Bangladesh Renewable Energy Newsletter

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Inaugurated by the Minister of S & T, Lt. Gen. Noor Uddin Khan, PSC (Rtd.), MP (middle). Also seen in the picture from left are BCAS Executive Director, Dr. Saleemul Huq, PDB Chairman, Mr. Q. I. Siddique, LGED Chief Engineer, Mr. Md. Monwar Hossain Chy., and BCAS Director, Dr. A. Atiq Rahman

EDITORIAL

As a follow up of the 3-day International Workshop on "Dissemination of Solar Photovoltaic Energy in Bangladesh", held on 28-30 May, 1999 at the LGED Bhaban, organized by Bangladesh Centre for Advanced Studies (BCAS) and Local Government Engineering Department (LGED) in collaboration with other government, non-government and private sector organizations, a committee named "Committee for Promotion and Dissemination of Renewable Energy in Bangladesh" has been formed (page 8). The terms of reference for this committee, as the name indicates, includes all kinds of activities related to promotion and dissemination of renewable energy in this country. The publication of this Newsletter is one of the steps undertaken by this committee.

Bangladesh has a plentiful supply of renewable sources of energy. These sources are biomass (including biogas and solid waste), solar energy, wind, hydro-potential, peat, tidal and wave. Since the conventional sources will be dried up, according to experts, by the middle of this century, we will have no alternative other than renewable sources. Again, at present, biomass contributes more than two-thirds of the total energy consumption and this huge consumption is adversely affecting the soil fertility and environment. An immediate step is needed to arrest this trend.

A good number of organizations including BCSIR, BAEC, LGED, BCAS, Grameen Shakti, CMES, BUET, Dhaka University, Rahimafrooz BRAC and some others are now engaged in the development and dissemination of some of the above technologies. The Ministry of Science & Technology is playing a catalytic role by providing fund and encouragement.

The fact that renewable sources of energy are destined to play a very important role in our future energy programme is not yet realized by all. It is hoped that this Newsletter will help fill up this gap to a great extent.

Wind Energy in Bangladesh

--- Dr. Anwar Hossain
Former Chairman, BAEC, Ex-Consultant
LGED, Presently Energy Advisor, BCAS

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Government has recognized the importance of renewable energy in our energy planning programme and a draft Renewable Energy Policy is on the verge of being approved. In the context of Bangladesh, renewable energy consists mainly of biomass, solar energy and wind power. Hydropower potential appears very limited. Studies could be made for microhydropower which could meet some of the local needs of electricity. This would, however, be seasonal and other forms of power generation may be required during some months of the year. There is little chance of geothermal power and further R&D would be needed to exploit wave/tidal power.

Wind energy has the potential to provide mechanical energy or electricity without generating pollutants. Historically it was used in many countries, especially, the Netherlands, as a source of mechanical energy, e.g. grinding corn or pumping water. In Bangladesh, as in many other countries, wind energy has also been used to provide some motive force to boats with sails of various designs. Unfortunately, not much research has been conducted in these areas, although renewed interest have recently been generated in utilizing the energy of wind for windpumps and sailing boats.

Wind electricity for decentralized system or hybrid generation of electricity using other energy sources as complementary to wind energy has now been given some attention and this could be suitable in low wind regimes for localized small grid systems or battery charging. For low wind speed, wind pumps could also be a viable option.

Bangladesh is situated between 20º34'-26º38' North Latitude and 88º01'-92º41' East Longitude . The country has a 724 km long coast line and many small islands in the Bay of Bengal, where strong south-westerly tradewind and sea-breeze blow in the summer months and there is gentle north-easterly tradewind and land breeze in winter months.

In Bangladesh, little systematic wind speed study has been made. Data collected by the meteorology department are usually meant for weather forecasting and are insufficient for determining wind energy potential. In an early study report in 1982, a 30-year meteorological data from a number stations throughout the country were considered. It was found that wind speeds in the districts of Chittagong and Cox's Bazar were the only ones which showed promise. Extending the idea, only coastal area and the bay islands showed promise for possible electricity generation from wind.

