

Renewable Energy Scenario in Bangladesh

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Abstract

The rural and remote sector of Bangladesh economy, where 85% of the population lives, is characterized by an abundance of open and disguised unemployment, high Man-land ratio, alarmingly large numbers of landless farmers, extremely inadequate economic and social facilities, low standard of living and a general environment of poverty and deprivation. Larger energy supplies and greater efficiency of energy use are thus necessary to meet the basic needs of a growing population. It will therefore, be necessary to tap all sources of renewable energy and to use these in an efficient converted form for benefit of the people. Primarily this will be done in remote inaccessible un-electrified area in a standalone system where grid expansion is expensive. This energy conversion will reduce pressure on the national power demand. This will not only save excessive grid expansion cost but will also keep environment friendly. Bangladesh is endowed with plentiful supply of renewable sources of energy. Out of various renewable sources solar, biomass, peat, and hydro-power can be effectively used in Bangladesh (Government of Bangladesh, 1991). Renewable energy practices in Bangladesh are: Solar Energy, Wind Energy, Biomass Energy and Hydro-power energy.

Keywords: Renewable Energy, Scenario, Sources, Solar Energy, Bangladesh

I. Introduction

The interest in renewable energy has been revived over last few years, especially after global awareness regarding the ill effects of fossil fuel burning. Energy is the source of growth and the mover for economic and social development of a nation and its people. No matter how we cry about development or poverty alleviation- it is not going to come until lights are provided to our people for seeing, reading and working. Natural resources or energy sources such as: fossil fuels, oil, natural gas etc. are completely used or economically depleted. Because, we are rapidly exhausting our non-renewable resources, degrading the potentially renewable resources and even threatening the perpetual resources. It demands immediate attention especially in the third world countries, where only scarce resources are available for an enormous size of population. The civilization is dependent on electric power. There is a relationship between GDP growth rate and electricity growth rate in a country. Bangladesh is a largely rural agricultural based country. Fossil energy resources in Bangladesh consist primarily of natural gas. Several small deposits of coal exist on the north eastern region of the country, but these consist of peat, with low caloric value and very deep bituminous coal that will be quite expensive to extract. Only 15% of the total population has got access to the electricity. In 1990 only 2.2% of total households (mostly in urban areas) have piped natural gas connections for cooking and only 3.9% of total households used kerosene for cooking. These are by no means a pleasant scenario. Per capita consumption of commercial energy and electricity in Bangladesh is one of the lowest among the developing countries. In 1990, more than 73% of total final energy consumption was met by different type of biomass fuels (e.g. agricultural residues, wood fuels, animal dung etc [21]).

II. Methodology

II A. (i) Solar Energy

Solar Energy is inexhaustible and pollution free. It is available everywhere; but the greatest amount is available between two broad bands encircling the earth between 15° and 35° latitude north and south[1-11]. Fortunately, Bangladesh is situated between 20°43' north and 26°38' north latitude and as such Bangladesh is in a very favorable position in respect of the utilization of solar energy. At present energy utilization in Bangladesh is about 0.15 watt/sq. meter land area, whereas the availability is above 208 watt/sq. meter. This shows the enormity of the potentiality of this source in this country[12-17].

A good number of organizations and departments are doing research, development, demonstration, diffusion and commercialization of solar energy technology. Diffusion aspects of the solar energy technologies are using mostly in Bangladesh especially solar Photovoltaic (PV) systems, solar cooker, solar oven, solar water heater and solar dryer. Bangladesh Power Development Board (BPDB), Rural electrification Board (REB), Atomic Energy Commission (AEC), Local Government Engineering Department (LGED), and Grameen Shakti (GS) have installed a number of solar PV systems in different parts of the country [18-25]. BPDB has implemented an excellent Solar PV electrification project in the Chittagong Hill Tracts Regions of Bangladesh. The main reasons for undertaking this SPV project are [14]: The extension as well as the maintenance of the National Grid into these areas is very highly expensive, difficult and risky. The transportation of fuels for the localized generators in these areas is also very highly expensive, difficult and risky. The load density of these areas is low and disperses. In light of these characteristics of these remote and hilly areas, the Solar PV electrification has emerged as the most appropriate technological option for the electrification of these areas [26-39]. The people are enthusiastically purchasing the Solar Home Lighting Systems [40].



