

GRAMEEN SHAKTI: PIONEERING AND EXPANDING GREEN ENERGY REVOLUTION TO RURAL BANGLADESH

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Abstract: Grameen Shakti (GS) has been very successful in promoting Renewable Energy Technologies (RETs) in Bangladesh using a market-based approach. GS has been successful because it has developed a unique approach involving soft credit for consumers, adaptive technology to lower costs, maximizing income generation, and effective after sales service including consumer friendly options such as a buy back system. GS has installed 100,000 Solar Home Systems as of June 2007, making Bangladesh, one of the countries with the fastest growing Solar PV programs in the world.

Grameen Shakti has always been pro-active in promoting pro-renewable energy policies in Bangladesh. Because of its commitment and dedication, one of the most successful government programs in Bangladesh has been implemented. By 2005, 50,000 Solar Home Systems (SHSs) had been installed, three years ahead of schedule, under this project. It was the first time the Bangladeshi Government promoted private energy players instead of directly implementing the project.

Grameen Shakti has always emphasized community participation and motivation as the basis of all its activities. It has employed local youth as technicians, trained users on home based trouble-shooting, and provided scholarships for children of its clients. Particularly it has focused on ensuring the participation of women. This includes training women from user families on repair, maintenance, employing local women as technicians, etcetera. GS has been pro-active in promoting the benefits of renewable energy technologies to rural women through demonstrations, house-to-house contacts, etc.

Grameen Shakti plans to install one million SHS by 2015. It also plans to construct two million biogas plants and Improved Cook Stoves by 2015. GS plans to do this through promoting local entrepreneurs that will market, install, and carry-out repair and maintenance activities at the local level on behalf of Grameen Shakti. Twenty Grameen Technology Centers (GTCs) have already been set-up locally to train women technicians. Nearly 650 women technicians are already operating at the field level. They are producing SHS accessories at the local GTCs, as well as installing, repairing, and maintaining SHSs. GS has also trained more than 600 local youths to construct, repair, and maintain ICSs. GS is also providing seed capital and technical assistance to twenty manufacturing units for producing ICS accessories. These are the first steps for developing full-fledged rural based RET ENTREPRENEURS.

Bangladesh needs to do more to fully utilize its renewable energy potential and remove the energy barriers to its social and economic development. It is urgent that a Renewable Energy Development Agency (REDA) is set-up as soon as possible to support local initiatives and promote renewable energy technologies. We hope to see the emergence of all sorts of innovative schemes for promoting RET in Bangladesh.

Grameen Shakti - A Successful Social Business:



Grameen Shakti (GS) has used micro-credit imaginatively to develop one of the first successful market based models to take renewable energy technologies to rural people. Though energy is essential for improving livelihoods and facilitating economic development, around 70% of Bangladeshis still do not have access to electricity. It is impossible economically and

logistically to reach the millions of off-grid rural people with electricity through conventional means. GS, set-up in 1996 as a not-for-profit company, has taken up the challenge and developed an integrated program, which is both market and social based to successfully popularize Solar Home Systems (SHSs) including other renewable energy technologies to millions of rural villagers.

Professor Yunus, Nobel Laureate and the Founder of Grameen Bank has shattered the myth that the poor are not credit worthy and has made micro-credit a global movement. Another myth shattered by GS was that **renewable energy technologies are too expensive for the rural people.** **Mr. Dipal Barua**, who has been with Professor Yunus right from the start, is one of the **co-founders** of Grameen Bank. Inspired by Professor Yunus's vision that nothing is impossible, he has devoted many years of his life to develop different financial and technical packages to make renewable energy technologies affordable for rural people. He has been rewarded with a very successful organization - GS,- one of the largest and fastest growing rural based renewable energy companies in the world, which has contributed to Bangladesh becoming a country with one of the most successful renewable energy programs in the world. As of June 2007, GS has installed more than 100,000 SHSs in rural areas with more than 4000 SHSs installed per month.

