REVIEW OF RENEWABLE ENERGY PROJECTS IN BANGLADESH

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Abstract

Energy is one of the basic needs of the present human civilization. Without energy a nation can not be developed. All the developed countries in the world have the adequate power generation. But in the developing and third world countries like Bangladesh is facing the deficiency of power generation which is a big barrier in the overall development of this country. The main source of energy in Bangladesh is natural gas. Due to continuous use of this source it is likely to be depleted by the year 2020. As natural resources are limited we can think of renewable energy resources which are abundant in our country.

Introduction

Now a days, energy is the major requirement for the development of a country. Energy can neither be created nor destroyed. It can only be transformed from one form to another. All the developed and developing countries in the world including Bangladesh are advancing by producing power with their resources. But as a developing country Bangladesh is facing a problem to produce required amount of power due to shortage of natural resources like natural gas, coal, oil etc. Bangladesh is situated on the northern coast of Bay of Bengal and is surrounded by India with a small common border of Myanmar in the south-east. The total area of this country is 1,47,570 km^2 . Its population is 162.20 million in 2011 and it is a densely populated country in the world (1099 people/km^2 in 2010) [1]. Among them 72% of the people living in rural areas. Only 47% of the total population have access to the electricity. So the greater part of the population are deprived of adequate power. Without electrifying this huge population a nation like Bangladesh can not be developed. So necessary steps should be taken to solve this problem. National grid can not fulfill the present demand of the country due to presense of inadequate natural resources. In Bangladesh main source of energy is natural gas (24%) which will be depleted by 2020 due to continuous use [2]. As natural resources are depleted day by day and the gird expansion in the rural areas is highly expensive so we can think of alternative sources. In this perspective, renewable energy can be the better solution for electrifying the people. Renewable energy sources are abundant in our country. So, producing power by this energy can meet the demand of the greater portion of people and reduce pressure on the conventional system.

Present Status

At present, Bangladesh is facing power crisis acutely. In 2012, it is observed that the peak power demand is 6000MW per day while it is increased to 7000MW during summer [3]. According to BPDB, the generation capacity is increased to about 8100MW (FY-2012). So far, the maximun demand that is satisfied is 6350MW on August 4, 2012. Excessive load shedding occurs due to power shortage throughout the year. About 67.11% of the power plants are greatly depend on gas. 21.7%, 6.15%, 2.41% and 2.65% of the total electricity are supplied by furnace oil, diesel, coal and hydro power respectively (September 9, 2012). About 600MW loss in production is due to inadequate supply of gas [4]. So by the conventional or mainstream energy the crying need for power can not be fulfilled as it is bleak in Bangladesh, regarding to the huge gap between demand and supply. The need for power supply is increasing day by day and for Government it is indeed impossible to meet the demand by the conventional or mainstream energy in terms of its economic and technological restraints. There is alternative of conventional energy by renewable resources available in the country such as solar, biogas, hydropower and wind energy through which the crippling power shortage can be solved.

Perspective and development of Renewable Energy in Bangladesh

There is a plenty of renewable energy resources in Bangladesh. Among them solar, biomass, biogas, wind, hydro power are remarkable sources of energy. Bangladesh Government has aimed to produce 5% of the total power generation by 2015 and 10% by 2020 from renewable energy resources. In this aspect several NGO's have come forward to develop the power generation sector. Among them Infrastructure Development Company Limited (IDCOL), Grameen Shakti (GS), Bangladesh Rural Advancement Committee (BRAC), Rahim Afrooz etc are remarkable.

The potentials and the development of the renewable energy are as follows-

Solar Energy

There is a strong potential for solar energy within the country. Through solar photovoltaic (PV)system power can be produce by converting sunlight into electricity using solar panel. Bangladesh is situated between 20.30 and 26.38 degrees north latitude and 88.04 and 92.44 degrees east longitude. As a result it is the suitable area for harnessing and utilization of solar energy. The hours of sunlight per day throughout a year can be shown by the following figure-1 [5]. The highest and the lowest intensity of the direct radiation of sunlight are also shown by figure-2 [5].

