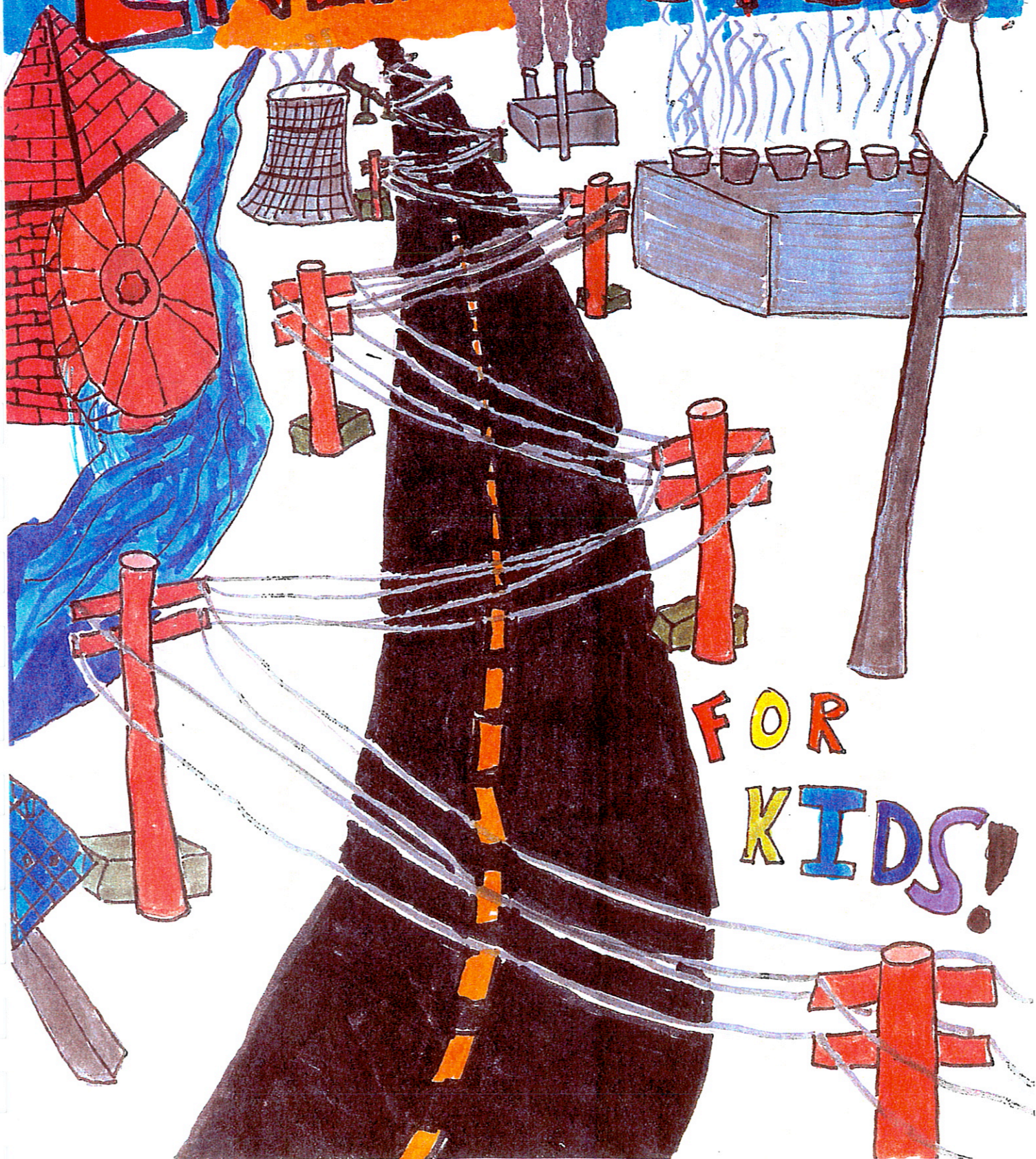


ENERGY GUIDE



FOR
KIDS!

Electricity

What Is Electricity?

Anything you plug in is powered by electricity. Some things that are electric are light bulbs, toasters, and coffee makers. All these things use electricity. The electricity comes from the power plants. Power plants make electricity. They use steam to turn turbines that in turn creates moving electrons that turn into electricity. These power plants use fossil fuels and nuclear power.

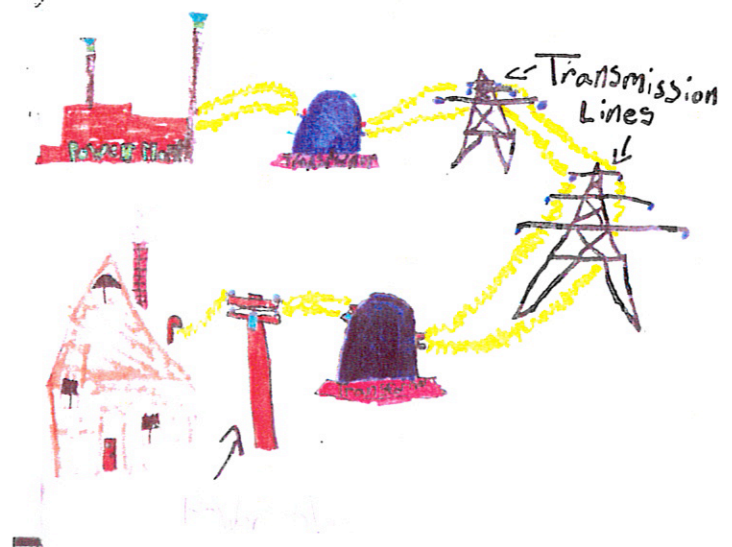
The History of Electricity

The word electricity comes from "elektron" which means amber in Greek. A Greek named Thales discovered static electricity around 600 BC. In 1752 Ben Franklin proved that static electricity and lightning were the same thing. In 1876 Charles Brush invented a generator that could make a steady current of electricity. In 1879 Thomas Edison invented an incandescent light bulb. In the same year California Electric Light Company was the first company to sell electricity to customers.