Successful Blending of Market and Social Forces with Technology

The demand for solar technology is increasing day by day. This did not happen in a single day. It took a lot of hard work and commitment from GS staff and management. This success especially was the result of a unique approach, blending market and social forces together to take the world's most up-to-date technology to the rural people. The main barrier that GS had to cross was the high up-front cost of these technologies.

Rural people were unaware of renewable technologies and would not spend their hard earned money on a technology, which did not have efficient after sales services at the local level and no opportunity to earn an income.

GS used its Grameen Bank's experience to develop a financial package based on installment payments. This reduced costs without providing any subsidies. GS believes that a product should sell because it enjoys high demand, not because of subsidies. GS's unique financial approach has been the key factor in expanding its solar program. It helped GS to reach economy of scale and provide more attractive packages to its clients such as reduced down payments, lower interest rates, and longer payback periods.



However, GS had to convince the rural people that renewable energy technologies provided a workable solution to their energy problems before its financial strategy would work. To do this, GS was pro-active in involving local communities in promoting and implementing its programs. Local teachers and elected leaders helped GS to explain the benefits of renewable technologies to the rural people. GS trained and employed locals as GS certified technicians. Local employment was created and users dealt with technicians whom they knew and trusted. GS trained users, especially the women of the households, to take care of their systems. This also had financial benefits. GS was able to provide repair and maintenance services at reduced costs locally, helping it to further scale up its program. The installed systems were in good condition, creating good will and reducing GS's overhead cost. In this way, a synergy between market forces and social forces was created and sustained.



GS had to earn the good will of the rural people and especially provide excellent after sales services to ensure the success of its program. No wonder GS engineers are also called social engineers. GS engineers train

women technicians and provide them with employment, they administer a scholarship program for school children, and they collect damaged batteries to ensure that they do not hurt the environment. GS engineers provide one-on-one excellent after sales services. They pay monthly visits to households during installment payment periods and are ready to offer their services for a small fee, afterwards, if a client signs an annual maintenance agreement with GS.

GS solar PV program really took-off the ground when rural clients realized SHSs are more cost effective than other conventional sources of energy such as kerosene. A typical household spends more than Tk. 500 on kerosene without taking into account other costs such as those health related. But a 50-watt system costs around Tk. 800 per month during payment of installments and next to nothing later. SHSs can be used to watch TVs, listen to radios, charge mobile phones, and provide pollution-free efficient light. SHSs generate no monthly bills, have no fuel cost, need very little repair or maintenance, and are easy to install anywhere.

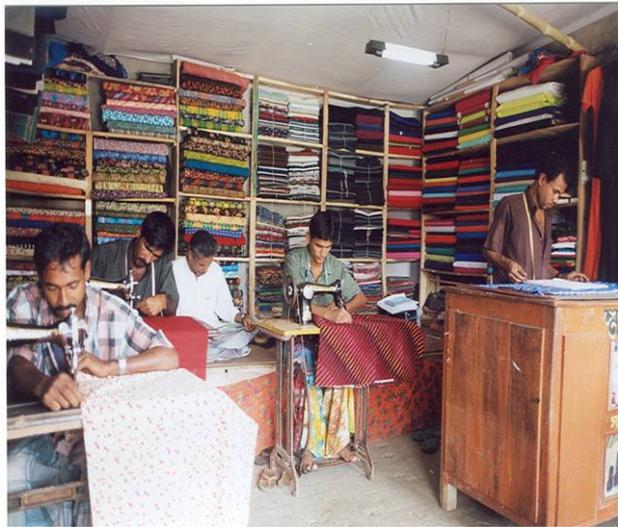
Advocacy for Market-based Pro-Renewable Energy Technology Policy in Bangladesh:

Grameen Shakti has advocated and succeeded in establishing pro-friendly renewable energy policies in Bangladesh. GS's single greatest contribution is the adoption by the World Bank of the GS model to expand renewable energy in Bangladesh through the Infrastructure Development Company Ltd. (IDCOL) project.

