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**Report No. 88546**

**PROJECT PERFORMANCE ASSESSMENT REPORT**

**The Peoples' Republic of Bangladesh**

**RURAL ELECTRIFICATION AND RENEWABLE ENERGY DEVELOPMENT  
PROJECT (IDA-36790 IDA-46430 IDA-50130 TF-51301)**

**POWER SECTOR DEVELOPMENT TECHNICAL ASSISTANCE PROJECT  
(IDA-39130 IDA-H0920)**

**POWER SECTOR DEVELOPMENT POLICY CREDIT (IDA-44360)**

**June 20, 2014**

**IEG Public Sector Evaluation**  
*Independent Evaluation Group*

## Currency Equivalents (annual averages; selected years)

Currency Unit = Bangladeshi Taka (BDT)

2002	US\$1.00	BDT59.63
2005	US\$1.00	BDT64.65
2010	US\$1.00	BDT70.58
2013	US\$1.00	BDT77.67

## Abbreviations and Acronyms

BERC	Bangladesh Energy Regulatory Commission
BPDB	Bangladesh Power Development Board
CFL	Compact Fluorescent Lamps
DESA	Dhaka Electricity Supply Authority
EGCB	Electricity Generation Company of Bangladesh
ESMAP	Energy Sector Management Assistance Program
GEF	Global Environment Facility
GTCL	Gas Transmission Company Limited
IDCOL	Infrastructure Development Company Limited
IPP	Independent Power Producer
kV	Kilovolt
kWh	Kilowatt-hour
MPEMR	Ministry of Power, Energy and Mineral Resources
MW	Megawatt
PBS	<i>Palli Bidyut Samities</i> or Rural Electric Cooperatives
PGCB	Power Grid Company of Bangladesh
REB	Rural Electrification Board
RERED	Rural Electrification and Renewable Energy Development (Project)
SHS	Solar Home System
SZPDC	South Zone Power Distribution Company

## Fiscal Year

Government: July 1 – June 30

Director-General, Independent Evaluation	:	Ms. Caroline Heider
Director, IEG Public Sector Evaluation	:	Mr. Emmanuel Jimenez
Manager, IEG Public Sector Evaluation	:	Ms. Marie Gaarder
Task Manager	:	Mr. Varadarajan Atur

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This report was prepared by Varadarajan Atur and Ramachandra Jammi who assessed the projects in December 2013. The report was peer reviewed by Arturo Rivera and panel reviewed by Peter Freeman. Romyne Pereira provided administrative support.



## Principal Ratings

### Rural Electrification and Renewable Energy Development Project (P071794)

	ICR*	ICR Review*	PPAR
Outcome	Satisfactory		Highly Satisfactory
Risk to Development Outcome	Moderate		Moderate
Bank Performance	Satisfactory		Satisfactory
Borrower Performance	Satisfactory		Highly Satisfactory

\* The Implementation Completion and Results (ICR) report is a self-evaluation by the responsible Bank department. The ICR Review is an intermediate IEG product that seeks to independently verify the findings of the ICR.

### Power Sector Development Technical Assistance Project (P078707)

	ICR	ICR Review	PPAR
Outcome	Satisfactory		Moderately Unsatisfactory
Risk to Development Outcome	Moderate		Substantial
Bank Performance	Satisfactory		Moderately Satisfactory
Borrower Performance	Satisfactory		Moderately Unsatisfactory

### Power Sector Development Policy Credit (P107797)

	ICR	ICR Review	PPAR
Outcome	Moderately Satisfactory	Moderately Unsatisfactory	Unsatisfactory
Risk to Development Outcome	Negligible to Low	Significant	High
Bank Performance	Satisfactory	Moderately Satisfactory	Moderately Satisfactory
Borrower Performance	Satisfactory	Moderately Unsatisfactory	Unsatisfactory

## Key Staff Responsible

### Rural Electrification and Renewable Energy Development Project

Project	Task Manager/Leader	Division Chief/ Sector Director	Country Director
Appraisal	Subramaniam V. Iyer	Penelope J. Brooke	Mieko Nishimizu
Completion	Zubair K.M. Sadeque	Jyoti Shukla	Isabel M. Guerrero

### Power Sector Development Technical Assistance Project

Project	Task Manager/Leader	Division Chief/ Sector Director	Country Director
Appraisal	Salman Zaheer	Penelope J. Brooke	Christine I. Wallich
Completion	Md. Iqbal	Jyoti Shukla (acting)	Johannes Zutt

### Power Sector Development Policy Credit

Project	Task Manager/Leader	Division Chief/ Sector Director	Country Director
Appraisal	Alan F. Townsend	Salman Zaheer	Xian Zhu
Completion	Alan F. Townsend	Salman Zaheer	Robert L. Floyd

**IEG Mission: Improving World Bank Group development results through excellence in independent evaluation.**

**About this Report**

The Independent Evaluation Group assesses the programs and activities of the World Bank for two purposes: first, to ensure the integrity of the Bank's self-evaluation process and to verify that the Bank's work is producing the expected results, and second, to help develop improved directions, policies, and procedures through the dissemination of lessons drawn from experience. As part of this work, IEG annually assesses 20-25 percent of the Bank's lending operations through field work. In selecting operations for assessment, preference is given to those that are innovative, large, or complex; those that are relevant to upcoming studies or country evaluations; those for which Executive Directors or Bank management have requested assessments; and those that are likely to generate important lessons.

To prepare a Project Performance Assessment Report (PPAR), IEG staff examine project files and other documents, visit the borrowing country to discuss the operation with the government, and other in-country stakeholders, and interview Bank staff and other donor agency staff both at headquarters and in local offices as appropriate.

Each PPAR is subject to internal IEG peer review, Panel review, and management approval. Once cleared internally, the PPAR is commented on by the responsible Bank department. The PPAR is also sent to the borrower for review. IEG incorporates both Bank and borrower comments as appropriate, and the borrowers' comments are attached to the document that is sent to the Bank's Board of Executive Directors. After an assessment report has been sent to the Board, it is disclosed to the public.

**About the IEG Rating System for Public Sector Evaluations**

IEG's use of multiple evaluation methods offers both rigor and a necessary level of flexibility to adapt to lending instrument, project design, or sectoral approach. IEG evaluators all apply the same basic method to arrive at their project ratings. Following is the definition and rating scale used for each evaluation criterion (additional information is available on the IEG website: <http://ieg.worldbankgroup.org>).

**Outcome:** The extent to which the operation's major relevant objectives were achieved, or are expected to be achieved, efficiently. The rating has three dimensions: relevance, efficacy, and efficiency. *Relevance* includes relevance of objectives and relevance of design. Relevance of objectives is the extent to which the project's objectives are consistent with the country's current development priorities and with current Bank country and sectoral assistance strategies and corporate goals (expressed in Poverty Reduction Strategy Papers, Country Assistance Strategies, Sector Strategy Papers, Operational Policies). Relevance of design is the extent to which the project's design is consistent with the stated objectives. *Efficacy* is the extent to which the project's objectives were achieved, or are expected to be achieved, taking into account their relative importance. *Efficiency* is the extent to which the project achieved, or is expected to achieve, a return higher than the opportunity cost of capital and benefits at least cost compared to alternatives. The efficiency dimension generally is not applied to adjustment operations. *Possible ratings for Outcome:* Highly Satisfactory, Satisfactory, Moderately Satisfactory, Moderately Unsatisfactory, Unsatisfactory, Highly Unsatisfactory.

**Risk to Development Outcome:** The risk, at the time of evaluation, that development outcomes (or expected outcomes) will not be maintained (or realized). *Possible ratings for Risk to Development Outcome:* High, Significant, Moderate, Negligible to Low, Not Evaluable.

**Bank Performance:** The extent to which services provided by the Bank ensured quality at entry of the operation and supported effective implementation through appropriate supervision (including ensuring adequate transition arrangements for regular operation of supported activities after loan/credit closing, toward the achievement of development outcomes. The rating has two dimensions: quality at entry and quality of supervision. *Possible ratings for Bank Performance:* Highly Satisfactory, Satisfactory, Moderately Satisfactory, Moderately Unsatisfactory, Unsatisfactory, Highly Unsatisfactory.

**Borrower Performance:** The extent to which the borrower (including the government and implementing agency or agencies) ensured quality of preparation and implementation, and complied with covenants and agreements, toward the achievement of development outcomes. The rating has two dimensions: government performance and implementing agency(ies) performance. *Possible ratings for Borrower Performance:* Highly Satisfactory, Satisfactory, Moderately Satisfactory, Moderately Unsatisfactory, Unsatisfactory, Highly Unsatisfactory.





## Preface

This Project Performance Assessment Report, prepared by the Independent Evaluation Group (IEG), evaluates Bangladesh's Rural Electrification and Renewable Energy Development (RERED) Project (FY2002-13), Power Sector Development Technical Assistance Project (FY2004-13), and the Power Sector Development Policy Credit (FY2008-09).

The RERED project was approved on June 25, 2002, became effective on December 31, 2002, and closed on December 31, 2012, nearly four and a half years after the planned closing date of June 30, 2008. The total project cost was US\$759 million, about two and a half times the original project cost of US\$298 million. Of this, the original IDA contribution was US\$191 million supplemented by two rounds of additional financing in December 2009 and August 2011 of US\$130 million and US\$172 million respectively. Of this US\$431 million was disbursed, and the remaining US\$61 million was cancelled from the credit. The project was restructured with Board approval on August 28, 2011, by which time US\$346 million were disbursed, amounting to 80 percent of the final disbursement of US\$431 million. Two other restructurings were carried out on July 6, 2009 and December 20, 2012 that related to changes in output targets and cancellation of unused funds.

The Power Sector Technical Assistance Project (IDA-39130, IDA-H0920) was approved on June 03, 2004 and closed on December 31, 2012, four years after the planned project completion date of December 31, 2008. The final project cost was US\$14.6 million, contributed entirely by IDA (including US\$8.60 million IDA Grant for Poorest Country) against the planned amount of US\$20.5 million which included a Borrower contribution of US\$5.5 million. In the end, there was no contribution from the Borrower.

The Power Sector Development Policy Credit (IDA-44360) was approved on June 17, 2008 and closed as planned on March 31, 2009. The planned Credit of US\$120 million was fully disbursed.

Together, the projects addressed priority needs of the country's energy sector with the overall objective of raising levels of social development and economic growth in the country. The RERED project aimed to increase access to electricity in rural areas. The Technical Assistance Project sought to improve the government's capacity for formulating power sector policies, industry institutional structures, and a gas supply strategy needed for a balanced development of Bangladesh's power sector. The Development Policy Credit focused on enhanced governance and accountability, and on financial stability in the sector that would lead to better and more sustainable service provision.

IEG considered several factors in choosing the above set of projects for assessment. Foremost, the World Bank has a long and continuous involvement in Bangladesh's energy sector going back over two decades. Despite significant efforts by the Government, especially over the last decade, the country lags behind in providing

electricity access to its population. The lack of access is particularly high in rural areas, even when compared with other countries in the South Asia Region. In this context, examining the Bank's role and effectiveness in supporting Bangladesh's power sector can provide valuable feedback for future engagement in the country as well as in similar country situations. The three projects that are assessed in this report overlapped in time, and complemented each other by covering policy and technical assistance to the energy sector, and provision of electricity infrastructure. The findings and lessons from this assessment will be an important input to the forthcoming IEG evaluation of the World Bank Group's Support for Electricity Access.

IEG prepared this report based on an examination of the relevant Project Appraisal Documents, Implementation Completion and Results Reports, legal agreements, project files and archives, as well as other relevant reports, documents, memoranda and working papers. An IEG field mission visited Bangladesh during December 2013. Discussions were held with Bank staff in Washington, DC and in Dhaka, officials of the government and various electricity sector institutions in Dhaka, a mini-grid operator, and a representative of a consumer forum. The planned site visits could not be carried out because of the prevailing security situation in Bangladesh.

The mission expresses its appreciation for the generous time and attention given by the Borrower and all concerned parties. A list of persons met by the mission is in Annex C.

Following IEG practice, copies of the draft report were sent to government officials and implementing agencies, and no comments were received from the government.

## Summary

Bangladesh has experienced sustained growth in recent years, but is facing widening deficits in the provision of electricity and other infrastructure services, as demand for them grows at a faster rate than investments. In 2012, the country ranked 134<sup>th</sup> out of 144 countries on the quality of electricity supply, which is seen as one of the most problematic obstacles to doing business in Bangladesh.

The Government has targeted universal access to electricity by the year 2021. In comparison, only 62 percent of Bangladesh's population had access to electricity in 2013, with a wide disparity between urban areas (90 percent) and rural areas (43 percent), and about 13 million rural households without electricity. Even those with access to electricity routinely experience supply disruptions. The dispersed nature of rural settlements, especially in the delta and hilly regions make the extension of the electricity grid to these areas difficult and expensive.

The Government's plans for addressing the generation shortages and to increase access to electricity call for energy conservation, load management, adopting grid and off-grid electrification approaches to extend electricity services, promoting private sector investment in short and longer-term power supply measures, and improving sector governance and efficiency.

The financial sustainability of the sector is under great strain as increases in retail tariffs have not kept pace with the bulk supply tariffs. Government subsidies to the power sector have increased from US\$85 million in FY2007 to US\$640 million in FY2013. In recent years, investors appear to be discouraged by political turmoil and uncertainty surrounding political transition, labor unrest in the prominent readymade garment sector, banking scams, and a lack luster global economy.

On the positive side, off-grid electrification is expected to cover about 30 million of the population by 2016 (about 18percent of population), up from about 15 million in 2013. The payment collection performance of the sector overall has been remarkable with accounts receivable less than 2 months of sales equivalent.

While the impressive off-grid expansion in Bangladesh still offers potential to expand electricity access to rural areas, overall sustainable development of, and benefits from, the sector could still primarily depend upon extending the grid to its feasible limits; moving towards a more remunerative tariff structure; improving governance and efficiency; and pursuing a least cost expansion of electricity generation while providing for a supportive environment for much needed long term investments by private sector.

### World Bank Assistance and Strategy

The World Bank Group's Country Partnership Strategies (CPSs) over the last decade and more have duly recognized the energy sector's role and importance for country's development agenda and also the key issues that need to be addressed in the sector. The World Bank has a long and diverse engagement with the electricity sector in Bangladesh covering investment lending, risk guarantees, policy support, and technical advice. Since

1989, the World Bank has provided about US\$1.1 billion in support to project costs, and developmental expenditure totaling US\$4.4 billion. A detailed list of World Bank activities in Bangladesh's electricity sector is provided in Annex B.

### **Assessment of Project Outcomes**

This Bangladesh Energy Cluster PPAR covers three projects which overlapped in their implementation periods: Rural Electricity and Renewable Energy Development (RERED) Project (2002-2013); Power Sector Development Technical Assistance Project (2004-2013); and Power Sector Development Policy Credit (2008-2009).

The projects were also interlinked in their overall objectives and the means to achieve them. The RERED project was focused on expanding electricity access - both grid-based and off-grid – for delivering social and economic outcomes. These outcomes were underpinned by the Technical Assistance Project and the Development Policy Credit, which addressed the broader power sector financial, governance, regulatory, and other institutional issues. Specifically, the objectives of the three projects were as below:

- **The Renewable Energy for Rural Economic Development (RERED) Project** sought to raise levels of social development and economic growth by increasing access to electricity in rural areas. It also worked to reduce atmospheric carbon emissions by overcoming market barriers for the use of renewable energy.
- **The Power Sector Development TA project** aimed at a balanced development of Bangladesh's power sector by improving government capacity to put in place power sector policies, industry structures, regulation, and a gas supply strategy; it also sought to prepare and secure financing for at least two power sector investment projects that would then be efficiently implemented.
- **The Power Sector Development Policy Credit** sought better and more sustainable electricity service provision through supporting a subset of the country's reform plan for financial, regulatory, institutional, and governance aspects and improving private investment in generation.

Summarized in the following sections are the assessment of the relevance of each project's objectives and design, development outcomes, risks to the sustainability of the development outcomes, and the performance of the Bank and Borrower.

### **The Renewable Energy for Rural Economic Development (RERED) Project**

The RERED project made a notable contribution to social and economic outcomes in rural areas by extending access to electricity through off-grid Solar Home Systems (SHS), supplemented by progress on extending the electricity grid. Areas covered by off-grid Solar Home Systems saw significant increases in study times for both boys and girls, and a greater number of children completing schooling. Household appliances such as fans, and television sets began to be used; for example half of all SHS users were found to have a television. Lighting contributed to a better sense of security for women,

increasing their mobility, and television has helped women improve their knowledge of health and environmental issues, apart from improving general awareness. An impact assessment study for the grid-based expansion found a 21 percent increase in household incomes in the project area, and a net income increase of BDT215 billion per annum for commercial enterprises. The effort to jump-start the use of compact fluorescent bulbs to improve energy efficiency helped in spreading awareness of the product.

The most prominent output attributable to the project was the installation of about 1.24 million Solar Home System units – a scale that far exceeded original targets. This task was carried out by the implementing agency Infrastructure Development Corporation Limited (IDCOL), which worked through several grassroots partnership organizations and demonstrated the feasibility of an ownership model by which beneficiaries paid for a substantial portion of the asset in affordable instalments. The extension of the rural grid added about 657,000 new connections. Together, the off-grid and grid efforts provided a population of between 9 and 10 million with access to electricity.

Separately, a pilot effort under the project on stand-alone mini-grids yielded few tangible results, mainly due to lack of clear policy and incentives. The project also helped to jump-start the use of Compact Fluorescent Lamps in both urban and rural areas as an important means of improving energy efficiency.

The relevance of the project's objectives is rated *high* before and after the project was restructured, given the potential developmental benefits from improving electricity access in rural areas, and from improving efficiency of electricity usage in the country. The relevance of the initial project design is rated *high* with its broad reliance on both grid and off-grid expansion to improve electricity access to yield economic and social benefits for rural areas. The relevance of design after project restructuring is rated *substantial* given the partial integration of the electricity efficiency effort with that of improving access. Efficiency is *high* rated prior to restructuring from the favorable economic rates of return and cost-effective nature of operations; while it is rated *substantial* following restructuring due to the large share of unusable CFLs among the total number that were distributed. Overall Development Outcome (based on the guidelines for restructured projects) is rated *highly satisfactory* based on the significant social and economic outcomes from grid and off-grid electrification, while noting the scope for better performance in the mini-grid pilot and CFL distribution efforts. As the deployment of Solar Home Systems took on a momentum of its own, the Bank was quick to support this trend through additional financing on a vastly higher scale. The Bank's performance is rated *satisfactory*. Borrower performance is rated *highly satisfactory* as the Government provided crucial support and considerable autonomy to IDCOL to chart its own course and to secure the confidence of its financiers, partnership organizations and beneficiaries. The risk to development outcome is considered *moderate*, as IDCOL, notwithstanding its commendable performance so far, faces an ambitious goal of nearly doubling its current achievement over the next three years, and a less favorable cost structure as it reaches out to poorer and more dispersed beneficiaries.

## The Power Sector Development TA project

This project helped improve the capacity of the Power Cell in the Ministry of Power, Energy and Mineral Resources for sector planning, analytical work and dealing with technical matters. Though attribution is difficult, this technical assistance may have played a role in supporting a ‘balanced development’ of the power sector, which during the project period (2004-2013) saw an increase in electricity access from 35 percent to about 62 percent; an increase in generation capacity from 3,622MW in 2004 to 9,500 MW; a reduction of systems losses from about 20.0 percent to 1.3 percent; and a drop in accounts receivable from 6.45 months to 2.21 months.