Today we use electricity for many things like computers, microwaves and lights. Electricity comes from wind, solar, fossil fuels, geothermal, biomass, water and nuclear power. If you put them all together, then they will make enough electricity to power many things around the world.

Cool Facts about Electricity

- ❖ Electricity is a form of energy made by the movement of electrons
- ❖ Just 200 years ago electricity was not used to power anything in the world
- ❖ Static electricity is the kind of electricity you feel after you drag your feet across a carpet and touch someone
- ❖ Lightning is static electricity but more spectacular



By: Julia Michaels

Fossil Fuels

How It Works

Oil is burned directly to heat water, which makes steam. Steam turns the turbines, which turns the generators. The generator creates electricity. Then electricity power is sent through wires around the country.

The History of Coal

Coal was discovered by explorers in 1673 along the Illinois River in northern Illinois. It was not mined commercially until the 1740's in Virginia. Before then coal had been used by the Hopi Indians for heating and cooking. In 1816 Baltimore, Maryland became the first city to light its streets with gas made from coal. Coal is still the number one fuel used to produce electricity. Today over half of the electricity in the United States is produced by burning coal in power plants.

Advantages

- ❖ A very large amount of electricity can be generated in one place using coal, oil, and gas
- ❖ Transporting oil and gas to power stations is easy
- ❖ A gas-fired power station is very efficient
- ❖ A fossil fuel power station can be built almost any where so long as you can get a large amount of fuel to it

Disadvantages

- ❖ Fossil fuels cause global warming and basically the main draw back of fossil fuel is pollution
- ❖ Burning any fossil fuel produces carbon dioxide, which contributes to the Green House effect warming the earth
- ❖ Mining coal is dangerous and destroys the land

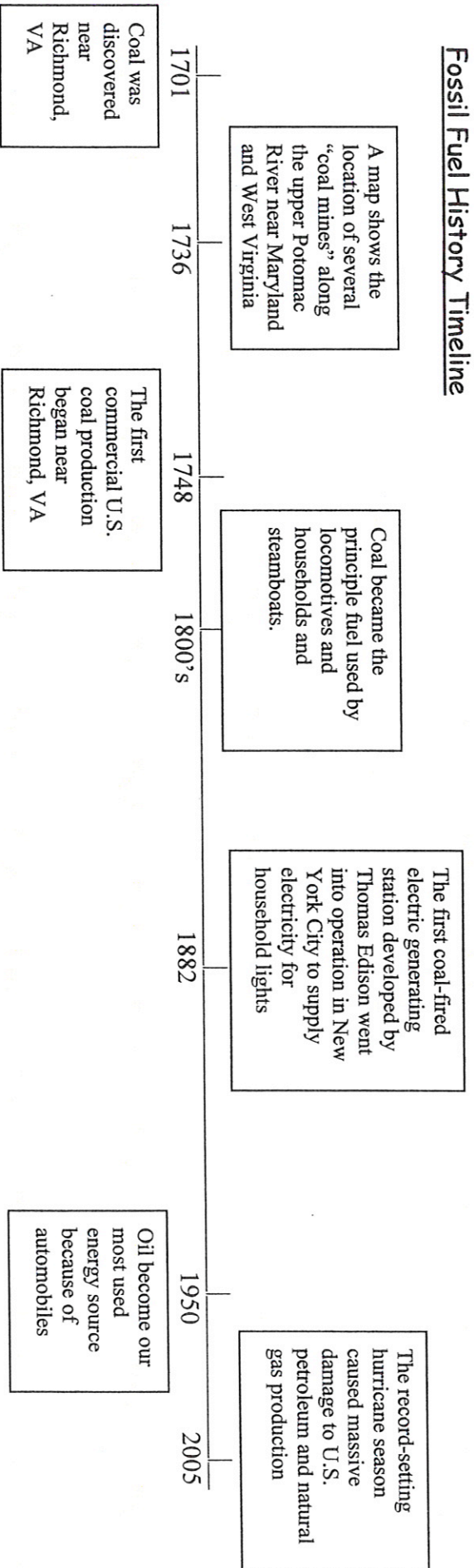


Cool Facts on Fossil Fuels

- Oil is a dark syrupy liquid.
- The weight and other natural forces turned tiny plants and animal bodies into oil and natural gas
- Like the air we breathe, natural gas is invisible
- Gasoline is a liquid fuel made from oil
- The United States is the world's largest user of petroleum