IDCOL, a Public Limited Company, took-up a project to install 50,000 solar home systems from 2003-2008 through private players and allocated a budget of US\$ 20 million. Instead of direct implementation, IDCOL provides soft loans and technical assistance to private players interested in promoting Solar PV technology. This project has become one of the most successful initiatives taken on by the government. By 2005, 50,000 Solar Home Systems (SHSs) have been installed three years ahead of schedule. GS alone installed 65% of the 50,000 SHSs. Bangladesh has become one of the countries with the fastest growing Solar PV program in the world. The project has been extended and now also includes a program to support biogas technology.

Bringing Light and Energy to One Million Rural Households:

GS has opened the door of untold opportunities for the rural people. Rural people live in a vicious cycle. Because of their lack of economic power, they cannot access efficient energy, this in turn hugely limits their economic and business activities. Additionally they face environmental and health hazards because of their over-dependence on



traditional energy sources, such as biomass and fuelwood. Lands are denuded of trees and foliage, women and children suffer from air pollution and related diseases.

GS program is like a ray of light and hope for this grim picture. Its solar, biogas, and improved cookstoves programs reduce dependence on wood and biomass, bringing in environmental benefits. Thousands of women and children are benefiting from these programs. They do not have to suffer from indoor air –pollution. These women can use biogas and improved cookstoves for cooking.

GS installed SHSs are helping to open new businesses such as community TV shops, solar charged mobile phone centers, electronic repair shops, etc. Hundreds of restaurants, tailors, grocery stores, saw mills and so forth are using solar systems to extend business hours, increase business turnover, and create new employment opportunities.

Biogas technology has come as a boon for poultry farmers who can now easily get rid of their poultry wastes. They are also earning extra money by selling biogas and slurry to others. Rural households that cannot afford a solar system or a biogas plant are the main beneficiaries - they are purchasing biogas from others at a cheaper price than kerosene. GS has helped to construct around 1000 biogas plants within two years. This trend is increasing. Many entrepreneurs are experimenting with biogas plants to produce electricity and power small business units. At least four GS installed biogas plants are producing electricity.



In thousands of rural homes people are now enjoying entertainment opportunities, which were once beyond their imagination before the advent of GS. They can watch TV, listen to radios, use mobile phones, get connected to the Internet - all with the help of solar home systems. Their horizons have been extended; their vision and dreams for the future have become wider to extend beyond Bangladesh towards the whole world. Their children can

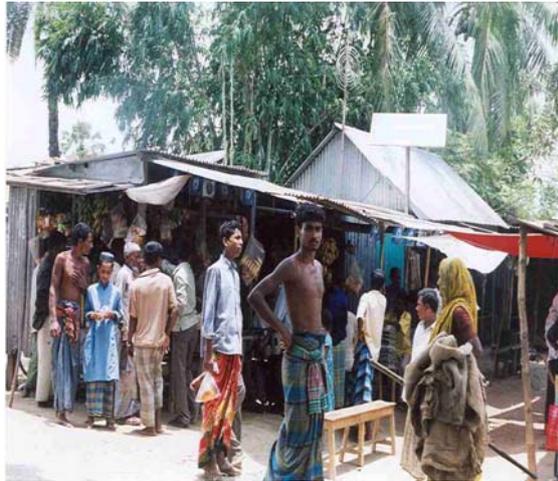
study by solar light. Schools and Madrasas are using solar light to provide education to the children. Hospitals and Clinics have started using solar power for operation and other activities. Orphanages and some industries have become interested in biogas technology to meet their energy needs and generate income. For example, Muslim Mission has constructed biogas plants on its premise and has signed an agreement with GS to manufacture and promote organic fertilizers.

For its one million beneficiaries, GS has turned the vicious cycle rural people face into a positive cycle of social and economic growth. Economic upturn increases consumption, which in turn increases business and employment opportunities. Consequently, all these pave the way for better education, better health, and a pollution free environment.