Fig. 1: Centralized AC Market electrification system at Barkal upazila under Rangamati District.



Fig. 2: Solar PV powered Street light at Barkal Upazila under Rangamati District.

(ii) Solar Cookers

Institute of fuel Research and Development (IFRD) of BCSIR and Centre for mass Education in Science (CMES) are engaged in the development and dissemination of solar cookers [41-48]. A low cost reflector type cooker developed by IFRD is a spun-aluminum parabolic reflector. It is light weight (2-3 Kgs), cheap and simple to construct, but the disadvantages are that it needs manual sun tracking frequently and the reflectivity deteriorates rather rapidly and cooking is interrupted by cloudy and hazy conditions. On a bright sunny day a 42 inch aperture spun aluminum cooker takes about three hours for cooking three items (rice, fish or meat, pulses) for a family of 5-6 members in Bangladesh [49-50].

Fig.3 shows a photograph of solar cooking system in Bangladesh.



Fig.3: Solar cooking by a paraboloidal concentrator

(iv) Solar Oven and Dryer

Different models of solar ovens have been designed and constructed with locally available raw materials. The institute of Food Science and Technology (IFST) has developed a cabinet dryer for drying fruits; vegetables etc. by simply spreading a transparent cover over a box [51-58]. These dryers are made of bamboo and polythene sheet [60].

(vii) Solar Water Heater

This heater is designed and constructed by IFRD. It consists of coated flat-plate which absorbs solar radiation, converts into heat and transfers the resulting heat to circulating water. This type of heater is useful for supplying low grade thermal energy at temperatures below 90°C [72-78].

II B. Wind Energy

Of the several available option of renewable energy, wind systems have captured interest for a long time. The modern development of wind turbines was started from 1973 and the main achievement of this development lies in the improvement of aerodynamic efficiency and reliability, leading to lower costs per kWh generated. A great deal of information has been gathered in the past two years on the wind energy potential along coastal Bangladesh[79-83]. The potential of wind energy in the coastal areas of Bangladesh is very high but this cannot be determined accurately until sufficient good quality data on wind speeds over at least twelve months of the year are available in different location[84-89].

Bangladesh Centre for Advanced Studies (BCAS) with the assistance from Overseas Development Administration (ODA) of UK launched the Wind Energy Study (WEST) Project in October 1995. The aim of this project is to assess the potential of utilizing wind energy as mechanical and electrical power. They collect and analyze wind speed data at seven areas of Bangladesh. The locations are widely dispersed along the vast coastline in the district of Cox's Bazar, Chittagong, Noakhali, Bhola and Patuakhali[90-96].

The wind speed in some regions of Bangladesh is satisfactory for operation pumps and for generation of electricity. The wind turbines may also be useful to drive hand pumps used in irrigation agricultural land[97-103]. It was found that the wind speed in Chittagong is 2.57 m/sec or more for 4000 hours a year. At this available speed a wind plant can be operated both for generation of electricity and for driving pumps. Grameen Shakti has been assessing the wind resource at Chokoria, Cox's Bazar as well. Till now, the activities regarding wind energy are related to wind resource assessment only. There has been little investigation of potential markets for wind power. There are some industries along the Bay of Bengal coastline using wind power for electricity supply. These are shrimp farming, fish processing, and ice making industries[62]. These are all electricity intensive and represent major industries along the coast, especially in the Cox's Bazar, Chokoria, and Chittagong, and Khulna areas. Many of these industries are in areas without electrical grid availability, and rely on diesel generator to provide electricity. In particular, there are a number of islands, such as Mohaskhali near Cox's Bazar, that could be important locations for fish and shrimp related industry, but that are far from the grid and are not likely to receive grid connection in the near future due to the high costs of running the trunk lines out to these islands[63]. These islands may also have among the highest wind speeds in the country[104-111]. Site for wind turbines needs wind speed at least 6 m/s. good accessibility of the location for heavy transport and cranes, wind direction, soil condition, noise, birds, disturbance of landscape, TV and radar reception interference should be considered for wind turbines installation[64].