The Bangladesh Energy Regulatory Commission (BERC) became functional during the project period; has executed some tariff increases for electricity and gas in recent years; and is trying to involve and educate the public on the need for remunerative energy prices. However, BERC is increasingly seen to be constrained by undue political and bureaucratic interference in its staffing and decision-making, and lack of financial autonomy, limiting its scope for playing an objective role as a regulator and protector of the consumer interest.

The project helped prepare six investment proposals in power generation, transmission, distribution, energy efficiency; and gas transmission and distribution. Among them financing could be secured only for the Siddhirganj Peaking Power Plant, while the South Zone Power Distribution Corporation proposal was held back due lack of progress in corporatizing the entity. The remaining four proposals stalled because of the Bank’s decision to suspend financing large infrastructure projects due to broader governance issues.

The project objectives are rated **highly** relevant to the issues facing Bangladesh’s electricity sector. The relevance of design is also rated **high** with planned inputs being logically linked to the expected outcomes. Efficiency is rated **modest** mainly due to the project implementation period being nearly twice the original plan, despite several complementary project activities by the Bank as well as other active multilaterals and bilaterals covering several common sector issues. Overall Development outcome is rated **moderately unsatisfactory** with the overall goal of balanced development of the sector being undercut by the poor prospects for financial sustainability as discussed in the context of the Development Policy Credit below; the sector regulator BERC yet to display the independence and competence to gain credibility with all relevant stakeholders; and lack of sufficient progress in respect of implementing two planned power sector investment projects. The risk to development outcome is rated **substantial** as the sector’s financial situation remains constrained by high supply costs and unremunerative tariffs, together with the lack of private investment in power generation, and a weak regulator. The Bank’s performance is rated **moderately satisfactory** for its attempts to maintain the dialogue with the Government for making progress towards the project objectives, while the Borrower’s performance is rated **moderately unsatisfactory** for not being proactive in augmenting power supply and improving the regulatory process.

## The Power Sector Development Policy Credit

This Credit operation displayed several shortcomings in pursuit of its objectives. The corporatization of the South Zone Power Distribution Company was effectively rolled back in the four years after Credit closure, nullifying earlier progress in constituting a Board and electing a Chairman. The planned installation of automatic metering to monitor inter-utility flows and consumption by large electricity consumers in the South Zone has similarly not been taken up in a serious manner till now. The Bibiyana independent power producer effort was stalled in the run up to elections four years ago, and little progress has been made since then. The strategy prepared for improving the functioning of the Rural Electrification Board continues to be under the consideration of the government. The lone positive outcome of the Credit operation was that the Government systematized the transfer of subsidy payments to the main utility, Bangladesh Power Development Board (BPDB), which has ensured timely payments to the power providers and improved the reliability of power supply within the existing parameters. However, since Credit closure, the scale of subsidy has grown from BDT 9.9 billion in 2009-10, to BDT 63.6 billion in 2011-12, and BDT 44.1 billion in 2012-13, clearly showing deterioration in the financial condition of the sector.

The Relevance of the Credit's objectives and design are rated *high*. Bangladesh's power sector clearly faces major constraints in improving overall electricity service provision, and financial sustainability and governance are priority areas for intervention to improve the power situation. The overall development outcome of the project is rated *unsatisfactory* with little progress towards solvency in the sector and a continuing high level of government subsidies that may not be sustainable. The reversal of SZPDC corporatization, and the politicization of BERC signal a backslide in respect of governance with strong implications for financial sustainability. The Risk to development outcome is rated *high*, as the government shows little movement towards improving prospects for investment in power generation; is yet to give clear signals to improve governance in the sector, and provide the space to the regulator to play its role effectively. The Bank's performance is rated *moderately satisfactory* considering its continued dialogue with the government to adhere to the reform process, though it could have leveraged its wide involvement in the sector to a greater extent in this regard. Borrower's performance is rate *unsatisfactory* due to its rollback in commitment to most of the reform actions.

**Some overall conclusions:** The three operations assessed in this report show mixed results, which are also reflected in the larger performance in the sector. Despite progress in increasing access to electricity, large gaps are yet to be covered, especially in the rural sector. Generation capacity greatly lags demand and there is little progress in attracting badly needed private investment for this purpose. Tariffs continue to be significantly short of cost recovery levels. While BPDB's current role as a single buyer is considered appropriate, its financial strategy and operational focus needs to be oriented towards supporting long term investments by the private sector. Bangladesh has compromised the Bank's support for mobilizing long-term private investment in the generation sector due to serious governance issues, which has come in the way of realizing a least cost expansion of the sector which can lead to lower power generation costs and decreased

need for government subsidies. This situation continues to mask the significant achievements made in expanding rural and off-grid electrification country-wide, and remains a critical constraint to further grid expansion and a significant fiscal risk. While the off-grid expansion still offers potential to expand electricity access to rural areas, sustainable development of the sector depends upon Bangladesh restoring the path of least cost development in the sector. The Bank has a critical role to play in this regard through broadening and deepening reforms in the sector.

## Lessons

The following lessons are drawn from the experience with the three operations that have been assessed in this report.

- A. **Off-grid household electrification can accelerate the benefits of “lighting” in a cost-effective manner, to populations that face uncertain waiting periods for grid-based electricity, or are unlikely to obtain grid-based electricity due to remote or inaccessible locations.** The RERED project experience shows that potential beneficiaries can respond well to ownership-based Solar Household System schemes, and factor in the likelihood of gaining access to grid-based electricity at a later stage.
- B. **A public-private partnership model can efficiently deliver large-scale and dispersed off-grid electricity services, by deploying public funding through private sector stakeholders.** Flexibility to adapt to market conditions and signals are the hallmarks of this model, while quality assurance and after-sales and maintenance service mechanisms are a necessity for acceptance by beneficiaries.
- C. **One-off technical assistance or credit support operations should be highly strategic, selective and practical in supporting policy and institutional issues of a complex nature.** The PSD Technical assistance project took on an ambitious agenda covering power sector policies, regulation, industry structure and private sector participation, and struggled to get traction on any of these matters.
- D. *Similarly to Lesson C, One-off Credit operations cannot be expected to make headway on multiple policy fronts in a sector, especially if these issues have some commonalities with other sectors.* The Power Sector Development Policy Credit single-tranche operation covered complex issues of governance and financial sustainability, which were difficult to resolve to any significant extent in a program of short duration.
- E. **Achieving broader social and economic outcomes from electricity access provision will primarily depend upon the pursuit of a least cost path for grid expansion backed by appropriate sector policies, complemented by off-grid electricity in the interim or permanently as needed.** While Bangladesh has demonstrated impressive growth in Solar Home Systems and continues to pursue this path for improving access to electricity, it needs to keep in mind that off-grid electrification can inherently provide only a limited range of services to beneficiaries compared to grid-based electricity. Achieving broader social and economic outcomes



from electricity provision will primarily depend upon the pursuit of a least cost path for grid expansion for which persisting policy and regulatory bottlenecks have to be resolved.

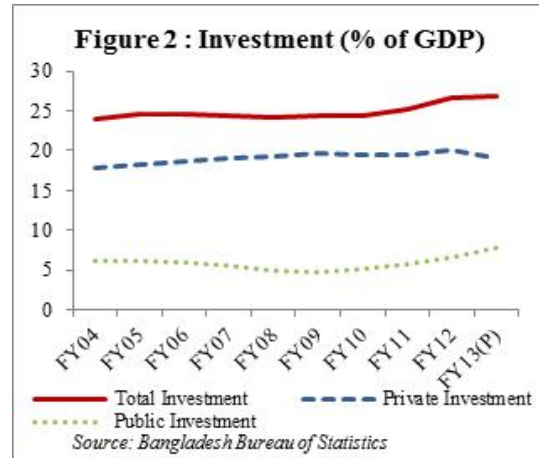
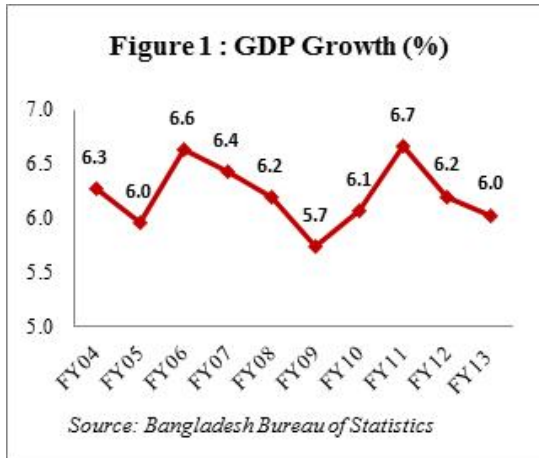
Caroline Heider  
Director-General  
Evaluation



## 1. Background and Context

1.1 Bangladesh, with a population of about 150 million and a land area of 147,570 square kilometers (km), is among the most densely populated countries in the world. Situated in a low-lying river delta, the country is vulnerable to natural disasters and extremely sensitive to climate change impacts.

1.2 *Despite several challenges, Bangladesh's economy has proved to be remarkably resilient, especially in the last decade.* The country has maintained an average annual GDP growth rate above 6 percent since FY2004 (Figure 1) raising GDP per capita (current US\$) from US\$353 in 2003 to US\$752 in 2012. Poverty (people living on less than \$2 a day) fell from 49 percent in 2000 to 40 percent in 2005 and further to 32 percent in 2010. Bangladesh has achieved remarkable progress in its social indicators, and is likely to achieve the Millennium Development Goals for poverty reduction, infant and child mortality, primary enrolment and gender parity in education.<sup>1</sup>



1.3 The recent sustained growth has generated higher demand for electricity, transport, and telecommunication services and has contributed to widening infrastructure deficits in Bangladesh as demand for infrastructure has risen faster than investments. The country ranked 118<sup>th</sup> on the Global Competitiveness Index, out of 144 countries, and 134<sup>th</sup> on quality of electricity supply. On the Global Competitiveness Survey, the highest number of respondents (20%) identified inadequate supply of infrastructure as the most problematic factors for doing businesses, followed by corruption (16.7%), access to financing (9.5%), and bureaucracy (9.5%). Inadequate supply of infrastructure, corruption, access to finance and an inefficient government bureaucracy are the most problematic obstacles to doing business in Bangladesh.<sup>2</sup>

1.4 *Private investment has remained stagnant or declined relative to public investment in recent years.* Public investment as a percent of GDP increased from 6.5 in FY12 to 7.9 in FY13—the highest in Bangladesh's history. On the other hand there has

<sup>1</sup> Bangladesh Bureau of Statistics

<sup>2</sup> World Economic Forum: The Global Competitiveness Report 2012-2013.

been a decrease in private investment between FY2012 and FY2013 that is equivalent to about one percentage point of GDP (Figure 2), after having stagnated at around 19.5 percent of GDP for several years. The magnitude of the decline in the private investment rate is the greatest ever in a single fiscal year in Bangladesh, though not very large by regional standards. Investors appear to have been discouraged by political turmoil and uncertainty surrounding the impending political transition, labor unrest in the prominent readymade garment sector, banking scams, and a lack luster global economy.<sup>3</sup>

1.5 The burden of subsidy increased rapidly after FY10, with growing fuel and electricity subsidy payments adding to continued high subsidies for agricultural inputs. The total budgetary subsidy bill, which was around 1.5 percent of GDP in FY10, steadily increased to 3.6 percent of GDP in FY13. Rapid growth in fuel, agriculture inputs, and electricity subsidies contributed to this unsustainable situation. Total subsidy increased to BDT 374 billion, against the original target of BDT 345 billion. The recent adjustments in the electricity tariff have helped to reduce the Bangladesh Power Development Board (BPDB)'s subsidy bill, though the allocations for the Bangladesh Petroleum Corporation (BPC) and the agriculture sector increased.<sup>4</sup>

### **Sectoral and Institutional Context**

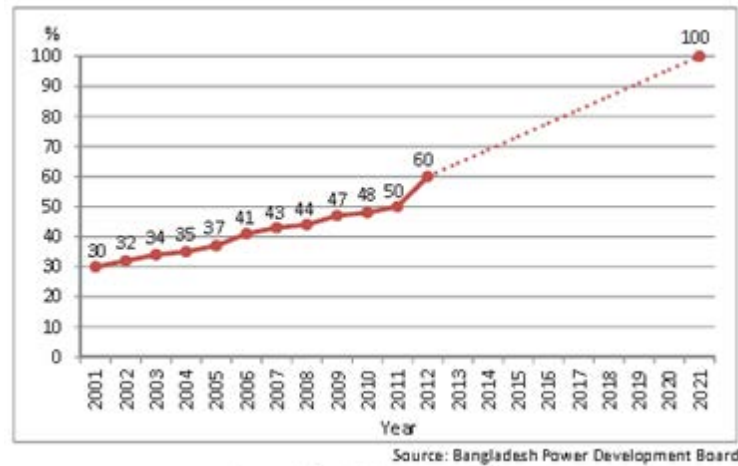
1.6 About 62 percent of Bangladesh's population had access to electricity in 2013, (up from 32 percent in 2000) with a wide disparity between urban areas (90 percent) and rural areas (43 percent), and about 13 million rural households without electricity. Per capita consumption overall at 270 kWh per year as of 2013 is one of the lowest in the world. The dispersed nature of rural settlements and areas in the delta and hilly regions that are difficult to access make the extension of grid electrification difficult and expensive. Even those with access to electricity experience supply disruptions because the available generation capacity of 6,500 MW is considerably short of the peak demand at 8,349 MW (2013). Rural areas suffer a disproportionate share of the electric supply interruptions. Natural gas, which is the primary fuel for more than 75 percent of power generation, is in short supply and several old power plants are operating considerably below their rated capacity. Of the 9,500 MW of installed capacity, BPDB and the other three generation companies own about 5,376 MW, while large independent power producers (IPPs) and short-term rental plants comprise the remainder.<sup>5</sup> (Figure 3).

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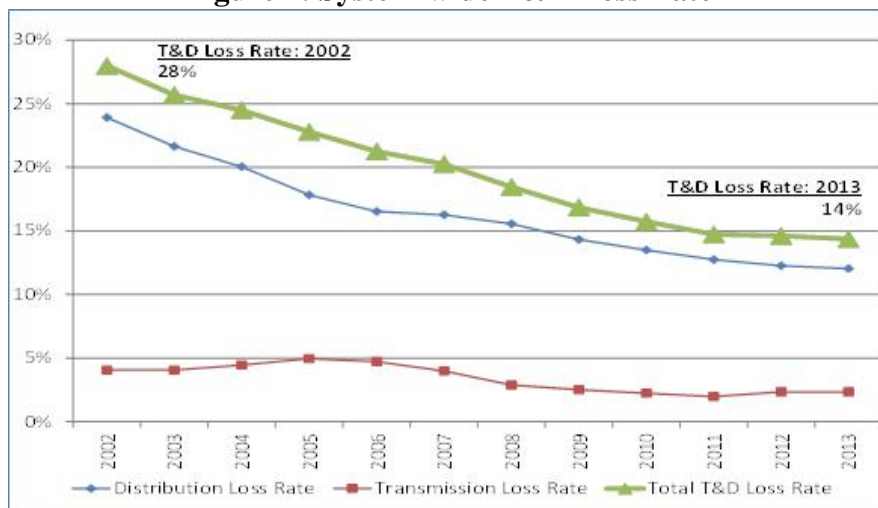
<sup>3</sup> Bangladesh Bureau of Statistics

<sup>4</sup> Ministry of Finance, Government of Bangladesh

<sup>5</sup> Bangladesh Power Development Board

**Figure 3: Trend in Electricity Access**

1.7 *Electricity availability and the number of consumers have grown steadily over the last decade.* This has been particularly true for the rural electricity system, which has seen electricity sales grow by about 11.7 percent annually over the last ten years and has added an average of 425,000 new consumers annually over the last three years alone. By 2013, the grid system had about 14.7 million connections while the off-grid system about 3 million. This growth was driven primarily by: i) continuing reductions in system losses; ii) moderate generation additions earlier in the decade; iii) more recent generation capacity additions from short-term power plants, and iv) impressive off-grid growth. This has been enabled by substantial investment, mostly from the Government, for extension of the network, particularly in low-voltage systems to support new connections. Other technical investments have not kept pace with the growth, however, and now transmission and distribution load limits and deficits in generation capacity threaten future expansion.<sup>6</sup> (Figure 4)

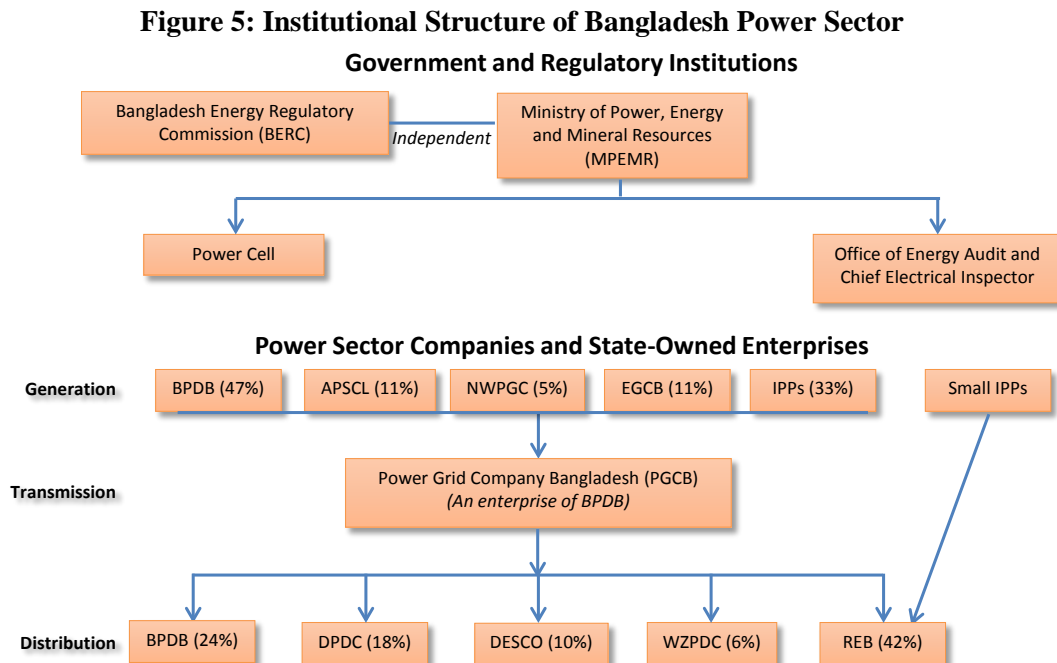
**Figure 4: System-wide T&D Loss Rate**

<sup>6</sup> Bangladesh Power Development Board

1.8 Prior to 1996, Bangladesh had a vertically-integrated power system, with the state-owned Bangladesh Power Development Board (BPDB) handling generation, high-voltage transmission, and urban transmission and distribution, and with the Bangladesh Rural Electrification Board (BREB) handling rural transmission and distribution. Since then, BPDB has gradually been unbundled into four generation companies, one transmission company, and four urban distribution companies (Figure 5).

1.9 The Ministry of Power, Energy and Mineral Resources (MPEMR) is responsible for policy making, planning and development of power sector through its Power Division. The Bangladesh Energy Regulatory Commission (BERC) was set up in 2003 with the mandate to regulate power, gas and petroleum sectors.

1.10 The BPDB is the core part of the power sector structure, has significant generation and distribution functions, and also performs the role of single-buyer for the country, purchasing power from the other generation companies and IPPs and selling it to the distribution utilities. The BPDB also carries out national generation and distribution expansion plans and has responsibility to implement the approved plans by the government. BPDB has supported significant addition to the country's generation capacity over the last decade, including short-term rental plants from private operators.