Recently, some measurements were made by F. Rahman in some coastal areas followed by a year's measurement in Patenga (Chittagong) at a height of 20m in 1995. It was found that wind speed is higher than the values obtained by the meteorological department. This led to a year-long systematic wind speed study at seven coastal sites in 1996-97 at a height of 25m by Bangladesh Centre for Advanced Studies (BCAS), in collaboration with Local Government and Engineering Department (LGED) and Energy Technology & Services Unit (ETSU), UK which was financially supported by the British Government (DFID). A parallel study was also conducted by another Group (REVB/GTZ).

The BCAS study first made an analysis of available meteorological data and established the following worthwhile information:

- Wind speeds are higher in coastal areas.
- Wind speeds exhibit strong seasonal cycle, lower in the September to February period and higher in summer (March to August).
- Wind speeds exhibit a diurnal cycle, generally peaking in the afternoon and weakest at night (the trends are also similar in West Bengal, India).

Sponsored by : Bangladesh Centre for Advanced Studies (BCAS) and Local Government Engineering Department (LGED).
Funded by : Sustainable Rural Energy Project (SRE) component of Sustainable Environment Management Programme (SEMP) under Ministry of Environment and Forest (MoEF).

The wind speed measurements by BCAS Group and GTZ group confirmed that wind speed is much higher in summer months (due to monsoon wind) than in winter months. Actual windspeed found by GTZ was slightly higher than those of BCAS Group; but the frequency distribution was similar. Diurnal variation confirmed the trend observed by the meteorological department.

Power curves of wind turbines with two different installed capacities from two different manufacturers have been used to calculate energy generation. The estimated annual energy outputs for Kutubdia and Kuakata are 133 MWh and 160 MWh for a 150 KW wind turbine; while the outputs are about 200 MWh and 230 MWh respectively from a 250 KW station at these places.

Some of the specific projects that could be undertaken were pointed out by the WEST study as follows:

- A pilot wind turbine plant may be set up and be linked with the existing 250 KW diesel power station at Kutubdia, to study the overall performance of a hybrid wind-diesel system in an isolated local grid.
- A demonstration wind power generating plant at Kuakata may be set up and connected to the existing grid to study the performance and efficiency of such a system.
- A study may be undertaken to assess the performance of wind pumps for lifting water for drinking (Kutubdia) and irrigation for crop production (Chittagong).
- Some wind-pv generators (100 W to 2KW) may be set up at remote locations to charge battery systems for specific users.
- It is necessary to continue the present effort of collecting, processing and analysis of wind-data from the existing monitoring sites for at least three years for developing realistic plans and projects on wind energy.
- In addition, other monitoring sites should also be selected for proper assessment of the wind-regime of the country. The proposed sites may include different terrain conditions including the coastal region.
- As an initial step, demonstration and pilot plants may be set up to examine the technical, operational and economic viability of wind energy in the country.

Recently, several small wind generators have been installed by BRAC (11 small wind turbines in various coastal sites) and Grameen Shakti (two wind generators of 300 W and 1 KW at its Chakoria Shrimp Farm). These are small DC operation type systems supplying power to target groups to improve their quality of life. Their results are not well documented. Grameen Shakti has recently installed 4 small wind generators (3x1.5KW + ONE 10 KW) in Barguna district (coastal south). They are planning to develop these stations into hybrid systems later, first with diesel and then with solar pv, to maximize the energy output and then study the cost economics. Their final quantitative results would be awaited with great interest.

While the Government is yet to undertake extensive wind mapping followed by wind monitoring, a research Group of Bangladesh University of Engineering and Technology (BUET) is now conducting a wind speed study at Chandana, Gazipur (near Dhaka) at a height of about 60ft and, as expected from previous meteorological studies, the speed is between 2-3 m/sec. Wind speed measurements are also being taken at St. Martin Island on top of a lighthouse by BCSIR. Extensive study is likely to discover wind pockets in the country, especially in the hilly areas (e.g. Chittagong Hill Tracts) and in coastal islands.