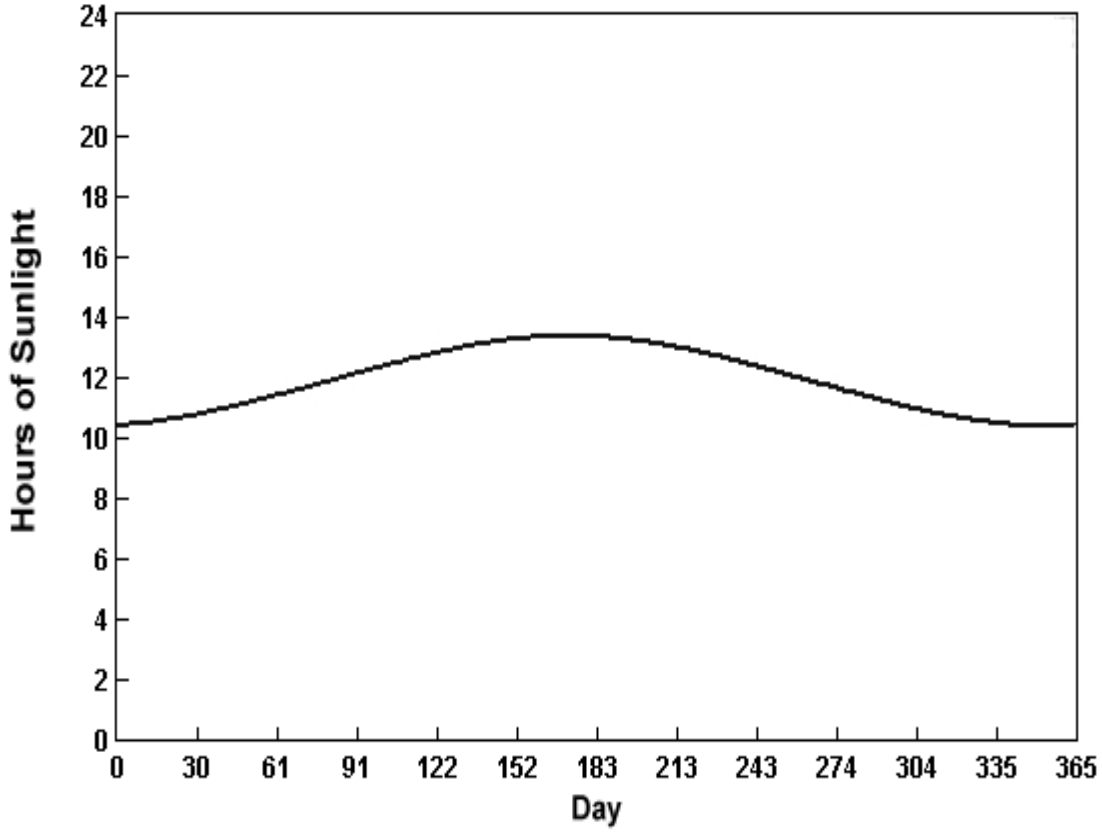

Fig-1: Amount of hours of sunlight in Bangladesh

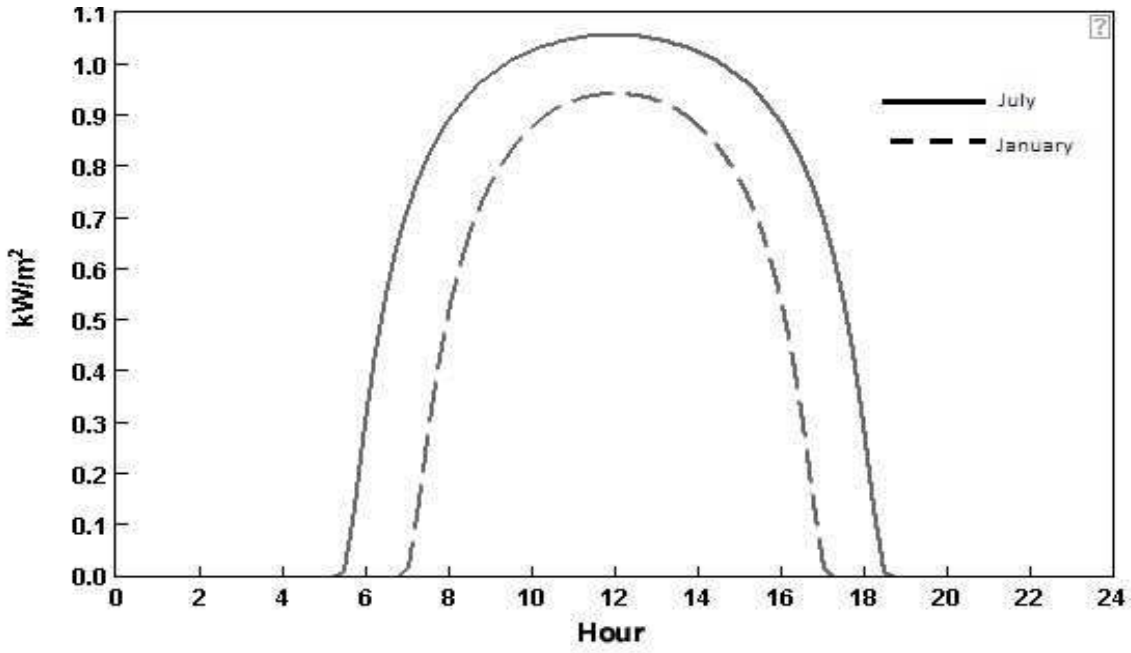

Fig-2: The highest and lowest intensity of direct radiation in W/m²

From these two graphs we can see that the maximum amount of radiation is available in the month of March-April and minimum in the month of December-January. From a recent study, the daily average solar radiation varies between 4 to 6.5 kWh per square meter. The seasonal variations over the year is small. So it is suitable for solar energy.

Fig: Solar Energy

Different oragnisations disseminate the solar home sytem (SHS) in the rural areas of Bangladesh through their solar energy program. Solar PV systems are in practice throughout the country with over 1.5 million household-level installations of about 75MW (August,2012) capacity [4]. Infrastructure Development Company Limited

(IDCOL), Rural Electrification Board (REB), Local Government Engineering Department (LGED), Bangladesh Power Development Board (BPDB), different NGOs and private organisations have come forward to implement this solar program. Dissemination of solar home systems (SHSs) is being promoted mainly by private sector companies and NGOs, mainly based on the direct-sale approach and provision refinancing funds for micro-financing of SHSs to participating organizations (mostly NGOs) through IDCOL. Progress with SHS's installation upto 29 April, 2012 [6] is given here-

