

Draft Prospectus for SE4ALL Mission to Bangladesh

Mission Sponsors: USDOS, WB, UN

Lead Organizer: USDOS

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Introduction

This Draft Prospectus outlines the Mission objectives, participants and in-country stakeholders to meet. The Implementation Plan sets more specific activities for the mission to accomplish.

The Summary Analysis section addresses each focus area and begins to identify gaps and potential SE4ALL activities. This section is intended as a starting point, as it is primarily based on available reports and other documentation of the activities of the Government of Bangladesh, the major donor agencies, business and NGOs. The detailed supporting material is summarized in the following sections:

- Key Energy Sector Stakeholders
- Government National Strategy
- Programs by International Donor and Finance Organizations, and
- Activities by NGOs and the Private Sector

Key SE4ALL Principles

- **Ownership:** ensure a maximum degree of buy-in through a bottom-up approach and process that is driven by the stakeholders in the opt-in countries;
- **Inclusiveness:** engage with and involve a broad cross-section of stakeholders, including the private sector and civil society representatives, in addition to relevant regional organizations (e.g., power pools, RECs, and others);
- **Country-specific:** ensure an approach relevant for each country's needs and circumstances with value added actions specific to a country or region in question;
- **Complementary:** leverage existing programs and projects in each country and use existing donor coordination mechanisms where appropriate;
- **Open communication:** promote clear and timely communication between all key players and ensure that relevant information is shared with regional hubs and the Global Facilitation Team;
- **Comprehensive approach:** integrate bottom-up solutions to complement top-down sector reforms and large-scale investment planning.

Objectives

- Continue discussion of the Sustainable Energy for All initiative approach with the Government of Bangladesh and with key stakeholders.

- Review ongoing projects and programs related to sustainable energy to identify gaps, synergies, and areas that are ready for scale-up through innovative public-private partnership (PPP) arrangements.
- Develop aide memoire / non-paper outlining priorities for SE4All focus and steps and mechanisms to develop an investment prospectus.
- Use the SE4ALL high-profile leadership and cross-sector support to engage the major energy sector stakeholders to consider new approaches and processes that leverage traditional donor activities and achieve scaled-up impacts that will meet the 2030 goals.

Members

- Mission Leader: Robert Ichord, USDOS
- Molly Ward, USDOS
- Elizabeth Wallace (Finance expert)
- Pat DeLaquil (SE4ALL Expert)
- World Bank (Venkat Ramana Putti)
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Local Partners

- Jyoti Shakla, World Bank
- Hongliang Yang, ADB
- EU Mission
- UN Resident Coordinator
- US Embassy

Key Energy Sector Stakeholders¹

Government

- Ministry of Environment
- Power Division of Ministry of Power, Energy and Mineral Resources (MPEMR)
- Ministry of Finance
- Bangladesh Power Development Board (BPDB)
- Rural Electrification Board (REB)
- Bangladesh Energy Regulatory Commission (BERC)
- Infrastructure Development Company Limited (IDCOL)
- Sustainable and Renewable Energy Development Authority
- Titas Gas Transmission and Distribution Co Ltd

International donor and finance organizations

- World Bank

¹ The list of stakeholders is not comprehensive at this point.

- Asian Development Bank
- UNDP
- USAID
- GIZ
- KfW
- JICA

Businesses

- DCCI Energy Committee
- Summit Power Co. Ltd
- PH Consulting or Taylor Engineering Group
- Prokaushal Sangstha Ltd.
- Rahimafrooz
- Energypac

Civil society and Academia

- Grameen Shakti
- Bangladesh Rural Advancement Committee (BRAC)
- Accenture Development Partnerships
- Bright Green Energy Foundation
- United International University
- Others

Plan

A structured approach to global advocacy and stakeholder engagements is critical. There are many ongoing initiatives and processes related to sustainable energy as an enabler of development or that include energy as a key component. In order to make a positive impact and increase the likelihood of success, the following steps will be taken in a collaborative effort that:

- Meet with MEPMR to identify lead agencies² in each focus area
- Meet with country program directors and energy staff for ADB, USAID, WB and other major donor organizations to discuss progress to date, gaps and potential SE4ALL activities
- Meet with executing agencies, implementing partners, NGOs and private-sector stakeholders in each focus area to gain perspective on lessons learned, gaps and opportunities relevant to SE4ALL
- Identify high impact opportunities (HIOs) that leverage existing country programs
- Make initial estimates of how specific activities could bridge the gaps between current activities and SE4ALL goals
- Develop aide memoire / non-paper that will identify priorities and steps and mechanisms to develop an investment prospectus

The draft country action plans will be developed to complement sector reforms and large-scale

² A “lead agency,” is one that is endorsed by the recipient country as the point organization with which the SE4All initiative will collaborate

investment planning with market-based and community-led solutions for decentralized energy systems. The draft country action plans will identify donor coordination activities and development assistance requirements needed to leverage private investments for specific elements of the action plans.

Possible HIOs include:

- Electrification Roadmap
- Clean Cook Stoves and LPG/DME Distribution Networks
- Industrial Efficiency
- Appliance Standards
- Practitioners Network
- Joint RE Procurement

Summary Analysis³

Bangladesh has witnessed improved economic growth in recent years. The country's Gross Domestic Product (GDP) is estimated at 6.3% for FY12. The government of Bangladesh's (GOB's) target is to achieve 8% growth in National Income by 2013, and 10% by 2017. However, insufficient physical infrastructure facilities which results in power and energy shortages are key impediments to achieving the GOBs growth targets as well as the government's poverty reduction goals. The World Bank estimates (2010) monetary loss at nearly US\$1 billion as a result of power shortages and unreliable supply.

Energy Access

Electricity

Bangladesh is one of the world's lowest energy producers and suffers from a chronic shortage of electricity and gas. Electricity reaches only about 47% of the entire population despite the country's successful rural electrification program. The government's Sixth Five-Year Plan (6th FYP), FY2011–FY2015, sets a target of increasing electricity access to 68 percent households by 2015. Furthermore, the Government has set a target of providing electricity in every house by 2021. The 2015 goal will require over 5 million new household electricity connections, and achieving 2021 goal will require another 11 million households be connected.

The key challenges to expanding electricity access are insufficient generating capacity and a lack of distribution lines in rural areas. Bangladesh has insufficient generating capacity to meet demand. The current shortage in electricity production, relative to the actual demand, is estimated at about 1500-1800 MW during peak hours. The 6th FYP call for the addition of over 11,000 MW of new generating capacity by 2015, which is estimated to require USD 15 billion investment, of which USD 10 billion is expected to be provided by the private sector. Significant investments will also be required to expand the rural electricity distribution network. Achieving the 2015 goal is expected to require building an additional 60,000 kilometer of rural distribution lines, compared to a 2010 total of 223,000 km. However, the dispersed nature of rural settlements and the numerous rivers that crisscross the country make grid electrification in many areas difficult and expensive. Off-grid renewable energy appears to be the only near-to-medium-term option left for millions of people in the remote areas of the country.

Bangladesh has developed strong programs addressing off-grid rural energy issues. The country's award-winning rural energy program is based on rural electric distribution cooperatives where major focus has been the use of solar home systems (SHS) in the country's off-grid regions. Grameen Shakti runs one of the leading rural renewable energy programs, and since its inception in 1996 till November 2012, Grameen Shakti installed 1 million home systems across all 64 districts of Bangladesh. Today, Grameen Shakti and other organizations like it install about 30,000 home systems every month. Infrastructure Development Company Limited (IDCOL), a government-owned nonbank financial institution that funds infrastructure projects, including these solar home system programs, has a goal to reach 2.5 million systems by 2014. The key to the Grameen Shakti's success is its microfinance program based on the fact that customers save money by switching to solar. Kerosene for lantern is expensive – especially in

³ Derived in part from SE4ALL Rapid Assessment and Gap Analysis – Bangladesh, Prepared with support from Energy Sector Management Assistance Program, The World Bank, Draft June 2012.

remote areas where there are additional distribution costs compared to the cities – and low-income households can save money to pay back the micro-loans as well as have better illumination for various productive uses. However, without significant scale-up, it seems unlikely that the 2021 target will be achieved. The World Bank Rural Electrification and Renewable Energy Development project supported IDCOL and these SHS programs. The RERED-I project closed in December 2012, and the follow-on RERED-II project has been approved, and will have new components in access to electricity, modern household cooking, energy efficient lighting and technical assistance.