By: Jacob

Fossil Fuel History Timeline



Cool Facts about Fossil Fuels

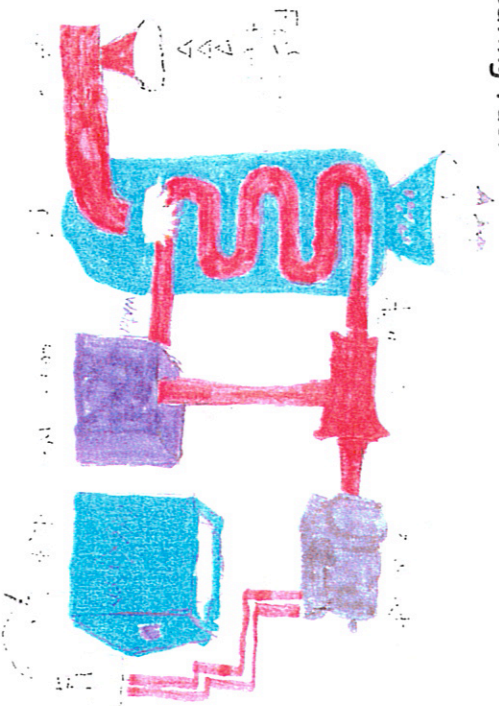
- ❖ Natural gas is colorless, odorless, and tasteless. A chemical called mercaptan is added to give it a toxic smell. That's why natural gas smells like rotten eggs!
- ❖ Over one half of the homes in the U.S. use natural gas as their main heating fuel
- ❖ New Mexico is the fifth largest oil producing state in the country

Advantages

1. It is cheap to transport
2. A tons of electricity can be made in one place
3. Natural gas power plants are very efficient

Disadvantages

1. Fossil fuels pollute the air with carbon dioxide
2. Getting coal from mines is difficult and dangerous
3. Sulphur dioxide makes acid rain
4. Strip mining destroys large areas of land



By: Merari

Oil History Time Line

Oil has been used for over five thousand years as a source of power. The Mesopotamians used rock oil in medicines and adhesives (glue, tape or anything that's sticky) in the year 3,000 B.C. In 2,000 B.C., the Chinese used crude oil in lamps and for heating their homes. In the year 1750 oil was found in a lot of places in Northwest Pennsylvania and Western New York. Oil was first discovered in 1854 when a rig drilled down in Titusville, Pennsylvania and came up coated with oil.

In the 1890's Henry Ford made the first automobile. Also in this time kerosene (a fossil fuel) had been the main oil product. In 1920 there were nine million cars in the United States of America. Petroleum (oil) became our greatest energy source in 1950 because of cars. Our nation depends on oil for many things such as cars, light, heat, and much more. Now that's a lot of power!

Recent News

The hurricane season in 2005 caused a lot of damage to the U.S. petroleum and Natural Gas Company. Hurricane Katrina and Rita, caused a lot of damage to off shore platforms in August and September. They hit the Gulf of Mexico, one of our nation's largest sources of oil and natural gas production.

Turning fossil fuels into Electricity

First you start out with some coal and then you burn it. This then heats up water so it makes steam. Once you have all that steam in a small room it builds up a lot of pressure. There's a small opening in the room so when the compact steam comes out it comes at a high speed. Then the steam goes through some pipes and finally hits a turbine and the pressurized steam makes the turbine turn. Then the turbine spins a generator, which makes electrons move which makes electricity.

When fossil fuels such as coal are burned the carbon mixes with the oxygen in the fire and creates heat and carbon dioxide (CO₂). Carbon Dioxide is also known as pollution.

Advantages

1. Warms homes
2. Useful products (heaters, stoves)
3. Swift comfortable transportation
4. It's cheap and can be used all the time

Disadvantages

1. It pollutes
2. The U.S. needs to buy oil products from
3. other countries
4. Nature takes million of years to produce oil
5. Coal dirties a lot of our water
6. When coal is burned as fuel, it gives off carbon dioxide



By: Tatyana

The History of Nuclear Power

In 1896 Henri Becquerel discovers uranium gives off a special ray. In 1898 Marie and Pierre Curie discover radioactive polonium and radium. In 1932 James Chadwick calls an atom a neutron because it is electrically neutral. In 1953 the first nuclear powered submarine was launched. In 1955 Arco Idaho was the first U.S town to use nuclear energy. In 1965 the first nuclear reactor, a 500- Watt system, operated in space (It operated for 43 days and remains in orbit.) In 2002 nuclear power provided about 16% of the world's electricity. In 2005 President Bush wanted to build new nuclear power plants.

Nuclear Power

Nuclear energy is created in a power plant. First, nuclear fission makes heat in the reactor core with uranium pellets. Second, water turns into steam from the heat in the steam generator. Third, the steam turns the turbine. Fourth, the turbine turns the electric generator. This is how electricity is made from a power plant and sent to places that use energy.

Did you know that...

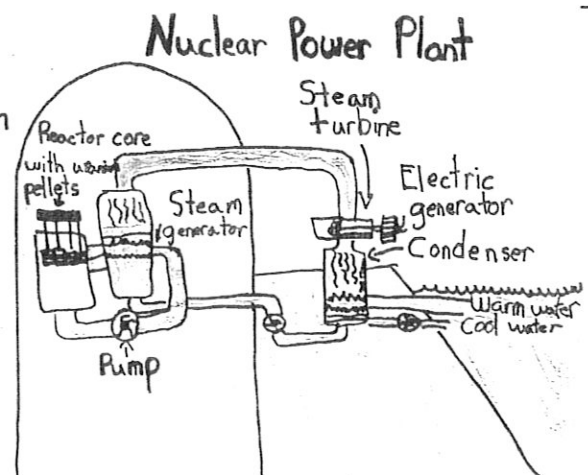
- Nuclear energy can power submarines, ships and spacecrafts
- Not everything nuclear is dangerous. Natural uranium can be handled safely because it decays so slowly that it does no harm.
- Millions of atoms can fit on a head of a pin
- The cost of producing nuclear energy is low