As for mechanical power from the wind, recently two groups have worked in such projects. The first one, form LGED, has set up a number of 27 ft high windpumps at Tangail, Kushtia, Cox's Bazar and other places. Theoretically, these indigenously made windpumps have a power of 0.5 h.p. (385W) at a windspeed of 4m/sec. The pump outlet is narrow and the output was found to be 25 liter/minute at windspeed of 3.2 m/sec. No quantitative results are, however, available. The second Group from BCAS installed a windpump designed by the IT (Intermediate Technology) Group of the UK and made in Karachi (Pakistan). The windpump was located in an agricultural field in Patenga (Chittagong). The Tower height was 40 ft and the rotor consisted of 12 blades. Daily water output has been varying and the average water output between November and January was about 8000 liters/day. It appears that suitablly designed windpumps can be extensively used for irrigation of vegetables in winter months in the coastal region. It should also be possible to draw fresh underground water for drinking purposes in the coastal islands.

The potential of wind energy has not been fully explored in Bangladesh, mainly due to lack of reliable windspeed data. It appears that the windpeed will not be high but wind energy can be put to a variety of uses, especially for windpumps, hybrid electricity generating systems with wind as one of the energy sources, small battery chargers at isolated places and electricity inputs to local grids in some coastal areas or the bay islands. To mention some practical applications, wind energy in Bangladesh could be used in shrimp production, fish/poultry firming, salt/ice production, fish-mill industries, hatcheries, domestic applications and vegetable irrigation – all using decentralized electricity (hybrid or mechanical energy from wind). Wind energy is a clean renewable energy source cheaper to maintain, saves fuel and can give decentralized energy. We should make maximum use of it (including more efficient boat sails where wind energy is directly used). This needs creation of necessary data and manpower base, setting up some demonstration plants at appropriate locations and carrying out research and studies for indigenization of technology.

A windpump set up by BCAS at Patenga, Chittagong

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Solar Market Electrification Under LGED

LGED has successfully completed solar market electrification in Gangutia growth center under Sailkupa Thana in Jhenaidha district. This activity has been taken under sustainable rural energy (SRE) Project implemented by LGED. The objectives of this project is to install a demonstrative plant of a centralized solar photovoltaic system for electrification of a rural market in the off-grid area and to assess its technical and economic viability in the context of rural Bangladesh. Gangutia growth center has been selected for solar electrification because of its remote location particularly when the nearest grid extension is around 7 kilometers apart. The market was previously served by a private entrepreneur using small size diesel generator of 5 KW. This is the first centralized solar PV system in Bangladesh where DC generated power has been converted to AC in order to match grid power quality. The system has the capacity to produce 1.8 KW power with daily consumption of 2000 watt-hour providing electricity to 45 shops, 3 food processing small industries, one health center and one bazaar mosque.

The responsibility of operation and maintenance has been entrusted with a

Picture : Gangutia Bazar, Shoilkupa, Jhenaidah

local NGO, Shubashati. The private entrepreneur, Mr. Azam Ali who was providing electricity to the market earlier from a diesel generator, will act as the technical person for operation and maintenance of the system. Each consumer is paying Tk.4.00 per day, which is adequate to support major maintenance requirements like replacement of CFL lamp and battery at regular intervals. The total cost of market electrification is around Tk. 11 lacs and it was borne by SRE Project which has been conceived as a component under Sustainable Environment Management Programme (SEMP) implemented by the Ministry of Environment and Forest

(MOEF) with financial support from UNDP. The successful installation of solar market electrification has created great enthusiasm and it will act as a milestone for green energy movement in the country.

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SEMP: The Green Vehicle to Promote Bangladesh Environment

The UNDP supported Sustainable Environment Management Programme (SEMP) is a follow up to the National Environment Management Action Plan (NEMAP). The programme is being executed by the Ministry of Environment and Forest (MoEF) and implemented by 21 Sub-Implementing Agencies within a period of five years. As a multi-dimensional follow-up action of NEMAP, SEMP aims at sustainable environment management, sustainable human development and a breakthrough in the poverty situation by helping the poor particularly the women. It supports community capacities for sustainable management of environmental resources. The programme will strengthen the capacity of the public sector on policy development in support of enhanced community participation and sustainable management of the country's environment and natural resources. There are 26 components with a total cost of US $ 26.00 million under SEMP which are categorized under five thematic areas such as (a) policy and institutions; (b) participatory ecosystem management; (c) community based environmental sanitation; (d) awareness and advocacy; and (d) training and education.