Table-1: Installation of Solar Home System

Partner Organization	Number of SHSs Installed
Grameen Shakti	795,957
RSF	216,434
BRAC	77,019
Srizony Bangladesh	58,927
Hilful Fuzul Samaj Kallyan Sangstha	37,078
UBOMUS	25,234
BRIDGE	20,449
Integrated Development Foundation	14,238
TMSS	13,059

PDBF	10,672
SEF	21,720
AVA	12,817
DESHA	10,931
BGEF	16,995
RDF	20027
COAST	6,181
INGEN	9,871
CMES	5,714
NUSRA	9,372
RIMSO	8,196
Shubashati	5,370
REDI	5,711
GHEL	6,138
SFDW	9,485
PMUK	2,166
Patakuri	3,409
ADAMS	2,848
AFAUS	1,161
RISDA	1,552

Xenergeia	320
Other	389
Total	1,429,440

Division wise installation of SHSs

Division	Number of SHSs Installed
Barisal	265,320
Chittagong	278,730
Dhaka	374,587
Khulna	158,409
Rajshahi	200,480
Sylhet	151,914
Total	1,429,440

Solar irrigation pump

To run a submermisible solar water pump, IDCOL is financing a 11.2 kWp solar photovoltaic (PV) power plant at Shapahar, Naogaon with a capacity of 250,000 liters per day at 35 meter head [7].

The two ongoing project of Rural Electrification Board (REB) are capacity of 135.84 kWp and 183.7 kWp located in Chapai-Nawabganj, Rangpur, Tangail, Gopalganj, Mymensingh.

A 10 HP solar powered irrigation pump has been installed by Rahimafrooz at Savar, Dhaka.

