

Energy Generation from Biomass

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Abstract: Energy is highly essential for human survival and development of almost nine billion population world wide . It is generally generated by using fossil fuels, coal and other conventional sources like wind, hydro, solar, tyndall and others. Biomass seems to be one of the cheapest available renewable energy sources for power generation, cooking, lighting, communication and other routine requirements. Renewable energy from photovoltaics, wind turbines and small hydro plants is highly suitable for off-grid electricity supply. Application of biomass as a sustainable electricity source seems to be highly promising ad challenging. Biomass can be combusted, gasified, biologically digested, fermented, or converted to liquid fuels propelling a generator in order to generate electricity. Conversion from biomass to electricity is a low-carbon process as the resulting CO₂ is captured by plant regrowth. In contrast with solar PV or wind power, biomass power technology can generate electricity on demand at any time, provided a sufficient supply of biomass stocks is assured. Many agricultural and forest product residues can provide feedstock for energy conversion without increasing land requirements. Local farmers can generate additional income by providing biomass fuels for small local power plants. In spite of its benefit, there has been little experience of implementing small electricity-generating biomass plants in off-grid areas of developing countries. The current work is an attempt to review various options for power generation and compare their technoeconomic feasibility.

Keywords: Biomass, renewable energy.

1. Introduction

Exploding population and rapid industrialization has created a huge demand for energy supply all over world. These energies are mainly derived from petroleum, natural gas, coal, hydro and nuclear [Kulkarni, M.G. and A.K. Dalai, 2006.]. Petroleum based fuels have lots of disadvantage like, atmospheric pollution, greenhouse gas (GHG) and other air contaminants like NO_x, SO_x, CO, CO₂ (global warming), H₂S, inert gases, suspended particles, particulate matter and volatile organic compounds and many more [Klass, L.D., 1998]. Biomass is an alternative and renewable resource. It is widely available, carbon-neutral and has the potential to provide significant employment in the rural areas. Biomass most often refers to lignocellulosic biomass and [Kulkarni, M.G. and A.K. Dalai, 2006.] important tool for mitigating greenhouse gas emissions. It is an important substitute of costly fossil fuels [Goldemberg, J., 2000;]. Its use at large-scale may contribute to sustainable development on several fronts, environmentally, socially and economic [Turkenburg, W.C., 2000]. It fixes CO₂ in the atmosphere through photosynthesis. Its combustion has no impact on the CO₂ balance in the atmosphere.

Among biomass, algae (macro and microalgae) usually have a higher photosynthetic efficiency than other biomass [Shay, E.G., 1993.]. Algae are the highest yielding feedstock for biodiesel. It can produce up to 250 times the amount of oil per acre as soybeans. Algae produce 7 to 31 time greater oil than palm oil. Microalgae are an organism capable of photosynthesis that is less than 2 mm in diameter. Microalgae has much more oil and it is much faster and easier to grow [7].

Renewable power generation provides 18% of total energy generation worldwide. About 32% of the total primary energy use in the country is still derived from biomass. More than 70% of the country's population depends upon it for its energy needs. Currently about 90% of all the bioenergy consumption is in the traditional use. Woody biomass is the source of over 10% of all energy supplied annually. Overall, woody biomass provides about 90% of the primary energy annually sourced from all forms of biomass. The estimated biomass