Source: Ministry of Power, Energy and Mineral Resources (MPEMR)

1.11 The transmission system is operated by a single transmission company, Power Grid Company of Bangladesh (PGCB), which is an enterprise of BPDB, and owns and operates 2,600 km of 230 kV lines and 6,000 km of 132 kV lines and transmits power from the generation plants to the 70 PBSs under REB and the other distribution utilities. The Power Grid Corporation of Bangladesh has a sound governance structure, with a

Board of Directors that provides oversight to a professional management that runs the company's day-to-day operations.<sup>7</sup>

1.12 On the distribution side, 42 percent of electricity is distributed through the rural distribution system. About 30 percent is supplied to Dhaka, the capital city, by two corporatized distribution companies (Dhaka Electric Supply Company and Dhaka Power Distribution Corporation). The third corporate distribution company, the West Zone Power Distribution Company Limited, supplies 6 percent, and the remaining 22 percent is still supplied by BPDB's distribution subsidiaries.

1.13 The rural electricity system is the responsibility of the Bangladesh Rural Electrification Board (REB), a semi-autonomous body responsible for planning, financing, and installation of the rural electrification network of the country. Once constructed, responsibility for the distribution system is transferred to rural electricity cooperatives (Palli Biddiyut Samities, or PBSs), which provide retail service, as well as operate and maintain the system, and are overseen by REB. Small IPPs supply a small percentage of the rural system's power directly to REB. The rural system currently consists of about 270,000 km of distribution lines, managed by 70 PBSs, and accounts for almost half of country's power demand. The performance efficiency of REB is in sharp contrast to that of the other two utilities operating in the country, Bangladesh Power Development Board (BPDB) and the Dhaka Electricity Supply Authority (DESA), which together account for 75% of total electricity sales.

### **Sector planning and financial performance**

1.14 The Government articulated a Vision and Policy Statement on Power Sector Reforms in 2002, aiming at i) universal access by the year 2021 with improved reliability and quality; ii) stabilizing the sector's financial status and increasing its efficiency; and iii) operating the sector on commercial principles and increasing private sector participation. The Government's strategy was cast in a 3-year reform road map during 2007-08, which has further been updated through a Power System Master Plan of 2010.<sup>8</sup>

1.15 To address the generation shortages and to increase access to electricity, the Government has adopted a multi-pronged strategy in the power sector that includes energy conservation, load management, adopting grid and off-grid electrification approaches to extend electricity services, promoting private sector investment in short and longer-term power supply measures, and improving sector governance and efficiency. The Government has embarked upon an ambitious generation expansion plan that envisages adding more than 11,000 MW to the national grid by the year 2018. As part of that plan, a number of large gas-fired power plants have recently been awarded to the private sector, and one large coal fired plant (1,320 MW) has been undertaken by the public sector. These plants are facing delays due to challenges in reaching financial

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<sup>7</sup> Bangladesh Power Development Board

<sup>8</sup> Ministry of Power, Energy and Mineral Resources, Government of Bangladesh. 2010.

closure, and as an interim measure, the Government has contracted over 2,300 MW of plants run on liquid fuel for 3-to-5year terms.<sup>9</sup>

1.16 Though these short-term plants help to reduce the power shortages, they are expensive and have imposed a large financial burden on the power sector. The Government handles this by subsidizing the gap between the bulk supply tariff that the distribution utilities pay to BPDB and the price that BPDB pays to generate and purchase power. Despite increasing the bulk supply tariff by a total of 80% in phases since February 2011, the subsidy was BDT40 billion (US\$550 million), BDT63 billion (US\$800 million), and BDT50 billion (US\$640 million) in FY11, FY12, and FY13 respectively. In contrast, the power sector required only a US\$85 million subsidy per year from FY07 to FY09 and US\$140 million in FY10.<sup>10</sup>

1.17 Increases in retail tariff have not kept pace with the bulk supply tariff, causing a financial burden to distribution utilities. Retail tariffs have been increased overall by 55 percent from FY10 to FY13. The collection performance of the sector overall has been remarkable with accounts receivable less than two months of sales equivalent. This provides a very important financial foundation for the Government to pursue reforms in a sustained manner, including adjusting electricity tariffs and structure over the next years to reach cost recovery levels, while at the same time phasing out high cost rental power plants through a least cost expansion plan, as planned. The reach of off-grid electrification is expected to double to 30 million people by 2016, from about 15 million in 2013.<sup>11</sup>

### **World Bank Assistance and Strategy**

1.18 The World Bank has a long and diverse engagement with the electricity sector in Bangladesh covering investment lending, risk guarantees, policy support and technical advice. Since 1989, the World Bank has provided about US\$1.1 billion to support project costs and developmental expenditure totaling US\$4.4 billion. A detailed list of World Bank activities in Bangladesh's electricity sector is provided in Annex B.

1.19 The Bank's Country Partnership Strategies (CPSs) over the last decade duly recognized the energy sector's role and importance for country's development agenda and also the various key issues that needed to be addressed to improve sector performance. The Bank's sector strategy and assistance showed a proactive approach, beginning with the sector reform discussions and options in 2001, supported by ESMAP<sup>12</sup>, and laid the foundations for expanded private sector investments in the power generation segment, in addition to sustaining the rural electrification program. During mid-2000s, the Bank sharpened the reform focus through policy notes<sup>13</sup> centered around

<sup>9</sup> Ministry of Power, Energy and Mineral Resources, Government of Bangladesh

<sup>10</sup> Ministry of Finance, Government of Bangladesh

<sup>11</sup> Ministry of Finance, Government of Bangladesh

<sup>12</sup> ESMAP Technical Paper 018, December 2001

<sup>13</sup> "Mitigating Bangladesh Power Crisis: Possible Response Options", and "Bangladesh – Energy Policy Note for the New Government", World Bank notes, 2007



improving the sector's financial situation through reforms and restructuring options to be implemented through actions and strategies over short-, medium- and long-term. The actions included both power and gas sectors in view of the interdependent issues and helped Bangladesh develop a detailed Power System Master Plan (2010), in addition to various sub-sector studies and financial restructuring plan. The series of Sector Investment Loans and Policy Credits, including the Power Sector Development Policy Credit (2008), supported the sector reforms and development, in concert with development partners such as ADB and JICA.

1.20 What follows is an assessment of a cluster of three energy sector projects in Bangladesh – the Rural Electrification and Renewable Energy Development (RERED) Project (2002-13), Power Sector Development Technical Assistance Project (2004-13), and the Power Sector Development Policy Credit (2008-09).

## 2. Rural Electricity and Renewable Energy Development (RERED) Project

### Objectives, Design, and their Relevance

#### OBJECTIVES

2.1 According to the original Development Credit Agreement<sup>14</sup>, the project development objective for this project was “to support the Borrower’s vision of attaining a higher level of social development and economic growth by increasing access to electricity in rural areas.”

2.2 Following additional financing and formal restructuring approved by the Board in 2011, the development objective was restated in the Financing Agreement<sup>15</sup> as “to increase access to electricity in rural areas of the Recipient’s territory and help promote more efficient energy consumption.”

2.3 Following the World Bank’s Harmonized Operational Policy and Corporate Services (OPCS)-IEG Evaluation Guidelines for restructured projects, the project development outcome is rated based on the outcome ratings before and after restructuring, and weighted by amount of disbursement in the two stages.

2.4 The Global Objective of the Project, which remained unchanged, was to reduce atmospheric carbon emissions by overcoming market barriers for renewable energy development, including high implementation costs.

#### RELEVANCE OF OBJECTIVES

2.5 ***Relevance of the original project development objectives is rated High.*** The original project and global development objectives are in line with national priorities as well as the Bank’s partnership strategy for the country at project appraisal as well as at completion. The Government’s 2002 Vision and Policy Statement on Power Sector Reforms aimed to provide the entire country with electricity service by 2021, commercialize the sector, attract private investment, and improve financial viability. These goals are also emphasized in the country’s Three-Year Roadmap for Power Sector reform.

2.6 The Bank’s 2000 Country Assistance Strategy emphasized the importance of rapidly increasing electricity access, undertaking reforms in the electricity sector and leveraging community institutions and micro-credit. The project’s original objectives remain consistent with the Bank’s current Country Partnership Strategy for FY11-14, which emphasizes increased infrastructure provision, and access.

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<sup>14</sup> Dated July 16, 2002

<sup>15</sup> Dated November 24, 2011

**2.7 Relevance of the project development objectives after restructuring is also rated High.** The restructured objective effectively retained the original objective, and added the objective of promoting more efficient energy consumption. The relevance of the new objective is underlined by Bangladesh's Energy Conservation Act of 2008 which placed emphasis on improving energy efficiency, as well as the Bank's current Country Partnership Strategy for FY11-14, which stressed the need to increase efficiency in the energy and other infrastructure sectors.

## DESIGN

**2.8** The project's original components and the activities introduced by additional financing in 2009 and 2011 are listed below:

- A1: Rural Electrification System Expansion, Intensification, and Rehabilitation** (*at appraisal: US\$264.6 million; at completion: US\$306.0 million*): To facilitate the handover of Bangladesh Power Development Board (BPDB)-operated power systems to Rural Electrification Board (REB) to increase the efficiency of supply and reduce overall costs of electrification.  
**Added through Additional Financing in 2009** (*US\$19.0 million*): Provide financing to REB to close the funding gap that arose due to exchange rate fluctuation that occurred between the time REB issued contracts for renovation of taken-over lines in 2008 and the time those contracts came due in 2009.
- A2: REB Technical Assistance** (*included in component A1 above*): To address REB and 45 Palli Bidyut Samitis' (PBS or Village Electricity Co-operatives) institutional capacity needs for socio-economic impact monitoring and evaluation, financial restructuring, environmental safeguard compliance, and poverty reduction aspects of electricity provision.
- B1: REB Solar Program** (*at appraisal: US\$8.8 million; at completion: US\$4.5 million*): To help establish a commercial framework for the off-grid lighting market in Bangladesh by supporting REB and PBS to develop a fee-for-service SHS program supplied to 14,000 off-grid households.
- B2: REB Solar Technical Assistance** (*included in component B1 above*): To support the REB Solar Program, for a) market development and capacity building for PBSs, helping them to market, sell and service SHSs b) development of a quality assurance program to establish and monitor technical standards for SHS components and systems and c) monitoring of the SHS program.
- C1: IDCOL Renewable Energy Sub-loans** (*at appraisal: US\$24.9 million; at completion: US\$473.5 million*): To provide the Infrastructure Development Company Limited (IDCOL) with project development support and financing to offer loans and grants for renewable energy development. This component aimed to provide SHS to 50,000 households through SHS employing a micro-finance-based, direct sales program. The SHSs would be supplied and serviced by private companies in partnership with multilateral financing agencies and NGOs.

**Added through Additional Financing in 2009 (US\$196.0 million) and in 2011 (US\$253.0 million):** Scale up SHS program, and provide technical assistance to support a) quality assurance of SHS through photovoltaic (PV) and SHS lab and field testing / inspection.

- C2: IDCOL Technical Assistance** (*included in component C1 above*): This component was designed to support IDCOL's internal capacity and broaden its scope of activities by a) supporting technology promotion and market development activities b) building administration capacity with a focus on fiduciary and safeguard compliance; c) increasing monitoring and evaluation capacity and activities; and d) supporting renewable energy development of wind, hydro and biomass.
- D: Energy Efficiency Compact Fluorescent Lamps (CFLs)** (*at appraisal: US\$15.00 million; at completion: US\$14.2 million*): This new component was introduced through Additional Financing in 2009 to deploy 10.5 million energy-efficient CFLs in exchange for incandescent lamps to help reduce peak demand under the first-phase of the Efficient Lighting Initiative of Bangladesh Program.<sup>16</sup>

## Implementation Arrangements

2.9 The project was implemented by REB and IDCOL. REB was responsible for rural electrification through grid expansion, intensification and rehabilitation activities. REB also implemented a fee-for-service SHS program (where systems would be installed and owned by REB, and consumers would pay a monthly fixed fee for using the systems) through PBSs. The Energy Efficiency component involving distribution of Compact Fluorescent Lamps was implemented by REB.

2.10 IDCOL anchored the SHS effort by promoting sales of SHS to households through microfinance by selected Participating Organizations drawn from NGOs/ microfinance institutions/private entities. Refinancing support was provided to the partnership organizations covering up to 70 percent to 80 percent of the micro-credit extended to households for SHS purchase. IDCOL also provided grant support to reduce the capital cost of SHS, to make the technology more affordable for rural and low-income households. Technical assistance was also provided to partnership organizations and communities to overcome social and marketing barriers.

## RELEVANCE OF DESIGN

2.11 ***Relevance of the original project design is rated High.*** Rural electrification greatly improves the quality of life.<sup>17</sup> Lighting alone brings benefits such as increased study time and improved study environment for school children, extended hours for small businesses, and greater security. Its second most common use is for television, which

<sup>16</sup> A donor-funded project with the purpose of removing barriers to the large scale use of CFL's by distributing 27 million CFL bulbs and collecting an equivalent amount of incandescent bulbs from about 12.5 million households in Bangladesh, urban as well as rural.

<sup>17</sup> IEG. 2008. The Welfare Impact of Rural Electrification: A Reassessment of the Costs and Benefits An IEG Impact Evaluation.

brings both entertainment and information. The original project design appropriately sought to improve electricity access through additional connections while reducing system losses to increase available power in the system, so as to deliver the outcomes of improved social development and economic growth. Providing additional connections was pursued through expanding and rehabilitating the grid network; as well as providing off-grid SHS and mini-grids in targeted rural areas where the grid was not likely to reach in the near future, or in areas that are economically unviable or inaccessible to the grid such as hilly areas or islands.

2.12 The project design tapped the existing capacity and experience of the REB and the PBSs primarily for extending the grid to rural areas, while leveraging the country's vibrant network of NGOs and microfinance institutions through the organizational strength of IDCOL. Therefore, REB/PBSs would engage primarily in implementing the grid-based components of the project, and secondarily the fee-for-service models for off-grid SHS systems. As discussed in detail under 'implementation experience' below, the responsibility for off-grid SHS was shifted almost exclusively to IDCOL operating through its partnership organizations, using an ownership model. There were no exogenous factors that were likely to affect the project design.

2.13 ***Relevance of the restructured project design is rated Substantial.*** The revised project design resulted from the introduction of the objective (with the additional financing in 2011) of improving the efficiency of electricity consumption in the country. Besides being desirable by itself, this objective complemented the effort for improving supply side efficiency through reducing systems losses that was already included as an element at appraisal. Increased efficiency in use of electricity can release some generation capacity that can potentially improve the availability of electricity for greater use in rural areas, which are typically more likely to experience power shortages. Therefore the new electricity efficiency objective was also consonant with the larger objective of improving social development and economic growth by increasing access to electricity in rural areas. The electricity efficiency drive was not a broad sector-wide effort, and was limited to the distribution of Compact Fluorescent Lights (CFLs) to replace incandescent bulbs as a means of delivering quick savings in electricity consumption. A more integrated approach at the appraisal stage might have enhanced the complementarity of the new objective and – in retrospect – earlier planning may have helped avoid the difficulties that were faced during implementation in this respect.

## **IMPLEMENTATION EXPERIENCE**

2.14 The Project was approved on June 25, 2002, but credit effectiveness took six more months due to issues that arose in the handover of the first package of lines from BPDB to REB under the grid component (Component i). Handover of subsequent packages was also similarly delayed. These delays are attributed by the project team to resistance from vested interests within BPDB; from some consumers that had fallen into a non-payment pattern and feared collection efforts from REB; and discrepancy between the length of distribution lines that were included in BPDB's plans and those that actually existed on the ground. The issues related to distribution lines were ultimately resolved. But the grid component faced further delays due to a moratorium imposed by the Government in 2007 on new grid connections in the face of power supply constraints.

Mainly as a result of these factors, the project was extended by a year from June 30, 2008 to June 30, 2009.

2.15 The project was extended for a second time to December 31, 2009, to allow for the preparation and submission of an additional financing request for US\$130 million to support the fast growing SHS component. This additional finance also included savings resulting from the depreciation of Special Drawing Rights (SDR) against the US dollar. The project was extended for a third time in December 2009 till project completion in December 2012 to allow the SHS work program to be completed. Meanwhile, in April 2011, a reallocation of US\$24.57 million was made from the SHS component to meet the funding needs for the second-phase of CFLs as requested by the Government. A second round of additional finance for US\$172 million for the expanded needs of the SHS component was approved in August 2011. Finally, in December 2012, the project was restructured by cancelling US\$54.91 million (SDR 35.78 million) due to savings achieved in the SHS component and the scaling down of the CFL component.

2.16 The scale of the IDCOL off-grid SHS program proved to be much larger than originally anticipated. The program started with five NGOs as IDCOL's partnership organizations with an original target of installing 50,000 SHS. As of now, there are 49 partnership organizations collectively installing about 60,000 SHS per month under a competitive business model. The Bank's continued support helped to mobilize widespread support from other donors, including the Global Partnership of Output-Based Aid (GPOBA), the Asian Development Bank, the Islamic Development Bank, the United States Agency for International Development, KfW, GIZ, and JICA.

2.17 A parallel effort by REB using a fee-for-service approach for SHS did not fare well as it was not cost-effective for the REB/PBSs to undertake bill collection or perform maintenance in dispersed locations. Also a lack of ownership of the asset resulted in neglect and even abuse of the systems by the users.

2.18 The CFL component for nation-wide distribution of 10.5 million CFLs involved four urban utilities and 15 rural PBSs, and proved to be a challenging task. Notably, an ambitious plan was carried out to distribute about 5 million CFLs (nearly half of the total number) in a single day to create a demonstration effect. However, a post-installation survey and sample life-time testing of CFLs indicated a 34 percent lamp failure rate and a significantly lower lamp life than specified. This was despite the CFLs having passed all pre-shipment tests. It was found that the test reports accompanying the bids were for standard lamps, and had little relevance to the customized specifications for the product that was being procured under the project (longer lamp life, higher power factor, larger voltage fluctuations tolerance etc.). Procurement of the second phase of the CFLs had been initiated before the quality issues in the first phase emerged, but none of the contracts could be signed, either due to non-submission of performance guarantees or, in some cases, submission of fake performance guarantees for some lots. Eventually, the second phase of the CFLs had to be abandoned under the project, with the allocations cancelled before the project closing date.

2.19 **Safeguards:** The project was placed in category B under the Bank's environmental and social safeguards and triggered the policies for environmental

assessment and involuntary resettlement. Expected environmental impacts related to temporary and minor land disturbances arising out of laying new distribution lines, construction of substations, and small-scale gas or diesel-based power generation. Environmental impacts from SHS installations were expected to be minor with the exception of disposal of used batteries.

2.20 REB and IDCOL jointly prepared an Environmental and Social Assessment Framework to form the basis for undertaking sub-project-specific environmental plans. REB and IDCOL also made provision for public consultation on sub-projects and components financed under the project. An updated version of the framework has been prepared and publicly disclosed under the follow-up RERED II project. IDCOL has created a full-time Environment and Social Safeguards Management Unit. IDCOL now has full-time environmental staff members working with partner organizations and battery manufacturers/suppliers to raise awareness about the importance of environmental and social safeguards. IDCOL staff visit all battery recycling plants on a half-yearly basis for ensuring environmental compliance. No significant issues arose for involuntary resettlement as the project generally restricted itself to unencumbered government property or land that was made available by the community.

2.21 The project helped to enhance the standards for battery suppliers to the SHS program by requiring them to adopt ISO 14001:2004 and OHSAS (Occupational Health & Safety Management Systems) 18001:2007 standards. At the end of the project, all 13 battery manufacturers and all 3 recycling facilities in the country became ISO and OHSAS compliant.