SEMP, through its component "Sustainable Rural Energy", is intended to address the recent concern for environmental degradation by the conventional fossil fuels that has drawn the attention of energy planners to increasingly tap renewable energy source for energy production. Local Government Engineering Department (LGED), with its major mandate for sustainable rural development, has been entrusted to implement "Sustainable Rural Energy" component of SEMP for demonstration and transfer of technologies related to the use of renewable energy in Bangladesh.

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Practical Applications of Solar Photovoltaic (PV) Electricity in Bangladesh

--- Dr. - Engr. Khursheed-Ul-Islam
Renewable Energy Consultant and Partner, ARMCO

Background--Development of Global Market Demand for Solar PV Electricity & Other RE-Technologies

The Global "Energy Crisis" of 1973 - a situation created by the Oil Embargo, imposed by the Organization of Petroleum Exporting Countries (OPEC) – triggered a series of 'Shock-waves' across the globe, which literally *jolted the "Petroholic" human society back to their senses* to become careful in the use of Fossil Fuel Resources and the look for solutions through the use of alternative sources of Energy. The human race, which, until then, had otherwise been lavish in their use of global resources, started realizing seriously for the first time that the fossil fuel resources of this planet are limited in their reserves. This 'crisis' initiated the first innovative thoughts and 'kicked off' a series of market-oriented R&D activities by serious research institutions, as well as *commercial companies all over the world, including large Oil Multinationals, to develop and market commercially applicable Renewable Energy (RE) Technologies and Systems, amongst which Solar PV occupies a key position.*This initial 'driving force' which created the first Market demand for Renewable Energy, was soon further reinforced by the *'big scare' of Global Warming,* caused by the Greenhouse Gas Emission from Fossil Fuels.

Why Solar Energy ?

Let me answer this question with a Vision in future.

Pictures from Weather Satellites show something odd about our Planet - Earth. The familiar Icecaps are not there any more. A large part of Bangladesh , Maldives, St. Marshall and other low-lying countries of the world lie submerged below the Oceans. So does a part of Florida. In Washington you can row from White House to the Capitol. The Sahara Desert is blooming again. Travel Agents are advertising on Chice Sea-shores in Sacranmento. But the Sand Dunes have began drifting across what used to be the Corn Belts of the North American Continent.

That could have been the Nightmare Scenario of the Earth, perhaps in less than a Century from now. No one knows for sure whether any of this nightmare will come true; but experts do know that mankind is now in a position that it has never known before.

"The world has never been faced with such a complex problem before – certainly not in the environmental area and probably nowhere else", said David Slade of the U.S. Department of Energy once thoughtfully.

However, as the human history teaches us, crisis situations in terms of dwindling global resources and visionary thoughts resulting out of such situations – no matter in which sector - have always 'jolted' the human race back to their senses to be careful with global resources and find out appropriate alternative solutions. This too has already started to happen in the area of Energy use - to look for :

Environmentally Clean "Energy Sources of Tomorrow

Sun--an almost "Endless Source of Clean Energy."

About ninety three million miles away from our Planet, there burns in Cosmos, an almost endless source of Energy - the SUN, powered by its unique and magnificent self-sustaining thermonuclear fusion - the most Powerful Powerhouse of our Planetary System, which sends to earth each year an Energy Input that is equivalent to 15,000 times the world's total Commercial Energy Consumption and more than 100 times the world's proven Reserves of Oil, Gas and Coal !!

Commercialization/Marketing of Solar PV Technology—Global Constraints--Past, Present & Future Trends

Unfortunately, harnessing SUN's gigantic power on earth and the dissemination/commercialization of this technology through a serious team-work between Scientists, Engineers, Economists and Market Experts had long remained a somewhat non-serious issue, when compared to the efforts that were being put for developing and commercializing more conventional energy technologies. On a global basis, not even 1/20th of the financial investments and technical efforts that were put in the past in developing and commercializing the Nuclear Energy, for example, were made available initially for developing and disseminating Solar Energy Technologies. Experts are aware, why it had been so in the past and why the Price of Solar Cells and Panels are still relatively high, although in the recent past it is dropping at a faster rate than expected.