Key Challenges	Current Activities	Gaps	Potential SE4ALL Activities
Insufficient generating capacity	Rental power plants, near-term oil and gas fired power plants, medium-term coal and nuclear power plants.	USD 15 billion investment is required, of which USD 10 billion is expected to be provided by the private sector.	None
Lack of distribution lines in rural areas	WB RERED I and RERED II projects plus Bangladesh Investment Promotion and Financing Facility	Goal to achieve 3000 km of new transmission lines and 60,000 km of distribution lines by 2015.	Promote PPP solutions eligible for Facility financing.
	Micro-finance of SHS to off-grid customers.	Goal to achieve 2.5 million connections by 2014.	PPP approaches to scale-up marketing distribution and service activities.

Cooking Fuels

Regarding access to modern cooking fuels, the vast majority of households in Bangladesh (>90%) cook with biomass in rudimentary stoves. The transition to modern, clean cooking fuels like natural gas, liquefied petroleum gas (LPG) and electricity, will take a long time, as access to these fuels is limited. Improved cook stoves (ICS) are the transitional option for the majority of the poor along with biogas systems for families with cattle.

In spite of a number of efforts to introduce ICS in Bangladesh since the 1980s, only about 2% of the population relying on traditional fuels has access to ICS. A recent study has explored options for developing a large-scale ICS program to reduce exposure to indoor air pollution in Bangladesh. A recent study shows that a sustainable ICS program in Bangladesh should be based on a market-driven model that would allow for the growth of entrepreneurs and micro-enterprises through intensive training and capacity building. The recent mobilization on clean stoves and fuels through the Global Alliance for Clean Cookstoves (GACC) and the United Nations Sustainable Energy for All Initiative offers a unique opportunity that Bangladesh should explore to scale up the dissemination of clean cook stoves and fuels. To increase use of ICS, the GOB, in particular IDCOL, should take measures to facilitate a process that promotes variety, improved durability, better safety, and greater efficiency. Strengthening the involvement of Grameen Shakti, and other similar NGOs in Bangladesh, could go a long way to achieving these objectives.

Key Challenges	Current Activities	Gaps	Potential SE4ALL Activities
Poor quality stoves and Lack of distribution and service in rural areas. Lack of Standards and Protocols for ICS	GIZ pilot program based on commercial approach to promoting improved cook stoves. RERED II through IDCOL	The GIZ Program has disseminated over 400,000 domestic stoves and over 3000 commercial stoves, and scale-up is needed. Potential market for more than 20 million clean cook stoves	Support commercial manufacturing approaches and microfinance based distribution and service. Global partnerships. Carbon Finance

Renewable Energy

In spite of all the short and long-term efforts at increasing power generation and demand-side management, it will take years to fully close the demand-supply gap. In a small way, even though foreign and domestic Independent Power Producers (IPP) are keen to invest, the Government is wary of excessive private sector participation in the sector, especially for contracts requiring all payments in foreign currency.

To generate additional power, GOB has taken a number of steps, including further development of coalfields, intensifying new exploration of natural gas, and increased importation of Liquefied Natural Gas (LNG), although progress has been slow. In addition, renewable energy sources are to be harnessed. However, the GOB's longer term energy strategy (as outlined in the 6th FYP) is focused on near-term power plants using fuel oil and natural gas, and medium to long-term power plants using coal and nuclear fuel. The GOB is planning coal-based power plants using domestic and imported coal; and they continue the development of the Rooppur Nuclear Power Plant in cooperation with Russia. The 6th FYP includes only 12 MW of solar power and a 100 MW wind farm.

The Renewable Energy Policy (2008) of GOB laid out a target of meeting 5% of total power demand from renewable energy sources by 2015 and 10% by 2020. However, beyond the successful solar home systems (SHS) program, there have been little renewable energy generation investments made since the policy was announced. GOB is preparing the legislation to establish a Sustainable and Renewable Energy Development Agency (SREDA) as an autonomous body to lead its efforts in promoting renewable energy and energy efficiency in the country. In addition, further energy sector reforms are needed to have better functioning energy markets, which can support both rural energy access and increased use of renewables and energy efficiency.

Wind energy can potentially generate more than 2000 megawatts of electricity in the coastal regions. Initial reports of the wind-mapping project launched by the government indicate that areas in the southern coastal region are suitable for setting up wind turbines. Implementation of wind energy in the underdeveloped, coastal areas of the country would help poor, isolated communities that are not connected to the national electricity grid and who are also unlikely to receive grid connection in the near future. Leading NGOs including Bangladesh Rural Advancement Committee (BRAC) and Grameen Shakti have installed 17 small wind generators in coastal areas. They are also conducting research to develop hybrid power stations, which are a combination of wind turbines, solar PVs and diesel generators to maximize energy output and optimize cost. Grameen Shakti has set up four of its wind generators to

power cyclone shelters set up along the coast. The organization now plans to develop micro-enterprise zones around these cyclone shelters.

Much of Bangladesh is a plain delta having three of the world's major rivers flowing through it. During monsoon the flow rate of most of the rivers is high but it reduces substantially during winter. Hence the potential for hydropower generation is very limited in Bangladesh except in some hilly regions in the northeast and southeast parts of the country. However there are a lot of tributaries, canals, and small waterfalls which have good potential for setting up small hydropower plants.

Bangladesh has strong potential for biogas production. Being an agricultural country, the raw materials for biogas are easily and cheaply available everywhere in the country, and the temperature usually varies from 6°C to 40°C, which is well suited for biogas production. Most biogas systems provide clean cooking gas, while the Government along with several NGOs are working together for development of power production from biogas. Grameen Shakti has completed 13,500 biogas plants and BRAC has about 3,664 plants. IDCOL has a target to set up 37,669 biogas plants in Bangladesh under its National Domestic Biogas and Manure program.

Key Challenges	Current Activities	Gaps	Potential SE4ALL Activities
Additional energy sector reforms are needed to allow higher RE tariffs	ERC capacity building activities by USAID	Lack of empowerment of the regulator.	Continue with reform initiatives including regulatory reforms.
Relatively low speed and seasonal winds	Small off-grid systems supporting remote coastal areas. UNDP RE resource assessment program.	Poor RE resource data	Promote rural mini-grid hybrid systems supporting micro-enterprise zones.
Low hydropower heads and highly seasonal water flow	UNDP Renewable energy investment scale-up focused on wind, solar and biomass.	Lack of incentives for small hydropower	Promote IPP development of SHP projects
Sustainable use of biomass residues	GIZ Sustainable Energy Development project	Scale-up needed	Support approaches to community-based biomass power systems.

Energy Efficiency

For promoting energy efficiency (and also increased renewable energy) in Bangladesh, the government is implementing some key measures. For example, it is in the process of establishing SREDA as a statutory policy and resource mobilization agency for promoting renewable energy and energy efficiency in Bangladesh. The necessary legislation has been drafted and, as an interim measure, a small cell within the MPEMR has been established to initiate the preliminary activities of SREDA. Once fully operational, SREDA is expected to be the coordinating agency for the national household energy program.

As part of its efforts to reduce the existing demand-supply gap, GOB has embarked upon the Efficient Lighting Initiatives of Bangladesh (ELIB) program with the World Bank support to replace incandescent lamps with energy efficient Compact Fluorescent Lamps (CFLs). The first-phase distribution of 10 million CFLs has been completed, though there are problems related to product quality. The second-phase distribution of another about 7 million is being planned, including actions to overcome quality issues.

The Rural Electrification Board (REB) is implementing the CFL component under the ELIB program. For the program, REB is the apex body responsible for planning, financing, and installation of the rural electrification network of the country. The CFLs are procured by REB and are given to the distribution utilities and the rural cooperatives for distributing to the households in exchange for incandescent lamps. The program is registered under the Clean Development Mechanism (CDM) for claiming carbon credits with IDCOL as the Coordination and Managing Entity (CME).

Energy prices (gas and electricity) have been traditionally low in Bangladesh and theft is endemic. Therefore, there is very little incentive to be energy efficient from an energy cost point of view. In the past, most energy efficiency improvements in the country seems to have come about as a result of other things, such as autonomous efficiency improvements, product quality improvement, environmental regulations, etc. Bangladesh's import policy is heavily biased against energy efficient devices.