ADVANTAGES

- Doesn't rely only on coal and oil
- Nuclear power plant needs less fuel than do coal and oil burning plants
- Coal and oil pollutes the air
- Nuclear reactors do not release pollution if they are working right
- Nuclear power doesn't pollute the air

DISADVANTAGES

- Nuclear is a deadly gas
- It produces nuclear radiation
- It is dangerous to produce because plants can leak
- Nuclear reactors have waste disposal problems
- Nuclear reactors only last about fifty years. They have to put cement on the reactors and seal them when they're done.



By: Santiago

Nuclear Power History

In 1896 Henri Becquerel discovered that uranium gives off a special ray. Then, in 1898 Marie and Pierre Currie discovered two radioactive elements, radium and polonium. In 1942 Enrico Fermi produced the first self-sustained atomic fission reaction in Chicago. The U.S. exploded two atomic bombs on Hiroshima and Nagasaki, Japan ending World War Two. Then in 1958 the United States' first full scale nuclear power plant went into action in Shipping Port, Pennsylvania. In 1980 nuclear power was generating more electricity than oil did for the U.S. The 109 nuclear power plants in the U.S. make 620 billion kilowatt hours of net electricity each year.

How it works

When a moving neutron hits a group of nuclei, energy is released inside a reactor. This is called nuclear fission. Nuclear fission creates heat. You heat the water to make steam. The steam turns turbines. The turbines turn generators. The generators move electrons. That sends electricity through wires.

Advantages

1. Nuclear power costs about the same as coal, so it is not very expensive to make
2. Nuclear power produces a huge amount of energy from a small amount of fuel
3. It does not produce smoke or carbon dioxide
4. Nuclear power is reliable

Disadvantages

1. Nuclear power is very, very dangerous
2. A lot of money has to be spent on safety

Did you know?

- Luminous watch dials used to be made by hand. The people who painted the luminous spots on the dials often licked their brushes to a fine point. The paint they used was radioactive. As a result some of these workers developed mouth cancer.
- Not everything nuclear is dangerous. Natural uranium can be handled safely because it decays so slowly, that it does no harm.
- The first peaceful, practical use of nuclear power was in 1951 when an experimental nuclear reactor in Idaho Falls became the first to generate electricity.
- Uranium is the most commonly used nuclear fuel.
- A ton of uranium produces the same amount of energy as 25,000 tons of coal or 100,000 barrels of oil.
- The first nuclear powered submarine was the U.S. Navy's "Nautilus".



By: Zascha

History of nuclear power

Albert Einstein was the first person to say, "I think we can split an atom." Then he told other scientists his idea. The first man to actually create a self-sustained nuclear chain reaction was Enrico Fermi. He did this in a football field in Chicago. Then during World War 2 the U.S. said, "if he can split an atom and get a lot of energy I think we can make a bomb." So they worked on this project during World War 2. When they were done they had made 2 bombs, one of plutonium and one of uranium 135. Then people started sustaining the reaction and they got energy from it. Which they put in power plants to get energy. The first nuclear power plant was in Russia. It was built in 1953.

How nuclear power is made

First a neutron hits a group of nuclei. Then the group of nuclei splits into two. That creates other neutrons and a lot of energy. The energy is heat. Then the heat hits the water, which makes steam. Then the steam goes through tubes and gathers up. Then they let it go and the pressure from the steam turns the turbine. The turbine turns the generator. The generator moves the electrons. The electrons go through wires, which makes electricity.

Nuclear power needs a power plant because they need a lot of room to block in the nuclear fission. It is very hard to work in a nuclear power plant because you have to be careful of the radiation.

Different Uranium

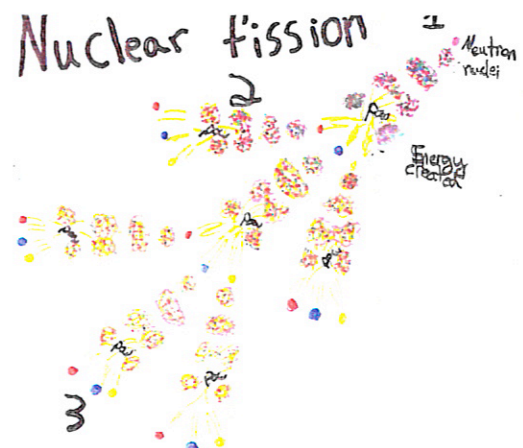
People get uranium from the ground. There are 2 different types of uranium. There is uranium 135 and uranium 138. Uranium 135 is fusible and uranium 138 is not, but both types come together in the ground. To separate them, they put them in a machine that spins really fast. The 2 types of uranium are different weights. So, the heavier uranium, which is uranium 138, goes to the outside of the machine and they suck out the uranium 135 and use it. But now they can't do anything with the uranium 138. So they smash a neutron into it and it becomes plutonium, which is fusible.