Reaching Lower Income Households: Bringing Renewables within the Reaches of the Masses

GS is always undertaking research to bring renewable energy technologies within the reach of poor people. For example, GS introduced **Micro-Utility System** to help very poor consumers who cannot afford a complete solar home system. Under this model, one entrepreneur installs the system at his own premise and shares the load with some of his neighbours. The owner of the system is responsible for making installment payments to GS - more than 50% of which is covered by the rents he collects from the users of his system. The Micro-utility model has become very popular in the rural market places and has helped to increase business turnover by extending business hours. More than 10,000 micro-utility systems are operating in the rural market places.

Another successful initiative of GS is **Biogas Plants shared by multiple households**. Bangladesh is one of the most densely populated countries of the world. Most rural people live either as joint families or in clusters where each household joins another, usually with relatives living very near each other. Joint families and relatives living near



each other can share the cost and benefit of owning and operating a biogas plant. GS is also seeking to bring low-income groups under its biogas program by linking them with micro-credit and providing them with alternative for repayment. For example, in famine affected northern areas, GS is providing poor farmers with livestock so that they may set up a biogas plant and at the same time generate income. They have the option to pay for the system in livestock or slurry instead of cash.

Grameen Shakti is also successfully promoting **Small Solar Home Systems** for the rural poor who cannot afford larger systems. GS has already installed more than 500 systems within 2 months. GS is also focusing on manufacturing LED and CFLs in its production units to provide its rural clients with more cost-effective options. GS is also looking to assemble systems, which would cost less, but would be more efficient.

Bridging the Gap - Synergy between Technology and Women:

There is no doubt that women have been one of main beneficiaries of GS programs. Women traditionally responsible for household energy needs have been rescued from this burdensome task by GS installed SHSs. In thousands of rural homes, women no longer need to clean kerosene lamps every evening and can finish their household activities more easily and in less time. They feel more secure after dusk and can be more mobile.



In particular, they enjoy better in-door environment and are protected from indoor air-pollution, which is one of the main reasons for women suffering from diseases such as asthma, cancer, pregnancy related problems, still births, etc.

Many women have also opened cottage and small-scale industries such as poultry and handicrafts with the help of SHSs. **One of the successful examples of synergy between women and technology is the Grameen initiated Polli Phone Program under which thousands of women are running profitable mobile phones business in off-grid areas; their mobile phones are powered by GS installed Solar Home Systems.**

GS has made women the cornerstone in the success of its renewable energy technology program. Women users as satisfied customers would be in the forefront in promoting and implementing renewable energy technologies in their households and elsewhere. Now, GS has a program to train more than 5000 women from user households on repair and maintenance of SHSs, not only to ensure that systems are better taken care of at the household level, but also to ensure that their children become aware of, and used to, renewable energy technologies. We consider women to be the prime decision maker at the household level. So we plan to train nearly 10,000 school children, especially girls from rural schools, on renewable energy technologies.

Grameen Technology Centers: *Training & Educating Women to be Future Renewable Energy Entrepreneurs*

More than 40,000 rural people are installing Solar Home Systems per year. One of the most ambitious plans undertaken by GS is to set up local Grameen Technology Centers (GTCs) to meet the growing demand for SHS to market and produce SHS accessories, as well as provide effective after sales service at the local level. We have made women the focal point of this program. We plan to train and develop women technicians for implementing GTC activities. GS has already set-up 20 Grameen Technology Centers (GTCs) on a pilot basis to train 1,000 women technicians within the next three years. These technicians will operate independently or as GS certified technicians to market, install, repair, and maintain SHSs for their rural customers.



They will also produce SHS accessories locally. We look forward to a day when many of these women will eventually start their own small businesses and become key players in promoting and implementing renewable energy technologies in rural Bangladesh.

