

Present Status of Installed Solar Energy for Generation of Electricity in Bangladesh

Nusrat Jahan, Md. Abir Hasan, Mohammad Tanvir Hossain, Nwomey Subayer

Abstract— Electricity is a basic need of our daily life. Our daily life depends on the amount of electricity usage. But in our country only 40 percent people has the access of the electricity. Moreover fossil fuel is non-renewable, so it is diminishing day-by-day. As a result we need different solution of electricity generation. In our country, so renewable energy is becoming more popular day by day along with the world. Solar Energy is one of that kind renewable energy. Its application is increasing day by day. Bangladesh has good availability of solar energy to generate electricity. In this study production of electricity using solar energy in Bangladesh along with the world has been shown in details.

Index Terms— Electricity, Solar Energy, Bangladesh, PV installation, Renewable Energy, fossil fuels.

1 INTRODUCTION

Low-income developing countries like Bangladesh are very much susceptible to the setbacks arising from the ongoing energy crisis. Natural gas lies at the heart of the country's energy usage, accounting for around 72% of the total commercial energy consumption and 81.72% of the total electricity generated [1, 2]. However, the waning gas resources suggest that the country will face deficit of 142 million cubic feet per day (mmcf) in 2011 and it will rise to 1714 mmcf by 2019-20. Even if Bangladesh's GDP growth remains as low as 5.5 percent till 2025, the country will need to add 19,000 MW of additional power, causing the gas demand to spiral up to 4,567 mmcf by 2019-20 [3]. Such an overwhelming dependence on bio fuel has brought into focus the substantial amount of renewable energy resources available in the country. The potential non-exhaustive sources of energies, available in the form solar, biomass, biogas, hydropower and wind, can be harnessed to provide an environmentally sustainable energy security, as well as affordable power supply to the off-grid rural areas of the country. To this end, effective utilization of renewable energy resources has been adopted as a policy of the Government of Bangladesh (GOB) [4]. Different government, semi-government and nongovernment organizations (NGOs) have been working separately or jointly to disseminate renewable energy technologies (RET) throughout the country over a significant period, as has been reported in the recent literature [5, 6]. So, a significant amount of solar panel is being built day by day around the world along with Bangladesh as to reduce the pressure on fossil fuels.

2 Global Photovoltaic Markets:

The global photovoltaic market has grown significantly over the last five years. Photovoltaic production has been increasing by an average of more than 20% each year since 2002, making it a fast-growing energy technology. At the end of 2011 the photovoltaic (PV) capacity world-wide was 67.4 GW. Top capacity countries were, in GW: Germany 24.7, Italy 12.5, Japan

4.7, Spain 4.2, the USA 4.2, and China 2.9. Many solar photovoltaic power stations have been built, mainly in Europe. As of December 2011, the largest photovoltaic (PV) power plants in the world are the Golmud Solar Park (China, 200 MW), Sarnia Photovoltaic Power Plant (Canada, 97 MW), Montalto di Castro Photovoltaic Power Station (Italy, 84.2 MW), Finsterwalde Solar Park (Germany, 80.7 MW), Okhotnykovo Solar Park (Ukraine, 80 MW), Lieberose Photovoltaic Park (Germany, 71.8 MW), Rovigo Photovoltaic Power Plant (Italy, 70 MW), Olmedilla Photovoltaic Park (Spain, 60 MW), and the Strasskirchen Solar Park (Germany, 54 MW). There are also many large plants under construction. The Desert Sunlight Solar Farm is a 550 MW, Topaz Solar Farm is a 550 MW, Blythe Solar Power Project is a 500 MW, Agua Caliente Solar Project is a 290 MW, California Valley Solar Ranch (CVSR) is a 250 MW, and Antelope Valley Solar Ranch is a 230 MW are being built in USA. [7]

3 CURRENT SITUATION OF ELECTRICITY IN BANGLADESH:

In 1971, just 3% of Bangladesh's population had access to electricity. Today, that number has increased to around 40% of the population – still one of the lowest in the world – but access often amounts to just a few hours each day. Bangladesh claims the lowest per-capita consumption of commercial energy in South Asia, but there is a significant gap between supply and demand. Bangladesh's power system depends on fossil fuels supplied by both private sector and state-owned power plants. After system losses, the country's installed capacity for electricity generation can generate 3,800 megawatts of electricity per day; however, daily demand is near 6,000 megawatts per day. In general, rapid industrialization and urbanization has propelled the increase in demand for energy by 10% per year. What further exacerbates Bangladesh's energy problems is the

fact that the country’s power generation plants are dated and may need to be shut down sooner rather than later.