2.22 The Bank mission in April/May 2012 noted the lack of a national guideline on safe disposal of CFLs. These guidelines are now being developed under the follow-up RERED II project with a team of international and local consultants, and are required to be in place before the distribution of the CFLs financed under the project can commence. RERED II also provides for technical assistance on ensuring safe disposal of expired CFLs financed under the project.

2.23 **Financial Management.** Shortcomings in financial management occurred in 2008 from REB's failure to appoint an auditor, which was corrected in 2009 when the auditor was in place and REB had taken corrective measures to remove a qualified observation from its project audit report. Further qualified observations arose in 2010, but were gradually addressed over the next three years, particularly by making their satisfactory resolution a condition for disbursement for the energy efficient lighting (CFL) component under RERED II.

2.24 IDCOL faced legacy issues in transitioning from a manual to a computerized system for generating financial management reports. The project team informed the mission that the computerized system is being made functional under the RERED II project and will help reduce/eliminate the scope for manipulation and error.

2.25 There were shortcomings in the procurement process in 2008 and beyond - due to delays by REB in concluding several procurement packages related to the construction of new lines and connecting new consumers (this was partly due to the Government

moratorium on new connections, given the prevailing power supply shortage). The related funds were then reallocated to the IDCOL component to support renewable energy development in 2009. Procurement was affected again in 2010 due to delays by REB in concluding the first-phase CFL procurement and several complaints of alleged corruption received during the procurement process. The second-phase procurement of CFLs was initiated in late 2010, but due to various issues (including issues related to the submission of fraudulent performance guarantees by the winning bidder), the procurement could not be completed and the second phase was cancelled.

2.26 Procurement of SHS was the responsibility of IDCOL's partnership organizations, which are expected to follow established commercial practices. IDCOL officers informed the mission that stringent standards, including a five-year warranty for batteries are strongly enforced. SHS warranty requirements in Bangladesh are among the longest and most honored in the world, while SHS costs remain some of the lowest in the world. IDCOL's management informed the mission that as a result of these strictly enforced quality assurance measures, customer satisfaction has been consistently high. The task team informed the mission that a recent third party monitoring exercise had rated customer satisfaction at 97 percent.

## **Achievement of the Objectives**

**Original Objective.** Raise levels of social development and economic growth by increasing access to electricity in rural areas. *Rated High.*

2.27 The project resulted in several significant outputs in respect of grid extension, provision of SHS on a fee-for-service as well as an ownership basis, and to a lesser extent, mini-grids. Technical assistance under the project contributed to building capacity in technical and administrative areas in entities engaged in the electricity access effort. Favorable economic and social outcomes for the beneficiaries can be attributed to these outputs to a significant extent on the basis of impact studies carried out during the project as discussed in the following sections on outcomes and outputs under this objective.

### **Outputs**

2.28 *Grid extension.* Between 2002 and 2009, REB made 656,802 new grid connections, against an original target of 700,000. REB fell somewhat short of the target due to a moratorium on additional grid connections ordered by the Government in 2006, due to prevailing generation constraints and large-scale load shedding in the country.

2.29 *System Loss reduction in grid.* Between 2002 and 2009, REB took over 11,295 km of lines from BPDB and carried out rehabilitation to reduce losses from an overall average of 59.9 percent in 31 PBS in 2002 to 13.7 percent in 2009, against an overall target of 20 percent. This loss reduction effectively increased availability of electricity at a time of wide-spread load-shedding and helped more reliable electricity access for PBSs' consumers.



2.30 *Provision of SHS on fee-for-service basis by REB.* REB provided SHS to 11,796 households on a fee-for-service basis against an original target of 14,000 households, which accounted for about 3 percent of the initial project cost. It proved difficult for REB to provide maintenance services to these dispersed units in a cost-effective manner. This mission was informed that many of the installed units are expected to have fallen into disuse due to lack of interest on the part of users who had no ownership of the asset. Also, the REB effort for SHS was greatly overtaken by the promotion of SHS by IDCOL on an ownership model.

2.31 *Installation of SHS by IDCOL.* A total of 1,231,720 million SHS were installed by IDCOL with support from this Project. At appraisal, the target for the distribution of SHS by IDCOL was 50,000, corresponding to only 8 percent of the initial project outlay. By taking advantage of the falling costs of solar PV and the un-utilized loan amount in the grid component, the number of SHS installed rose to 236,000 by 2009. Two rounds of additional finance helped increase the project target to 994,000 SHS, and this was exceeded at project completion through further cost savings. Together with support from the Bank and other development partners, IDCOL achieved installation of a total of 1.88 million by December 2012, bringing electricity to an additional 6 percent of the nation's population. IDCOL management indicated to this mission that they were on stream to reach 3 million SHS installations by end-2013.

2.32 *Developing Partnership organizations.* IDCOL has helped mentor and develop 49 partnership organizations. Technical quality assurance of installations is overseen by a committee headed by the head of department of electrical engineering in Bangladesh Institute of Engineering and Technology.

2.33 *Mini-grids by IDCOL.* IDCOL's experience with renewable energy mini-grids faced challenges both in terms of implementation and results. Of the three mini-grids that were attempted, only one was reported to be in commercial operation. The team was briefed by the owner of this mini-grid facility, the 'Sandweep mini-grid' which is a 100 KW solar-cum-40 KW diesel backup hybrid located on a battery have a lifetime of 20 years and 10 years respectively. Electricity is currently sold to 201 consumers including 158 commercial users. The tariff charged to consumers is BDT 32 (about 40 US cents) per kWh, six times higher than the average grid-based tariff of BDT 5.9 (about 7 US cents) per kWh in Bangladesh. The mini-grid operator informed the mission that the willingness and capacity to pay was high on the island on which this facility is situated due to established commercial activities as well as remittances as a source of income for many households in the area. Prior to this mini-grid, most of the island relied on individual diesel generators with higher operating costs relative to the mini-grid. Most of these generators are retained by the owners as a backup. Factors that worked in favor of the mini-grid were a 50 percent capital cost grant from KfW, and exemption from tariff control (which applies to units below 1 MW capacity as per current regulations). If and when the grid is extended to the island, the mini-grid will no longer be commercially viable. In general, the viability of mini-grids in Bangladesh depends crucially on capital subsidy for entrepreneurs, and tariff subsidy for consumers where the capacity to pay is low. Also, mini-grid operators would require guaranteed off-take at remunerative prices in case the grid is extended to the area. Discussions with the concerned ministry officials

do not suggest any new policy initiatives in this respect.<sup>18</sup> The follow-up RERED II project includes a component for mini-grids. But in the absence of a clear policy in this matter, it is unlikely that there will be much traction in the market for mini-grids.

2.34 The issues raised by the mini-grid operator were corroborated by the mission's discussion with the task team. The team added that renewable energy mini-grids were implemented as a pilot for proof of concept under RERED, and the lessons learned from these pilots were incorporated in the design of RERED II, which includes a component for mini-grids. The implementation of such projects will be expanded under RERED II. The task team also stated that the Bank wanted both AC and DC technologies to be tested for mini-grids before committing a design. This process has taken some time and the tests of a DC pilot are awaited.

2.35 A 2004 ESMAP study "Integrating Gender in Energy Provision Case Study of Bangladesh" takes note of REB's requirement for all PBSs to employ only women in their billing departments. In the power industry, traditionally dominated by men, employing women exclusively in the PBS billing departments provides a unique employment opportunity for rural women. Women receive training and improve their skillset as PBS billing departments transitioned from manual to computerized records.

#### Technical assistance

2.36 Under the project, both REB and IDCOL received technical assistance to help build administrative and project implementation capacity. The project team informed the mission that REB has built information technology infrastructure in the PBSs and streamlined environment management practices and procedures. REB has also developed a monitoring and evaluation framework and a methodology for evaluating socio-economic and gender related impacts on electrification projects and used this to measure the impacts under the RERED project.

2.37 The project provided significant capacity building to IDCOL in financial management, planning, and technical issues, and the impact of this assistance was demonstrated by IDCOL's performance in successfully managing the growing renewable energy program. IDCOL management confirmed the added value from the Bank's support. Some technical assistance activities introduced during the additional financing in 2011 (establishment of SHS testing facility and commercial financing study) were delayed and are being implemented under RERED II.

2.38 There was no progress on a plan to establish a special unit in REB to provide continuous socioeconomic monitoring through surveys and measures of physical achievements and socioeconomic benefits. While it is noted that REB successfully commissioned impact evaluation studies in 2005 and 2010, the failure to mainstream socio-economic monitoring within the organization is a shortcoming that needs to be addressed.

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<sup>18</sup> In its memo dated June 19, 2014, the Task Team adds that "in the last couple of months, there has been progress in establishing a compensation mechanism where the mini-grid operator would be compensated if grid was extended to the mini-grid area within 5 years of establishment of the mini-grid."

## Outcomes

2.39 Two impact evaluations were carried out for the REB grid components, one in 2006<sup>19</sup> and the other in 2010<sup>20</sup>, and an impact evaluation was carried out for the IDCOL SHS component in 2012.<sup>21</sup> The REB study found positive impacts of grid electrification on household incomes, use of technology in the home, women's empowerment, and study time for boys and girls. The SHS impact evaluation found a positive and significant impact on study time and a correlation between those households with a television, and health outcomes and impact on women's mobility, among others, as discussed below.

2.40 As in all impact evaluations studies, there were some limitations faced in assessing the outcomes from project interventions. As noted in the 2010 impact study, the presence of electricity and a better quality of life does not automatically mean electricity as the cause and the quality of life as the outcome. To truly trace the effect of participation in a project on a participating individual or household one must compare the observed outcome with the outcome had the person/household not participated in the project or program. Much of the discussion contained in the impact evaluations is concerned with household level impact where grid and off-grid households are present in adequate numbers. For commercial and industrial households, and especially for the latter, the number of off grid units that could be used as control or comparison units was, unfortunately, few. Because electrified and non-electrified units are very different types of units, locating appropriate counterfactuals was inherently difficult. Another limitation arose from the difficulty in quantifying benefits in monetary terms. In most cases, such benefits had to be overlooked, resulting in an underestimation of the benefits. In other cases, benefits may have been exaggerated or dramatized by respondents and proponents, and therefore, overestimated.

### Social outcomes

2.41 *Study time* in the evening went up by 21 minutes per day for boys and 12 minutes per day for girls in the grid connected households (REB 2010 impact analysis) and by 10-12 minutes for boys and girls in SHS households on average (2012 SHS impact assessment); all compared to households without any electricity access. The SHS study also found that boys and girls in SHS households have completed more schooling than those without any electricity access. REB's impact analysis found that grid-connected households helped decrease illiteracy rates from 21 percent to 14 percent between 2005 and 2010, and the average number of years in school increased from 6.43 in 2005 to 6.86 in 2010.

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<sup>19</sup> Rural Electrification Board 2006. Midterm Report: Socio-Economic Monitoring & Impact Evaluation of Rural Electrification and Renewable Energy Program,

<sup>20</sup> Rural Electrification Board 2010. Final Report: Follow-Up (Panel) Survey of Socio-Economic Monitoring & Impact Evaluation of Rural Electrification and Renewable Energy Program, 2010.

<sup>21</sup> Bangladesh Institute of Development Studies. 2012. Research Team: An Evaluation of the Impacts of Solar Home Systems in Bangladesh.

2.42 An increase in *women's mobility* was reported and women reported feeling more secure when traveling to health complexes, clinics, schools, learning centers, NGOs and other places (REB 2010 impact analysis). The 2012 SHS impact analysis similarly found increased mobility and increased feelings of security among female respondents.

2.43 Households with a new grid connection under the project began using electric fans, television sets, , cassette players, irons and charging mobile phone batteries. (REB 2010 impact analysis). Half of the households with SHS were found to have a television (2012 SHS impact assessment).

2.44 The SHS impact study found that SHS homes had statistically better *empowerment outcomes*, specifically their mobility, general decision making and economic decision making, than those households without SHSs. The 2010 REB study showed that women were able to get more information about home and abroad through watching television, and subsequently were more aware of reproductive health, children's health, family planning and other social (early marriage, dowry) and environmental (forestry) issues.

2.45 Although there were no significant differences in *health outcomes* between the members of SHS households and that of non-SHS households, having a TV in the SHS households seems to make a significant difference in health outcomes for women. Among the SHS households with a television set, girls were about 4 percentage points less likely to suffer from respiratory and gastro-intestinal diseases than their counterparts from SHS households without a television set. The study also found that contraceptive prevalence was higher and recent fertility was lower among married women in households with SHS that own a black and white television. The 2010 REB study suggested that access to reliable mobile phone charging allowed women to communicate with doctors in the case of emergency.

2.46 The project was expected to help provide access to arsenic-free *clean water* through installing pumps from new electricity connections. Some pumps were installed, but their impact was overtaken by alternative measures taken by the Government for a nationwide arsenic testing program that helped distinguish safe wells from arsenic-contaminated wells using color-coded markings.

#### Economic Outcomes

2.47 *Increase in income of small commercial units.* There were a total of 742,194 units connected to the grid under the project by 2008. The commercial units among these connections were predominantly in the service sector (shops, salons, restaurants). The REB impact evaluation survey found that income increased by about BDT214.8 billion per annum for commercial enterprises in the project area that had benefited from grid electricity connections. For non-electrified commercial units, there was little change in income over time, while for grid-electrified units, gross incomes rose by over 2.8 times between 2005 and 2010. Overall, the impact survey suggests that electricity usage has resulted in a positive and significant impact on income and productivity.

2.48 *Increase in household incomes and decreased expenditures on fuel.* The REB survey also showed that electrified households save money by using two liters less kerosene per month compared to un-electrified households, translating to an average monthly savings of BDT 136 (US\$1.70). Users of SHS reported an average of 3.68 liters of lower kerosene consumption per month than households without SHS, saving an average of BDT 250 (US\$3.15). Both grid and SHS users are able to save money by charging mobile phones from SHS.

2.49 *Employment creation in rural communities.* IDCOL and each of its partnership organizations have created employment for rural communities through the establishment of the program. As of November 2012, IDCOL estimated that the SHS program had helped create about 30,000 direct jobs and 50,000 indirect jobs. As an example, one of the partnership organizations, Rural Services Foundation began in 2002 with one employee and a small office in Dhaka. In 2012 it had 75 offices across Bangladesh and employed over 300 people in rural areas while providing on-the-job training to households purchasing SHS. *Grameen Shakti*, the largest partnership organization, with a market share of more than 40%, is estimated to have created 10,000 jobs through their SHS program. These employees cover equipment sales, installation and service, and payment collection. A number of other partnership organizations including *Grameen Shakti* are providing training to village women on assembling some SHS components; some of these women are then becoming entrepreneurs, running their own units for assembling SHS and providing maintenance services. (SHS Impact Assessment 2012).

#### Gender-related outcomes

2.50 A 2011 ESMAP publication “Integrating Gender Considerations into Operations” recognized gender best-practice projects from around the world and highlighted RERED project’s gender-informed design, noting that it included analysis of the likely impact on women’s security, income generation opportunities and knowledge via access to radio and television. The report also highlights the project’s indicators for measuring outcomes for women and girls, such as the number of hours that girls study at night, access to news by women, improved reproductive health and increased HIV/AIDS information and awareness. This report is used to provide best practice in gender mainstreaming and gender informed design, and RERED is held as a model for other operations to follow

**Revised Objective 1a.** To increase access to electricity in rural areas of the Recipient’s territory. *Rated High*

2.51 This objective is for all practical purposes identical to the original objective, and a discussion on the revised objective cannot be easily separated from that of the original. This is especially because the vast majority of the project cost attributed to these objectives had already been disbursed by the formal restructuring which occurred on November 24, 2011, barely a year before project completion. Therefore, this objective is awarded the same rating as the original objective.

**Revised Objective 1b.** To help promote more efficient energy consumption. *Rated Substantial*

## Outcomes

2.52 At the beginning of the CFL program in 2009, there were only two CFL manufacturers in Bangladesh manufacturing about 9.6 million CFLs per year in the country. By 2012, there were 19 CFL manufacturers, producing over 30.64 million CFLs per year. While some of this production is meant for export, it is also seen to reflect increased customer demand within Bangladesh, in contrast to low awareness and demand among potential customers before the project. The increased demand can be partly attributed to the publicity surrounding the large-scale CFL demonstration deployment supported by the project. In May 2014, the Government has cancelled a WB project to replace incandescent bulbs by energy efficient compact fluorescent lamps. According to the World Bank statement, ‘The need for a demonstration effect for a free distribution of CFLs is no longer apparent. Considering this, the government has decided to drop the second phase of CFL program’. A Power department official was quoted as saying that ‘Now people are interested to invest over Tk 200 to replace an incandescent bulb by a CFL bulb and thus the purpose of the project was achieved’. The current project was being referred to by the official.<sup>22</sup>

## Outputs

2.53 Around 10.5 million CFLs were distributed across Bangladesh in a large-scale nationwide program. A one-day nationwide distribution and the awareness campaign associated with the program helped to increase public awareness about the energy saving benefits of CFLs. However, early lamp failure rates due to sub-standard products meant that the immediate expectation of reduction in peak demand through introduction of CFLs was not achieved. The task team informed the mission that a survey conducted by Infrastructure Development Company Limited revealed that about 34 percent of 10.5 million units were damaged.

2.54 **Global Environmental Objective.** To reduce atmospheric carbon emissions by overcoming market barriers for renewable energy development, including high implementation costs.

2.55 The GHG emissions reduction of the project until project completion (including IDCOL SHSs, system expansion and system loss reduction) was approximately 1.33 million tons, while the total GHG emissions reduction including the 15 year life of the IDCOL supported SHS is estimated to be more than 4.14 million tons by 2027. The original target of displacing 250,000 tons of carbon was greatly exceeded as the SHS program was ramped up through additional financing.

2.56 IDCOL has developed a competitive market for its 49 partnership organizations which are allowed to compete for customers without any geographic restrictions. It has been successful in developing supplies for SHS and batteries and related equipment. There are now 16 local battery manufacturers and 17 charge control suppliers in the country. IDCOL has managed to secure attractive warranties of 20 years duration for the SHS panels and 5 years for batteries, which are reported by the project team to be of

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<sup>22</sup> “Free CFL bulb distribution project cancelled” Article in New Age (Daily Newspaper) May 6, 2014.

longer duration than available in most other countries. Battery manufacturers have also made some inroads in some countries in Africa, indicating the acceptability of the products beyond Bangladesh. The outcomes related to overcoming market barriers are evident from the discussion on the outcomes from the IDCOL SHS program as discussed under Objective 1.

## **Efficiency**

2.57 *The efficiency of the original project objective is rated High.* Each of the major activities covered by the project is estimated to produce higher economic rates of return relative to expectations at appraisal.

2.58 *Grid Expansion & System Loss reduction.* The financial viability of grid expansion was calculated based on the average tariff. The tariff rate is administered and subsidized, and over the years the increase in the bulk supply tariff was not passed on to the consumers in time, leading to a low financial rate of return of 5.36 percent to the investment. Even at the appraisal stage, the estimated financial rate of return was low (5 percent). The main reasons for this were (i) administered tariffs that are not fully cost reflective (ii) the high capital cost of rural electrification; and (iii) the slow pick-up of loads in rural areas and the low intensity of electricity use.