It is easy to control and twist the price of the Fossil Fuels like Petroleum by 'screwing up or down' its production and/or influencing the OPEC member-countries, by the Oil Multinationals. But the dilemma has always been to put a 'Price Tag' on the SUN and form 'Price Cartels' to control it, which such International Oil Companies - the Seven Sisters can easily do with prices and production of Fossil Fuels? Sun's endless clean energy is free and available for everybody on earth! Hence, more complicated control on the Market Pricing and Price Control Mechanisms through Price Control on Solar PV Equipment & Technology and the Inputs that go into Production of Solar Photovoltaic Cells & Panels for its commercial use, needed to be globally thought out. Manipulating the Price of Silicon Ingots – the major Raw Material from which PV Cells & Panels are produced - is still being used as a major Strategic Parameter to control the Cost of Solar PV Cells and Panels. Solar PV Technology is now totally proven, only what needs to be done is the reduction of the Price of PV Cells & Panels. The time for Price reduction is, however, now ripe, driven by the 'big scare of Global Warming', as well as the deminishing Global Reserves of the Fossil Fuels, which, at the present dynamic growth rate developed and developing nations alike, is expected to be exhausted in next 65 to 100 years at the most !

However, the 'Good News' is that the multinational Oil Companies, have themselves now entered the 'Solar game', investing millions dollars for cost optimization of Production Processes and corresponding Costs for Solar Cells/Panels through industrial R&D activities, as well as actual manufacturing and dissemination/marketing of Solar PV Panels & Systems, realizing the fact that this "endless source of clean energy" can sustain their future Energy Business on long term – when all Fossil Fuels,

especially Oil reserves of this planet will be depleted. The Energy Vision of this Millenium is Alternative Energy Technology. The largest share of such a diversification of Energy Technology will be in the form of Production and Marketing of Solar PV, Wind, Bio-mass and other Renewable Energy Equipment, Systems and Technologies.

The development of the Cost Scenario of Solar PV - its past, present and future - is very important as a parameter which determines its Market Penetration in developing countries like Bangladesh the PV Module price dropped from several hundred US dollars per Peak Watt (Wp) in 1970 to abt. US$ 5 - 6/Wp in the mid Nineties. This is a real impressive cost-reduction ratio of over 1 : 20 over the last 20 years !! With the 'Cost-Barrier' gradually reducing, the Solar PV Capacities globally rose from a humble 1 MW, 20 years ago from now, to the current worldwide SPV Capacity of over 190 MW – a growth rate that equates to an avg. of over 30% per annum. This is abt.3 times the average annual growth rate of conventional electricity capacities on a global basis. The target is to reach at least US$ 2/Wp (i.e. US$ 2000/kWp) or even below (abt. US$ 0.50/Wp). When this is achieved, which is expected to happen soon (possibly by Year 2008-2010), the Solar PV will become economical as Grid-interactive Systems, especially in 'Sun-rich' developing countries like Bangladesh.

Application of Solar PV in Electrification of Remote Rural areas of Bangladesh

Less than about 20% of Bangladesh's population have access to the major Secondary Energy - Electricity, which stays at the middle-point of all development activities. Being primarily an agro-based country, the major population of Bangladesh - abt. 105 million, live in rural areas. Only a little over 2 million consumers in rural area could be connected to Grid Electricity through Rural Electrification Board (REB)/Palli Bidyut Samity (PBS)'s Grid over the past two decades. It is estimated, however – based on the degree of inaccessibility/remoteness and the dispersed location of Households ('thin-load' areas) – that at least about 20-25% of the rural areas of Bangladesh shall not be able to enjoy the facility of conventional grid electricity in foreseeable future. In India, for example, this is about the percentage of Rural Consumers, who could not yet be accessed by the grid electricity, whereas India started with their Rural Electrification Programme much earlier than Bangladesh

The first (62kw) solar PV pilot project at Narsingdi

Inspite of the present high level of PV costs, we, in Bangladesh, have already initiated the first practical steps towards field-testing its Market Potential, through Pilot/Semi-comercial PV Projects. PV Applications in the 4 isolated Islands of Meghna river in Narsingdi – Karimpur, Natunbazar, Alipur and Panchabati - are for Rural Solar Home Systems, which provide about 62 kW of Solar PV Electricity to 795 Rural Consumers by using both Stand-alone type, as well as Central Battery Charging PV Systems to operate Lights, Fans, TV/Radio/Cassette etc. APEX INGENEURIE, France, supplied the PV Equipment and the entire Project was implemented by a Bangladeshi Engineering firm - ASSOCIATED RESOURCES MANAGEMENT CO. (ARMCO), specialized in Energy, Power and Renewable Energy in particular. FONDEM, France did the initial (Conceptual) Design, and selected the Site, based on a Socio-economic Study and Site Survey, conducted by Bangladesh Centre for Advanced Studies (BCAS).