Advantages

- Nuclear power costs the same as coal
- Nuclear power does not pollute
- Nuclear power produces a huge amount of energy
- Nuclear power produces a small amount of waste
- Nuclear power is reliable

Disadvantages

- Nuclear power produces dangerous radiation
- Nuclear power is cheap but all the money goes to safety expenses, which are very expensive



By: Wesley

Water Power History Timeline

In 1800 William Nicholson discovered how to split water into hydrogen and oxygen with an electrical current. In 1880, forty to fifty of the first water power stations run by waterpower were built. In 1889 two hundred power plants were listed for using waterpower to make all of their electricity. In 1895 the first water powered generators were built. In 1920 the discovery of waterpower begins. In 1921 to 1922 waterpower created three times as much electricity than ever before. In 1930 waterpower became more trusted and cost less. In 1933 the Headwater Company knows enough about waterpower to join the group that tries to find out how to move the electricity. In 1937 the first high transmission lines were made. In 1948 the city of Vanport was ruined and the first flood control team was hired. In 1961 Canada made their first storage dams. From 1986 to 1994 the Headwater Company makes wild life safer. Finally, the Headwater Company promises wild life safety.

How It Works

Waterpower goes through a process to create usable power. One of the ways is to create a dam. Dams block water like a wall but there is a hole in the dam with a turbine in it. That turbine is responsible for only letting water go through it. When it goes through the turbine, which spins the generator, electricity is created.

Advantages

- Waterpower is very cheap
- Once a dam is built the energy is virtually free
- Waterpower is renewable, no waste or pollution produced
- Waterpower is more reliable than wind, wave, or solar power
- Waterpower stations increase to full power very quickly
- Electricity can be generated constantly

Disadvantages

- Dams are very expensive to build
- Floods from dams will ruin plant and animal life
- It is very hard to find a place to build a dam

Fun Facts

1. Hydro is Latin for water
2. Waterpower was first discovered by the ancient Romans
3. Waterpower owns one dam that is one of the world's largest buildings. It is located in China.



By: Brass

Water Power History

People have used water's energy for thousands of years. The waterwheel was the first machine created to use waterpower. Most water powered mills and machines disappeared during the nineteenth century as steam engines took over from waterpower. Most of the waterwheels were dismantled or left to decay but a few mills with working waterwheels have survived to the present day. The first U.S. hydroelectric power plant opened on the Fox River near Appleton, Wisconsin on September 30, 1882.

How a Grist Mill works

Water falls on the waterwheel, which turns the gear wheels. Then, it turns the stone spindle, which turns the runner, which grinds the grain.

Recent News

At a charter school in Redding, CA the project "water power" will consist of three different uses of water as a source of power for heating. They will explore hydropower stations located on the Pit River, Sacramento River, and other smaller creeks in the Northern California area.

Advantages

1. Hydropower is renewable
2. Hydropower is cheaper to create than fossil fuels
3. Electricity can be created constantly
4. Water power does not cause pollution
5. The electricity created can be used immediately

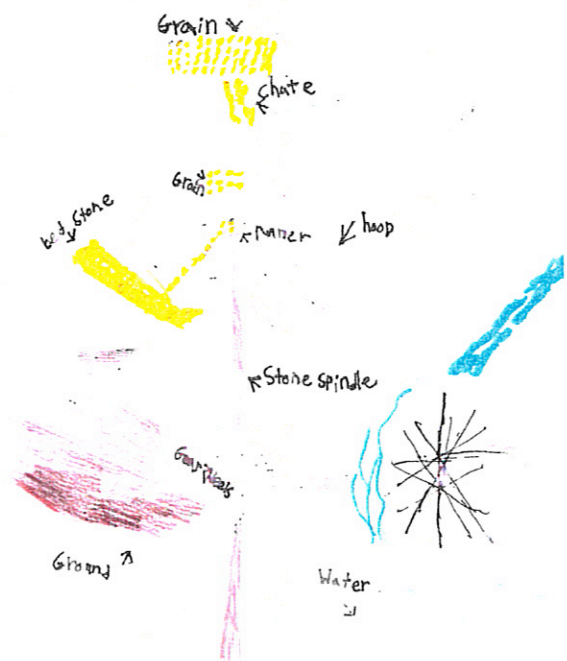
Disadvantages

1. Dams are very expensive to build. However, many dams are also used for flood control or irrigation, so building costs can be shared.

Cool Facts about Waterpower

- The Kuroyon dam in Kurobe, Japan, is one of the world's biggest dams. It is 610 feet high and 1,614 feet long.
- Canada's province of British Columbia could become an importer of hydroelectric power from the state of Alaska.

How a grist mill works



By: Alliya Chatterjee

Water Power in History

People have used waterpower for thousands of years! Greek and Romans have used water wheels to grind wheat into flour and to grind corn. Oceans have brought explorers to their destinations and river currents have pulled logs to sawmills. Waterpower is still being used to saw wood. The Egyptians were probably the first to use water wheels. Waterpower is one of the oldest sources of energy.

How It Works

This is the process of tidal power. First the tide comes in and it turns and spins the Swan turbine's blades. This spins the generator, which makes electricity. There are cords at the bottom of the Swan turbine that lead up to the surface. This process makes useable electricity.