Energy efficiency in Bangladesh is generally not a high priority, with attitudes that ranges from neutral to negative. Based on actual interviews with Bangladesh banks, most are not interested in funding energy efficiency projects especially because these are difficult to monitor and in many cases profitability is marginal. This lack of awareness about the role and the need for energy efficiency is partly a result of the low level of per capita energy use in the country. Banks will only invest in an energy efficiency project if they initially funded the particular industry and the project initiator can prove that it will make savings and repay the loan. It is highly unlikely that Bangladesh's banks will get involved in an industry just for energy efficiency component. Leasing companies are more likely to be interested in investing in refurbishing and energy efficient technology for existing industries.

Using the highly successful US Federal Energy Management Program (FEMP) as a model, SE4ALL could assist establishing PPPs between the GOB and ESCOs (international, regional, national or local) for energy saving schemes in facilities of selected ministries and public institutions such as hospitals or power plants as a way of creating greater acceptance for energy efficiency.

In spite of this attitude, there is a significant potential to save energy in the industrial sector through implementing energy efficiency measures. For example, there are about 4,100 garment industries registered with the Bangladesh Garment Manufacturers and Exporters Association (BGMEA), and garment industry exports constitute more than 50% of total value of goods exported from Bangladesh. These industries on average consume about 1 million kWh of energy per day, and significant efficiency improvements are feasible. The energy efficiency potential in these industries should be studied in detail.

The transport sector, which consumes the bulk of the imported oil, is severely constrained by restricting rules and regulations that do not encourage efficiency. Exorbitant taxes and duties on transport vehicles and their accessories forces transport owners to continue using old vehicles for as long as they can. In fact, using periodic engine rebuilding, a truck or a bus can be made to operate indefinitely. The high taxes also encourage entry into the country of second hand engines, sometimes from other developing

countries where pollution laws are strict. These factors cause the specific energy consumption of vehicles to be extremely high in Bangladesh. In addition, these vehicles are responsible for a considerable amount of local pollution in all cities.

Gas is predominantly used in boilers, furnaces and kilns, and most of this equipment is used by Bangladesh's Small and Medium Enterprises. However, given the predominance of local manufacturing and lack of technical standards and/or their enforcement, the efficiencies of most these devices are low to extremely low, and in many cases these devices are also unsafe. There exists good opportunity to improve the efficiency of gas use in these applications.

Another area is in the improvement of power quality, motor and transmission efficiency and monitoring and maintenance could increase the efficiency of energy use. Low voltage, sag, flickers and other such problems are common phenomena. Cheap, low quality motors are often used in many small and medium scale industries. Voltage balancing of all the three phases is not always practiced. Many small and medium scale industries cannot employ qualified graduate electrical engineers to look after their electrical system.

Bangladesh could benefit from new private sector initiatives, primarily in industry and commercial buildings, using the Energy Service Companies (ESCOs) and the "shared savings model" where the ESCO provides its services to the end user in partnership with a commercial bank. Under this proven scheme, the bank loan is directly repaid from the energy saving incremental cash flow resulting from the EE investment. As a first step, SE4ALL could work with the new SREDA to facilitate the performance of Investment Grade Audits in selected facilities that would opt into the program and assist with the establishment of innovative financing mechanisms e.g., via Special Purpose Entities that could leverage the current ADB-financed facilities.

Key Challenges	Current Activities	Gaps	Potential SE4ALL Activities
Low energy prices, low energy consumption and little incentive for efficiency	CDM project to replace incandescent lamps with energy efficient Compact Fluorescent Lamps (CFLs).	Significant potential for building efficiency exists.	Establishing PPPs between the GOB and ESCOs for energy saving schemes in selected government and public institutions.
Policies and rules inhibit improved transport efficiency		Policy improvement is needed	
Low quality boilers, furnaces and kilns	ADB Financing Brick Kiln Efficiency Improvement Project and Industrial Energy Efficiency Finance Program	Significant scale-up is needed	Work with SREDA to establish Shared savings financing mechanisms.
Poor power quality and low transmission efficiency	ADB Power System Efficiency Improvement Project	Significant scale-up is needed	

Key Energy Sector Stakeholders

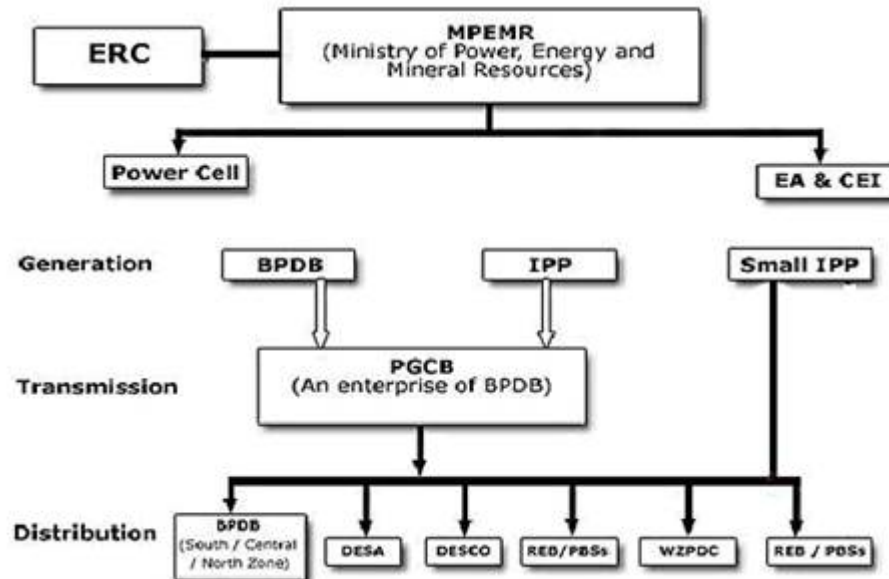
Government of Bangladesh

Key public sector players in power production in Bangladesh are: (i) Bangladesh Power Development Board (BPDB), (ii) Ashuganj Power Station Company Limited (APSCL), and (iii) Electricity Generation Company of Bangladesh (EGCB). Private sector participants include: Independent Power Producers (IPPs) and large industries, which produce approximately 1200 MW of electricity for their own use and supply about 88 MW to the national grid. At present nearly 63 % of total electricity production is produced from public entities. BPDB's contribution to the total supply is about 46%, as of 2010.

Ministry of Power, Energy and Mineral Resources (MPEMR) is the responsible government authority in these sectors. The Power Division of the MPEMR is responsible for policy in the electricity sector.

The Bangladesh **Energy Regulatory Commission (ERC)** was established through the Bangladesh Energy Regulatory Commission Act, 2003 to create an atmosphere conducive to private investment in the generation of electricity and transmission, transportation and marketing of electricity, gas resources and petroleum products, to ensure transparency in the management, operation and tariff determination in these sectors; to protect consumers interest and to promote the creation of a competitive market in the Country. It is administratively under the Energy and Mineral Resources Division of MPEMR.

Bangladesh Power Sector: Current Structure



Power Cell, a technical arm of the Power Division of MPEMR, provides technical assistance for design and implementation of power sector reform activities. In support of this service to the sector, the Power Cell has been receiving technical assistance funding through the ongoing WB-supported Power Sector Development Technical Assistance (PSDTA) project, which is scheduled to close in December 2012.

Bangladesh Power Development Board (BPDB) is a statutory body created in 1972 after bifurcation of the Bangladesh Water and Power Development Authority. BPDB mission is to provide quality and reliable electricity to the people of Bangladesh. As part of reform and restructuring a number of Generation and Distribution companies were created as subsidiaries of BPDB:

- Ashuganj Power Station Company Ltd. (APSCL)
- Electricity Generation Company of Bangladesh (EGCB)
- North West Power Generation Company Ltd. (NWPGL)
- West Zone Power Distribution Company Ltd. (WZPDCL)

The BPDB is responsible for major portion of generation and distribution of electricity mainly in urban areas except Dhaka and West Zone of the country. The Board is under the Power Division of the Ministry of Power, Energy and Mineral Resources (MPEMR).

Power Grid Company of Bangladesh (PGCB) is responsible for Operation, Maintenance and Development of the transmission system of the Country for distribution of generated electricity. PGCB was created under the restructuring process of Power Sector in Bangladesh with the objective of bringing about commercial environment including increase in efficiency, establishment of accountability and dynamism in accomplishing its objectives. PGCB was incorporated in November 1996.