2.59 For the economic analysis of grid expansion and system loss reduction, three revenue streams were considered *viz.*, revenue from sale of power, the incremental revenue from system loss reduction which is valued at the cost of alternative generation (diesel-based power plants, new private generation, and island generation for grid quality) and revenue from avoidance of GHG emissions from displaced kerosene. The economic rate of return of the investment with carbon benefit is 27 percent and without carbon benefits is 23.6 percent. In comparison, the economic rate of return of the grid expansion at the time of appraisal was 16 percent.

2.60 *SHS rollout.* The estimated overall financial internal rate of return was 26 percent, lower than estimate of 34 percent made at the additional financing in 2011. The main driver of the difference was the increase in costs due to an increase in duties and operations and maintenance costs. The overall economic rate of return for SHS deployment is estimated at 42 percent at project completion. The benefits that were considered were better lighting services from electricity and savings from reduced expenditures on kerosene and battery charging. A separate economic rate of return was not estimated at appraisal for SHS because of the low scale of SHS roll out planned at that time.

2.61 *The efficiency of the revised project objective is rated Modest.* The efficiency of the revised objective is related principally to the objective promoting more efficient energy consumption. The financial rate of return for the CFL component which pursued this objective was estimated at appraisal to be 44 percent and higher at 52 percent if CDM benefits were included. This analysis considered the lifetime savings of energy from using CFLs based on avoided generation costs as the only benefit. The cost comprised the procurement of the energy efficient and high-quality CFLs, the cost of CFL distribution, the cost of implementing consumer awareness programs, and the cost

of monitoring and evaluation plans. After factoring in the Clean Development Mechanism benefits, the economic rate of return was estimated to be 60 percent. Clean Development Mechanism benefits were quantified at a validated economic value of \$30/ton.

2.62 Taking into account the large percentage of CFLs damages and rendered unusable (34 percent of the 10.5 million units), efficiency of the restructured objective is rated *modest*.

## OUTCOME

2.63 *Outcome of the project prior to restructuring is rated Highly Satisfactory.* The relevance of the original projects objective is clearly *high* given the large unfulfilled need for electricity especially in the rural areas of the country and the potential development benefits from increased electricity access especially for women and children. The relevance of the initial project design was *high* with its appropriate and logical reliance on the country's existing strengths for rural grid expansion while making a start with off-grid household SHS. Efficacy for the original objective is rated *high* given the favorable social and economic outcomes that can be attributed to the outputs that exceeded original targets. Efficiency of the original objective is rated *high* from the favorable economic rates of return and cost-effective nature of operations. Overall Development Outcome for the project prior to restructuring is rated *highly satisfactory*.

2.64 *Outcome of the restructured project is rated Moderately Satisfactory.* The objective of improving energy efficiency – which was added at restructuring – was *highly* relevant to the country's priorities as well as the Bank's partnership strategy for Bangladesh. The project design following restructuring was appropriate for improving energy efficiency, but is rated *substantial* because the approach was narrow, and could have been better integrated with the original objective at appraisal. Efficacy is rated *substantial*, due to some shortcomings in meeting targets, and efficiency is rated *modest* due to the large share – approximately 34 percent – of unusable CFLs among the total number that were distributed.

2.65 *Overall outcome of the project is rated Highly Satisfactory.* The overall outcome is derived using the harmonized OPCS-IEG evaluation guidelines for restructured projects. On a scale of 1 to 6 (from Highly Unsatisfactory to Highly Satisfactory), the outcomes prior to and after restructuring scores 6 and 5 respectively. At restructuring, 80 percent of the final IDA contribution had been disbursed. Weighting the outcome scores by 80:20 gives a weighted average outcome score of 5.6, which when rounded yields a score of 6 or *Highly Satisfactory*.

## RISK TO DEVELOPMENT OUTCOME

2.66 *The risk that the achieved development outcomes will not be sustained is rated Moderate.* The risks facing the sustainability of installed SHS are low, though the large scale-up planned over the next few years may pose challenges in the future. REB and PBSs face significant capacity, financial, and governance constraints in sustaining the quality and pace of grid-based rural electrification. There is unlikely to be much progress



in installing mini-grids without significant and clear policy signals from the Government. The CFL effort has helped nudge a trend that is likely to continue on its own momentum.

### Solar Home Systems

2.67 IDCOL has created a sound system for financing, installing, and maintaining SHS with its access to and appropriate use of financial resources, fostering partnership organizations, and establishing effective frameworks for capacity-building, customer service, payment collection, monitoring, and quality assurance. IDCOL has expanded and upgraded its own capacity as it ramps up the SHS rollout.

2.68 A remarkable achievement of the project has been to demonstrate the willingness-to-pay of even relatively poor consumers for electricity infrastructure and maintenance. Unlike grid electricity service, which is heavily subsidized, SHS users paid nearly the full cost of the equipment, as well as the full cost of replacement and repairs. A small subsidy and microfinance made the SHS affordable to even low-income households in rural areas. During the project, 99 percent of households purchased SHS on credit, paying between BDT 12,489 for a 20-Wp (watts peak) panel to BDT 40,911 for an 85-Wp panel. The program was also able to decrease the subsidy from US\$90 on the selling price of the SHS in 2002 to US\$50 in 2009, US\$28 by 2011, and further to US\$25 by the end of the project.

2.69 However, as IDCOL expands the reach of its SHS program towards its ambitious goal of a total of 6 million households by 2016, it will progressively face poorer and more dispersed customers. IDCOL has also set itself an end-goal of fully commercial sales. To keep SHS affordable in pursuit of these goals, IDCOL will need to gear up in terms of institutional capacity, reducing installation and service costs, as well as broad-basing access to finance. Even as solar panel prices have decreased over the years, this has been more or less compensated by the rise in battery prices and the premium applied to them for the relatively longer warranty period of five years.

2.70 The mission was informed that IDCOL has established a separate renewable energy department and is in the process of hiring and training additional people to keep pace with the growing renewable energy program. The renewable energy department consists of divisions covering the following subject matter: household SHS, bio-gas; engineering; marketing and consumer awareness. RERED II is supporting a vocational training institute to help train trainers for imparting skills relating to renewable energy products. IDCOL's commitment to the training is seen from its commitment to provide 70 percent of the training costs. IDCOL is also exploring innovative means to control installation and service costs such as routing payments through mobile phones. World Bank support for the IDCOL SHS program will continue to be supplemented by other agencies including KfW, the Asian Development Bank, the United States Agency for International Development, and the German Development Agency (GIZ). However, donor funds for either grants or credit will be insufficient to meet the government goals for off-grid electrification. For instance, RERED II supports 550,000 out of the additional 4 million SHS that are planned till 2016. A study is therefore being carried out under the RERED II project to find ways to leverage additional financing from commercial sources.

## Grid-related components

2.71 *Reductions in transmission losses.* Physical targets under the grid component were largely achieved, but generation constraints continue to be a risk for optimum utilization of new/rehabilitated lines provided under the project. The Government has plans to address generation constraints, which includes awarding contracts for large scale Independent Power Producers (IPPs), and also adding short-term power plants (albeit at higher cost), but the time line for this additional generation coming on-line is not certain. The project achieved significant reductions in transmission losses which can be sustained if regular repairs and maintenance are carried out. This may not be possible if the tariff revisions do not keep pace with the cost of the supply of power.

2.72 *Financial sustainability and governance issues for REB/PBSs.* PBSs - which operate under REB oversight - have now reached about 8 million rural households. However, shortcomings in institutional capacity, financial performance and governance of REB/PBSs threaten the sustainability of the progress achieved in rural electrification. The financial performance of PBSs has deteriorated significantly over the past ten years as the rapid expansion in rural electrification expansion has outstripped REB's capacity to monitor their performance. There has also been a gradual decline in the quality of management and governance which is partly attributed to the relatively new practice of appointing generalist civil servants without the requisite background and skills to run a specialized agency like REB.

2.73 Aided by this project, a reform action plan was developed on three key broad areas: i) strengthening the REB Board with professionals; ii) establishing zonal offices of REB for managing the growing program; and iii) greater delegation of authority to the PBSs. The action plan is currently under review by the Ministry and significant action has yet to be taken.<sup>23</sup>

## Mini-grids

2.74 Mini-grids may be the only option for providing electricity for household and commercial needs in remote and inaccessible areas, and as an intermediate arrangement before the electricity grid reaches such areas. Under this project, the mini-grid experiment yielded less than expected results, with only one mini-grid in successful commercial operation out of the seven that were originally planned, and the three that were actually attempted. Capital and operating costs for mini-grids are typically far higher than for equivalent grid-based electricity. Further, mini-grid operations can be limited by the capacity and willingness to pay on the part of consumers. Prospective mini-grid operators also need reasonable certainty that in the event of the grid reaching the area in the near to medium term they would be compensated for any stranded assets. The Government needs to clarify its policies and plans on all these issues including demarcating areas for mini-grid development and possible subsidies to improve viability

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<sup>23</sup> In its memo dated June 19, the Task team notes that the REB board has been strengthened with professional members, zonal offices have been established and a revised organogram is currently under review at the Ministry of Public Administration for additional manpower for REB.

of mini-grid operations, if this segment is to show any significant results.<sup>24</sup> IDCOL staff informed the mission that they are coordinating with the Power Cell to clarify policy on buy-back provisions and other incentives through the Remote Area Power Scheme (RAPS).

## CFLs

2.75 Since CFLs have already gained popularity in the urban areas, under RERED II, a reduced number of CFLs will be distributed in rural areas only. RERED II is also opting for simple door-to-door distribution of CFLs free of cost to build consumer awareness. It is recognized that for long-term continued use of CFLs, products of good quality at affordable prices are made available. The project team informed us that following RERED, there are now about 30 firms manufacturing CFLs in Bangladesh, indicating a promising competitive market.

## BANK PERFORMANCE

*The quality at entry for the project is rated Satisfactory.* The project drew upon the Bank's past experience on rural electrification within and outside Bangladesh, assembled a diverse and experienced team, generally ensured institutional readiness for implementation, and identified major risks while mostly provided for their mitigation. An exception was the failure to foresee the lack of readiness and compatibility of REB to provide SHS on a fee-for-service basis.

2.76 In respect of the grid-related components, the project design incorporated lessons from the Bank's previous implementation experience with REB (Rural Electrification Projects I, II and III). For the off-grid SHS components – which were new for the Bank in the Bangladesh context – the project design drew upon the Bank's experience with SHS implementation in other Asian countries. Major risks across the project components were generally identified well and mitigating measures were provided for, though the CFL component that was added in 2009 gave rise to unforeseen challenges as explained below. The project team brought together professionals with a range of country and sector expertise in rural electrification and renewable energy projects in the Philippines, Zimbabwe, Vietnam, South Africa, Thailand, Laos, Cambodia, Indonesia, Pakistan, India and Sri Lanka.

2.77 Both REB, acting as a quasi-regulator and financial manager, and the PBSs acting as service operators, had good track records of operational and financial management for implementing the grid-related components. For these components, the timely transfer of BPDB lines and facilities to REB was recognized as a high risk. To ensure that this transfer was carried out smoothly a comprehensive program was agreed upon between the BPDB, REB and the Government ministry. This risk was further addressed by tying disbursements to actual progress in effecting the transfers. The financial sustainability of the PBSs was also identified as a risk, and efficiency improvements, line rationalization,

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<sup>24</sup> In its memo dated June 19, 2014, the Task Team adds that “in the last couple of months, there has been progress in establishing a compensation mechanism where the mini-grid operator would be compensated if grid was extended to the mini-grid area within 5 years of establishment of the mini-grid.”

and increased generation were suggested as the mitigation measures. In retrospect, the project design did not anticipate constraints in power supply that might reduce the benefits from grid extension and rehabilitation. The project team reasons that at appraisal the country had started generating power from large IPPs, and load-shedding was relatively low (less than 10 percent of peak demand was unmet in 2002, compared to over 30 percent in 2009) and the supply scenario had looked promising overall at that time.

2.78 For the IDCOL-managed SHS effort, the project design drew upon the Bank's experience with promoting SHS in other Asian countries including India (Renewable Resources Development Project), Indonesia (Solar Home Systems Project) and Poverty and Gender studies in Indonesia and Sri Lanka. The project applied lessons learned from Sri Lanka's Renewable Energy for Rural Economic Development project, which had employed easy-to-implement grant and delivery models; commercially managed credit lines and grant administration; and the promotion of industry associations and NGOs as agents of growth. The project design also drew upon the proven success factors of community-based stakeholders (NGOs and microfinance institutions) in Bangladesh.

2.79 The project team considered the potential pitfalls for REB – which specializes in grid management – in providing off-grid SHS on a fee-for-service basis. Though the project design provided flexibility for REB to adapt administratively and financially, the efficacy and cost-effectiveness of this effort proved to be low.

2.80 The CFL component that was introduced in 2009 was guided by the criteria used by the Government's Efficient Lighting Initiative of Bangladesh and lessons from similar projects in other countries. The component design recognized the risk associated with the quality of CFLs, and provided for pre-shipment inspection agents to check for quality during the production process, and testing for lamp lifetimes at the national testing lab of the Bangladesh Standards and Testing Institute. However, the Project National Steering Committee (NSC), which had oversight over the project's activities, lacked the mandate to oversee CFL quality, monitoring or record keeping, and these challenged the success of the program.

2.81 ***The Bank performance during project supervision is rated Satisfactory.*** The Bank conducted intensive supervision with over 235 staff weeks devoted for this purpose over the project period. The task team leaders and important core team members were based in Dhaka which enabled frequent and intensive interaction with Government and implementing agencies. Discussions with IDCOL and REB underline this. REB noted that the Bank's performance exceeded its expectations and made a significant contribution to the rationalization of distribution lines.

2.82 The project team played a catalytic role in assisting the Government to establish an appropriate policy framework to guide the rural electrification program. The Bank's involvement enabled the establishment of appropriate standards for the selection of grid and off-grid options and the transfer of lines in rural areas from BPDB to REB, thereby contributing to the sustainability of the rural electrification program. Importantly, the Bank and GEF transferred knowledge of global established international best practice in the field of renewable energy to Bangladesh. Respondents from IDCOL and the Government give high marks to the Bank for seizing the SHS scale-up opportunity using

the IDCOL ownership and micro-finance model. They told the mission that the Bank's contribution was crucial in terms of planning, training, and advising on financial and capacity development matters. The Government and IDCOL also credit the Bank with setting the stage for other donors to join in the efforts – Asian Development Bank, KfW, GIZ, JICA, and the Islamic Development Bank. IDCOL staff noted the active participation and contribution of WB staff in monthly operational meetings during the formative period of the SHS program.

2.83 The Bank demonstrated flexibility in responding to issues that negatively affected project implementation, including those arising from handover of lines and deployment of CFLs. More importantly, as the IDCOL model of SHS deployment was found to be more effective (compared to the REB fee-for-service model) the team encouraged IDCOL to scale up its efforts through re-allocating funds from the underperforming component, providing two rounds of additional financing, and project restructuring. During supervision, the Bank team supported the borrower in overcoming difficulties, such as the delay in handing over lines from BPDB, and addressing concerns of partnership organizations based on their experience in the field.

2.84 The focus of the Bank's team on quality assurance was demonstrated by the monitoring and quality assurance framework agreed with IDCOL and the timely technical advice and support extended to REB in the wake of quality issues under the CFL component. The lessons from the first phase of the CFL distribution were captured and incorporated in the planning of the CFL deployment component under RERED II.

2.85 The project team agrees that the project could have been restructured following the additional financing in 2009 (rather than 2011), when it became evident that there would be no new activities under the grid component and the focus of the project had settled on the off-grid component and efficiency improvements. Likewise the cancellation of unused funds for SHS and CFL could have been carried out earlier, but the rapidly increasing installation rate of the SHSs made it difficult to accurately establish the cancellation amount before late 2012, and the team saw it as more convenient to process both the SHS and CFL cancellations together in one restructuring paper.

2.86 Overall Bank Performance is rated *Satisfactory*.

#### **BORROWER PERFORMANCE**

2.87 *The government's performance is rated Highly Satisfactory.* The Government's strong commitment to the project was demonstrated by several actions that it took to solve problems that arose during implementation in cooperation with the Bank's team and implementing agencies. The Government also importantly provided the requisite autonomy to IDCOL to achieve its potential in implementing the SHS component. The IDCOL Board has been constituted in a balanced manner with four government and private sector representatives each, and headed and staffed by qualified professionals.

2.88 When the project was initially delayed due to one of the conditions for effectiveness (handing over of lines between BPDB and REB) was not met, the Government worked to overcome the opposition of the vested interest groups until the

issue was resolved. For IDCOL's SHS program, the Government allowed a large portion of IDA resources to be channeled through the non-government channel, indicating a strong commitment to increasing access and improving services throughout the country. IDCOL's strong financing model and good relationships with its partner organizations ultimately translated to the large-scale distribution of SHS and the creation of a vibrant SHS and ancillary industry in Bangladesh.

2.89 The Government has yet to seriously address the financial, institutional and governance issues facing REB and PBSs. In respect of mini-grids, the Government needs to get a better handle on the need and demand for such facilities and clarify policy issues that are holding back their development.

2.90 ***Implementing agency performance during the project is rated Highly Satisfactory.*** IDCOL has played a pivotal role in the success of the SHS program, and its performance is considered exemplary by this assessment. The program has now reached a pace of about 60,000 SHS installations per month and IDCOL has set itself the impressive goal of financing a cumulative 6 million SHS by 2016. Up to November 2013, a total of about 2.7 million SHSs have already been installed by IDCOL.

2.91 IDCOL demonstrated full ownership of the project and proactively developed solutions to problems that were encountered when initiating and ramping up the pace of SHS installations. The relative autonomy accorded by the Government gave IDCOL the institutional flexibility to adapt to changes, including increasing its staff strength to meet the growing demand of SHS, and to incentivize staff performance and reduce turnover through market-based salary structures.

2.92 IDCOL successfully evolved a structure that involved multiple partnership organizations (NGOs and micro-credit finance institutions) to carry out marketing, sales, installation, system maintenance and payment collection. In doing so, IDCOL leveraged the geographical reach of the partnership organizations and their social acceptability at the community level, and the existence of a micro-credit culture in rural Bangladesh resulting in customer readiness to try SHS. IDCOL works with partnership organizations to train consumers to carry out regular, simple maintenance work by themselves. IDCOL ensures quality assurance by setting technical standards and enforcing the standards through strong supervision and monitoring. By using the ownership model and working through its partner organizations IDCOL has been able to create a sense of ownership on the part of consumers resulting in proper system care.

2.93 IDCOL succeeded in developing a successful model for SHS involving financial risk sharing with partnership organizations together with proper customer selection and attention to collection efficiencies. Partnership organizations have achieved an average collection efficiency of 94 percent and are servicing their debts owed to IDCOL on a timely basis. IDCOL has succeeded in blending access to financing and availability of grant assistance to increase affordability and to ensure that partnership organizations have adequate capital for investing in and operating the service infrastructure.

2.94 IDCOL's experiment has proved that multilateral financial institutions in Bangladesh could successfully diversify their services to include access to infrastructure

services by coupling micro-lending with leveraged donor resources. This has served to demonstrate to other low-income countries that the users' willingness-to-pay for energy services can be tapped - with an affordable payment plan and assurance of good service - to leverage assistance from multilateral and bilateral financing agencies and donors.

2.95 REB displayed commitment to reducing technical losses and connecting additional households and was largely successful in carrying out these tasks. In respect of providing SHS on a fee-for-service basis, REB's performance was less than satisfactory. Since this was not the core business of REB, it found itself institutionally challenged to meet the installation targets and conduct installation and bill collection in a cost-effective manner. However, the institutional capacity and performance of REB has deteriorated over time as discussed in some detail under the sections on 'achievement of objectives' and 'risk to development outcome'. This was partly evident from the number of audit observations by the Government auditor on REB project accounts and delays faced in the procurement in the activities implemented by REB.