Solar mini grid

Nation's first solar mini grid of 100 kW has been installed in the remote island of Sandwip, Chittagong. IDCOL has financed the power plant with grant and loan from KfW of Germany. Purobi green energy limited is distributing solar power through a mini grid to make the daily demand of a rural market of Sandwip [12].

Biomass

Biomass is the most significant source of energy in Bangladesh. This technology can be used to generate electricity in this country mainly in rural areas. Biomass is carbon, hydrogen and oxygen based. The prime sources of biomass fuel are rice husk, bran, wood, twigs, jute stick, leaves, livestock (animal dung) etc. These are abundant in our country. So we can make best use of these sources.

A 250 kW biomass based power plant has been installed at Kapasia, Gazipur. That is financed by IDCOL. For setting up this plant IDCOL provided concessionary loan and grants, sourced from IDA and the Global Environmental Facility (GEF), for a total project cost of 25 million taka of which the World Bank provided 60%. The project sponsor is the Dream Power Private Limited (DPPL). The plant is expected to supply environment friendly grid quality power to 300 households and commercial entities of that area [7].

IDCOL is also financing 400 kW biomass based gasification power plant at Chilarong, Thakurgaon sadar, Thakurgaon. The total cost of this project is 64.25 million taka. The project sponsor is Sustainable Energy and Agro-resource Limited (SEAL) [7].

Biogas

One of the most promising renewable energy resources in Bangladesh is biogas which can be produced from animal and municipal wastes. For a developing country like Bangladesh, it is economically beneficial to convert waste materials into energy. Biogas may be produced by the anaerobic digestion (absence of oxygen) of biodegradable materials such as biomass, municipal wastes, green waste, plant materials, manure etc. After the fermentation methane (CH_4) (60-70%) and carbon dioxide (CO_2) (30-40%) and may have small amounts of hydrogen sulphide (H_2S) are produced. Biogas comprises of these components.

Fig: Biogas Plant

About 82% of the electricity generation has been derived from the natural gas. As it is continuously used in different purposes so it will be depleted in the recent years. In this aspect, the Government and different NGOs have come forward to disseminate biogas plant in Bangladesh as it is suitable in this country. A 4 kW power generation plant has been installed by LGED at Faridpur Muslim Mission. At Kashimpur, Gazipur another 10kW project of Advance Animal Science Company Limited has been installed under German Technical Cooperation [8]. For setting up of three biogas based electricity generation plants, one in Mymensingh and two in Gazipur are financed by IDCOL. There is an Organic Fertilizer Plant in Gazipur by Paragon Agro Limited [7]. About 22,549 biogas plants have been installed throughout the country up to April, 2012. Progress with biogas plant installation up to April, 2012 of different organizations [9]is given in a table –

Table-2: Installation of Biogas Plant

Partner Organization	**Biogas Plant Completed**
Grameen Shakti (GS)	12,795
Rahman Renewable Energy Co. Ltd. (RB)	972
Save our Urban Life -SOUL	784
Kamrul Biogas and Compost Fertilizer Research Development Co. Ltd. (KB)	783
Hossain Biogas and Compost Fertilizer Company Ltd. (HB)	634

Rural Services Foundation (RSF)	925
Srizony Bangladesh	610
DESHA	655
Shubashati	493
Basic Organization Network for Development and Humanitarian Aid for Nation (BONDHAN)	407
Nirapad Engineering	344
Bhelabazar Shamaz Unnayan Sangstha (BSUS)	316
Development of Poor Society (DOPS)	190
Samaj Unnayan Kendra (SUK)	331
Anannyo Samaj Kallyan Sangostha (ASKS)	178
Mohila Bohumukhi Sikkha Kendra (MBSK)	103
Access toward Livelihood and Welfare Organisation (ALWO)	132
Sonali Unnayan Foundation (SUF)	99
Jahanara Biogas Construction Co.Ltd (JB)	82
SETU	93
RISDA-Bangladesh	310
Rural Reconstruction Foundation (RRF)	164
Shariatpur Development Society (SDS)	41
Barendra Advancement Intergrated Committee (BAIC)	68