Clearly, the present gas production capacity in Bangladesh cannot support both domestic gas needs, as well as wider electricity generation for the country. On September 15, 2009, the Power Division of the Ministry of Power, Energy and Mineral Resources of Bangladesh pushed for urgent action to be taken to improve the country’s energy outlook. The Power Division made recommendations such as ceasing gas supply to gas-fired power plants after 2012 to conserve gas reserves for domestic use.

The Government of Bangladesh is actively engaged in energy crisis management. The National Energy Policy has the explicit goal of supplying the whole country with electricity by 2020. Since 1996, the government has allowed private, independent power producers to enter the Bangladeshi market. It is already importing 100 megawatts of power from India and has negotiated with private companies renting plants to buy power at higher rates. [8]

4 Installed Solar Energy in Bangladesh:

Solar Energy is a great source for solving power crisis in Bangladesh. Bangladesh is situated between 20.30 and 26.38 degrees north latitude and 88.04 and 92.44 degrees east which is an ideal location for solar energy utilization [10]. At this position the amount of hours of sunlight each day throughout a year is shown in the following graph in the Figure-1 [9]. The highest and the lowest intensity of direct radiation in W/m² are also shown in the Figure-1 [9].

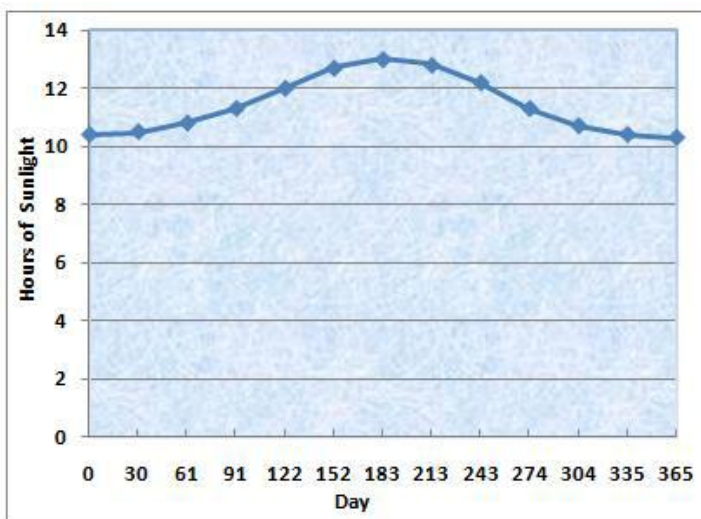


Fig. 1: The amount of hours of sunlight in Bangladesh

Infrastructure development company limited (IDCOL) has supported NGOs in installation of solar home systems (SHSs)

and a total of 1,320,965 SHSs having capacity of about more than 36.5 MW have been installed up to February 2012 [13]. Bangladesh power development board (BPDB) has implemented an excellent Solar PV electrification project in the Chittagong hill tracts region. The Solar PV electrification has emerged as the most appropriate technological option for the electrification of these areas [11]. A 10 kW central AC solar PV system has been installed in one selected market in each of the three Rangamati district’s sub-districts. With these systems, the shops of that market have been electrified with normal AC electricity [12].