2.96 Overall Borrower Performance is rated *Highly Satisfactory*.

## MONITORING AND EVALUATION

### Monitoring & Evaluation

2.97 **M&E Design.** Outcome indicators for the project's first objective - social development and economic growth resulting from increased electricity access - appropriately included i) impact on incomes and reduction in poverty; ii) enhanced rural productivity and other development opportunities; iii) increased empowerment of women; iv) enhanced children's study time through improved lighting; v) improved provision of safe drinking water; and vi) improved quality of life as measured by selected factors.

2.98 Output indicators for the first objective included i) number of rural households provided access from grid; ii) number of rural households serviced from renewable energy sources; iii) the number of SHS; and iv) the number of renewable energy mini-grids supported. The number of kilometers of distribution lines renovated by REB and the resultant reduction of system losses was to be tracked.

2.99 The output indicator for the second objective of improving electricity consumption efficiency was simply the number of CFLs that replaced incandescent bulbs. The key global environment objective was to be measured through the reduction of atmospheric carbon emissions/ greenhouse gas (GHG) emissions.

2.100 **M&E Implementation.** The socioeconomic outcomes from increased electricity access were measured through two impact assessments of grid electrification carried out in 2005 and 2010 by REB, and an SHS impact evaluation in 2012 for the IDCOL program.

2.101 The number of households and enterprises connected to the grid by the project was obtained from REB/PBS monthly reports on new connections. The indicators for

length of lines renovated and total system loss reduction were tracked by the internal reporting system of REB/PBSs and reported regularly to the project.

2.102 IDCOL established an ongoing monitoring system for the SHS program. An Operations Committee comprising IDCOL management and partnership organizations' representatives conduct monthly meetings on the SHS program results and issues. The data on the number of rural households serviced by SHS is collected through progress reports of IDCOL/partnership organizations. SHS installations are randomly selected for inspections and verifications by IDCOL field inspectors. In parallel, independent technical audits are undertaken on a regular basis. IDCOL regularly submitted reports to the Bank's project staff on the progress in installation of SHS, minutes of the Operation Committee meetings, and financial statements.

2.103 **M&E Utilization.** The data collected through project M&E had a strong impact on improving project implementation. In particular, in the case of the SHS, feedback from the field helped the project team and IDCOL incorporate new technical specifications and technologies, such as LED lights, to better serve lower-income households. Feedback from the project teams also proved crucial for the establishment of improved SHS testing facilities and improved service provision for partnership organizations. In the case of the CFLs, though there were some deficiencies in record-keeping and updating the computer database to meet the stringent CDM requirements, post-installation surveys helped to detect early lamp failure rates and prompted REB to take remedial measures, including withholding final payments to the supplier and claim replacement of CFLs.

2.104 Overall, M&E is rated *High*.

## 3. Power Sector Development Technical Assistance Project

### Objectives, Design, and their Relevance

#### OBJECTIVES

3.1 According to the Development Finance Agreement dated August 2, 2004, the project development objectives were to:

- i. create effective capacity within the Government (Ministry of Power, Energy and Mineral Resources) to put in place power sector policies, industry structures, and a gas supply strategy needed for a balanced development of Bangladesh's power sector;
- ii. create capacity within the Bangladesh Energy Regulatory Commission (BERC) to regulate the sector effectively; and
- iii. prepare and secure financing for at least two well-structured power sector investment projects that are then efficiently implemented.



## RELEVANCE OF OBJECTIVES

3.2 **Relevance of the project development objectives is rated High.** At the time of project appraisal in 2004, low electricity coverage (only 35 percent of households) and erratic electricity supply were seen as significant obstacles to economic growth and poverty alleviation in Bangladesh. The energy sector's weak institutional framework and weak financial situation were constraints to scaling up investment and improving performance in the sector. A lack of adequate and reliable electricity continues to be seen as a major constraint by businesses according the Bank's "Doing Business Reports."<sup>25</sup>

3.3 The shortcomings in the sector were recognized in the Government's "Three-Year Road Map for Power Sector Reform (2009-2012)", which placed emphasis on improving policy and regulatory frameworks, developing capacity in the power sector, preparing energy sector projects, and making progress on the Government's corporatization agenda.

3.4 The project's objectives were also consistent with the Bank's Country Assistance Strategy (2001-2003) with its focus on better governance and private sector-led growth, and the Bank's current Country Partnership Strategy (2011-2014) which aims to "accelerate growth: increase transformative investment and enhance the business environment."

3.5 On the above basis, the relevance of the project's objectives is rated high for having recognized the weaknesses in the power sector that span policy, capacity and investment-related issues, and proposing a balanced development path for the sector.

## DESIGN

3.6 The project comprised the following five components:

A. **Technical Assistance** (US\$5.5 million; at completion: US\$8.23 million)

A.1 **Power Sector - Policy Making and Enterprise Restructuring** (at appraisal: US\$3.5 million; at completion: US\$5.70 million) to provide the government (Power Division/Power Cell) with the consulting support to scale up sector reforms by preparing a detailed restructuring plan, using this plan to shape government policies and the regulatory arrangements, and creating corporate structures for at least two urban electricity distribution entities.

A.2 **Energy Sector Regulatory Framework** (at appraisal: US\$0.5 million; at completion: US\$0.41 million) to be defined after the BERC is staffed, and to complement activities being funded from other sources.

A.3 **Gas Sector Support** (US\$1.5 million; at completion: US\$2.12 million) to assist the Energy and Mineral Resources Division of the MPEMR to strengthen planning and management capacity; prepare and update the Gas Sector Master Plan and Strategy (GSMPS); and for PetroBangla to prepare implementation and

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<sup>25</sup> World Bank 2013. Doing Business: Smarter Regulations for Small and Medium-Size Enterprises; World Bank 2014. Doing Business: Understanding Regulations for Small and Medium-Size Enterprises

financing plans, which will ensure reliable and adequate gas supply to power, industry, and other sectors.

**B. Power Companies Management Strengthening** (at appraisal US\$4.0 million; at completion: US\$0.0 million) to introduce modern operating and management practices into electricity distribution in non-rural areas and into a few power plants.

**C. Training and Other Capacity Building Measures** (at appraisal US\$1.25 million; at completion: US\$1.33 million) to be designed under component A, based on feedback from beneficiary entities, and taking into account other ongoing training programs.

**D. Goods and Equipment** (at appraisal US\$4.25 million; at completion: US\$4.59 million) to facilitate project management and install interface and system metering to support the unbundling of power sector enterprises.

**E. Support for Project Implementation Operating Costs** (at appraisal US\$0.5 million; at completion: US\$0.40 million) to ensure the smooth operations of the Power Cell and BERC.

3.7 **Implementation Arrangements.** The Ministry of Power, Energy and Mineral Resources (MPEMR) supervised the project. MPEMR was the also the main implementing agency for the components relating to reforms and training and capacity building activities, along with the procurement of goods and equipment. The Bangladesh Energy Regulatory Commission (BERC), created under the Energy Regulatory Commission Act (March 2003); and the Energy and Mineral Resources Division of Petrobangla were the implementing agencies for components A.2 and A.3 respectively.

#### **RELEVANCE OF DESIGN**

3.8 **Relevance of project design is rated High.** The project inputs were geared to produce the outcomes that were sought by the Government within the scope of its medium-term energy sector reform. Thus, enterprise restructuring was expected to result in an effective separation of policy making, regulation, and service providers and therefore yield improved sector performance. Changes to the energy sector regulatory framework were to result in an independent and effective regulator that would balance financial sustainability with consumer interests. Training and capacity building were geared to increase utilization of existing assets and manpower through a mix of better corporate governance, regulation, and investment in infrastructure. Technical assistance for preparing investment projects was intended to mobilize investment financing for the sector.

#### **PLANNED VS. ACTUAL COSTS; DATES**

3.9 The planned IDA contribution was US\$15.5 million consisting of a US\$7.1 million credit and a grant of US\$8.4 million. At project closing, US\$6 million of the credit (84 percent of the planned amount) and US\$8.59 million of the grant (approximately same as the planned amount) was used. In October 2012 there was a

partial reallocation of credit funds to categories originally identified to be financed only through the grant fund, to cover shortfall for committed contracts. At project completion, an estimated amount of SDR 0.51 million that remained undisbursed was canceled.

3.10 In November 2008, the project closing date was extended by 30 months to June 30, 2011 due to slow project implementation. The reasons for the delay are discussed in the next section on ‘implementation experience’. A second extension of 18 months was made to December 31, 2012 to complete the then-ongoing project activities and to support the preparation of two major investment projects (feasibility studies for “National Grid 3 & 4” and “Repowering of Existing Power Plants to Improve Efficiency”) and development of an LNG (Liquefied Natural Gas) terminal.

### **IMPLEMENTATION EXPERIENCE**

3.11 The project experienced delays in the beginning due to complications in implementation arrangements and frequent turnover of key management and staff of the implementing agency. While the Power Cell was meant to be the implementing agency for the entire Power Sector Component, in practice, the beneficiary power utilities preferred to bypass the Power Cell and implement their activities directly. Another complication arose from project funds being routed through two different divisions of the MPEMR, requiring frequent meetings to review project processing and implementation. Finally, the Energy Regulatory Commission took nearly four years to access project assistance due to the delays in the administrative apparatus in the Government. There were frequent transfers of the Power Division Secretary, and periodic transfer/removal of key Power Cell and Planning Board Staff, and occasional understaffing in the Power Cell and the Energy Regulatory Commission.

3.12 Following the mid-term review in 2007, the Bank agreed to a 30-month extension after the government completed the following actions within a stipulated six-month period: (a) increasing the capacity of Power Cell by hiring at least three experts in the fields of finance, information technology, and engineering; (b) awarding the contract for the Owner’s Engineer to the Siddhirganj Peaking Power Project; and (c) preparing the bid evaluation report for the power system interface metering contract. Thereafter, the pace of project implementation improved. The Power Secretaries generally showed high commitment to resolve the implementation bottlenecks. From 2008 onwards the new Chairman of BEREC was pro-active in moving the Energy Sector Regulatory Framework agenda forward.

3.13 Other interventions by the Bank and multilateral partners complemented the development objectives of this project. The Bank’s four multi-sectoral development policy loans (Development Support Credits I to IV) and one Power DPL (totaling US\$720 million in budget support: see Annex B) had several energy sector triggers for improving utility finances and creating an enabling environment through i) reducing account receivables, ii) reducing system losses, iii) preparing and implementing a financial recovery plan, iv) establishing the Energy Regulatory Commission, v) upgrading energy prices and specially index petroleum prices to international fuel oil price, and vi) reducing Bangladesh Petroleum Corporation’s debt, among others. The Asian Development Bank (ADB) and other donors also provided additional technical

assistance in parallel and supported the preparation of the 2006 Power System Master Plan, corporatization of BPDB, and the preparation of investment projects in power generation and transmission. USAID supported capacity building of BERC and helped it draft and finalize several regulations. AusAid trust funds executed by the World Bank helped six energy sector companies with designing Key Performance Indicators (KPIs) to strengthen corporate governance and accountability.

3.14 Towards the end of the project period, concerns arose about the quality of governance of procurement arrangements across sectors.<sup>26</sup> Following this, the Bank and some other financiers withdrew much of their support for the project. This led to significant delays in the financial closure of some of the expected IPPs, as some of these had planned to approach the World Bank for financial guarantees. The mission found that there has not been any significant progress in this regard. The task team informed the mission that attempts are being made to secure finance from IFC and other sources, but the IPPs have not yet made any significant progress towards financial closure.

3.15 **Safeguards.** The project was placed in Category C under the Bank's environmental and social safeguard policies, and no safeguards policies were triggered.

3.16 **Financial Management.** The procurement process was reported to be time consuming and burdensome. The implementing agencies from time to time asked for simplification of the process including some delegation of authority but no specific actions appear to have been taken in this regard. The Government and the implementing agencies preferred to employ full-time consultants to supervise firm-level contracts rather than committing their own time to these tasks, and this may have slowed the pace of procurement to some extent.

3.17 In the earlier stages of the project, PetroBangla failed to report project activities in entity audit reports, but the Bank followed up to ensure that this reporting was done for the remainder of the project duration. The Power Cell settled all outstanding audit observations by the project completion date. The task of computerizing BERC's financial management and preparing its audit report for FY2012 were not completed by the project completion, but have since been completed and reviewed by the Bank.

## Achievement of the Objectives

**Objective 1.** *To create effective capacity within the Government (Ministry of Power, Energy and Mineral Resources or MPEMR) to put in place power sector policies, industry structures, and a gas supply strategy needed for a balanced development of Bangladesh's power sector. **Rated Substantial***

### Outputs

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<sup>26</sup> This arose from the WB Bangladesh Padma Multipurpose Bridge Project when the World Bank stated that it "will proceed with support for the Padma Bridge only if the Anti-corruption Commission (ACC) launches a full and fair investigation based on evidence of corruption under the project." WB Press Statement on Padma Bridge: December 8, 2012

3.18 The project produced the following outputs that were expected to build capacity within MPEMR and energy sector enterprises and contribute to a balanced development of the Bangladesh's Power Sector.

**Training.** About 56 training events, conferences, meetings, and study tours were conducted for staff at different levels of the government and energy sector enterprises. The events addressed capacity building in the electricity and gas sectors for planning, technical matters, financial systems, and promoting private participation.

**Power Sector studies.** For the power sector, fifteen documents were prepared, ranging from plans and strategies to technical studies and training material. The plans included the Power System Master Plan, the Financial Restructuring and Recovery Plan, and a Roadmap for energy efficiency improvement and demand side management. Strategies and technical assessments covered the corporatization of the Electric Generation Company of Bangladesh (EGCB) and the South Zone Power Distribution Company; REB effectiveness; assessment of power system interface meters; a generation support framework; and an assessment of energy demand. Technical support was provided for transactions for rental power, environmental impact assessments, construction of transmission related facilities, and repowering existing power plants of BPDB.

**Gas Sector studies.** For the gas sector, PetroBangla prepared the Gas Sector Master Plan and Strategy (GSMPS) and other important documents related to a communications strategy for gas and energy reforms, and a natural gas pricing framework.

**Power Sector Policies.** The Power Cell prepared several policy documents. These included the National Power Policy update (2012), the Renewable Energy Policy (2008), the Private Sector Power Generation policy and the Emergency Energy & Power Supply Special Act. Also, policy guidelines were developed for purchasing power from captive power plants and for supporting Remote Area Power Supply Systems (RAPSS).

**Project formulation.** Project preparation activities completed include: the Siddhirganj Peaking Power project, the Ghorashal Repowering project, the Remote metering project and the National Grid 3 and 4 power transmission lines. Contract documents were prepared for four combined cycle power plants: Bibiyana 1 and 2 (341 MW each), Meghnaghat (335 MW) and Serajganj (300-450 MW).

**Installation of metering system.** A Power interface metering system with 415 meters was installed in 2011 based on an in-house assessment by the Power Cell.

**Utility balance sheets 'cleaning'.** Utility balance sheet cleaning for the country's power sector was continued, including making within- and inter-utility adjustments and making provisions for long-term debts.

## Outcomes

3.19 The outcome as expressed in this objective was ‘balanced development’ of the energy sector, but this is not defined in the project appraisal document. Therefore, the extent of balanced development of the sector is inferred from the results discussed below in respect of sector capacity, sector structure reform, private participation, energy output parameters; and sector financial management and performance. However, the extent of attribution of these results to the project intervention remains unclear.

### *Power Sector*

3.20 For the power sector, the training provided under the project has contributed to the Power Cell expanding its role as a “think tank” for sector planning, analytical work, and providing solutions to technical problems. This is evidenced by the advisory role played by the Power Cell on inter-utility and gas-to-power issues and on long-term power sector planning. The Power Cell participates in all IPP procurement and EPC (engineering procurement and construction) for the Government and BPDB. Feedback to the mission from MPEMR officials suggests that the Bank’s technical assistance has played a pivotal role in improving the capacity of the Power Cell.

3.21 Electricity access increased from 35 percent in 2004 to about 62 percent in 2013. Installed electricity generation capacity has increased from 3,622 MW in 2004 to 5,201 MW in 2008 and 9,500 MW in 2013 compared to the project target of 7,158 MW target by 2012. Of the capacity added since 2004, 3,922 MW came from private IPPs, with 3,207 MW more under construction, and 3,635 MW under process. However generation capacity remains well below demand, while the addition of rental power to the generation mix raises the average cost of generation significantly.

3.22 System losses have reduced significantly between 2004 (20.04 percent) and 2013 (12.26 percent). Though no target was set for this parameter, the system losses are the least in the South Asia region.

3.23 A very significant reduction in accounts receivable from 6.45 months in 2004 to 2.21 months in 2012 is seen in the distribution segment. The same indicator for BPDB shows a favorable trend (from 11.4 months in 2007-8 to 6.5 months in 2012-13) but still remains high. It is also unclear to what extent this performance is linked to the balance sheet cleaning exercise that was undertaken in parallel in the sector.

3.24 The task team reported that as a result of installing interface metering systems, inter-utility disputes on energy flow have been reduced, and invoices are being published based on accurate readings of the system meters.

### *Gas Sector*

3.25 The Gas Sector Master Plan and Strategy (GSMPS) has been guiding the investment and development programs in the gas sector. The GSMPS established that the country’s domestic gas supply capacity would diminish after 2020 as reserves dry up. As a result, the government has decided to gradually shift electricity generation to combined cycle and coal-based thermal power plants to reduce gas consumption and to start

importing Liquefied Natural Gas (LNG) to supplement domestic gas supply. The project activities were therefore modified to fund preparation for construction of an LNG import terminal.

**Objective 2.** *Create capacity within BERC to regulate the sector effectively.* **Rated Modest**

#### Outputs

3.26 BERC became operational as the energy sector regulator and is carrying out its role of issuing service providers' licenses, and power tariff orders. BERC staff received training related to preparation of technical standards and codes, reviewing and processing license applications, and preparation and enforcement of tariff regulations.

3.27 Six regulations on licensing and energy tariffs (excluding for petroleum products) were prepared, and four of them have become effective. In total, four technical and financial codes and standards were prepared to realize least-cost investments. The Power Factor Improvement Plan was developed and implemented. Based on regulations in place, 1,460 licenses (1,250 for electricity sector and 210 for gas sector) and 43 tariff orders (excluding for petroleum products) and directives were issued between 2008 and 2012.

3.28 Public perception of the power sector's performance and customer satisfaction were monitored through a public hearing held during 'electricity week' every year. Public hearings, procurement notices, and open meeting notices, through BERC and respective utility websites have made data available on the electricity sector in general as well as utility operational and commercial performance. BERC has been carrying out utility tariff reviews in connection with tariff application and seeking public opinion in this regard through websites and media advertisements. In addition, with BERC's support, the Energy and Mineral Resources Division of the PetroBangla and operating companies prepared and disseminated a report on "Communication Strategy and Campaign for Natural Gas and Energy Reforms" to help create awareness for gas sector reforms and pricing within stakeholders and consumers.

3.29 However, no quantitative information was gathered on customer satisfaction and public perception on sector performance. The project developed a mechanism to provide information on better sector performance and services to customers. For example, online application for new connections was established, electricity bill-pay facilities were improved to allow payments via automated teller machine (ATM), mobile phone, and online.

#### Outcomes

3.30 As a result of tariff and other regulations, between 2008 and 2012 wholesale and retail electricity tariffs were increased by 118 percent (from USC 3.09/kWh to USC 6.71/kWh) and 62 percent (from USC 5.09/kWh to USC 8.21/kWh), respectively. Different categories of gas tariffs were also increased by between 8 percent and 79 percent after 2008. However, this translated to only a 13 percent reduction in fiscal

burden compared to the no adjustment scenario, due to the increase in costs of electricity supply.