We are planning to make GTCs an integral part of our expansion plan. More than hundred GTCs will be set-up to complement 500 unit offices for training and developing women entrepreneurs, who will promote, install, repair, and maintain renewable energy technologies on behalf of GS.

Through our programs, we are making women, the worst sufferers of the rural energy crisis, come to the forefront as the chief implementers of change to bring efficient, pollution-free energy to the rural communities. Instead of passive victims, they are becoming active implementers to bring socio-economic improvement in their lives as well as the lives of others

Let Many Flowers Bloom:

GS envisions a future where every Bangladeshi will have access to pollution free and efficient energy and will be connected to the world through telecommunication and other modern facilities. GS has already shown that renewable energy technologies can viably be provided to the rural people, and now GS plans to develop renewable energy entrepreneurs who will play a major role in making renewable energy technologies an everyday reality in the lives of the rural people. GS initiated entrepreneurs will develop and implement diverse ways to promote renewable energy technologies. For example, some entrepreneurs will manufacture, others will sell, and still others will provide repair and maintenance services. Again, some entrepreneurs will promote SHSs for lighting; others will promote biogas plants for electricity, gas and organic fertilizers, etc. GS has laid the groundwork for developing renewable energy entrepreneurs as we

can see below:



One Million SHSs by 2015 – Better Life More Income

GS plans to install one million Solar Home Systems by 2015. A crop of efficient local technicians have already have been created. GS has also set up 20 GTCs and trained 660 women

technicians. Many of them are already marketing, installing, and repairing Solar Home Systems. GS plans to provide more training, business education, and access to credit to set them up as entrepreneurs. They will be the front soldiers in the scaling up of GS's solar program. At least 100 GTCs will be set-up in the next five years to reach this goal. Another goal of GS is set up modern manufacturing units for producing SHS accessories to initiate large-scale production and have a further reduction of costs. Many of these manufacturing units would be set-up at the rural areas and use local entrepreneurs.

200,000 Biogas Plants by 2012- Fuel, Health, Income Solution

Biogas technology has a huge potential in Bangladesh. Biogas plants can produce gas for cooking and lighting, electricity for power generation, and slurry for developing organic fertilizers. A minimum of four million biogas plants and at least one million poultry waste based biogas plants could be constructed.



Most rural households own two to three cows and poultry. The waste produced from these animals can help to fuel an emerging business sector. The cost of biogas plant maintenance is about one US\$ per month with a maximum payback period of two to three years. GS plans to construct 200,000 biogas plants by 2012. GS has already laid the basis for creating the linkage between biogas technology, livestock, and agriculture. Moreover, GS has successfully promoted its program to local entrepreneurs including poultry and live stock farmers. GS has constructed more than 1000 biogas plants within two years. Currently more than 200 biogas plants are constructed per month and the trend is increasing. Biogas plants are very popular among both poultry and livestock farmers, and also rural households who have to spend more than Tk. 500 monthly on kerosene. Livestock and agro-businesses have become energy self-sufficient by turning poultry and live stock wastes into energy. These businesses have also been connected with agriculture through the promotion of slurry, which is the source of high quality organic fertilizer. GS has signed agreements with two companies for producing and marketing organic fertilizers. Agriculture cost will come down and yield will increase from these initiatives.

Intermediaries have grown up that are collecting cow dung or poultry wastes from farmers and are selling these to biogas plant owners, who do not have enough cows or poultry. Again, these people are collecting slurry from biogas owners and selling it to farmers. GS sees them as future entrepreneurs who will be the main force in promoting biogas technology. GS plans to provide them with training and credit facilities to become full-fledged entrepreneurs. GS has also taken up an initiative to provide livestock as credit to low income households who want to construct biogas plants. GS sees its innovative entrepreneur based biogas program boosting agriculture, live stock sectors and providing energy and light for business and domestic purposes.