Advantages

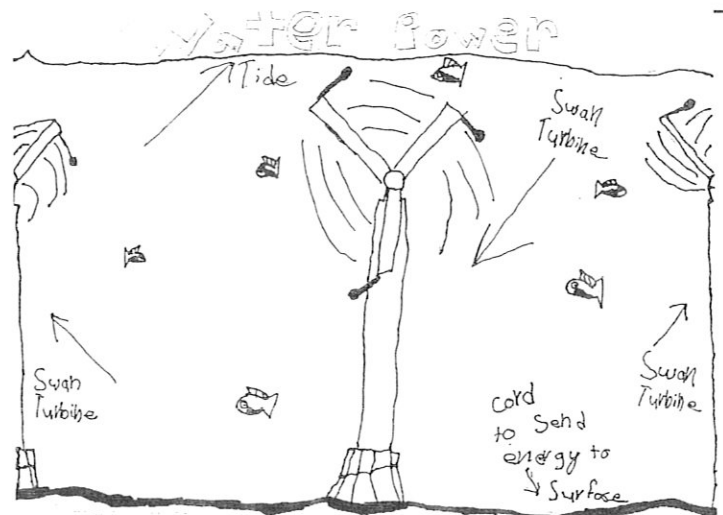
- Hydropower is cheaper to create than power from fossil fuels
- Waterpower does not cause pollution
- The electric energy created by water can be used immediately
- Huge quantities of water move with the tides each day
- It produces no greenhouse gases or other waste
- It needs no fuel

Disadvantages

- Dams are expensive to build
- Building dams destroys the environment and can cause flooding
- Turbines can hurt animals in the water
- Tidal power generators work for only ten hours a day
- Swan turbines only provide power for around 10 hours each day when the tides are actually moving

Cool facts:

- In 1953 high tides broke through the dikes and flooded the countryside, killing 1,800 people
- The tides are caused by the moon
- Floods are not always destructive
- In 1868 an earthquake in the Pacific Ocean produced a tsunami that surged to a height of 46 ft. It was so power full that it carried an American war ship.
- Earthquakes under the sea can produce a massive wave called a tsunami



WIND POWER HISTORY

In 500-900 AD, wind mills in Persia were used to grind corn and pump water. Today, we use wind turbines to create electricity. In the early 1980's, a big amount of wind turbines were installed in California to meet the growing electricity needs. In 1993 U.S. wind power developed one of the first commercially available variable-speed wind turbines. The energy policy act of 2005 made the use of wind and other renewable energy sources stronger in the U.S.

HOW IT WORKS

How does wind power work, you may ask? Well, it's simple. There is a three bladed wind turbine, and when the wind turns the three blades it turns a generator. That creates electricity. See I told you it was simple!

ADVANTAGES

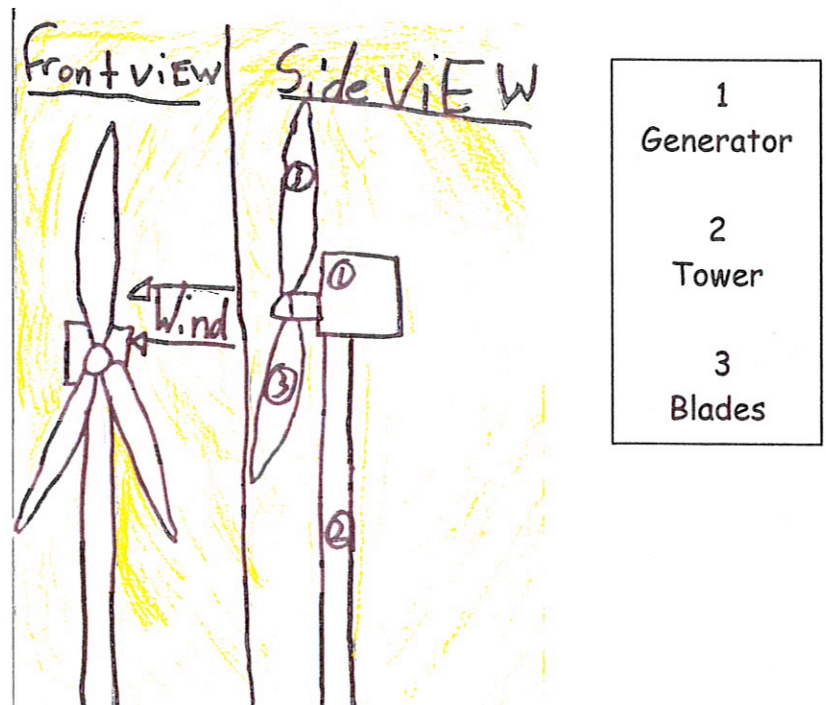
1. Wind is free
2. Wind farms need no fuel
3. Wind is renewable
4. Wind produces no waste or greenhouse gasses

DISADVANTAGES

1. Wind turbines kill birds
2. The wind is not predictable
3. Wind turbines can be noisy

FUN FACTS

- The U.S.A. is the biggest wind producer in the world
- The wind mills in Persia were used to grind corn and pump water
- Wind power was used in the Middle Ages in Europe to grind corn. They used millstones to grind corn, which is where the term "wind mill" comes from



Wind power history

The first tool designed to use wind power on land was the windmill. The windmills were known to some of the ancient people. The windmill was invented in the seventh century in the countries that are known today like Afghanistan and Iran. From that beginning, windmills spread to the Middle East and then China. The first wind-powered thing were sailboats! Charles F. Brush used the first big windmill to power electricity to Cleveland Ohio! The difference between a windmill and a wind turbine is that windmills pump water, grind grain, and make flour! Wind turbines are used to make the electricity that we use today!