The Project is operating successfully since its commissioning in 1996/97. The degree of Consumer-satisfaction is demonstrated by a regular Bill Payment by the Consumers, the Bill Recovery Rate being over 90%. Although a 'low-profile' Project in terms of its total cost (about US$ 1.5 million), this Pilot Project has attracted the attention of a large number of International Donor Agencies (e.g. The World Bank, GEF, ADB, USAID,CIDA etc.) and has acted as a 'Flagship Venture' in encouraging a series of PV and other Renewable Energy Projects by public, private and NGO Institutions. Private, totally commercially-oriented Companies like Rahim-Afrooz, Micro Electronics, Siemens and reputed NGOs like Grameen Bank, BRAC, ANANDO etc., have programmed and ventured in a much serious and larger way into the Renewable Energy sector, since implementation of this Pilot Project.

'Feed-Back' and lessons learnt from Narsingdi PV pilot project

The Objective of the Narsingdi Pilot PV Project was to test the various Commercial PV Systems under the Rural socio-economic conditions of Bangladesh and apply the 'Feed-backs'/Lessons learnt, while replicating all future PV Projects in the country. The major Lessons learnt through this Pilot PV Project are the following :

- Stand-alone PV Home Systems are more popular than those where Deep-Cycle Storage Batteries need to be transported to and from a Central PV Battery Charging Station.
- There is a necessity and ample scope to improve upon the Maintenance / Repairs and Monitoring of the Systems and Services to Consumers
- There is a need also to try Solar A.C. (Alternating Current) based 'Mini-Grid' System, which is able to provide a higher load (about 150-200 W) and will allow use of readily available Grid Appliances (normal Lamps, A.C. Fans etc.)
- There is a lack of interest and dynamism in replicating / disseminating Renewable Energy Projects of this type amongst the GOB implementing institutions. Maintenance, Monitoring and further Project/Fund development activities of future Solar PV and other Renewable Energy Projects are not being given the due serious consideration they deserve from concerned GOB institutions, who, apparently are more pre-occupied with Conventional Electric Supply.

The future

The Solar and Other Renewable Energy Technologies (Wind Power, Bio-mass, Bio-gas, Geothermal, Oceanic Tidal, Oceanic Thermal etc.) are no more 'Pipe-dreams'. Many of them, especially the Solar PV, and Wind Power Generation, have crossed the threshold of large-scale Commercial Applications. These *"Energy Sources of Tomorrow"* – as already mentioned – are expected to penetrate at least abt. 40-50% of the total global Energy-mix in the next 40-50 years. There is no better choice in sight to mitigate the Greenhouse Gas generation and the related problem of Sea-level Rise to save our Planet than to gradually switch over to Renewable Energy.

Diversifications

Diversifications of Solar PV are also being planned and tried in a Pilot scale first, later to be scaled up and commercially applied. Apart from Rural Home use, the Solar PV Water Pumping, especially for Rural Water Supply, using Solar Deep-well Pumps, is the next Market trial target. Other major Diversifications will take place in practically testing the Hybrid Systems, for example, PV-Diesel, PV-Biomass and PV-Wind could be very appropriate for Rural areas and Coastal belts of Bangladesh, as such Systems offer better 'System Reliabilities'. Larger capacity Low Tension Central Grid (A.C.) Systems also need to be field-tested in pilot scale for later Commercial Operation under Bangladesh conditions.