Improved Cook Stoves for Health and Environment



Improved Cook Stoves (ICS) can reduce deforestation, save energy costs up to 50%, and most importantly, protect the health of millions of women. ICSs use local technology and cost little. GS has become interested in ICS because it helps women and makes their lives easier. GS sees a potential market of at least two million ICSs in the first three years of the program.

GS plans to depend on two types of local players for expanding Improved Cook Stoves: technicians and manufacturers. GS has already trained more than 600 local youth, especially women to make, sell, and repair ICSs. GS plans to train more technicians in the next phase. These trained technicians will train others as well as produce and commercialize improved cook stoves on behalf on Grameen Shakti. Many of them will soon start their own business in arrangement with GS and will lay the basis of developing **ICS entrepreneurs** at the rural level. GS has developed and pilot tested its own model of three mouthed stoves, which is more efficient than previous models in Bangladesh. GS has also set up 10 manufacturing units in rural settings for constructing ICS accessories such as metal grates and chimneys. These manufacturing units are run by entrepreneurs with the financial and technical assistance from GS This strategy has proved to be successful. More than 2000 ICSs have been constructed within the first six months of the program. Women and commercial organizations, such

as food industries, restaurant hostels, and soap manufactures have shown great interest in ICS.

The Way Forward: Potential and Constraints

What We Have Achieved:

Currently, Bangladesh has one of the fastest growing Solar PV programs in the world with Grameen Shakti installing two thirds of the total systems installed in Bangladesh. The success of Grameen Shakti in Bangladesh has clearly demonstrated that mass appeal can be created among the rural people using a market-based approach if a program has the following key elements:

- Ownership model is a key factor where the technology is owned by the beneficiaries and they take the responsibility of proper maintenance and utilization of the system
- Soft credit should be blended with adaptive technology to minimize costs and maximize income generation for the rural clients
- Efficient and effective back up service should exist locally so that clients are ensured that their systems will receive proper repair and maintenance services
- Community awareness and participation should be enhanced through promotion and employment of local youth as technicians , especially through training of owners so that they can take care of their systems
- Focus should be on women as beneficiaries and active agents of change. This is because women are the chief victims of energy crisis and they benefit most from any changes.

What More Needs to be Done?

Bangladesh still has a long way to go to utilize the full potential of renewable energy technology to protect itself from economic degradation and economic, social under – development due to energy crisis. We need to further update our National Energy Policy to maximize and facilitate the active role of each major player, such as financial institutions, business organizations, non–governmental organizations, micro-credit organizations, etc. We should focus on the following:

- Tariff policy should be changed. Presently, finished goods costs less to import than raw materials and parts. This is hampering with our manufacturing industry for renewable energy technologies,
- Tax breaks and other financial incentives should be provided to manufacturers

- Governments should provide tax incentives and other measures to encourage financial institutions to provide soft loans to RET companies
- Micro-credit organizations should be encouraged to provide credit to rural consumers for purchasing RETS. This would reduce the transaction costs and financial costs of RET companies
- Micro-credit organizations should be encouraged to provide credit to local entrepreneurs, especially women for initiating seed RET businesses such as repair, maintenance, and production of accessories
- Feed-in options and tax breaks should be provided to consumers
- Government, technical institutions, and RET companies should forge links together to focus on Research & Development and developing human resources. There should also be more focus on linkage with international organizations to ensure effective technology transfer
- Linkage between livestock, agriculture, and biogas technology should be emphasized and scaled up
- CSR initiatives by Big Business Institutions should be encouraged for promoting renewable energy technologies

The Bangladeshi government has made the decision to establish an authority in the name of Renewable Energy Development Agency (REDA) to support local initiatives and promote renewable energy technologies. We hope this institution will be implemented as soon as possible, and we will be able to see the emergence of all sorts of innovative schemes for promoting RET in Bangladesh.

Grameen Shakti has always been pro-active in advocating the promotion and implementation of renewable energy technologies in Bangladesh. We hope to continue and upgrade our role to play a bolder part in unleashing the power of renewable energy technologies in Bangladesh.