The **Rural Electrification Board (REB)** of Bangladesh was founded in October 1977 as a semi-autonomous government agency reporting to the Ministry of Power Energy and Minerals Resources that is responsible for electrifying rural Bangladesh. The REB is responsible for electrifying the rural areas through generation, transmission, and distribution of electric power. The REB functions by establishing and developing the local distribution utilities (PBSs in Bengali) that function on a “no-profit and no-loss” cooperative basis. To extend electricity to rural populations, REB provides or arranges a number of support services to the PBSs, including: arranging loans for system development, power supply agreements with BPDB and Independent Power Producers (IPPs), procurement and supply of equipment/materials, system engineering, and construction and overall management services.

Infrastructure Development Company Limited (IDCOL) was established in 1997 by the Government of Bangladesh. The Company was licensed by Bangladesh Bank as a non-bank financial institution in 1998. Since its inception, IDCOL is playing a major role in bridging the financing gap for developing medium and large-scale infrastructure and renewable energy projects in Bangladesh. The company now stands as the market leader in private sector energy and infrastructure financing in Bangladesh. IDCOL has been implementing the WB-supported SHS and other renewable energy programs under the RERED project. IDCOL is also channeling funds to the private sector for the renewable energy based mini-grids and solar irrigation schemes, and has also been implementing the national domestic biogas program providing for clean fuel options for cooking and lighting purposes.

Independent Power Producers (IPPs) in Bangladesh operate under the Private Sector Power Generation Policy of Bangladesh. Leading IPP companies include the following:

- Khulna Power Company
- NEPC Consortium Power Ltd
- Westmont Power Bangladesh Ltd
- Rural Power Company Ltd

- AES Haripur Ltd
- AES Meghnaghat Ltd
- Summit Power Co. Ltd

The Power Cell has a mandate to lead private power development, recommend power sector reforms & restructuring, conduct study on tariffs and formulation of a regulatory framework for the power sector. The Power Cell facilitates all stages of promotion, development, implementation, commissioning and operations of private power generation projects and suitably address the concerns of project sponsors.

Government National Strategy

The government's Sixth Five-Year Plan⁴, FY2011–FY2015 focuses on accelerating the growth rate to 7.3% on average during the plan period and reducing poverty by substantially boosting private sector investment, developing infrastructure, improving the quality of social services to build human resources, supporting family planning, fostering gender equity, strengthening social protection, and enhancing the productive resources of the rural poor. Investment in infrastructure development is to be tripled, from 2% of GDP to 6%, with substantial private sector participation through PPP. To achieve these goals, the authorities will need to strengthen macroeconomic management; deepen policy and regulatory reform; develop project preparation and implementation capacity; improve the incentive structure for encouraging private investment; and undertake capacity building for designing, tendering, and implementing PPP projects.

The sixth plan includes a firm commitment to pursue an environmentally sustainable development policy that conserves natural resources; reduces air and water pollution; and sustainably manages rivers, other water bodies, forests, and common lands. Efforts to mitigate the adverse effects of climate change figure high on the agenda, involving a wide range of interventions for climate-proofing and reducing disaster risk, as well as targeted assistance to vulnerable coastal populations.

The government aims to maintain a conservative fiscal stance, with modest budget deficits and a decline in the ratio of external debt to GDP from 20.3% in 2010 to 16.3% by 2015. Investment requirements for the plan are an estimated Tk13.3 trillion, of which the government is expected to provide 22%, with the remainder from the private sector and PPP. External borrowing is forecast to meet a fifth of the government's public investment requirements, or Tk671 billion, during the plan period.

Energy Sector Plans

Energy and infrastructure is one of the 7 core target areas of the Sixth Five-Year Plan (6th FYP). The specific targets related to energy and infrastructure are:

- Generation of electricity to be increased to 15,457 MW by FY15 such that the target of 20,000 MW electricity generated by FY21 is attained.
- Electricity coverage to be increased to 68 percent.
- To increase energy efficiency by 10%
- Improve railways and waterways as energy efficient multi-modal transport system to reduce carbon emission.

⁴ Extracted from ADB Country Partnership Strategy.

- Production of natural gas to reach about 4500 mmcf/d by December 2015
- Optimizing domestic production of primary energy resources including renewable energies.
- Expanding access of the poor to primary and secondary energy sources through affordable pricing and targeted distribution.
- Construction of 6.15km long Padma Multipurpose Bridge at Mawa-Janjira;
- Construction of about 26 km long Dhaka Elevated Expressway.

The Plan envisages increasing electricity generating capacity from 4699 MW (as of June 2011) to 11457 MW by 2015, which is estimated to cost USD 15 billion investment out of which USD 10 billion is expected to be provided by the private sector.

The Plan includes elements for all generation options: Coal-based power plants using domestic and imported coal; Installation of two 1000 MW Nuclear Power Plants at Rooppur⁵; Finding new oil and gas fields through extensive exploration; Electricity generation and transmission; Oil and gas exploration through Public-Private Partnership Projects; Participation of local investors in the power sector; Import of LNG; Energy trade including grid connectivity with neighbors, and Development of renewable energy sources.

Under the Plan, the production cost of electricity is expected to rise by 50-60 percent in the next two to three years due to installation of high cost fuel-based peaking plants. The government will increase the power tariff by phases. However, after 2014 the cost is expected to come down slightly as the gas and coal-based power plants start operation.

Sources of Electricity Supply

Electricity supply in Bangladesh comes from both public and private sources. The Bangladesh Power Development Board (BPDB), Ashuganj Power Station Company Limited (APSCCL) and Electricity Generation Company of Bangladesh (EGCB) are producing electricity in the public sector. On the other hand, through IPP (Independent Power Producer) and through Rental Power, electricity is produced in the private sector which is purchased by the Government at a fixed rate. Besides that big industries produce 1200 MW electricity for their own use from which additional 88 MW is supplied to the national grid. Data on electricity generation from public and private sector is given in the following table. At present nearly 61 percent of total electricity is produced from public entities. BPDB alone accounts for 46 percent of total electricity production.

Sectors	Public			Private			
	BPDB	APSCCL	EGCB	SIPP	SIPP (BPDB)	SIPP (REB)	Rental
Generation Capacity(MW)	2470	606	150	1271	99	226	449
Total(MW)	3226			2045			

Source: Bangladesh Power Development Board

⁵ The Prime Minister is expected to visit Moscow in January 2013, and media reports have it that Bangladesh and Russia will sign a US \$500-million deal to complete various studies needed for completing pre-construction phases of the planned nuclear power plant. The prime minister is also expected to sign a Memorandum of Understanding with Russia that will spell out terms of long-term loan the Russian government intends to provide to Bangladesh for building the plant.

The power and energy needs of Bangladesh are huge, and the government has taken a phased approach starting with a planned 1753 MW of Rental Power Plants using liquid fuels or gas that can be able to produce electricity within 4-12 months. Next are short-term power stations (1178 MW) that are also gas or liquid fuel based and implementable within 12 to 24 months. The proposed list include one 7 MW solar power plant. In the medium term, the Plan calls for 7919 MWs that are implementable within 3 to 5 years of which 2450 MW will be coal based, 5 MW are solar, and 100 MW are wind.

Access to Electricity

At the end of 2010, only 47 percent of the total population had access to electricity. According to the Plan, the government has fixed a target of reaching power to 68 percent households by 2015. Furthermore, the Government has set a target of “Providing Electricity in every house by 2021”.

As one part of achieving this goal, the Plan includes steps for building an additional 60,000 kilometer distribution lines by 2015. Providing electricity in rural areas is an integral feature of the distribution system. The electricity in rural areas is provided by the Rural Electrification Board (REB), which obtains most of its supply from the Power Development Board as it has very little capacity for production.

The Government of Bangladesh has a long track record of being supportive of micro credit programs/projects in both GO and NGO sectors. As many as 14 ministries and 26 department/agencies and hundreds of NGOs (15,000 registered with government’s NGO Bureau) and handful of financial institutions serve more than 12.5 million clients across the country (2005 data). Advocates for micro-credit place great emphasis on lending to women. Total number of women micro credit borrowers has reached 12 million with a total micro credit debt of US \$ 1.2 billion (2.4% of GDP) and loan repayment rate prevails above 97%. Micro credit provided by government departments /agencies /NGOs /MFI institutions has given many benefits for village women, by increasing their mobility, income generation, decision-making in the family and community.