Conclusions -- Investment potential by the private sector

The International Finance Corporation (IFC), the Global Environmental Facility (GEF), created by the World Bank and a number of other international donor agencies are now encouraging the private-sector investments in these areas and supporting them with finance. Apart from this, a number of Private-sector Companies and reputed Non-Government Organizations (NGOs) like BRAC, Grameen Bank, Bangladesh centre for Advanced Studies (BCAS), ANANDO (German backed-up) etc. are operating in this sector, even if - at present price situations of Solar PV – the commercial returns are either very slow and/or negative now. This, they are doing, looking, naturally at its enormous future Commercial Market Potential. Being inspired by the success of the Narsingdi Pilot Project, further replication of the same are now being sought through international finances, e.g. materilization of 6000 Household Solar PV Electrification and Planning & Implementation of typical 25 – 50 kW 'Mini-Grid' (A.C.) PV-Diesel Hybrid Systems

We are quite confident that the Solar PV - now being a field-proven technology, such bold and visionary investments made to-day, can really 'spark-off' the beginning of a long journey into the realm of Commercial Applications of Solar PV and other Renewable Energy Technologies for enhancing the quality of life of the people in developing countries like Bangladesh, especially

in rural areas. So let's march forward with the rest of the world to harness the "most Powerful Powerhouse of our Planetary system", as we call it, and "plug even the remotest rural area of Bangladesh to this gigantic source of energy – the SUN!"

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Dissemination of Solar PV Systems in Bangladesh:

A Case Study: Narsingdi Solar PV Systems

---- Dr. M. Eusuf
Former Chairman, BCSIR, Presently Senior Fellow, BCAS

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This was a pilot project based on a French financial grant of 6.4 million french frank. Foreign currency component of the project is provided as grant by the Govt. of France to GOB and subsequently by GOB to REB. Local currency of Tk. 2.70 crore was provided by the Govt. of Bangladesh.

A total of 795 PV units of 5 systems ranging from 6 Wp to 92 Wp have been supplied/installed. These PV units are divided into two broad categories, viz. (1) Stand-alone system, and (2) Charging-station-based system. Systems I, IV and V belong of the former category and systems II and III to the latter.

In the stand-alone system, the users are provided with all the components, viz. PV module, battery, controller, wiring system and the loads. In the charging-station-based system, all the components excepting the PV module are provided to the users.

System I consists of a 8-watt lantern, 3-watt incandescent lamp and 6 watt peak (Wp) module. In System II, there is a 12-volt (60 AH) battery to light two 8-watt fluorescent tubes and to run a TV/Tape and in system III, there are two 12-volt batteries (60 AH each) to light two 8-watt and one 13-watt fluorescent tubes and also to run a fan and a TV/Tape. The batteries for these systems are charged at solar charging stations. Three solar charging stations have been set up in the project area. System IV has one 46 Wp module to charge a 12-volt (100 AH) battery which runs the same type and number of appliances as in System III. In System V, two 46 Wp modules charge two 12-volt (100 AH) batteries which light one 8-watt and two 13-watt fluorescent tubes and also run one fan and one TV/VCP.

Under this project, PV systems have been installed at one rural health clinic for running fans, lights and a refrigerator.

As the first solar system (system-V) was installed on 3rd August 1996, it is now too early to make any firm comment on the systems. Assessment to date indicates that, in respect of system reliability, System-V is the most preferred option followed by System-II and System-IV. System-I with the initial design was not acceptable. Although System-III provides greater load facilities than System-II, the demand for the former is much less than the latter because of transportation hazards of two batteries.

Some kind of solar culture has already caught up in the area. Some consumers have already made comments saying that their PV systems are better than the grid, because the entire system is under their control and there is no fear of unwanted blackout because of load shedding. They know how to plan the duration of different appliances to get the maximum benefits.

The Karimpur, the Natun Bazar and the Alipur charging stations have been in operation since 18 January 1997, 3 February 1997 and 6 March 1997 respectively. As stated, it is too early to make any definite comment on these charging stations. However, for better functioning of the systems and more satisfaction of the consumers, the following observations are in order:

- REB/PBS personnel placed at the charging stations need be properly trained on the installation, operation and maintenance of all the components of solar systems.

  It is suggested that arrangement be made to train up these personnel together with some rural unemployed youths. Providing training to the local youths will help manpower development for better technical backup service, create more job opportunities (self-employment) and encourage more replication of the current project. Some training programmes have already been completed.

- Since the same battery is circulated among the different consumers, the maintenance of the batteries is severely affected, so much so that within one year more than 100 batteries have been put out of commission. As per specification, the durability of these batteries is 3-5 years.

  It is suggested that, in order to check this bad maintenance, batteries with code numbers be assigned to individual consumers. M/S Rahim Afrooz have supplied batteries to replace the damaged ones.

