Sustained Growth of Green Energy Economics

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Abstract: ***Energy is one of the critical inputs for economic development of any Country. In order to overcome the present energy scenario problems, energy should be conserved and since we are consuming disproportionate amount of energy that day is not far when all our Non-Renewable resources will expire forcing us to rely just on Renewable Sources. These non renewable sources of energy will not last forever and are proven contributors to environmental degradation. This has led to governments and industries around the globe thinking seriously about alternative energy sources. This along with declining availability of the fossil fuels have led to the development of renewable energy resources such as Biomass, Bio fuels, Wind, Solar, Geothermal, and Hydro energy etc.***

Current global trends in energy supply and consumption are not sustainable – environmentally, economically, socially but this situation can be changed if we can secure the supply of reliable and affordable energy and effect a rapid transformation to a low-carbon, efficient and environmentally benign system of energy supply. Since exhaustible energy sources are limited, there is an urgent need to focus attention on development of renewable energy sources and use of energy efficient technologies. It is estimated that renewable energy could contribute to at least half of all electric power in each of the large economies by 2050.

This Paper emphasis on the various types of modern energy generation techniques and cost analysis as well as economics from Biomass.

Biomass is biological material derived from living, or recently living organisms, such as wood, waste, hydrogen gas, and alcohol fuels. Correctly managed, biomass is a sustainable fuel that can deliver a significant reduction in net carbon emissions when compared with fossil fuels.

Keywords: Biomass, Energy Conservation, Renewable Energy, Energy Economics

I. INTRODUCTION

Commercial sources of Energy are only 50% of total energy consumption in India. Means non-commercial sources like fuel wood, agricultural waste & animal dung constitute ½ of the total energy consumption in India. At current rate of consumption & production, coal reserves in India would last for about 130 years and at current rate of consumption & production, oil in India would last only for about 20 to 25 years

The modern lifestyle depends tremendously on the use and existence of fossil fuels. With levels of these fuels constantly decreasing, we should act now to become less dependent on fossil fuels and more dependent on renewable energy sources. The decreasing levels of fossil fuels aren't the only reason why we should begin to use renewable energy. Pollution is becoming a huge problem in many countries in the world, especially the developing world. With carbon emissions at an all time high, air quality can be very low in some areas; this can lead to respiratory diseases and cancer. The more carbon dioxide we pump into the atmosphere, the greater the Global warming effect becomes.

Manuscript Received March, 2014.

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We can slow down and dilute the effects of global warming through the wide spread use of renewable energy resources. Biomass is available in unlimited quantities for unlimited period of time.

This paper presents the various methods of Energy Conversion Techniques from Biomass and Comparative Economic study of Biomass Power Generation with Centralized Grid systems. This study proves that about 22% of Power reduction & 30% of Cost reduction can be achieved in a remote village when the energy generation is done by a Decentralized Biogas Plant.

II. PRESENT ENERGY SCENARIO

65% of total rural energy consumption is met from fuel woods. At this rate, in near future, fuel wood could be a greater constraint than availability of food grains. From 1951 to 2004, the coal production has increased 12 times, crude oil 110 times & electricity 65 times [3]. Only 0.3% of world's known oil reserves are in India. Transport sector accounts for 56% of total oil consumption in India. Millions of poor people in India spent 100 man-days every year in gathering fuel wood for cooking purposes. India is the second largest exploiter of Wind Energy – 1000 MW, out of this 70% is contributed by private sector. There are 33 lakhs biogas plants, 2 lakhs solar cookers & 10000 street lighting systems using solar photo-voltaic technology. Out of the total electricity consumption in India, 34% goes to Industry, 24% to agriculture, 21 % to domestic use, 12% to public lighting & 2% to railway traction. Currently 5,87,560 villages in India have electricity. Still 1,12,400 villages haven't seen what electricity is ?

III. WHY CONSERVE ENERGY?

A. Problems in Conventional Systems

Energy should be conserved since we are consuming disproportionate amount of energy and that day is not far when all our Non-Renewable resources will expire, forcing us to rely just on Renewable Sources. The electricity that we use comes from nuclear power, coal power plants. Oil that we use to run our vehicles are fossil fuels that were created million of years ago from decaying plants. When burned they emit carbon-dioxide which is harmful to human and the environment. Apart from these it also helps us to save money, mitigates the numerous adverse environmental and social impacts associated with energy production and consumption. These include air pollution, acid rain and global warming, oil spills and water pollution, loss of wilderness areas, construction of new power plants, foreign energy dependence and the risk of international conflict over energy supplies. Energy conservation extends the lifetime of equipments and reduces the maintenance cost by operating fewer hours and at less than maximum capacity.