Strengthening Public Private Partnerships (PPP)

In the 6th FYP, the Government recognizes that strong public private partnerships can play a catalytic role in mobilizing additional resources as well as creating additional capacity and help for implementing public programs. Accordingly, the Government has put emphasis on PPP to ensure expeditious development of infrastructure and utility services by attracting local and foreign investment and improving the expertise and technology. Through a well-defined policy framework, private initiatives would be encouraged to promote quality service delivery in the area of essential economic infrastructure. The Government is keen to encourage private investments in energy and power, roads, waterways, railways, ports, water and sanitation, telecommunications/ICT, housing and tourism. The Government will also consider expanding the scope of PPP further in the social sector. The positive experience of collaboration with NGOs in the delivery of basic education, health and population management services will be further enhanced.

Efficient Lighting Initiative of Bangladesh (ELIB)

The objective of this Clean Development Mechanism (CDM) Program of Activities (PoA) is to replace, approximately 30 million household incandescent lamps (ICLs), with equal number of energy efficient, compact fluorescent lamps (CFLs), of same or higher lumen output with a minimum expected rated life

time of around 8,000 hours. The use of CFLs instead of incandescent lamps (ICLs) will reduce carbon dioxide emissions associated with the combustion of fossil fuel from grid connected power plants in Bangladesh. For a given lumen output, CFLs consume up to one-fourth (approximately) of power of equivalent ICLs causing reduction in requirement of electricity from the connected electricity grid which predominantly uses fossil fuel for electricity generation. Less use of electricity leads to reduction in fossil fuel requirement and reduction in greenhouse gas emissions.

The program, known as the Efficient Lighting Initiative of Bangladesh (ELIB), will be implemented in phases and in geographically defined areas of Bangladesh by various utilities and potentially other private partners under the technical supervision of the Rural Electrification Board's program management unit (REB PMU) i.e., utilities and potentially other private sector entities will be the CPA Implementers. In cases where more than one utility is involved in the installation of CFLs in one CPA, the CPA Implementer will be decided based on the share of the number of CFLs falling under the utility. However, wherever REB is involved in the implementation of a CPA, REB will be considered as the CPA Implementer due to its larger consumer base. The Infrastructure Development Company Limited (IDCOL) is the Coordinating/Managing Entity for CDM activities due to its unique experience in this regard with the current Bangladesh Solar Home System CDM program. IDCOL will be responsible for inter alia; (i) allowing CPAs under ELIB (ii) identifying and finalizing CPA boundaries and ensuring that the aggregate energy savings from each CPA are less than 60 GWh per year; and (iii), managing the overall program data base and ensuring that accurate records are maintained.

Private Sector Power Generation Policy of Bangladesh

The Power Cell has a mandate to lead private power development, recommend power sector reforms & restructuring, conduct study on tariffs and formulation of a regulatory framework for the power sector. The Power Cell shall facilitate all stages of promotion, development, implementation, commissioning and operations of private power generation projects and suitably address the concerns of project sponsors. IPP plant sites will be selected by GOB in consultation with the investor/project sponsor. Fuel for such projects will be determined by GOB keeping in view preference for indigenous resources like Natural Gas, Coal and any other fossil fuels. However, when deemed necessary, GOB may also allow other fossil fuels including imported fuels. Investors may also be asked to bid for projects based on hydro or other renewable and/or non-conventional sources of energy, such as solar, wind, biomass etc. For such projects, IA & PPA would be different from those for conventional IPPs.

Feed-in Tariff Proposed

BERC has initiated a move to prepare a 'Feed-in-Tariff' (FIT) structure for renewable energy to promote its use in the country. The FIT was prepared under a project being financed by the USAID. Under the project, Deloitte Touche will prepare the FIT considering the socio-economic conditions and technological cost of different renewable energies like solar, wind or biomass. The goal of FIT is to offer cost-based compensation to renewable energy producers, providing price certainty and long-term contracts that help finance renewable energy investments. To follow the path, the Bangladesh government has recently announced a plan to increase the renewable energy's share in the total power generation to 5 per cent by 2015 from the present less than 1 per cent and to 10 per cent by 2020.

This means Bangladesh has to produce about 700 MW power from renewable energy by 2015 when the total power generation will go up to 13,000 MW from the present 6000 MW. To reach the target,

renewable energy sector will require billions of dollar investment both in private and public sectors. But until a FIT is in place, the private sector or financial institutions are unlikely to come forward to invest in the sector.

Programs by International Donor and Finance Organizations

World Bank

Country Assistance Strategy

The 2011-2014 Country Assistance Strategy (CAS) has one key outcome that relates directly to access.

Outcome 1.3: Increased infrastructure provision, access and efficiency. Bangladesh's people and economy suffer from severe shortages of reliable electricity and natural gas. Peak system deficit (during warmer months) is more than 2,000 MW, arising partly from a gas deficit of at least 200 million cubic feet per day (mmcf/d). In the absence of investment, these deficits are expected to more than double in the next ten years. Only 45 percent of households are electrified and perhaps 5 percent have access to gas. An estimated US\$1.5 billion per annum in investment is needed to close these gaps and keep pace with rising demand.

As a strategic priority for Government, transformative investments in the energy sector will be a prime focus for the Bank during the CAS period. Working with other partners in the sector, like the Asian Development Bank (ADB), the World Bank's support will be three-pronged. The Bank plans to:

- 1) Adopt a programmatic approach to domestic generation and transmission that will combine support for sector reforms with large-scale investments in generation capacity and transmission systems. Sector reforms will enhance financial sustainability, strengthen regulation, build institutional capacity and encourage private investment. From a corporate governance perspective, a key focus will be on improving cash management at the distribution end of the business for example with the South Zone Power Distribution Project, and bolstering procurement transparency and efficiency in large investments such as the Bibiyana power station.
- 2) Encourage integration with regional electricity networks and with the global gas market through strategic infrastructure investments.
- 3) Scale up the positive results of the IDA-funded Rural Electrification and Renewable Energy Development project which has successfully connected 600,000 households to the national grid and another 320,000 households to solar systems, bringing affordable and reliable energy to rural populations. IFC will complement Bank's efforts and will seek to support power and gas sectors, including public-private partnerships (PPP) and investments where there are strong partners and transparent processes.

The Rural Electrification and Renewable Energy Development-I

Access to electricity is being provided in rural areas through off-grid technologies, and consumption of energy is being reduced through distribution of energy-efficient CFLs. With IDA support, more than 850,000 solar home systems have been installed through May 2012 in remote villages, and every month

about 50,000 new homes and shops in rural areas are being connected to electricity through the installation of these systems.

Key project components of the project, which was closed in Dec 2012 are:

- 1) Rural electrification systems expansion, intensification, and rehabilitation, through the construction of new power lines, rehabilitation of previously transferred lines, and expansion of distribution substations, and associated facilities. The component will further facilitate, and finance the takeover, rehabilitation, and loss-reduction program of the Bangladesh Power Development Board (PBDB) lines, in a three-phase transfer of lines. Technical assistance (TA) will support the Rural Electrification Board (REB) institutional development, including financial restructuring, socioeconomic impact, monitoring and evaluation, environmental safeguards, and poverty reduction aspects of electricity provision;
- 2) Implementation of a free-for-service solar home system (SHS) program, that includes a Global Environment Facility (GEF) grant program for capital cost buy-down to increase project financing, for the provision of installation grants; however, these grants will be contingent on actual consumer installation of systems. TA will support REB in the development of the solar program, build awareness among communities, and establish and train solar service units, for the deployment of staff to implement the project; and,
- 3) Promotion of conditional sales of the SHS program by the Infrastructure Development Company Ltd. (IDCOL), based on micro-finance from nongovernmental organizations, and financial institutions. TA will support the establishment of a renewable energy market development, capacity building, and monitoring and evaluation.

Rural Electrification and Renewable Energy Development II

Rural Electrification and Renewable Energy Development II (RERED II) is a new project under the World Bank. Three Bangladesh organizations, Infrastructure Development Company Limited (IDCOL), Power Cell, Rural Electrification Board, will implement the project. IDCOL is a government owned infrastructure finance company that has been implementing the Bank-supported SHS and other renewable energy programs under the RERED project since 2003.

The development objective of the Second Rural Electrification and Renewable Energy development Project is to increase access to clean energy in rural areas through renewable energy and promote more efficient energy consumption. There are four components to the project.

1. Access to electricity. This component will support the Solar Home Systems (SHS) and other renewable energy options for increasing access to electricity. The component will also include technical assistance support to Infrastructure Development Company Limited (IDCOL) for capacity building, inspection and monitoring, impact evaluation, training, and other related activities for ensuring effective implementation.
2. Household energy. This component supports the efforts of various Non-Government Organizations (NGOs) in providing rural households with clean cooking solutions. The component will build on the success of Bangladeshi NGOs in the areas of community outreach in total sanitation programs.