- Hand/head carrying of batteries containing sulfuric acid weighing about 15 kgs is sort of hazardous and a kind of drudgery. This is disliked by the consumers.

  ARMCO has suggested to design a special bicycle capable of carrying 8 batteries in a single trip. This bicycle may be tried.

- NPBS-1 should arrange for collection of complaints of consumers through formats and the personnel placed at the concerned charging stations must attend the complaints the same day.

- Fortnightly visits to the project areas by a team consisting of represen-tatives of REB, NPBS-1, BCAS and ARMCO will help quicken the settlement of the complaints made by the consumers.

- In order to improve the bill collection, it is suggested that the concerned PBS personnel visit the project areas during the first week of the month for the collection of bills with prior information. If the consumers fail to clear the dues during the visits, they (consumers) have to come to the NPBS-1 office at Madhabdi to make the payment.

- One Consumer Board consisting of local elites under each charging station may be formed. This board is expected to help check misuse of batteries and settle local social problems.

- Solar electricity is different from grid electricity in that the consumers know what amount of electricity they have in their possession and they must ration the consumption out. With solar electricity, there is no fear of unpredictable outage.

  BCAS is maintaining an office at Karimpur to monitor the functioning of the solar PV systems and disseminate other renewable energy technologies.

  With the financial support from the Ministry of Science and Technology, Government of the People's Republic of Bangladesh, a survey is now being conducted by BCAS to study the workability and acceptability of the PV systems.

An MOU has recently being signed between BCSIR and BCAS to intensify the R&D activities in the project area and other places of the country.

Watching TV run by solar PV at Karimpur, Narsingdi

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Solar PV System in Bangladesh by Rahimafrooz

There is an immense potential for the use of solar PV technology here in Bangladesh. Photovoltaic is a proven viable option in remote areas. Solar irradiation in different regions of Bangladesh is sufficient for cost effective application of solar photovoltaic electrification.

Bangladesh is continuing its efforts for harnessing its solar power for reaching electricity in its hilly areas and islands where supply of traditional electricity will not be possible in foreseeable future. The people in other areas will need electricity for running hospitals, vaccine refrigerator, telecommuni-cation, cyclone shelter & navigational lighting system.

Although there are good prospects for solar PV system in Bangladesh, potential market development has rather been limited. The Govt., Private sectors and NGOs are taking increasing initiative towards development of the solar energy utilization.

Rahimafrooz, the pioneer organization engaged in research and commercial utilization of solar energy since 1986 in Bangladesh has made some progress. Rahimafrooz has been working in this field both individually as well as in association with other agencies like NGOs (Grameen, BRAC etc.), private and government sectors.

Rahimafrooz's local manufacturing facilities of quality solar batteries, charge controller, mounting structure and other components have considerably brought the system price down.

SPV Home Lighting System

Rahimafrooz has installed the following SPV systems for rural applications.

- Solar PV lantern
- Domestic lighting System
- Small and medium stand alone SPV system (<3 KW)
- Centralized AC SPV power plant
- Solar hot water system
- Solar vaccine refrigerator
- Solar water purification system
- Railway signaling system
- Telecommunication
- Navigation lighting system

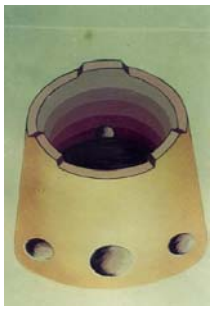
Some projects implemented by Rahimafrooz are highlighted as under:

Solar Power Telephone Exchange at Charfashion and Monpura Island

Under financial assistance of the Govt. of Finland, T&T Board has installed 1.2 K Wp Solar Engineering system to provide power to Telephone Exchange in the coastal island of Charfashion & Monpura.

Central AC Power Generation at Sholkupa, Jhenaidah

The project site comprises a village market. The main income of the people at the site is trading. There are about 50-nos. of energy saving lights in the market to light the entire place powered from 1.8 KWp centralized AC Solar power plant to provide lights to 12 W energy saving lamps in shops, hospitals, mosques and husking mills. Here one person or an administrator is responsible to operate and maintain the system.



Improved biomass stove developed in IFRD, BCSIR

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