Table 1: SHS's installation up to February 2012 [14]

Partner Organization	Number of SHSs Installed
Grameen Shakti	750,657
RSF	199,209
BRAC	75,440
Srizony Bangladesh	54,011
Hilful Fuzul Samaj Kallyan Sangstha	32,630
UBOMUS	23,651
BRIDGE	19,148
Integrated Development Foundation	12,618
TMSS	11,787
PDBF	9,869
SEF	16,783
AVA	10,564
DESHA	9,593
BGEF	13,684
RDF	15,911
COAST	6,181
INGEN	8,487
CMES	5,543
NUSRA	7,651
RIMSO	6,798
Shubashati	4,933
REDI	5,209
GHEL	4,981
SFDW	7,417
PMUK	2,046
Patakuri	2,087
ADAMS	2,433
AFAUS	1,003
Xenergeia	252
Other	389
Total	1,320,965

The amount is significant considering the upward trend of the number of SHSs (Solar Home System) installations in the country.

The Figure 2 shows the approximate division wise SHSs installation. The figure illuminates that the distribution of the SHSs is highest in the Dhaka district whereas lowest in the Sylhet

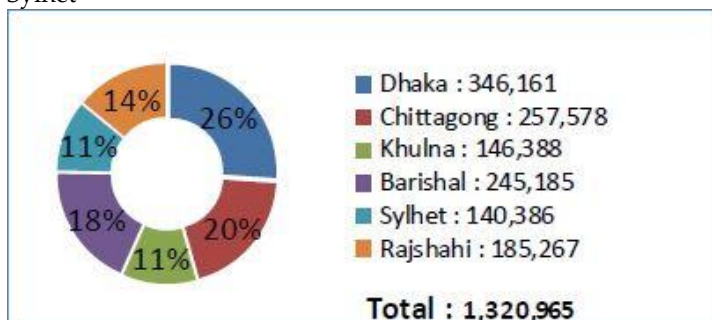


Fig. 2: Distribution of the SHSs (Solar Home System) in six divisions in Bangladesh up to Feb 2012 [14]

As we said only 40 percent of Bangladesh's population has access to electricity from the national grid. Fossil fuels account for almost all the current capacity of 5,500 MW, with renewable sources – mostly solar power – contributing just 55 MW. Grameen Shakti(GS), a pioneer in promoting 'green energy', started out in 1996 as a lone player and today is the largest distributor of Solar home service(SHS)- over 700,000 units out of a total of about 1.1 million in the country – contributing to the daily generation of about 60 Mw of solar power. In 2008, the government set a target of five per cent of total energy from renewable sources and 10 per cent by 2020. Government incentives for companies setting up solar plants include a 15-year tax holiday and exemption from paying import duty on equipment. Foreign investors get exemptions on royalties, technical knowhow, technical assistance fees and facilities for their repatriation of profits. Foreigners working in solar energy projects need pay no income tax for the first three years of their stay in this country.

Since November 2010, the government has mandated the installation of roof-top solar panels on all new high-rise buildings, and it currently has other solar power projects under development with a total capacity of 35 MW. Under the plan, 340 MW of new capacity will be generated from systems installed on residential, commercial and industrial buildings, as well irrigation pumps, mini-grid systems and solar parks. Infrastructure Development Company Limited (IDCOL), which funds 90 per cent of Bangladesh's 1.1 million SHS – mostly in partnership with GS, but also with other companies and NGOs. Seven city corporations will get solar street lights by 2015, which will ensure persistent light on city streets during

nighttime and will eventually increase the security of city-dwellers. The government has set a target of generating 500 megawatts (MW) of green energy – almost ten times the current amount – by 2015, in an attempt to narrow the gap between current supplies of grid electricity and the needs of the country's 160 million people. The government believes investments totaling \$2.24 billion will be required to reach its solar power target. It is seeking about \$1.6 billion dollars in financing from the Asian Development Bank (ADB) and other development partners. The plan calls for the remainder to be funded by the government and the private sector.[7]

Solar energy therefore has significant potential for Bangladesh. Solar power does not require sophisticated technology or know-how. It does not require fossil fuels to function, and is highly reliable: it is an economically feasible energy source. There are studies that suggest that if solar energy is adopted, as much as 10,000 megawatts daily of solar electricity can be created in the short- and medium-runs – this is equivalent to twice the total amount of electricity produced and supplied on the national grid.