Gonoshasthaya Kendra (GK)	44
Gram Bikash Kendra (GBK)	61
Center for Community Development & Research (CCDR)	340
ADAMS	68
Bright Green Energy Foundation (BGEF)	22
Ghashful	33
NUSRA	20
GHEL	80
Grameen Motsho O Poshusampad Foundation	48
PIPASA	9
LPEP Renewable Energy Bangladesh Ltd	5
WAVE Foundation	22
MAKS	5
Others	283
Total	**22,549**

Wind Energy

The rapid growing renewable energy source in the world is wind energy. Among other renewable energy sources, it is low in price. In wind energy, kinetic energy of wind is used as it is always moving. The power that is produced is directly proportional to the cube of speed of the wind. Coastal areas, higher areas are suitable for developing wind power plant. Bangladesh has a coastal line of 724 km and many small islands along the Bay of Bengal. Here a strong south-westerly tradewind and sea-breeze blow in the summer season and a north-easterly tradewind and land breeze during the winter season. Wind speed is higher in coastal areas. The variation of wind is from 4-5.5 m/s at a height of 25-50 m. The average wind speed in different areas of Bangladesh [1] is given here –

Table-3: Wind condition in different areas of Bangladesh

Site	Reference height (m)	Annual average wind speed (m/s)
Teknaf	5	2.16
Cox's bazaar	10	2.42
Patenga Airport	5	2.45
Kutubdia island	6	2.09
Sandwip island	5	2.16

Hatia island	6	2.08
Bhola island	7	2.44
Khepupara	10	2.36
Comilla Airport	6	2.21

Fig: Wind Energy

A 0.90 MW capacity of wind energy at the Muhuri Dam areas in the Feni has been implemented by Bangladesh Power Development Board (BPDB) in 2004. There are 2 MW of installed wind turbine at Feni and Kutubdia. SRE has installed seven small wind turbines at St. Martin's Island. Each of the turbine has a capacity of 3.2 kW at a rated wind speed of 10.5 m/s [10].

Hydropower

Bangladesh is flat delta plain covered by a lot of big and small rivers. Current of river water and low head of water fall may be used for harnessing hydro power. The power output of a hydroelectric power station depends on the availability depends on the amount of water and its head. Hydropower assessments have identified some possible sites from 10 kW to 5 MW but no appreciable capacity has yet been installed. There is one hydro power plant at Kaptai established in the 1960s with present installed capacity of 230 MW. BPDB has identified another two prospective sites for the generation of hydro power at Sangu and Matamuhuri River. The potential small hydrosites of Bangladesh that are identified by BPDB and BWDB [11]are given in a table-

Table-4: Potential small hydrosites that are identified by BPDB and BWDB

District	Name of river/chara/stream	Potential of electrical energy in kW
Chittagong	1. Foy's lake	4
Chittagong	2. Choto kumira	15
Chittagong	3. Hinguli chara	12
Chittagong Hill Tracts	4.Sealock	81
Chittagong	5. Lungi chara	10
Chittagong	6. Budia chara	10
Sylhet	7. Nikhari chara	26
Sylhet	8. Ranga pani Gung	616
Jamalpur	9. Bhugai-kongsa at 2 miles U/S of Nalitabari P.S	69 kW for 10 months 48 kW for 2 months
Jamalpur	10. Marisi at Dukabad near Jhinaigati Thana Head Quarter	35 Kw for 10 months 20 Kw for 2 months
Dinajpur	11. Dahuk at Burabari 12. Chawai at U/S of Chawai L.L.P	24 32

	13. Talam at U/S of Talam L.L.P 14. Pathraj at Fulbari 15. Tangon at D/S of Nargun L.L.P 16. Punarbhaba at Singraban	24 32 48 11
Rangpur	17. Bhuri khora Chikli at Nizbari 18. Fulkumar at Raigang Bazar	32 48

Conclusion

As Bangladesh is facing acute energy crisis and its conventional energy is failed to meet the necessary demand of the country. In this aspect, dissemination of renewable energy throughout the country should be the first priority to solve the present energy crisis as well as to improve the living condition of the mass people of rural and remote areas. Therefore, the Government and private sectors should emphasize on renewable energy sources to solve the present power shortage.

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