Producing Electricity

Electricity can be produced in many ways, and in each way, energy is converted from one form into electrical **difference of potential**, or voltage. Voltage sources work by causing one material to transfer its electrons to another material.

1) Friction can cause static charges called the triboelectric effect.

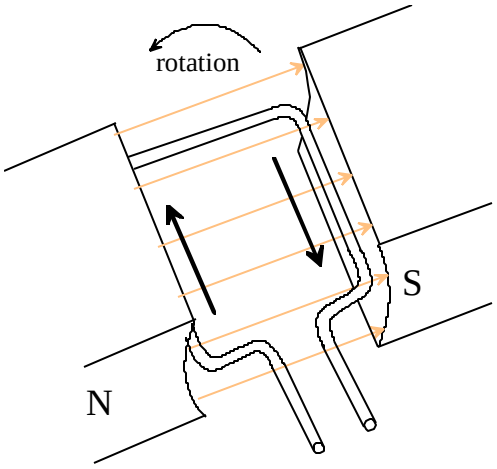
2) Pressure can be applied to some materials, such as barium titanate and certain ceramics, and electrons are forced from their orbits in the direction of the pressure. These piezo crystals are commonly used in microphones and phonograph pickups.

3) When heat is applied to a junction of dissimilar metals, such as copper and zinc, electrons will leave one metal and join another is a device called a thermocouple.

4) With some materials like cadmium, lead sulfide, and potassium, atoms release their electrons when struck by photons from a light beam. This photoelectric effect is the principal behind photovoltaic generation of power.

5) Electrochemistry is the basis for the operation of the wet cell battery. Sulfuric acid and water are mixed to form an electrolyte. When copper and zinc bars are added, they react with the solution and positive zinc ions are given off leaving the zinc bar with a negative charge. The copper bar gives off electrons so it gets a positive charge and a difference of potential exists between the bars. Unfortunately, electrolyte loses its properties and the copper and zinc bars, called electrodes, disintegrate and the battery wears out. Fuel cells operate on the same basic principle except that the chemicals are continuously fed into the device, and the waste product is water! Fuel cells have the potential to become a viable energy source and today's electricians should strive to know as much about this technology as possible.

6) Electromagnetism is, by far, the most applicable form of power generation. It utilizes the concept that whenever there is relative motion between a magnetic field and a conductor, such that the conductor cuts the flux lines of the magnetic field, a voltage is induced in the conductor. The energy that produces this motion can come from a gasoline motor, a water wheel, a steam turbine, a windmill, or any source of energy that can turn the armature of a generator.



Notice in this theoretical generator that while one side of the armature loop is cutting the lines of flux in one direction, the other side of the loop is cutting flux lines in the opposite direction producng voltage of the same polarity in the armature loop. The amount of voltage produced depends of the rate at which the flux lines are being cut by the armature loop. Faster armature rotation means more voltage. Increasing the strength of the field would increase the number of flux lines, also increasing the voltage. This is the way that most of our power is generated.