3. Energy efficient lighting. This component will support the distribution of 7.25 million Compact Fluorescent Lamps (CFLs) in predominantly rural areas where these energy efficient CFLs are not yet widely used.
4. Technical assistance. This will support developing national guidelines for safe disposal/recycling of CFLs and capacity building for ensuring safe disposal of CFLs financed under the project

The aim of the RERED II project is to increase: (i) number of households and enterprises getting access to electricity through renewable energy sources; (ii) number of higher performing cook stoves adopted by households; and (iii) number of CFLs distributed in exchange of incandescent lamps. In addition, the project proposes to establish a functional Sustainable and Renewable Energy Development Agency (SREDA) for promoting renewable energy and energy efficiency

Bangladesh Investment Promotion and Financing Facility Project

World Bank IDA is supporting public-private partnerships to build small power plants. The Bangladesh Investment Promotion and Financing Facility Project makes available partial debt financing through private sector financial intermediaries for eligible, government-endorsed infrastructure projects to be developed by the private sector. The developmental goals reflect key priorities, namely accelerating private-sector led growth; supporting an integrated approach to rural development; and strengthening government and building institutions.

The project consists of two components, a lending component and a technical assistance component.

- 1) The lending component provides long term finance in Taka to qualifying financial intermediaries to lend to eligible, government-sponsored infrastructure projects developed by the private sector.
- 2) The technical assistance component funds include: (a) Capacity building for Bangladesh Bank to develop its financial infrastructure for oversight over local markets and the sector (b) promoting private financing for infrastructure; and (c) implementing environmental impact assessments.

Asian Development Bank

Country Partnership Strategy (2011-2015)

The 2011-2015 Country Partnership Strategy (CPS) contains the following overview of the Energy sector.

Energy shortages, heavy reliance on a single primary energy source, and limited electrification are key sector constraints. The government has undertaken a major program to address power shortages during the plan period, aiming to raise access to electricity from 47% of households in 2009 to 65% in 2015. ADB's assistance in the previous CPS, 2006–2010 focused on power and gas generation, transmission, and distribution, as well as policy reform and capacity building. ADB engagement in this CPS period will enhance access to power, improve energy efficiency, develop a policy and regulatory setting conducive to private sector participation, boost power trade, and support green growth through reducing carbon dioxide emissions, including promoting renewable energy. Support for power system improvement will expand capacity for power generation and transmission using cleaner and more efficient technologies. Assistance for regional power generation will aim to expand power trading within South Asia. ADB will support private power projects in renewable energy, energy conservation, and other off-grid operations.

Capacity-building support will be provided to develop model PPPs in the power sector, while ADB's private sector operations will place priority on innovative and catalytic power projects based on gas, dual fuels, and renewable energy, as well as on developing gas fields, the liquefied natural gas terminal, and associated gas facilities. Support will aim to ensure reliable power supply and enhance all citizens' access to power.

Power System Expansion and Efficiency Improvement Investment Program - Tranche 1

The proposed investment program includes three tranches encompassing generation expansion and associated transmission and distribution improvements. Tranche 1 mainly focuses on generation expansion. Tranche 2 focuses on transmission and distribution improvement together with a pilot solar irrigation component. Tranche 3 also invests on generation expansion. Generation expansion in the MFF will be undertaken through supply side energy efficiency improvement so that about 50% power can be generated without burning additional gas. Given the acute gas shortages in Bangladesh, conversion of single cycle gas fired power plants to combined cycle plants the technology adopted in the investment program is the best way to expand the generation capacity. The sequencing of the tranches is well aligned with the sector needs and the government program. The Tranche 1 of the proposed Power System Expansion and Efficiency Improvement Investment Program will address two key areas in the power sector aligning with the priorities identified in the CPS: improving energy use efficiency of thermal power plants; and improving the transmission network capacity. The project interventions will include: (i) adding 235 MW capacity by conversion of four single cycle gas fired power plants to combine cycle plants at Khulna, Baghabari, Sylhet and Shahjibazar; (ii) construction of 180 km 132 kV transmission lines and four 133/32 kV substations; and (iii) capacity building. The capacity building component includes training on investment planning, operations planning, energy auditing and monitoring, financial management and auditing, project preparation and appraisal, and operation and maintenance of solar irrigation pumps. In addition, the capacity building component will provide consultants for preparation of subsequent tranches and implementation support.

Financing Brick Kiln Efficiency Improvement Project

Brick manufacturing process is energy intensive and a main source of greenhouse gas (GHG) emission and fine particulate pollution in Bangladesh. The proposed project intends to establish an equivalent of \$50 million credit facility in local currency at Bangladesh Bank (central bank) for relending to participating financial intermediaries (PFIs) to construct more energy efficient and environmentally superior brick kilns. The credit facility has two components: one is to upgrade existing polluting brick kilns to a transitional design as an immediate measure to comply with the government directive and reduce pollution, and the other is to promote the most advanced brick kiln pilots to demonstrate their operational and commercial viabilities in Bangladesh. The combined efforts, along with concerted donor assistances, will help catalyze domestic finance and leverage the demonstrative effect to build up sizeable clean brick manufacturing capacity in Bangladesh to eventually replace the existing pollution brick kilns and modernize the brick sector.

Industrial Energy Efficiency Finance Program

This finance program will promote energy efficiency investments in target industries through a \$30 million loan facility to selected participating financial institutions in Bangladesh. The participating financial institutions will onlend the facility amount to eligible energy efficiency projects in seven target

industries: brick making, textiles, steel, cement, ceramics, chemicals, and agri-industries. The finance program will initially target the brick making sector by promoting brick kilns that are 50% more energy efficient than existing kilns. The finance program will also identify bankable projects in the other target industries through a \$1.5 million PPTA. The finance program will contribute to energy savings equivalent to at least 350 GWh per year and to a reduction in carbon emissions of at least 150,000 tons per year by 2015.

USAID

USAID has provided \$210 million in assistance to the energy sector since 1977 and has leveraged \$1.4 billion from other donors to build and expand the rural electrification distribution network. One of USAID's most significant contributions to the energy sector has been to provide electricity to over 48 million people across rural Bangladesh. The Bangladesh Government's current and future efforts to increase energy production will also increase greenhouse gas emission. This necessitates that the Government consider options for mitigation of these emissions through economy-wide low-emission development while maintaining economic growth. Clean-energy project activities form a core component of the Bangladesh Low Emission Development Strategy (LEDS) program

USAID's clean energy program, Catalyzing Clean Energy in Bangladesh (CCEB) Project supports the development of a low greenhouse gas (GHG) polluting economy and promotes clean energy, energy efficiency and energy conservation in Bangladesh. CCEB is a five-year program beginning 2012 and key focus of the program includes:

- Improving the Regulatory Environment for Clean Energy Development
- Strengthening Analytical Capacity for Energy Sector Planning and Policy-making
- Supporting Industrial Energy Efficiency Analysis and Adoption
- Promoting Demand Side Management Programs for Electric Utilities
- Conducting Market Analysis and Promotion of Improved Cookstove use

CCEB's objective is to support energy sector development for energy security, economic growth and climate change mitigation. Building on USAID/Bangladesh's previous achievements, CCEB will work with the Bangladesh Energy Regulatory Commission (BERC), GOB Ministries and Agencies, energy utilities, private sector energy end-users and other relevant stakeholders. CCEB efforts will be focused on strengthening regulatory climate, increasing energy efficiency and promoting clean energy development through technical assistance that will provide targeted support to organizations through consultation, facilitation and advice; small grant from the project as incentive fund to promote industrial energy efficiency adoption; and training to individuals or groups through seminar workshops, courses etc. for knowledge and skills transfer. These efforts will help build institutional and human capacity in regulatory practices and energy businesses operations to strengthen Bangladesh's ability to make decisions related to clean energy and reduce GHG emissions.

Some of CCEB's actions include;

- Strengthen BERC's capacity to effectively execute its functions mandated by the BERC Act 2003;

- Strengthen energy planning to be able to model low GHG emission scenarios/analyze data and then compare/contrast various development options to achieve reduced GHG emissions in the energy sector.
- Build technical capacity for industries to analyze, fund, and adopt cost-effective energy efficient practices and various new methods to improve the efficient use of energy and reduce consumption.
- Working with urban electricity distribution utilities to implement demand side management (DSM) programs that will optimize supply and demand so that peak demand and load shedding is reduced thus ensuring a more stable power supply.
- Building a sustainable market for improved cookstoves that reduce energy consumption, indoor air pollution and promote the welfare and health of women and children in Bangladesh.

