Wind Energy Essay, Research Paper

Modern Advances and Applications

of Wind Energy

Wind is the natural movement of air across the land or sea. Wind is caused by uneven heating and cooling of the earth s surface and by the earth s rotation. Land and water areas absorb and release different amount of hear received from the sun. As warm air rises, cooler air rushes in to take its place, causing local winds. The rotation of the earth changes the direction of the flow of air. This produces prevailing winds, including Hawaii s trade winds. Surface features such as mountains and valleys can change the direction and speed of prevailing winds. Wind power is harnessing the wind with turbines to produce mechanical power of electricity.

Wind is form of solar power because the sun initially creates wind through it s heating and cooling of the atmosphere. This heating and cooling process forms jet streams and wind currents. Through modern advances in energy collection, we have learned to harness the abundant amount of clean energy by means of windmills. The basic process in which this works is as follows. The wind turns the blades of a windmill-like machine. The rotating blades turn the shaft to which they are attached. The turning shaft typically can either power a pump or turn a generator which produces electricity. For producing large amounts of electricity, many machines can be grouped together to from a wind farm.

Most wind machines have vertical blades attached to a horizontal shaft. This shaft transmits power through a series of gears which provide power to a water pump or electric generator. However, the Darrieus wind machine, a special type, has two or three long curved blades on a vertical shaft. It resembles a giant eggbeater shape. The Darrieus machine provides ease of maintenance as the operating gears and controls are located close to the ground, but it needs power assistance to start running. The amount of energy produced by a wind machine depends on the wind speed and the size of the blades in the machine. In general, when the wind speed doubles, the power produced increases eight times. Larger blades capture more winds and as the diameter of the circle formed by the blades doubles, the power increases for times.

Energy demands for the next century are increasing. The use of wind energy for electricity is growing in the United States. California has the largest number of wind machines with more than 16,000. These wind machines lead the nation with about 1,600 megawatts in total capacity. Texas is second with a total capacity of 42 megawatts and Minnesota is third, with 26 megawatts. Hawaii is forth with 12 megawatts installed and Iowa, Wyoming, Washington and Oregon have plans to install substantial quantities of wind generators over the next few years. As far as the New England states, they have a few wind machines and wind farms in several mountainous locations where wind is constant.

This newly discovered technology has improved substantially in the past ten years with the help of researchers and turbine manufacturers working together. The future prospects of this energy transformation is expected to be cheaper, more efficient, and more widely used. The United States currently produces 3.5 billion kilowatt-hours of electricity per year at the price of five cents per kilowatt-hour. This amount of production is enough to provide one million people with an adequate amount of clean, natural energy. This averages to $175 per year for every person that uses wind energy. By the end of this year, wind power companies are expected to drop their prices to four cents per kilowatt-hour which is only $140 per year. These prices are low enough to compete with the major fossil fuel companies. Wind power is the least expensive form of new electric generation.

These wind mills use turbines to generate electricity. Researchers and manufacturers have made many break throughs in the efficiency of the mills. They study aerodynamics, structures and fatigue, advanced components, and wind characteristics to find the optimum performance. They have made these turbines lighter and more flexible to produce the maximum amount of energy while withstanding the harsh conditions.

These turbines could be used for large scale power plants or as just single turbines for home or village use. The United States has spread this technology to different parts of the world, and invested a large amount of money to produce an efficient, renewable source of energy. In conclusion, in the near future, wind power will be a major source of the world s energy needs.