3.31 Feedback from government officials suggests that members of the public have access to information on electricity sector legislations, regulations, codes, tariff orders, energy sector data and operations, including utility operational and commercial performance. This information is available in both English and Bengali. This is broadly confirmed by a representative of an independent consumer affairs organization that met with this mission. However, the representative also conveyed the perception that public hearings seem to be carried out after tariff decisions have already been made internally. There does not appear to be a dependable provision for receiving consumer complaints and resolving them. It was also reported that there is yet to be any significant feeling of the electricity service consumer being ‘empowered.’

3.32 The presence of tariff regulations and benchmarks for tariff increases may have made a positive impact on private sector interest in electricity generation. Since BERC was established, four IPPs have expressed interest, and three among them have developed power plants to sell electricity to the grid.

**Objective 3.** *Prepare, and secure financing for, at least two well-structured power sector investment projects that are then efficiently implemented. **Rated Modest***

#### Outputs

3.33 Six investment projects were prepared in power generation, transmission, distribution; energy efficiency; and gas transmission and distribution. Two power sector investment projects (Siddhirganj Peaking Power or SPPP and the South Zone Power Distribution Company or SZPDC) were fully prepared,

3.34 Four other investment projects (apart from SPPP and SZPDC) - (a) Gas debottlenecking and energy efficiency project, (b) Ghorasal Repowering Project for increasing power generation efficiency, (c) NG-3 and NG-4 400 kV Transmission Project, and (d) the Remote Metering Project - were prepared with the intention of obtaining Bank financing. However, the Bank was not able to proceed with the appraisal of these projects for financing due to the Bank’s suspension of financing large infrastructure projects.

#### Outcomes

3.35 Financing was secured only for the Siddhirganj Peaking Power Plant. Although the SZPDC was also considered for Bank financing, this was held back because of backtracking of corporatization in the power sector and the Government’s inability to move ahead with the SZPDC corporatization. The Bank was not able to proceed with the appraisal of these projects for financing due to the Bank’s suspension of financing large infrastructure projects: (a) Siddhirganj Peaking Power Project – additional financing; (b) Ghorasal Repowering Project for increasing power generation efficiency, (c) NG-3 and NG-4 400 kV Transmission Project; and (d) the Remote Metering Project.



## Efficiency

3.36 ***Efficiency is rated Modest.*** The project period was extended by a total of 48 months through two restructurings, effectively doubling the originally planned implementation period. The total outlay for the project remained unchanged. In retrospect, the project design may have been ambitious given the institutional risks and the political economy relating to the electricity sectors, which were identified at project appraisal. As discussed in the sections on ‘implementation experience’, and ‘Bank and Borrower performance’, the reasons for the time overrun included administrative delays, resistance to institutional change from vested interests, and the political economy. Several if not all of these matters were within the control of the Government and various electricity sector institutions. Overall, the efficiency with which project outcomes were achieved is rated modest.

## OUTCOME

3.37 The project objectives were ***highly*** relevant to the issues facing Bangladesh’s electricity sector, and well aligned with the Government’s priorities as well as the Bank’s country partnership strategies. The relevance of design is also rated ***high*** with planned inputs being logically linked to the expected outcomes. Efficacy is rated ***modest*** overall with the goal of balanced development of the sector being undercut by the poor prospects for financial sustainability; the sector regulator BERC yet to display the independence and competence to gain credibility with all relevant stakeholders; and lack of sufficient progress in respect of implementing two planned power sector investment projects. Efficiency is rated ***modest*** mainly due to the project implementation period being nearly twice the original plan, despite several complementary project activities by the Bank as well as other active multilaterals and bi-laterals covering several common sector issues. Overall project development outcome is rated ***Moderately Unsatisfactory***.

## RISK TO DEVELOPMENT OUTCOME

3.38 ***The risk that the achieved development outcomes will not be sustained is rated Substantial.*** The sector policies and regulations and institutional aspects that have been supported by the project are largely accepted and mainstreamed, and there was significant capacity improvement in MPEMR and BERC as demonstrated by some positive outputs and outcomes in respect of policy formulation and sector regulation. Through successive tariff increases the Government has also demonstrated its intention and ability to move the sector towards sector financial sustainability and improvements in service.

3.39 ***Retaining sector capacity.*** The rate and nature of staff turnover is a matter of concern for retaining staff with the right training, capacity and experience. At project completion, only eight of the 16 Power Cell officers who worked on the project remained in their positions, and only eight of the 15 officers who took at least one of the training programs under the project remained at BERC. However, at a working level, frequent turnover or transfer was not observed in PetroBangla, and the last Project Director has been retained for more than five years at project completion. Feedback from the project team suggests that the capacity of the Power Cell and BERC has been affected negatively by staff turnover. Maintaining the capacity developed through the project in the Power

Cell and BERC remains a challenge. On the positive side, most of the senior staff that retired from the Power Cell and other power utilities during the project has remained active in the energy sector in various capacities; therefore, some skills earned through the project remain available to the sector at large.

## **BANK PERFORMANCE**

3.40 *The quality at entry for the project is rated Moderately Satisfactory.* The project design built on past experience with technical assistance projects in the sector in Bangladesh and other countries. The design addressed the identified institutional shortcomings in the sector through capacity development to generate sector reform, and provided for a competent and empowered reform team within the Government to implement the process. Thus, the project provided the reform implementation tools to the Government, which could then leverage lending and support sound investments. A detailed analysis was carried out at appraisal on utility commercial and financial performance, power sector issues, and the challenges of scaling up development of the power sector.

3.41 The appraisal document appropriately noted the prevailing weaknesses in institutional capacity and highlighted the risks in strengthening the Power Cell and operationalizing BERC, and empowering them to shape sector policies, regulations, and reforms. Risk mitigation measures were incorporated through strengthening staffing of Power Cell, and agreeing on predictable tenures for the heads and staff of the Power Cell and BERC. The institutional risk for the project was also expected to be mitigated by other policy reform and investment projects that provided additional policy leverage and financial support in support of the overall development objectives.

3.42 In retrospect, the project design may have been too ambitious in its estimation of the implementation period of the project given the Government's limited institutional capacity and the large number of implementing and beneficiary agencies.

3.43 *The Bank's quality of supervision during the project is rated Satisfactory.* The project was implemented under extremely difficult conditions, including political turmoil, high officer turnover rate, slow procurement, obstruction by vested interests, and more recently, the Bank's decision to suspend large infrastructure financing. In the face of these challenges, the Bank showed flexibility and coordinated with the Government, implementing agencies and other donors to maintain the pace of project implementation.

3.44 The project implementation was kept relevant by adjusting project activities in response to unforeseen issues and in general the changing political and economic environment in the country. For example, activities were added, dropped, and adjusted from the project plan based on discussion and agreement between the Bank, the Government, the implementing agencies, and other donors, such as the ADB and the JICA. Some dropped activities were completed in-house by the Power Cell or executed by other donors. New activities were added based on emerging demands, such as for partial support to prepare new investment projects. Ultimately, an extension of the project period from the planned four and a half to eight and a half years was necessary for the project to make greater progress towards its objectives. This reflected an overly

ambitious timeline given the initial institutional endowment and the overall challenging context in which the project was implemented.

3.45 Overall Bank Performance is rated *Moderately Satisfactory*.

#### **BORROWER PERFORMANCE**

3.46 *The government's performance is rated Moderately Unsatisfactory.* On the positive side, there was consistent commitment displayed to the project objectives and the broader sector agenda. This was reiterated in various public forums and formal documents, including the annual review of the Three-Year Power Reform Road Map. The Government assigned high-level officials to guide and review the project, and constituting a high-level Project Steering Committee, headed by the Principal Secretary in the Prime Minister's Office to review policy recommendations arising from the project activities. A Task Force headed by the Secretary, Power Division, was established to provide more frequent operational guidance and coordination for the project. The Government also undertook to establish and functionalize BERC as one of the implementing agencies of the project, though this was done later than planned, in 2007.

3.47 The flow of public funds to the sector was regularly communicated to the sector stakeholders, development partners and people at large through websites. The websites of the Government, BERC and the utilities published power and gas sector statistics, progress, procurement, and other necessary information for greater transparency and access to information on the sector. However, there was no significant attempt to gather quantitative information on customer satisfaction and public perception on sector performance.

3.48 The Government displayed inability to move ahead with the SZPDC corporatization, and there was general backtracking on corporatization in the power sector.

3.49 There were frequent changes in the core management staff of the Power Cell and delayed operationalization of BERC by the Government contributed to project implementation delays.

3.50 *The implementing agencies' performance is rated Moderately Satisfactory.* The project was implemented by the Power Cell, BERC and PetroBangla, all staffed with qualified personnel. The three implementing agencies collaborated well under the leadership of the Power Cell. They kept close communication with the Bank, and showed flexibility in amending the activities in order to comply with the project development objectives. The technical capacity of all three agencies was enhanced by training programs and on-the-job-training from international consultants provided through the project. A key shortcoming, however, was the somewhat high turnover rate in the Power Cell and BERC due to the issuance of shorter-term contracts that is typical in civil service, making it difficult to retain some of the trained staff. This leaves sustainability of the project outcomes in capacity building as a challenge if no mitigation measures are taken.

3.51 Overall, Borrower performance is rated *Moderately Satisfactory*.

## MONITORING AND EVALUATION

3.52 **M&E Design.** The results framework originally set out seven key indicators<sup>27</sup>: 1) Adoption Power sector policies (particularly for underpinning financial recovery, faster access for all, and private participation); 2) Regulatory processes put in place, particularly for power tariff-setting and quality-of-service monitoring; 3) Improved public perception of the power sector's performance and customer satisfaction; 4) Corporate governance structures and policies put in place for at least two power enterprises; 5) Updated Gas Sector Master Plan and Strategy (GSMPS) for meeting gas demand from power, industry and other sectors; 6) Management and operation of at least two power enterprises improved through the participation of global experts; 7) Monitoring, reporting, and invoicing of power flows between "unbundled" enterprises based on accurate metering.

3.53 Of the above indicators only three were in the nature of outcomes/intermediate outcomes – improved public perception/customer satisfaction; improved management of at least two power plants; and power flows between unbundled enterprises. The remaining indicators were in the nature of outputs – adoption of policies, processes, gas sector strategy; and corporate governance structures/policies. Specific baseline and target values for the indicators were provided in April 2005, a year after appraisal, and the target values were finalized in November 2006.

3.54 The project does not define its objective of "balanced development" which should have been the basis of the M&E framework with appropriate outcome indicators. In this assessment, the "balanced development" of the sector is inferred from a range of technical, financial and access parameters.

3.55 **M&E Implementation.** The Government set up mechanisms for M&E as it was designed, which consisted of monitoring scheduled activities and outputs, or routine reporting on operations such as metering power flows. The Government's Task Force for power sector reform, chaired by the Power Secretary, regularly reviewed the progress of project activities, outputs and policy recommendations.

3.56 **M&E Utilization.** The M&E design was simple and mainly output-based, as explained under 'M&E design'. These output indicators as well as regular information on electricity sector technical and financial parameters appear to have been collected regularly and fed back to decision-makers. The websites of the MPEMR, BERC and the utilities published power and gas statistics which provided greater transparency and access to information in the sector. Information on public perception/customer satisfaction was ad-hoc in nature, with no systematic surveys. Therefore no quantitative results were available that could be tracked over time and used as a basis for corrective actions or improving decision-making. Power flows between unbundled enterprises could not be tracked as envisaged as the installation of meters is still incomplete.

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<sup>27</sup> Indicators 2 and 3, and indicators 4 and 6 were merged in 2005 and 2006 respectively, following regional guidance for all projects. However, the original seven indicators were reported on by the project's implementation completion report.

3.57 Overall, M&E is rated *modest*.

## 4. Power Sector Development Policy Credit

### Objectives, Design, and Relevance

#### OBJECTIVES

4.1 The development objective of the Power Sector Development Policy Credit is stated in its Program document as “the enhancement of governance and accountability, and of financial stability, in the sector leading to better and more sustainable service provision.” The Financing Agreement for the Credit refers to but does not spell out the program objective.

The project development objective packs multiple outcomes in its statement. This assessment divides the project development objective into three outcome based statements to enable a clear evaluation:

1. Enhanced governance and accountability in the power sector;
2. Enhanced financial stability in the power sector; and
3. Better and more sustainable service provision in the power sector

The objectives as stated above are clearly interlinked with the overarching outcome amounting to better and more sustainable service provision in the power sector.

#### RELEVANCE OF OBJECTIVES

4.2 *The Relevance of Objectives is rated High.* At credit appraisal in 2007, Bangladesh’s faced a vastly inadequate power supply to meet the demands of a growing economy, and a growing gap between costs and revenues in the power sector. Governance problems and political considerations were holding the Government back from commissioning significant new generation capacity and charging cost-recovery tariffs. The full range of procurement processes whether geared to public investment or to attract private investment in generation – had become less transparent over time. Corruption was also a problem at the customer interface, often in the form of collusion between large customers and selected distribution utility managers, resulting in diversion of revenue and placing further pressure on utility operating margins. The Government compensated the largely state-owned and operated sector (in this case mainly BPDB as the bulk electricity supplier) for underpricing of electricity, though this was done in an ad hoc and unpredictable manner.

4.3 Against this background the Government prepared a Power Sector Reform Road Map (April 2008) which contained policy measures for financial stability, accountability and improved service provision in the sector. The Development Policy Credit that is being assessed was aligned with these policy measures. It was also aligned with the Country Partnership Strategy for the period (FY2006-09) which highlighted the need to improve access to and quality of infrastructure services, by strengthening sector governance and encouraging greater private sector participation.

## DESIGN

4.4 The project comprised the following components:

### **Pillar 1. Institutions of accountability**

- Approving service rules, organization chart, and table of equipment for the Bangladesh Energy Regulatory Commission;
- Registering the South Zone Power Distribution Company as a public limited company; and
- Completing the short-listing for the Bibiyana independent power producer (IPP)

### **Pillar 2. Financial sustainability of the power sector**

- Transferring BDT500 million per month to the Bangladesh Power Development Board (BPDB) and implementing the first phase of the financial restructuring plan;
- Issuing the tender for the supply and installation and implementation support for large customer metering in South Zone; and
- Issuing the tender for the new strategy for the Rural Electrification Board.

4.5 **Implementation Arrangements.** The implementing agencies were the Ministry of Finance and the Ministry of Power, Energy, and Mineral Resources (MPEMR) operating mainly through its Power Cell, as well as BPDB, SZPDC, BERC and REB. The Power Cell, supported by a transaction advisor, assisted with the procurement for Bibiyana IPP and automated meter reading equipment for SZPDC.

## **Relevance of Design**

4.6 *The Relevance of Design is rated Modest.* The project design appropriately diagnosed the crucial areas to be addressed for improving electricity service provision for beneficiaries. These covered the long-standing governance issues at different levels, and the financial sustainability of sector operations, which were interlinked to a great degree and which together impacted electricity service provision.

4.7 The specific actions that were attempted under Pillar I and II (Institutions of Accountability and Financial Sustainability) contained a mix of medium term and long-term measures to improve governance and financial sustainability that would yield better electricity service provision. Thus, ultimate beneficiaries would benefit from the reduction of losses in the existing power supply through introduction of a large customer metering unit at South Zone Distribution Company (to isolate and better serve the 2 percent of customers responsible for 40 percent of energy consumption), and the procurement of automated metering technology to reduce commercial losses from this subset of customers to zero; and the implementation of good corporate governance practices at SZPDC; and adopting a new rural strategy that would ring-fence REB from political pressures and adhere to its master plan and the use of objective criteria for expansion of new lines.

4.8 Operational and financial sustainability would benefit in the short and medium term by securing timely payment to existing IPP providers through assured budgetary transfers to BPDB, thus safeguarding on-time delivery contracted of power supply. This would be done in parallel with strengthening the regulatory agency to undertake rational tariff revisions, and completing and implementing a Financial Restructuring Plan. Introducing a transparent and competitive process for procuring new IPP contracts, using Bibiyana as a test case and a confidence building measure would lay the foundation for longer term operational sustainability by attracting much need private investment in the generation sector.

4.9 While the project design was logical and comprehensive, the reasons for going in for a single- rather than multi-tranche credit are not convincing. In retrospect, too much weight was given to quickly build upon the openness and commitment displayed by the Caretaker Government to the Credit objectives. The complexity of this Credit operation in the context of the Bangladesh power sector's existing institutional capacity and readiness, would have called for a multi-tranche operation which might have resulted in a different design.

## **Implementation**

### **PLANNED VS. ACTUAL COSTS**

4.10 Project costs remained unchanged at SDR 73.7 million from appraisal to disbursement and the actual closing date matched the planned closing date of March 31, 2009.

### **IMPLEMENTATION EXPERIENCE**

4.11 The Credit was negotiated in June 2008 with an interim Care Taker Government that had replaced an elected civilian government for two years. The Care Taker Government displayed openness and commitment to implement needed reforms and to bring transparency to economic decision-making during Credit preparation and appraisal, but became less flexible in its approach after elections were notified in July 2008, leading to a slowdown in the momentum that had been build up by the Credit thus far.

4.12 Two activities were especially affected – the Bibiyana IPP and South Zone Corporatization. The Bibiyana award was cancelled outright in November 2008. The corporatization effort for South Zone continued but key processes did not move quickly. It took some time to establish the search committee to select independent directors for and to operationalize the Board.

4.13 The pace of implementation did not increase despite complementary and parallel projects including the Power Sector Development Technical Assistance Project (the second project reviewed in this report) and a multi-sectoral single tranche budget support operation, the Transition Support Credit (TSC), which addressed critical longstanding weaknesses in core governance functions.

4.14 **Safeguards.** There is no discussion of any likely environmental or social safeguard issues arising out of this credit in the Program Document. As a Development

Policy Credit this operation is subject to the Bank's Operations Policy 8.60 by which the Bank is expected to determine whether specific country policies supported by an operation are likely to have significant social or environmental consequences, and if so, how such gaps or shortcomings would be addressed before or during program implementation. The Program Document could have made a statement to this effect.

4.15 **Financial Management.** There were no concerns reported in respect of financial management or reporting for the Credit. Procurement of the automated meter-reading equipment was not handled effectively by centralized entities, and MPEMR transferred this responsibility to the Chittagong-based SZPDC. There were significant lessons learned about how metering specifications are vulnerable to manipulation and these and other lessons were expected to be incorporated into the re-tendering effort. Achievement of the Objectives

**Objective 1. Enhanced governance and accountability in Bangladesh's Power Sector. *Rated Modest.***

4.16 ***BERC: Regulatory institutional reform and strengthening.*** The reform action supported here was the operationalization of the Bangladesh Energy Regulatory Commission (BERC). During the Credit period, the BERC's Board of Directors was appointed and was provided with the necessary staff complement. Technical assistance was provided to BERC through the Bank's parallel technical assistance project (Power Sector Development Technical Assistance Project, the second project reviewed in this report).

4.17 The outcome of the overall support to BERC is clear from the discussion relating to the relevant objective under the Technical Assistance project (see paras 3.26 to 3.32). Feedback from Government officials suggests some positive features of BERC's functioning in effecting periodic tariff adjustments and involving and educating the public on the need to charge remunerative tariffs. Other feedback suggests that this progress is outweighed by political interference in functional decision-making and staffing, and lack of financial autonomy, which constraints BERC's independence and effectiveness. BERC's organization chart is specified by the Government's human resources department, and staff at the Deputy Director level and above is seconded from other sections of the Government. BERC does not have any leeway in providing incentives for retaining staff, which would be possible with greater financial autonomy (based on license fees collected by BERC) and greater freedom in staffing decisions. Current tenure for BERC's head is relatively short, with BERC's head being appointed for three years compared to the five year norm for the corresponding regulator in India, for instance.