USAID has engaged the National Renewable Energy Lab (NREL) to undertake a Bangladesh wind resources assessment in the coastal belt and inland. Under the activity NREL team has extensively researched potential wind measurement sites with the intention to gather raw wind data from at least six locations using four Met Towers and two SODARS (Sonic Detection and Ranging)

Complementing these activities is USAID's South Asia Regional Initiative for Energy Integration (SARI/EI) program. The program promotes energy security in South Asia advancing regional energy integration and its project purpose is to increase cross-border energy trade through focus on the following three components:

- 1) Harmonization of Policy, Legal, and Regulatory mechanisms
- 2) Advancement of Transmission Systems Interconnections
- 3) Establishment of a South Asia Regional Electricity Market

UNDP

Development of Sustainable Renewable Energy Power Generation

UNDP is working with the Sustainable Energy Development Authority (SEDA) within the Ministry of Power, Energy and Mineral Resources (MPEMR) on a project to reduce the annual growth rate of GHG emissions from fossil fuel-fired power generation through the exploitation of Bangladesh's renewable energy resources for electricity generation. This \$34M project has four components:

1. RE policy and regulatory support program: Build capacity in SEDA to become a strong project facilitation center for supporting private sector development efforts for commercial RE projects; Increase understanding of the RE market that will enable regulators to determine fair but flexible tariff structures; Increase confidence of private investors in developing RE projects due to government clarity on policy and tariffs, and Increase the number of approved RE power projects that benefit from a favorable RE electricity pricing structure.
2. Renewable energy resource assessment program: Increase availability of reliable and accessible renewable energy resource data, especially for wind energy; Increase capacities and confidence of SEDA to generate and process reliable wind data; Increase capacity of SEDA to obtain, process and disseminate reliable data on renewable energy resources such as wind, solar insolation, and biomass for use by the GOB and potential project developers and investors.

3. Dissemination of solar LED lanterns to low-income enterprises and households: Support financing mechanisms that include credit schemes and buy-downs; Increase the affordability of solar LED lanterns for low income enterprises and families; Strengthen capacity of MFIs to support the increased number of loans and credit collection activities; Create a favorable regulatory regime for the import of solar LED lanterns into Bangladesh that meet international standards.

4. Renewable energy investment scale-up: Established and operationalize an investment fund with SEDA; Build capacity in SEDA to effectively manage the fund and to direct financial support to leverage commercial financing of RE power projects; Increase the number of financial closures on wind, solar and biomass energy projects; Increase the share of renewable energy in Bangladesh's power generation mix.

The project aims to install at least 3MW of wind power, 3MW of solar power and 4MW of biomass powered systems.

Barrier Removal for Energy Standards & Labeling (BRESL)

BRESL is aimed at rapidly accelerating the adoption and implementation of energy standards and labels (ES&L) across a number of Asian countries, and in so doing bring about energy savings from the use of energy efficient appliances/equipment. The project also facilitates harmonization of test procedures, standards and labels among developing countries in Asia, when appropriate.

The project is expected to cost-effectively deliver an average 10% reduction in total residential and commercial energy use in partner countries at the time of peak impact by the year 2030 compared to a baseline scenario, thereby contributing to more environmentally sustainable and economically efficient development.

BRESL will facilitate the transformation of the manufacture and sale of energy-efficient appliances and equipment through:

- 1) A regional initiative in Asia, with provision for general information, tools and training to all interested developing countries in the region plus customized efforts, all with a focus on regional cooperation; and
- 2) National technical assistance to 5 developing countries in Asia (Bangladesh, Indonesia, Pakistan, Thailand and Vietnam). The project will focus largely on capacity building and assisting government, manufacturing, distributing, retail, consumer and environmental stakeholders throughout the Asian region to implement the most cost-effective energy efficiency measure available. In each participating country, priority activities will be carried out to help foster each country's preferred process for developing or expanding its ES&L program.

Improving Kiln Efficiency in the Brick Making Industry

Bangladesh has over 4,000 brick kilns producing over 12 billion bricks annually, and demand is expected to continue to rapidly increase. Although providing a vital source of employment, the industry is also the largest stationary source of greenhouse gas emissions in the country - emitting over 6.4 million tons annually. Outdated and inefficient methods of production are causing growing environmental damage and contributing to climate change.

This project aims to reduce greenhouse gas emissions from the brick making industry by promoting and demonstrating the latest energy efficient kiln technology, and removing barriers that have so far

hampered adoption of cleaner and better kiln technologies. This goal will be achieved by investing in 16 demonstration kilns to validate the new technology, combined with awareness-raising of its benefits, capacity building and practical training for those working in the industry, financing options, as well as policy and institutional support.

As a result, the project is expected to directly reduce energy consumption by 526,000 tonnes of coal by its completion date, and 1.3 million tonnes of carbon dioxide equivalent over the fifteen year expected service life of the energy efficient kilns.

GIZ – Bangladesh Renewable Energy and Energy Efficiency Program

GIZ is working with Bangladesh on the Renewable Energy and Energy Efficiency Program with the following objective: "The decentralization of renewable energy supplies to households and businesses has improved and available energy is used more efficiently. Poorer families, too, are in a position to replace appliances such as traditional stoves and kerosene lamps, which are obsolete and pose serious health hazards."

In order to create an enabling environment, the program provides the government with advice on policy and strategy development and energy providers with prepared for technical assistance. Stakeholders such as trade associations and civil society are informed about the technical and financial aspects of projects to introduce renewable energies and enhance energy efficiency. The program supports the use of energy-saving appliances and production processes and promotes the dissemination of technologies based on renewables, such as solar energy systems and biogas plants." Results achieved so far include supporting the government in the process of setting up a coordination centre for the promotion of renewable energy.

Civil Society and Private Sector Activities

Private Sector

Most of the private sector activity in Bangladesh relating to power is focused on conventional Independent Power Producer (IPP) project development. For example, on January 9 the Cabinet Purchase Committee approved a number of project proposals, including construction of three power plants: the 250-megawatt (MW) extension of Barapukuria coal-fired plant, Ghorasal 300-450 MW gas-fired combined cycle power plant and Shahjibazar 300 MW gas-fired combined cycle plant.

The following data is available on the leading private sector IPP companies – taken from the latest Bangladesh Power Sector Data Book – from the Power Cell, which includes data to 2006.

Company	Start Date	Power Plant Site	Contracted Capacity	Fuel
Khulna Power Company	1998	Goalpara, Khulna	110 MW	Natural gas
NEPC Consortium Power Ltd	1998	Haripur, Narayangonj	110 MW	Natural gas
Westmont Power Bangladesh Ltd	2004	Bgahabari, Sirajgonj	90 MW	Natural gas
Rural Power Company Ltd	2001	Shambhugonj, Mymensing	140 MW	Natural gas

AES Haripur Ltd	2001	Haripur, Narayangonj	360 MW	Natural gas
AES Meghnaghat Ltd	2002 & 2008	Meghnaghat	2x450 MW	Natural gas
Summit Power Co. Ltd.	2003 to 2006	6 plants in Dhaka, Narsingdi and Comilla	92 MW	Natural gas

Summit Power Limited (SPL), sponsored by Summit Group, is the first Bangladeshi private sector Independent Power Producer (IPP) providing power to national grid. SPL was incorporated in Bangladesh on March 30, 1997 as a Private Limited Company. On June 7, 2004 the Company was converted to Public Limited Company. Its current list of power plants is shown below. All the plants are fired on natural gas or heavy fuel oil.

Ashulia, Savar	45 MW
Madhabdi, Narshingdi	35 MW
Chandina, Comilla	25 MW
Ullapara, Sirajganj	11 MW
Maona, Gazipur	33 MW
Jangalia, Comilla	33 MW
Rupganj, Narayanganj	33 MW
<u>Madanganj, Narayanganj</u>	<u>102 MW</u>
TOTAL	317 MW

Summit Group, the country's leading company on energy sector, has recently signed an agreement with China Energy Group, the largest government-owned Chinese company, to develop Bangladesh's energy sector. Earlier, Summit Bibiyana II Power Company, a venture of Summit Group, and China Energy Group and First NEPC, a group member of China Energy, signed a \$220 million deal on engineering, procurement and construction (EPC) of a 341MW power project in Habiganj. Meanwhile, another of Summit's company, Summit Meghnaghat Power Co, signed an EPC agreement with China National Electric Engineering Co (CNEEC) worth \$250 million.