How it Works

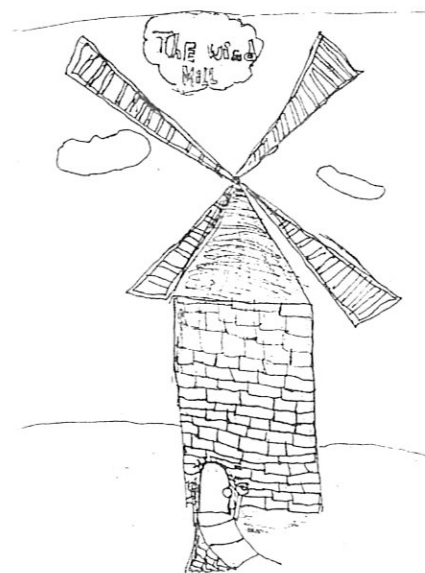
Wind power creates useable energy by the wind turbine. The wind turns the blades which turn the turbine. The turbine spins the generator, which moves electrons. That makes electricity! The picture you're looking at is a windmill. The windmill is used to grind grain, pump water, and make flour! In the windmill it has big millstones that are used to grind the grain!

Advantages

1. Doesn't pollute
2. Wind farms don't use fuel
3. Wind is renewable
4. The land beneath can be used as farming

Disadvantages

1. Can kill birds and migrating flocks
2. The wind is not always blowing
3. Wind effects television reception if you live near by a wind farm
4. Can be noisy day and night



Cool Facts on the Windmill & the Wind Turbine

- Did you know that the wind turbine is also known as a wind energy converter?
- The U.S is the biggest wind producer. The next biggest wind producers are Denmark and Germany!
- We've used wind power as an energy source for a very long time. The Babylonians and the Chinese were using the wind power to pump water for irrigating crops 4,000 years ago! The sailing boats were around for even longer than any wind-powered thing!

By: Jende

Wind Power History

In 500-900 AD the first windmills were invented in Persia. In 1941 on Grandpa's Knob wind turbines supplied power for the local community. In 1946 wind turbines fell down on Grandpa's Knob.

In 1983 because of need for energy, California used more wind energy. In 1988 wind turbines that were made in the early 1980's were taken down and later replaced with new wind turbines. In 2005 the energy act strengthened for wind power and other renewable energy sources such as water, solar, biomass and geothermal.

How it works

Wind power uses a wind turbine to create energy. In the wind turbine the wind turns three blades, which turns a turbine. The turbine spins a generator, which spins electrons. This is electricity!

Wind Power Recent News

In recent years in Santa Rosa, New Mexico, a wind farm has been built to supply power to the local community. The energy act strengthened for wind power. At the ski basin in Wolf Creek Colorado the ski lifts use wind power. New Mexico wind sources are stronger than California's because there is more wind in New Mexico.

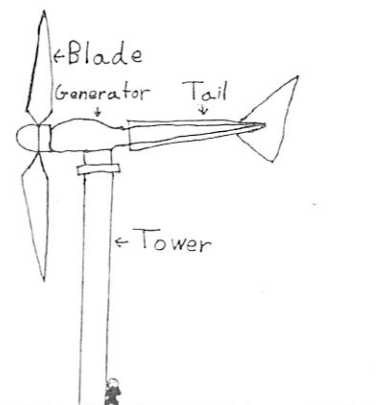
Advantages

- Wind farms are tourist attractions
- A good method of supplying energy to remote areas
- Wind is free
- Wind farms don't need fuel
- Produces no greenhouse gases or waste
- The land beneath can usually still be used for farming

Disadvantages

- Can kill birds
- Covers landscape
- Can effect TV reception
- Wind is not predictable

Wind Turbine



By: Eli Clayton

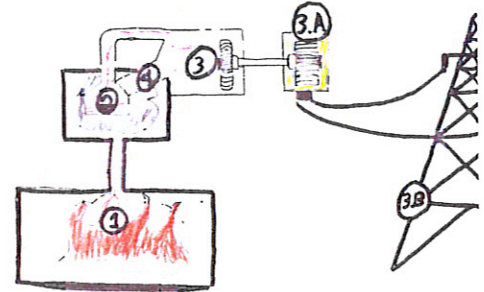
History of Biomass and Geothermal Energy

In the 1860s wood was used as the primary heating fuel, but in 1950 electricity replaced wood heating. In 1903 the first geo-plant was made in Larderello, Italy. In the next year electricity production began. Hot dry rock technology (HDRT) was demonstrated in N.M. In 1982 worldwide geo-capacity was 1,000 megawatts (mwts). In 1995 capacity reaches 6,000 mwts!

How Biomass works

(Refer to drawing)

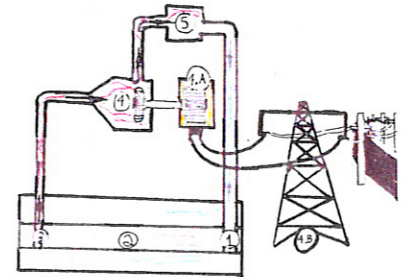
- 1) *Fuel*: fuel is burned which makes heat
- 2) *Boiler*: the heat makes the water boil
- 3) *Dry steam*: dry steam shoots towards the turbine
- 4) *Turbine*: dry steam spins the turbine
- 4.A) *Generator*: the turbine spins the generator
- 4.B) *Electricity*: the spinning generator makes electricity
- 5) *Condenser*: condenser turns dry steam back into water



How Geothermal works

(refer to drawing)

1. *Cool water*: cool water is pumped into the earth
2. *Earth*: the earth must be 212-300 degrees Fahrenheit
3. *Dry steam*: dry steam shoots up towards earth's crust
4. *Turbine*: dry steam spins the turbine
- 4.A) *Generator*: the turbine spins the generator
- 4.B) *Electricity*: the spinning generator makes electricity
- 5) *Condenser*: condenser turns back dry steam into water



Did you know?