In 2008, at the Washington International Renewable Energy Conference, Bangladesh pledged that 5% of its total electricity generation would come from renewable sources. In 2009, the Bangladesh Bank set up a US\$29m fund to promote solar power. Private commercial banks and state-owned banks signed an agreement with the central bank that allowed banks to draw money from this fund under a refinancing scheme with a low-interest interest rate of 5%. The banks could then lend the funds to borrowers from the solar power sector at a ceiling interest rate of 10%.

Although the Government of Bangladesh, along with the central bank, have made strong moves to bolster its solar power investment, in general, banks have not been interested because they do not find solar technology as profitable as other areas of business. The task at hand now is to make solar energy investment more attractive for lenders so that this area of renewable energy can be stimulated and grown.

5 Urban Potential

Most efforts to promote solar technology in Bangladesh have been directed towards rural areas. It is understandable given the poor electricity access in rural areas. Approximately 60 million people in the country are getting unreliable power. And it is fair to assume that since the demand for power in urban areas is generally greater than that of rural areas, urban households can also benefit from solar technology to escape the cycle of inadequate and irregular access to power.

The average energy need of cities like Dhaka and other urban areas is 4,000 megawatts per day – that is 200 megawatts in

excess of daily national supply. Under the current plan, Dhaka's energy needs have the potential to consume nearly the entire energy output of the national grid—a dire situation that leaves much of the country without power. The demand gap needs to be filled and alternative sources, like solar power, can easily bridge that gap. Bangladesh's tropical geography lends itself to solar technology since it receives plenty of sunlight.

There is no current government campaign in effect to promote solar power in urban areas, but if solar power becomes part of the country's energy agenda, it could play a significant role in relieving the stress on the national grid and help Bangladeshi cities move towards more sustainable energy practices.

Earlier this month, the city of Dhaka hosted a three-day solar power products exhibition to further popularize the idea of renewable energy for all people in the country. Every month, more than 30,000 solar home systems are installed throughout the country – up from 12,000 per month just under two years ago. The Rural Electrification and Renewable Energy Development Project (REREDP) have brought solar power to 7.5 million people in rural Bangladesh. A similar project needs to be initiated for urban Bangladesh where solar panels, for example, could be installed on the rooftops of buildings or in common living areas.

6 Country Projects

Despite a slow awakening to solar energy potential, Bangladesh has begun to be more actively engaged in promoting solar energy. In March 2011, the country set a target to install 500 megawatts of electricity via solar home systems to combat greenhouse gas emissions and to ensure sustainable development in energy. The plan is to use Asian Development Bank (ADB) solar power project funds to achieve the electricity generation target. The ADB will support 3,000 megawatts capacity power in the Asia-Pacific region; to benefit from this design, Bangladesh is partnering with NGOs to prepare its solar program. The country also has plans for a solar irrigation system to cut diesel costs.

AEC initiated solar PV programme (SPV) in 1985. The systems installed over the period 1985-1994 are 9790 watt peak. Most of the systems are not functional at present because of the lack of fund for spare parts, maintenance and back-up service.

LGED has so far installed SPV systems in 5 cyclone shelters, one at Cox's Bazar, four at Patuakhali.

According to LGED all the systems have been working satisfactory since their installation.

During the year 1996-1997, GS has installed 67 units of solar home systems (SHS) at different districts of Bangladesh. This includes Fluorescent Tube lights, T.V. point, Fluorescent lamps

etc. GS is planning to install a total of 400 under next phase of the solar PV development project.

So, solar panel is more establishing day by day around our country to reduce the pressure of the fossil fuels.

7 CONCLUSION

The controversy around solar technology is that it is expensive. The argument is that a country like Bangladesh does not have an abundance of money to throw at new technologies. However, that is a short-sighted point of view. The expense may be great, but if one weighs that against the potential for an energy crisis in the country, making provisions to invest in alternative energy sources does seem logical. Because most of the country still cannot access electricity, an energy crisis may have catastrophic effects on livelihoods. Recent studies by the UN and World Bank also suggest the vulnerability of developing countries to climate change – solar energy and other renewable energy sources allow for countries to plan future energy supply, as well as better prepare the country for the future effects of climate change. As Bangladesh continues to shape its future energy agenda, only time will tell to what extent the country sees alternative energy sources as a promising solution to a complex and convoluted problem.

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