Summit is now working to generate hydroelectricity in Bhutan while China Energy was involved in implementing Three Gorges Dam, the world's largest hydro power generator of 22,500 megawatt in China.

Rural Power Company Limited (RPCL) was the first Independent Power Producer (IPP) of Bangladesh and the first non-Bangladesh Power Development Board (BPDB) entity to be licensed to take up power generation. Rural Power Company Limited is registered in 1994 to build, own and operate power generation projects with business philosophy and principles. They currently have 4 power plants in operation or under construction.

Company	Start Date	Contracted Capacity	Fuel
Mymensingh Power Station	2005	210 MW	Natural gas
RPCL-Gazipur Power Plant	2011	54 MW	Natural gas & Fuel oil
Raozan Dual Fuel Power Plant	2012	25 MW	Natural gas & Fuel oil
BPDP-RPCL Powergen Ltd Power Plant	Starting construction	150 MW	Natural gas

Wind

A 60 megawatts wind power plant was approved by the Cabinet Committee on Purchase at a meeting held on December 19 with Finance Minister Abul Maal Muhith. In October last year, the Power Division placed a proposal to the Cabinet seeking the approval of this private sector wind power project.

The power plant will be installed by a US-Bangladesh private sector joint venture, PH Consulting Inc. USA with its local partner Taylor Engineering, who will install the plant in Cox's Bazar in 10 months after the approval. The state-owned Power Development Board (PDB) will purchase electricity from the plant at the rate of 12 cents (taka around 9.87) per unit to meet the demand in Cox's Bazar.

Non-Governmental Organizations

Microfinance for Electricity Access in Bangladesh – Grameen Shakti

Solar lanterns and solar home systems are a simple plug-and-play technology that is well suited to the small needs of most of the 100 million rural Bangladeshis with no access to electricity from the grid. Grameen Shakti, one of 32 Grameen social businesses, is perhaps the world's fastest growing rural renewable energy program. Since its inception in 1996 till November 2010, Grameen Shakti had installed 500,000 home systems across all 64 districts of Bangladesh. Today, it installs nearly 1,000 solar home systems each day, and in November 2012, Grameen Shakti hit 1 million solar home systems installed.

The key to the Grameen Shakti's success is that customers save money by switching to solar. For many families and small businesses, it makes economic sense to switch from a kerosene lantern to a solar home system. Kerosene, like diesel, is expensive – especially in remote areas where there are additional distribution costs compared to the cities. The company claims middle-income households save about 800 Bangladeshi taka (Tk) each month, while low-income households save Tk 200. For small businesses, such as traders, shopkeepers and artisans, a small solar energy system can also be very good for business, as the better illumination extends operating hours.

Grameen's micro-finance scheme allows a small shopkeeper or vendor to purchase up to a 50 Wp system on a 10% down payment, with zero-interest loan repayment spread over 48 months. A typical solar home system can power up three CFL lamps, a black-and-white television set, a small fan, a mobile charger and a music system. The total system costs Tk 26,800 (US\$387)

The typical monthly payment for a small shopkeeper or vendor is about Tk 600, which is often less than what they might pay for electricity from a diesel generator. At a price of 10 Tk per lamp each day, a small shopkeeper or vendor would pay up to Tk 900 each month for three lights. In addition, the solar home system will also power a black-and-white TV.

Grameen Shakti has been successful in spite of the high upfront costs for the solar systems. It markets to the poor, but not the very poor, and it has a range of options. The cheapest 10 Wp system, which can power two LED lights and one five-Watt CFL bulb, retails at Tk 8,800 in rural areas. After a 15% down payment, the monthly installment is just Tk 220 for a 36-month loan term, and at a flat service charge (a more acceptable term than interest rate) that ranges from four to six per cent. There's a four per cent discount for those who pay the entire cost upfront, but about 80% of all customers buy systems on credit. In addition, loans are extended without collateral, although the customer has to provide

evidence of a minimum regular income before the loan can proceed. A buy-back option against the depreciated value of equipment protects the customer in the event the grid reaches the area.

Another aspect of Grameen's success is efficient after-sale service, which is managed by involving local actors to keep costs low. The company has an extensive on-the-ground presence; a service center network of 1,159 offices staffed by 8,975 employees across the country; and it serves three million people in Bangladesh.

Each system sold, when still under warranty, has to be serviced once a month by a Grameen Shakti solar technician for a period of three years. As about half of the current population of solar home systems have been sold in the past three years alone, the human effort taken to visit about 250,000 households each month is significant. About five per cent of the company's Tk 1,000-crore annual turnover is spent on its employees' travel allowance.

Providing good after-sale service is considered a crucial aspect of the company's business, as 80% of their customers buy a solar system on credit, and the company collects dues from their customers' doorsteps. Without good service, they would find it difficult to collect the monthly installments, as customers refuse to pay if there's a breakdown in equipment or if they perceive any tardiness in after-sale service.

Infrastructure Development Company Limited (IDCOL)

The proliferation of solar home systems can be explained in part by the strong anchoring by Infrastructure Development Company Limited (IDCOL), a government-owned nonbank financial institution that funds infrastructure projects. Renewable energy accounts for close to 40% of IDCOL's investment portfolio. But it does more than direct donor funds.

IDCOL selects partner organizations to implement the program. IDCOL has 21 partners; Grameen Shakti is the largest. The list of partners is a veritable who's who of Bangladeshi NGOs, including BRAC, RSF—the social development initiative of Rahimafrooz—and COAST Trust, among others that also include private companies. However, only a few partners are focused on solar power.

Under IDCOL, the home system program has surpassed all targets. The initial World Bank supported target of 50,000 systems was achieved in August 2005, three years ahead of schedule and US \$2 million below estimated costs. As of September 2010, the program installed 680,000 systems, or about 34 MW of the 5,271 MW generated in the country. At that time, IDCOL was installing about 30,000 home systems every month and had set a goal to reach 2.5 million systems by 2014.

While partners such as Grameen Shakti leverage scale to get bargain prices on solar hardware (that's their profit), IDCOL charges the donors a fee of seven euros per system installed by POs. The roles are clear. Partners select the project areas and potential customers, extend loans, install solar systems and provide maintenance. IDCOL channels grants and soft loans to the partners, sets technical specifications for solar equipment, monitors partners' financial performance and helps build their capacities. The government, on its part, pitches in by waiving duties on the import of key components.

IDCOL financially supports partners with grants and soft loans—grants to its partner suppliers of SHS hardware to reduce the overall cost of approved solar equipment; soft loans at eight per cent for an eight-year maturity term to partners to manage their respective microcredit services. Partners also receive an 'institutional capacity building grant'.

IDCOL funds cover about 80% of the credit project partners give. IDCOL grants reduce with the progress of the project – from US \$90 per SHS for the first 20,000 systems, to the equivalent of €20 (US \$28) per system for 500,000 systems and more. The logic is to incubate and then withdraw as market forces and demand take over. It is compulsory for all to provide after-sale service.

A key role of IDCOL is the close and routine scrutiny of the performance of its partner organizations. IDCOL has 50 inspectors in the field, and two inspection offices.

IDCOL – Biogas

IDCOL plans to introduce 100,000 biogas plants in rural areas across the country by 2016. Since June 2006, the company already installed 25,500 Biogas plants in rural areas through its Partner Organizations (POs) under National Domestic Biogas and Manure Programme (NDBMP). These domestic size biogas plants provide clean cooking gas as well as a very good organic fertilizer can also be used to improve soil fertility.

Citi Foundation

Citi Foundation, the philanthropic arm of Citigroup, has launched a renewable energy project, 'Citi Solar Project for Rural Micro-enterprises'. Citibank, in collaboration with the Association of Underprivileged People (AUP), will manage the project, the first of its kind in Bangladesh. Green Housing & Energy Limited (GHLE) will provide installation training and supply solar panels. The project will enable both rural household and marketplace micro-enterprises to access solar power to reduce their operating costs, increase their income and improve their livelihoods. A Citi Foundation grant of \$40,000 will be used to subsidize interest-free, zero down-payment micro-loans to 510 rural micro-enterprises. AUP will be offering low-cost solar power systems to the low-income segment of the population in the Matlab, Chandpur region who do not have access to the national electricity grid.