- We use energy faster than it can be produced.
- Energy resources are limited.

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- Most of the energy sources we use cannot be reused and renewed.
- Energy saved is energy generated.
- It is our duty to conserve today for tomorrow's use.
- Reduces reliance on fossil fuels

B. Importance of Renewable Energy

Consumption of Non-Renewable Sources must be reduced as much as possible. For the following reasons,

- Resource Depletion
- Save Money
- Reduce Carbon-dioxide Emissions
- Climate Change
- Ozone Layer Depletion
- Adverse affect on humans and the environment
- Acid Rain
- Global Warming
- Inexhaustable

IV. BIOMASS ENERGY

Biomass is a renewable energy because it contains the energy which comes from the sun. Biomass is basically an organic material made from plants and animals. Biomass in itself contains chemical energy. So, when burning the biomass fuel, the chemical energy inside releases the heat. It can also be used to produce steam which can further be used to generate electricity. Using biomass for energy can cut down waste and can also help in reducing the landfill.

The biomass is defined as the total weight of dry matter present in the ecosystem at any one time. The biomass can be measured graphically. This graph represents the shape of a pyramid which is known as pyramid of biomass.

Applications of Bio-energy

- Water pumping and Electricity generation
- Heat generation
- High Efficiency wood burning stoves

Bio-gas plant is a clean and efficient fuel, generated from cow-dung, human waste or any kind of biological material derived through anaerobic fermentation process. The biogas consists of 60% methane with rest mainly carbon-di-oxide. Biogas is a safe fuel for cooking and lighting. By-products is usable as high –grade manure.

The types of biogas plant designs popular are:- floating drum- type, fixed dome-type, bag –type portable digester.

Biomass Briquetting is a process of densifying loose agro-waste u a solidified biomass of high density, which can be conveniently used as a fuel .Briquette is also termed as Bio-coal. It is pollution free and eco-friendly. Some of the agricultural and foresty residues can be briquetted after suitable pre-treatment. Biomass materials that can be briquetted are:- CornCob, Jute stick, Sawdust, Pineneedle, Bagasse, coffeespent, tamarind, Coffee-Husk, AlmondShell, Groundnutshells, Coirpith, Bagassepith, Barley straw, tobacco dust, Ricehusk.

Biomass Briquettes can replace almost all conventional fuels like coal, firewood and lignite in almost all general applications like heating, steam generation etc.It can be used directly as fuel instead of coal in the traditional chulas and furnaces or in gasifier. Gasifier converts solid fuel into a more convenient –to -use gaseous form of fuel called producer gas.

Biomass Gasifiers converts the solid biomass (basically wood waste, agricultural residues etc.) into a combustible gas mixture normally called producer gas. The conversion efficiency of the gasification process is in the range of 60% - 70%. The producer gas consists of mainly carbon-monoxide, hydrogen, nitrogen gas and methane. It has a lower calorific value(1000- 1200kcal/ Nm3). Gasification of biomass and using it in place of conventional direct burning devices will result in saving of atleast 50% in fuel consumptions. The gas has been found suitable for combustion in the internal combustion engines for the production of power.

Bio-fuels Unlike other renewable energy sources, biomass can be converted directly into liquid fuels- biofuels for our transportations needs (cars, trucks, buses, airplanes, and trains). The most common types of biofuels are ethanol and biodiesel.

Ethanol is an alcohol, similar to that used in beer and wine. It is made by fermenting any biomass high in carbohydrates (starches, sugars, or celluloses) through a process similar to brewing beer. Ethanol is mostly used as a fuel additive to cut down a vehicle carbon monoxide and other smog causing emissions. Flexible –fuel vehicles, which run on mixtures of gasoline and upto 85% ethanol.

Biodiesel, produced by plants such as rapeseed (canola), sunflowers and soyabeans can be extracted and refined into fuel, which can be burned in diesel engines and buses. Biodiesel can also made by combining alcohol with vegetable oil or recycled cooking greases. It can be used as an additive to reduce vehicle emissions (typically 20%) or in its pure form as a renewable alternative fuel for diesel engines.

Biomass Cogeneration

Cogeneration improves viability and profitability of sugar industries. Indian Sugar mills are rapidly turning to bagasse, the leftover of cane after it is crushed and its juice extracted , to generate electricity. This is mainly being done to clean up the environment ,cut down power costs and earn additional revenue.According to current estimates, about 3500MW of power can be generated from bagasse in the existing 430 sugarmills in the country.

