

BIOMASS ENERGY

Biomass energy is energy generated or produced by living or once-living organisms. The most common biomass materials are woods, agricultural crops, agricultural wastes, farm wastes, sugarcane wastes, etc. These sources are burned to generate heat or to convert it into electricity. There are three ways to use biomass.

1) It can be burned to produce heat and electricity,

2) Changed to a gas-like fuel such as methane (Biogas), or

3) Changed to a liquid fuel (Biodiesel). Waste material such as paper, food wastes, etc. can be converted into electricity by combustion boilers or steam turbines. Similar to any other fuel, biomass also creates some pollutants, including carbon dioxide, when burned or converted into energy. However, biomass generates less air pollutants compared to fossil fuels. Biomass is naturally low in sulphur and therefore, when burned, generates low sulphur dioxide emissions. However, if burned in the open air, some biomass would emit relatively high levels of nitrous oxides (given the high nitrogen content of plant material), carbon monoxide, and particulates.

Liquid fuels, also called “biofuels” or “biodiesel”, include two forms of alcohol: ethanol and methanol. Because biomass can be changed directly into liquid fuel, in future it could supply much of our transportation fuel needs for cars, trucks, buses, airplanes and trains with diesel fuel replaced by ‘biodiesel’ made from vegetable oils. In the United States, this fuel is now being produced from soybean oil. Researchers are developing algae that produce oils, which can be converted to biodiesel.

Biogas is produced from plant material and animal waste, garbage, waste from households and some types of industrial wastes, such as fish processing, dairies, and sewage treatment plants. It is a mixture of gases which includes methane, carbon dioxide, hydrogen sulphide and water

vapour. In this mixture, methane burns easily. Once used, the residue is used as an agricultural fertilizer. Denmark produces a large quantity of biogas from waste and produces 15,000 megawatts of electricity from 15 farmers' cooperatives. Biogas plants have become increasingly popular in India in the rural sector. The biogas plants use cowdung, which is converted into a gas and used as a fuel. It is also used for running dual fuel engines. The reduction in kitchen smoke by using biogas has reduced lung conditions in thousands of homes.

Wind Power:

Wind was the earliest energy source used for transportation by sailing ships. Some 2000 years ago, windmills were developed in China, Afghanistan and Persia to draw water for irrigation and grinding grain. Most of the early work on generating electricity from wind was carried out in Denmark, at the end of the last century. Today, Denmark and California have large wind turbine cooperatives which sell electricity to the government grid. In Tamil Nadu, there are large wind farms producing 850 megawatts of electricity. At present, India is the third largest wind energy producer in the world. The power in wind is a function of the wind speed and therefore the average wind speed of an area is an important determinant of economically feasible power. Wind speed increases with height. At a given turbine site, the power available 30 meters above ground is typically 60 percent greater than at 10 meters. Over the past two decades, a great deal of technical progress has been made in the design, siting, installation, operation, and maintenance of power-producing wind mills (turbines). These improvements have led to higher wind conversion efficiencies and lower electricity production costs.

Environmental Impacts of wind energy:

Wind power has few environmental impacts, as there are virtually no air or water emissions, or radiation, or solid waste production. The principal problems are bird kills, noise, effect on TV reception, and aesthetic objections to the sheer number of wind turbines that are required

to meet electricity needs. Although large areas of land are required for setting up wind farms, the amount used by the turbine bases, the foundations and the access roads is less than 1% of the total area covered by the wind farm. The rest of the area can also be used for agricultural purposes or for grazing. Siting windmills offshore reduces their demand for land and visual impact. Wind is an intermittent source and the intermittency of wind depends on the geographic distribution of wind. Wind therefore cannot be used as the sole resource for electricity, and requires some other backup or stand-by electricity source.

Geothermal energy

It is the energy stored within the earth (“geo” for earth and “thermal” for heat). Geothermal energy starts with hot, molten rock (called magma) deep inside the earth which surfaces at some parts of the earth’s crust. The heat rising from the magma warms underground pools of water known as geothermal reservoirs. If there is an opening, hot underground water comes to the surface and forms hot springs, or it may boil to form geysers. With modern technology, wells are drilled deep below the surface of the earth to tap into geothermal reservoirs. This is called direct use of geothermal energy, and it provides a steady stream of hot water that is pumped to the earth’s surface. In the 20th century geothermal energy has been harnessed on a large scale for space heating, industrial use and electricity production, especially in Iceland, Japan and New Zealand. Geothermal energy is nearly as cheap as hydropower and will thus be increasingly utilized in future. However, water from geothermal reservoirs often contains minerals that are corrosive and polluting. Geothermal fluids are a problem which must be treated before disposal.