Fig. 4 shows a photograph of wind pump system set up by Bangladesh Centre for Advanced Studies at Patenga, Chittagong, Bangladesh [17]

II C Biomass Energy

Biomass energy is the important source of energy in many countries of the world. It is oldest type of fuel which men used for centuries after discovery of fire itself. The increase in population has forced larger numbers of rural poor to use the forests unsustainably for fuel-wood, bamboo, fodder, game meat, medicines, herbs and roof materials. Deforestation will upset the natural recycling system as well as increase the cost of fuel wood required, both in time and money, creating a vicious circle and further deforestation. Forest in many developing countries are disappearing at a high rate. Major problems are facing Bangladesh are food and fuel. In Bangladesh, commonly known Biomass fuels are: fuel wood, agricultural residues and animal dung. The country has naturally high potential for production of Biomass resources; but because of high growth rate of population (2.4%) forest cover is being reduced in an alarming proportion [65]. In Bangladesh, while looking at over all energy consumption over the past 15 years, Biomass energy contributed 83% in 1980-81, 73% in 1989-90, and 67% in 1994-95. With the growth of GDP, consumption of commercial fuel increased [66].

II D. Alternative Technology for Biomass Energy

There are a few alternative technologies using in Bangladesh. These are improved stove, bio-gas technology etc. A short overview of these technologies is provided below more rapidly than that of Biomass fuel [67].

II E. Improved Stove

In the institute of Fuel Research & Development (IFRD), BCSIR both single and multiple stove have been modified to give fuel saving to the extent of 50-70%. There are several NGOs like Swanirvar Bangladesh, VERC, BACE, Bandhujan Parishad, AID-Bangladesh, and TSP are engaged in dissemination of improved stoves under Fuel Saving Project and have achieved some success [68].

II F. Biogas Technology

Biogas is a kind of gas obtained by anaerobic fermentation of animal and agricultural, wastes or other words anything which decomposes on standing. There are two models one is the floating cover design and the other is the fixed top design are used in Bangladesh[69].

Bangladesh Agricultural University (BAU) first setup a biogas plant in the University campus in 1972 to study the gas production characteristics and later set up a family size plant. Department of Environment (DOE) started the programme in 1981 under a government grant. Under the "Fuel Saving Project of BCSIR", the gas holder was supplied free of cost on condition that the owner would bear the cost of the digester and other accessories which usually involved approximately half the total cost. The IFRD of BCSIR in collaboration with Dhaka City Corporation built an experimental biogas plant of 85 M³ digester volumes in 1992 for treatment of city garbage [70]. So far, about 1000 biogas plants have been installed in the country. Since the current status of the technology, 4-5 cattle heads are needed for a family size plant, therefore only the well-to-do families of rural a rear can be brought under biogas programme [71].

Fig. 5 shows a photograph of Woman Cooking with Biogas [17].



Fig. 5: A Woman is cooking with Biogas

Barriers for Sustainability of Alternative Energy Technologies

Every energy resources have some sort of drawback or barriers. Similarly Alternative Energy Technologies has some barriers. Some of them are listed below:

- High initial cost
- Dependence on the weather
- Lack of awareness
- Lack of established high-volume supplier-dealer chains.
- High prices of the components.
- Lack of fund.

Conclusion

Bangladesh is experiencing an acute shortage of electric power. This situation is worsening day by day. Therefore it stresses the need for the deployment of renewable energy resources to meet up this energy crisis. Bangladesh is a country with some rich natural resources. The substantial availability of renewable energy sources in the form of solar, biomass, biogas, hydro power and wind energy can provide opportunities of sustainable energy based development. In Bangladesh, nearly 72% of the population lives in rural areas and renewable energy is considered to be the right choice for them.

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