A. Advantages of Biomass Energy Sources

- Biomass energy source is renewable
- Biomass can reduce greenhouse effect
- Indigenous fuels
- Clean surroundings
- Reduction of Air pollution and Acid Rain
- Energy Production Techniques

B. Biomass Resources in India

India is very rich in biomass. It has a potential of 19,500 MW (3,500 MW from bagasse based Cogeneration and 16,000 MW from surplus biomass). Currently, India has 537 MW Commissioned and 536 MW under construction. The fact reinforces the idea of a commitment by India to develop these resources of power production.

Following is a list of States for biomass production and potentiality.

- Andhra Pradesh (200 MW)
- Bihar (200 MW)
- Gujarat (200 MW)
- Karnataka (300 MW)
- Maharashtra (1,000 MW)
- Punjab (150 MW)
- Tamil Nadu (350 MW)
- Uttar Pradesh (1,000 MW)

Table 1: Biomass Potential in India

Source	Potential	Installed
Bio mass	16000 MW	222 MW
Bagasse	3500 MW	332 MW

India is a tropical country blessed with abundant sunshine and rains, thus offering an ideal environment for Biomass production. Further, the vast agricultural produce also makes available large quantities of agro-residues which can be used to meet energy needs. With an estimated production of about 350 million tones of agricultural waste every year, residual biomass is capable of mitigation of GHG emissions to the extent of 300 million tones / annum.

V. ENERGY ECONOMICS

There is a general perception that the cost of electricity generated by renewable energy technologies is always higher than electricity generated by fossil fuel sources. While this is true in many places, it is no longer valid for the rural areas of rural India. In most of the Indian villages diesel generators are often the only source of power but power from biomass gasifier based plants are considerably cheaper where ever biomass is available. Even for dual fuel operation where 20 % diesel is used, the generation costs are lower, especially with high running hours and loads. The savings are dramatic when pure gas engines are used. Even when grid power is available, the actual cost of power at the point of consumption is very high largely due to line losses in transmission and distribution. High subsidies and financial losses keep the power price low for agricultural pumps but now that industrial and commercial consumers pay the actual cost of power, the biomass gasification based electricity can easily compete when pure gas engines are used.

VII. CONCLUSION

The centralized power sector has failed to be the motive of development for the rural areas is clear from the national statistics. Out of the half million villages in India, about 3,10,000 villages have been declared to be electrified and 80,000 more villages remain completely un-electrified. In actual practice, most of the so-called electrified villages do not have reliable, regular, adequate, or good quality power. No commercial investments in micro enterprises can therefore be made by either individuals or companies without installing diesel generators which have a very high generating cost. In addition, with the advent of mature renewable energy technologies, the supply of power to the remote rural areas from the centralized grid is no longer competitive, for example, with a modern biomass gasification based decentralized power plant.

The economic consequences are quite dramatic. For 80000 unelectrified villages, a modest 50 kW of installed capacity per village will lead to total saving of 52000 million Rs. (Rs. 5200 Crore / 1100 million US $) in power plant investments. In energy terms, the saving in T&D losses will release a generation capacity of 800 MW for profitable sale. Reduced pollution and reduction of CO2 emissions will be the other advantages of a decentralized renewable energy based system for the rural areas.

Power generation using renewable energy resources from different waste materials which is not strange perception but required uncompromising consideration for economic reimbursement and environmental sanity in developing countries.With the present existing mismatch in demand – supply of electricity in many developing countries caused by growth in population and socio- economic needs. To improve the quality of life, develop small scale local industries and enhanced agricultural productivity in developing countries there is strong need to insistently diversify energy resources especially those with renewable background. This measure will obviously bridge the existing gap in the current state of affairs in demand and supply of energy in developing countries.

VIII. RECOMMENDATION

Keeping in view the reserves of the fossil fuels and the economic concerns, these fuels are likely to dominate the world's primary energy supply for another decade but environmental scientists have warned that if the present trend is not checked then by 2100, the average temperature around the globe will rise by 1.4 to 5.8 degrees Celsius, which will cause a upsurge in the sea water level drowning all lands at low elevation along the coastal lines. So the world has already made a beginning to bring about the infrastructural changes in the energy sector so as to be able to choose the renewable energy development trajectory. In developing countries where a lot of new energy production capacity is to be added, the rapid increase of renewable is, in principle, easier than in the industrial countries, where existing capacity would need to be converted if a rapid change takes place. Nevertheless India must give more thrust to research and development in the field of non conventional energy sources not only to mitigate green house effect but also to lessen dependence on oil/gas import, which consumes major chunk of foreign exchange reserve. It is also clear that an integrated energy system consisting of two or more renewable energy sources has the advantage of stability, reliability and economically viable. Last but not the least, it is for the citizens also to believe in the power of renewable energy sources, and understand its necessity and importance.

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