- ➔ That the tallest geyser in the world shot 1,510 ft. in the air. It was called Wainangu geyser. It's dormant now.
- ➔ Jemez Valley School uses biomass power
- ➔ Around 25 countries use geothermal power
- ➔ Some cavities of rock can reach 575 degrees
- ➔ Biomass is also a name for garbage
- ➔ In Latin *geo* means earth and *thermal* means heat which means that *hydrothermal* means water heat

By: Dmitri

Geothermal History

Geothermal energy has been around since the dinosaurs walked the earth. But we only started using it in the 1900's. Deep drilling gave us more power. In 1977 scientists made the first hot dry rock reservoir in New Mexico at Fenton Hill. In northern California the first power plant was made in 1980.

The whole world made a high level of 1000 megawatts with geothermal power in the 1980's. The world's first magma exploratory well was in the Sierra Nevada Mountains in 1991. In 1995 the world wide geothermal went from 1,000 megawatts to 6,000 megawatts in about one year.

How it works

A geothermal power plant pumps cold water down the long tube (look at the picture). Then it makes dry steam, which goes up the shorter tube into the power plant really fast. Then it goes through a tight space that shoots out the steam and hits a turbine, which spins and makes electricity. The electricity goes to the power lines.

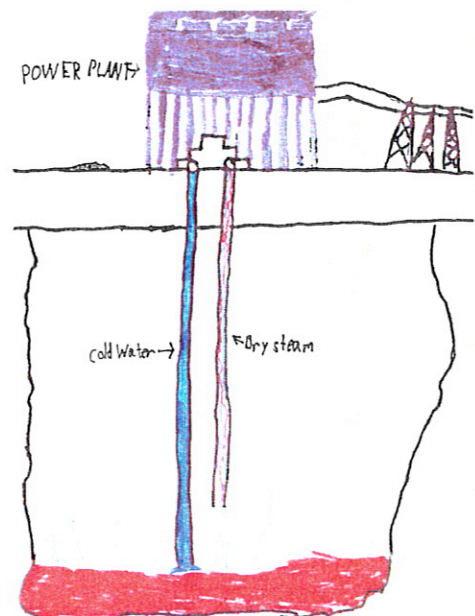
The steam then goes to a condenser then it turns back into water, but it doesn't turn back in to water like presto, it takes time. Then the water is pumped back down and it all happens again.

Advantages

1. Geothermal energy does not produce any pollution and does not contribute to the Greenhouse Effect
2. The power stations do not take up much space, so there is not much impact on the environment
3. No fuels are needed

Disadvantages

1. The big problem is that there are not many places that you can build geothermal power plants. You need a lot of hot rock of the suitable type at depths we can drill down to.
2. Sometimes geothermal power plants run out of steam
3. Hazardous gases and minerals may come up from the ground



By: Jamie

The History of Solar Hot Water Heaters

In 1890 the 1st commercially available solar water heaters were invented in southern California. Several thousand systems were sold to homeowners. The industry virtually ended in the 1950s when it was unable to compete against cheap and available natural gas and electricity services. Lots of people started using solar power in 1973 when there was a sharp rise in oil prices. In 1974 more than 20 companies started production of solar water heaters in the US. More and more people are getting solar hot water heaters.

How Solar Hot Water Heaters Work

1. The sun hits the panels, which sends cold in and hot water out into the water heaters and it gets you hot water. Hot water runs through the floors so it keeps the floors warm.
2. Solar hot water heaters do not have photovoltaic cells. They have black metal pipes that heat up when the sun hits them. They send hot water into the hot water heater.

Advantages

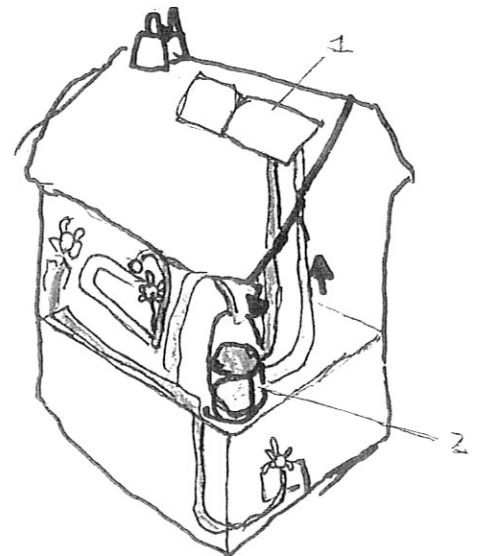
- Solar energy is free. It needs no fuel and produces no waste or pollution.
- In sunny countries solar power can be used where there is no easy way to get electricity to a remote place
- Handy for low-power use as solar powered gardens, light, and batteries

Disadvantages

- It is very expensive to build solar power stations
- Doesn't work at night
- Some places don't get that much sun

Cool facts:

1. A flat plate collector can heat water to a temperature of about 194 degrees
2. Sunlight does not have to be very intense to be useful for flat plate collectors
3. Flat-plate collectors are used to supply homes with hot water for washing



By: John Michaels |