HOW ELECTRICITY IS PRODUCED

(How Electricity gets to Your Home)

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Electricity is one of the most widely used forms of energy used by humans throughout the world. In early times many cities and towns were built alongside waterfalls (a primary source of mechanical energy) that turned water wheels to perform work. Before the electricity generation began slightly over 100 years ago, houses were lit with kerosene lamps, food was cooled in iceboxes, and rooms were warmed by wood-burning or coal-burning stoves.

Most people do not stop to think what life would be like without electricity and tend to take it for granted because it is always there. It does so many things for us such as lighting and heating/cooling homes, powering televisions and computers.

Sources of Electricity

- **Lightning**, a form of static electricity, is electrons moving from one cloud to another or from a cloud to the ground. An example of static electricity would be walking over a carpet and touching an object and a stream of electrons jumped to you from that object.
- **Magnets and Electricity,** The spinning of the electrons around the nucleus of an atom creates a tiny magnetic field. Most objects are not magnetic because the atoms are arranged so that the electrons spin in different, random directions, and cancel out each other. Magnets and wire are used together in electric generators.
- **Batteries** produce electricity using two different metals in a chemical solution. A reaction between the metals and the chemical frees more electrons in one metal than in the other. If a wire is attached to both ends of the battery and a light bulb, the electricity flows lighting the bulb.

Electricity Travels in Circuits

Electricity travels in closed loops or circuits, to provide a complete path before the electrons can move. If a circuit is open, the electrons cannot flow. When a light switch, is turned on there is a complete a circuit and electricity flows through the circuit illuminating the light bulb. When the light switch is shut off, the circuit is open and no electricity flows to the light bulb. When a light switch is turned on, electricity flows through a tiny wire in the bulb and it glows. When the tiny wire has broken, the path through the bulb is gone.

How Electricity is Generated

Most of the electricity in North America is produced in steam turbines. A turbine converts the energy of a moving fluid (liquid or gas) to mechanical energy. Steam turbines have a series of blades mounted on a shaft against which steam is forced, thus rotating the shaft connected to the generator.

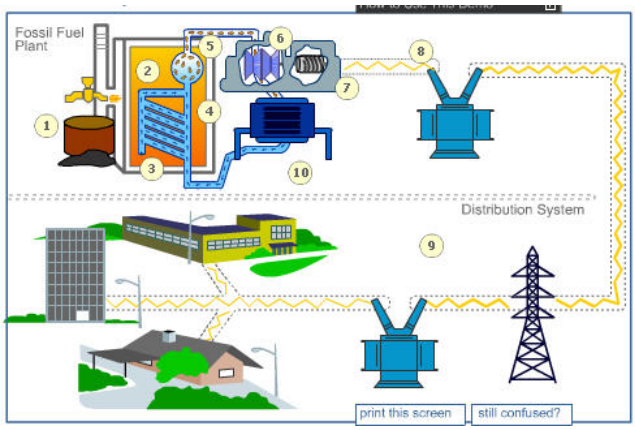
- **Coal, petroleum (oil), and natural gas** are burned in large furnaces to heat water to make steam that pushes on the blades of a turbine. Coal is the largest single primary source of energy used to generate electricity in the North America.
- **Hydropower,** the source of most electricity generated, consists of a process where flowing water is used to spin a turbine connected to a generator. There are two basic types of hydroelectric systems: one where flowing water from a reservoir is used, and the other the force of the water current applies pressure to the turbine blades.
- **Nuclear** is a method in which steam is produced by heating water through a process called nuclear fission. When atoms of uranium fuel are hit by neutrons they fission (split), releasing heat and form a chain reaction releasing heat that spins a turbine to generate electricity.
- **Wind Power** is derived from the conversion of the energy contained in wind into electricity. Wind power turbines are similar to a typical wind mill.

The Transformer - Moving Electricity

The transformer allows electricity to be sent over long distances. This made it possible to supply electricity to homes and businesses located far from the electric generating plant. The electricity produced by a generator travels along cables to a transformer, which changes electricity from low voltage to high voltage. Transmission lines carry the electricity to a substation which sends the electricity to homes, offices and factories.

Summary

1. **Fuel** (coal, oil natural gas or nuclear) is burned in a large boiler.
2. **Boiler,** and its walls are made up of tubes that carry water.
3. **Water,** the fuel gives off its chemical heat energy to the tube metal of the boiler. The



heat travels by conduction through the walls and is absorbed by the water. The water temperature increases until it is finally transformed into

4. **Steam** now under considrable pressure and at a very high temperature is piped to a
5. **Turbine** where mechanical energy is produced. The steam strikes the blades of the turbine and spins them revolvong the turbine shaft. The spinning shaft is connected to the
6. **Rotor,** a large electromagnet. A wire coil called the
7. **Stator** surrounds the rotor, as the rotor revolves within the stator, a flow of electrons, or
8. **Electricity** is produced. The electricity is then collected at a predetermined voltage and frquency and distributed by an elaborate
9. **Transmission and Distribution** system. After the steam passes through the turbine, it is led into a steam
10. **Condensor,** the hot steam is condened back into water and returned to the boiler to begin the cycle again.