4.18 BERC has yet to formulate service standards for electricity services, and enforce them as a means of protecting the interests of the consumers. Provisions for consumer complaints and a response mechanism are not evident. Public hearings appeared to be perceived as post-facto public relations exercises after tariff decisions have been made. Much more needs to be done in raising awareness among consumers on the regulatory system. Overall, BERC has a long way to go to discharge its responsibilities in the spirit



of the legislative act through which it was established over ten years ago in on March 13, 2003.

4.19 ***Corporate governance of state-owned enterprises in the power sector.*** The process of corporatization was completed for the North West Power Generation Co., Ashuganj Power Station Co., Dhaka Power Distribution Co. and Electricity Generation Co. of Bangladesh. Parallel work on corporate governance policy was initiated through the IDA-financed Siddhirganj Peaking Power Project and additionally covered the Power Grid Corporation of Bangladesh (PGCB), and the Gas Transmission Company Limited (GTCL). Feedback to the mission from EGCB officials suggests that matters relating to governance and management effectiveness are progressing well after corporatization in their company. The project team informs us that the corporatization process appears to be similarly internalized in the other entities.

4.20 However, there has been limited progress or even reversal in the corporatization of the distribution companies in the South, North West and Central zones. The reversal appears to be the most serious in the South Zone Power Distribution Corporation (SZPDC) which accounts for about 20 percent of the distribution load in the country. The governance issues in the South Zone received particular attention at appraisal. The reform plan for SZPDC had also involved the creation of a dedicated unit for large customers (1,200 out of 650,000 total, who account for 40% of energy sales despite representing only 2% of the customer base), and the introduction of automated meter-reading equipment (discussed below).

4.21 At project completion there had been some encouraging signs with the appointment of the SZPDC board and the election of a Chairman after two unsuccessful attempts. Discussions with the Government officials and the projects suggest that the Board is no longer functional and the status of the proposed SZPDC remains the same as existed before the project. This trend does not bode well for the overall corporatization effort in the power sector.

4.22 ***Private sector participation in power generation.*** The process of short-listing the bidders for the Bibiyana IPP was completed in March 2008; and despite diligence by reputed transaction advisers, only one qualified bid was received. Considering this to be insufficient, and worried at how an award to a lone bidder would be perceived by the incoming Government, the tender was re-issued in January 2009 in the hope that there would be competitive bidding from more than one bidder. However, even four years after Credit closure, there has been no further movement in awarding the Bibiyana IPP.

## **Objective 2. Enhanced financial stability in Bangladesh's Power Sector. *Rated Modest.***

**Power Sector Financial Restructuring.** The Credit program document does not define how financial sustainability would be measured. IEG notes that the sector's financial situation has deteriorated significantly since Credit closure. Since the Credit closure, net losses for BPDB have increased from BDT 6.4 billion in 2009-2010 to BDT 67.0 billion in 2011-12, and eased somewhat (perhaps due to recent tariff increases) but still extremely high at BDT 50.4 billion in 2012-2013. As a percentage of operating revenue,

these numbers accounted for 9 percent, 56 percent and 30 percent respectively (see Annex D Table 2 for details). Overall, the goal of financial sustainability is a distant prospect.

4.23 To compensate for un-remunerative tariffs, the government has provided budgetary support to BPDB of BDT 9.9 billion in 2009-10, BDT 63.6 billion in 2011-12, and BDT 44.1 billion in 2012-13. The transfers have permitted timely payment to the independent power producers and to rental power providers. This is a major departure from the pre-Credit situation when budgetary support was inconsistent, and has now helped with stable provision of power in a situation of scarcity.

4.24 **Transparency and accountability in service provision.** The Credit had provided for the procurement of system and interface metering equipment to strengthening the commercial interface between power generation, transmission and distribution entities. This would help the preparation of suitable contracts between these entities and reliable metering of power flows between them as well as improving internal controls within an entity in which management arrangements include incentives for improved performance.

4.25 The program document had envisioned that the contract for the meters would be awarded by December 2008, that the metering installation to be 35 percent complete by March 2009, and that the commercial losses from the large customers would be reduced to zero. The procurement of the automated meter-reading equipment was not handled effectively by the Power Cell/BPDB, and the Ministry has made a decision to ensure that further procurement efforts would be undertaken by the Chittagong-based SZPDC. The contract for the supply and installation of the meters had still not been awarded four years after the Credit closure. Financing of the meters is now provided for in the proposed South Zone Power Distribution Project.

4.26 **Restructuring of REB Business Model.** This reform involved the launch of a study to review the key drivers of REB's recent financial and operational decline, after years of success and citation as a model of international good practice for rural access expansion. The study is in progress. An interim report has presented the need for change to business as usual, before rural access can be sustainably expanded. At the heart of this strategy effort is the question of how REB will be structured to fulfill its mandate; the key issue, which evolved over the course of the last decade, has been the politicization of the Board its effective capture by the bureaucracy. The question now is whether or not some form of corporatization and a greater focus on commercial performance measures, can get REB back to a state of technical competence and accountability.

### **Objective 3. Improving Service Provision. Rated Modest.**

In the absence of a definition of 'improved service provision' in the project documents, this assessment looks at some parameters that can be considered appropriate outcomes under this objective, while noting the difficulty of attributing them to the Credit operation to any degree. Overall, the number of people connected to electricity through grid and off-grid means has risen from 44 percent in 2008 to 62 percent in 2013. Total installed capacity has risen by 90 percent from over this period to 9,500 MW. But the power deficit (peak demand minus maximum generation) has widened from 1,439 MW to 1,849

MW in 2013. This is reflected in load shedding which was 1,058 MW in 2012, nearly the same as in 2012. This does not present a favorable picture for sustainable service provision. (Table 1)

**Table 1: Power Generation Capacity Development, 2008-13**

MW	2008	2009	2010	2011	2012	2013
Installed capacity	5,201	5,719	5,823	7,264	8,716	9,500
Of which: rental basis *	58	351	548	1,685	2,149	2,449
Maximum generation	4,130	4,162	4,606	4,890	6,066	6,500
Peak demand	5,569	6,066	6,454	6,765	7,518	8,349
Surplus / (Deficit)	(1,439)	(1,904)	(1,848)	(1,875)	(1,452)	(1,849)
Load shedding	1,049	1,269	1,459	1,335	1,058	n.a.

Source: BPDB Reports; \* Diesel or fuel oil based and mostly private owned

## Efficiency

Not rated for DPLs

## Ratings

### OUTCOME

4.27 **Overall project outcome is rated Unsatisfactory.** The Relevance of the Credit objectives and its design are rated **high**. Bangladesh's power sector clearly faces major constraints in improving overall electricity service provision, and financial sustainability and governance are priority areas for intervention to improve the power situation. Efficacy of each of the three project objectives is rated **modest**, with little progress towards solvency in the sector and a continuing high level of government subsidies that may not be sustainable. Important actions in the process of corporatization, especially of SZPDC have seen a slowdown or a reversal, casting doubts on the seriousness of the government in improving overall governance in the power sector. The sector regulator BERC, is yet to attain sufficient administrative and financial autonomy to do justice to its mandate. Overall Development Outcome is rated **unsatisfactory**.

### RISK TO DEVELOPMENT OUTCOME

4.28 **The risk that the achieved development outcomes will not be sustained is rated High.** In the four years since the Credit was closed, the Government's commitment to power sector reforms covered by the operation appears to have lessened or even been reversed in several respects. Most importantly, the roll-back on the corporatization of SZDPC, which accounts for a significant share of electricity distribution in the country, and was diagnosed to have governance issues, sends a negative signal to the power sector, lenders and donors, especially after several positive steps have already been painstakingly taken for unbundling, corporatization, and tariff regulation over the years. Taken together with a lack of progress in procuring automated meters (which were intended to make measurement of consumption accurate and transparent), and in establishing the large customer unit at SZPDC, the originally planned corporatization and governance goals have clearly stalled.

4.29 The Government has not been able to put its act together for the Bibiyana IPP, again over four years after project completion, and there are no fresh and significant indications that this may change soon. This does not bode well for attracting private sector investment in generation on a large scale, without which it will not be possible for the country to make any significant headway towards its ambitious target of universal electricity access by 2021.

4.30 BERC's independence and effectiveness have been impacted negatively since the completion of the Credit. Unless political interference is reduced in its staffing and decision-making processes, and it is allowed autonomy to finance itself through license fees (which is provided for in the enabling legislative act) it is unlikely that BERC will be able to retain the right capacity and tone expected of an independent regulator.

4.31 Continued resistance to corporatization from entities such as the BPDB and the South Zone Corporation gives cause for concern. At the moment, the Government has been unable to overcome resistance to corporatization. Instead, the Government is promoting the SBU or separate business unit model, which establishes separate business units with independent decision-making power on business operations and clearly defined accountability. Under this model, however, the Government needs to make continuous efforts to accomplish adoption of key performance indicators (KPIs) for its targeted SBUs (to maintain accountability, transparency, and good governance) and to monitor, evaluate, and fix responsibility every six months. At this moment, without a market test, it is uncertain whether the SBU model with KPIs will take firm hold in the energy sector.

## **BANK PERFORMANCE**

4.32 *The quality at entry for the project is rated Moderately Satisfactory.* The Bank's performance during preparation and appraisal was satisfactory. The Bank team took into account lessons learned from the previous series of Development Support Credits, where the energy sector had been one reform area out of many. The team also acted opportunistically with a very reform-minded, although short-lived, caretaker administration. It was appropriate to have designed a sector-specific reform oriented Credit operation rather than be part of a multi-sector operation. The critical state of the sector and the need for high-impact reforms, and the Care Taker Government's commitment to initiate the reforms, weighed strongly with the Bank in initiating this Credit. The risk of reversal of the reforms by an incoming government was judged to be low, based on historical precedence. However, several risks that were identified at appraisal were realized during implementation: (a) the politicization of key appointments to new institutions, (b) the obstruction of reform by vested interests, (c) procurement/other procedural delays, and (d) frequent transfers of ministry and agency key officers. Consequently there was resistance to and delay in the implementation of the corporatization of power companies.

4.33 In retrospect, the complexity of the operation and the institutional readiness of Bangladesh's power sector may have been better addressed by a multi-tranche operation. The assessment that the incoming Government would not roll back the reforms provide given the uncertainties discussed in the section on 'risk to development outcome.'

4.34 ***The Bank's quality of supervision during the project is rated Moderately Satisfactory.*** The team was proactive in identifying issues and threats to the achievement of the project development objective. After the formation of the new Government the Bank team undertook a supervision mission in January 2009, and briefed them on the progress under the Credit and the pending actions to achieve the monitorable indicators as set out in the reform matrix. Most importantly, the supervision mission also provided updated data on the state of sector finances, which was an important analytical input to the incoming policymakers and put the reform program in perspective. The Dhaka based Bank team maintained continuous interaction and dialogue with the Government on power sector issues. The team members were able to proactively raise critical issues with the Government and sector institutions at critical junctures, and make attempts to resolve them, though the impact of these interventions were limited due to various factors as discussed under the section of 'risk to development outcome' (paras 4.28-4.31). For instance, the Bank team worked with the Government to find solutions to ensure that the IPP process remained transparent and to enable IDA funding support, though ultimately there was not much progress on the Bibiyana IPP.

#### **BORROWER PERFORMANCE**

4.35 ***The government's performance is rated Unsatisfactory.*** The Credit was appraised during the tenure of the Caretaker Government which showed commitment to the sector reform objectives of the Credit through the appraisal process and the initial period of implementation. Six months after the credit was declared effective, a newly elected Government came into power in December 2008. During the transition period after elections were first announced, the momentum for reform began to slow down. This was most evident in the Caretaker government's reluctance to go ahead with the Bibiyana IPP as explained in the section on "implementation experience" (para 4.11-4.13). Following credit closure, the Government appears to have pulled back on the corporatization effort and metering activity as they relate to the important entity of SZPDC, having very negative implications for both the governance and financial sustainability objectives of the Credit operation. In the four years following Credit closure, the prospect of an independent and effective BERC is unlikely to be realized unless it is insulated from undue political interference and given greater administrative and financial autonomy. The government has yet to display urgency with respect to the implementation of the Financial Restructuring Plan which is a crucial tool for moving towards financial sustainability. The lone positive feature appears to be the timely release of agreed budgetary allocations to BPDB to enable timely payment to IPPs and gas companies, though this at best an interim measure while the power sector is put on the road to financial sustainability.

4.36 ***The implementing agencies' performance is rated Moderately Unsatisfactory.*** The implementing agencies below the ministry-level were the Power Cell, BPDB, SZPDC, BERC and REB. The Power Cell (supported by a transaction advisor) assisted with the procurement for Bibiyana IPP, and for automated meter reading equipment for SZPDC. Both procurements did not lead to contract award; in the former case, the Power Cell was not responsible for the decision to re-tender (as the decision was taken at the higher Government levels). However, in the case of meters procurement, the Power Cell did not fully discharge its responsibilities to oversee a transparent procurement process,

and as a result of improper specifications contained in the bidding documents, the contract could not be awarded.

4.37 BPDB's IPP cell has effected timely payments to power and gas suppliers. BPDB has also worked closely with the consultants for the Financial Restructuring Plan in advancing implementation of key non-price recommendations i.e. cleaning up its own balance sheet as well as those of corporatized entities, which have inherited assets and liabilities from BPDB that were in some cases never reconciled. However, there is much work to be done in cleaning and updating meaningful financial statements for the corporatized entities so that they are in a position to provide justification for tariff increases based on allowable rates of return on assets.

4.38 As discussed in several sections above ('achievement of objectives' and 'risk to development outcome') SZPDC has slipped farther behind in the four years after Credit closure in respect of corporatization and making any serious attempt at procuring automated meter reading equipment. It is recognized that progress in these important matters is dependent on favorable signals from higher Government decision making levels.

4.39 BERC continues to face constraints from political interference in its staffing, scope of work, and financial autonomy, which is compromising its ability to act as an independent, technocratic agency. However, the organization has gained experience in the process of effecting tariff increases, consulting and educating the public, and in performing its function of issuing licenses to power sector entities.

4.40 REB is aware of the need for organizational restructuring and a new business model, and is awaiting action on the consultant study which should provide some recommendations to this effect. REB's operations have been politicized in the last few years, and the entity would need some unambiguous signals from the Government to the operational, financial and technical competence and results that it has displayed in the past.

4.41 Overall, the Borrower's performance is rated *Unsatisfactory*.

## **MONITORING AND EVALUATION**

4.42 **M&E Design.** The M&E indicators proposed by the Credit corresponded to the prior reform actions for the Credit: improvement in sector finances; performance of the distribution utility; and functioning of the regulatory framework (all of which related to financial sustainability), and introduction of non-arbitrary, transparent governance processes (related to governance and accountability). During project implementation. In April 2008, the government updated its 3-Year Road Map for Power Sector Reform which described the initiatives for reform and set targets and six-month rolling goals for the process between January 2008 and December 2010. The six-month rolling goals had performance indicators for transmission and distribution losses, bill collection, financial ratios and arrears. The 3-Year Road Map did not set targets for acceptable levels of financial losses.

4.43 “Service provision” – which this assessment considers to be the main outcome of the project – is not clearly defined in the project documents. At most the following indicators from the results framework can be seen to be related to this outcome: electricity sales (Gigawatt-hours); average number of customers ('000s); and retail (retail tariff)

4.44 **M&E Implementation.** The various quantitative indicators that were provided for in the original M&E design were amenable to routine observation and collection. Other indicators related to milestones in completing planned activities and were simple to track. M&E was implemented to this extent as designed.

4.45 **M&E Utilization.** There is a regular flow of financial and technical information on the power sector to decision makers in the ministry and various power sector entities as an input to overall sector management. However, data related to service provision is not clearly defined, and there is no systematic feedback mechanism for this important outcome expected from the project.

4.46 Overall, M&E is rated *modest*.

## 5. Lessons

The following lessons are drawn from the experience with the three operations that have been assessed in this report.

- A. **Off-grid household electrification can accelerate the benefits of “lighting” in a cost-effective manner, to populations that face uncertain waiting periods for grid-based electricity, or are unlikely to obtain grid-based electricity due to remote or inaccessible locations.** The RERED project experience shows that potential beneficiaries can respond well to ownership-based Solar Household System schemes, and factor in the likelihood of gaining access to grid-based electricity at a later stage.
- B. **A public-private partnership model can efficiently deliver large-scale and dispersed off-grid electricity services, by deploying public funding through private sector stakeholders.** Flexibility to adapt to market conditions and signals are the hallmarks of this model, while quality assurance and after-sales and maintenance service mechanisms are a necessity for acceptance by beneficiaries.
- C. **One-off technical assistance or credit support operations should be highly strategic, selective and practical in supporting policy and institutional issues of a complex nature.** The PSD Technical assistance project took on an ambitious agenda covering power sector policies, regulation, industry structure and private sector participation, and struggled to get traction on any of these matters.
- D. *Similarly to Lesson C, One-off Credit operations cannot be expected to make headway on multiple policy fronts in a sector, especially if these issues have some*

**commonalities with other sectors.** The Power Sector Development Policy Credit single-tranche operation covered complex issues of governance and financial sustainability, which were difficult to resolve to any significant extent in a program of short duration.

- E. **Achieving broader social and economic outcomes from electricity access provision will primarily depend upon the pursuit of a least cost path for grid expansion backed by appropriate sector policies, complemented by off-grid electricity in the interim or permanently as needed.** While Bangladesh has demonstrated impressive growth in Solar Home Systems and continues to pursue this path for improving access to electricity, it needs to keep in mind that off-grid electrification can inherently provide only a limited range of services to beneficiaries compared to grid-based electricity. Achieving broader social and economic outcomes from electricity provision will primarily depend upon the pursuit of a least cost path for grid expansion for which persisting policy and regulatory bottlenecks have to be resolved.



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## Annex A. Basic Data Sheet

Rural Electrification and Renewable Energy Development  
(Credit IDA-36790, IDA-46430, IDA-50130, TF-51301)

### Key Project Data (amounts in US\$ million)

	Appraisal estimate	Actual or current estimate	Actual as % of appraisal estimate
Total project costs	780.9	758.85	97%
Loan amount (IDA)	492.98	462.86	94%
Grant (GEF)	8.20	8.19	100%
Cofinancing	-	-	-
Cancellation	-	-	-

### Cumulative Estimated and Actual Disbursements (P071794)

	<i>FY03</i>	<i>FY04</i>	<i>FY05</i>	<i>FY06</i>	<i>FY07</i>	<i>FY08</i>	<i>FY09</i>	<i>FY10</i>	<i>FY11</i>	<i>FY12</i>
Appraisal estimate (US\$M)	2.0	4.6	8.2	10.3	11.5	12.0	12.0	12.0	12.0	12.0
Actual (US\$M)	0	0.0	0.9	1.8	2.7	5.3	9.7	11.2	12.7	12.7
Actual as % of appraisal	0	1	11	18	24	44	81	94	106	106
Date of last disbursement: September 7, 2010										

### Cumulative Estimated and Actual Disbursements (P074040)

	<i>FY03</i>	<i>FY04</i>	<i>FY05</i>	<i>FY06</i>	<i>FY07</i>	<i>FY08</i>	<i>FY09</i>	<i>FY10</i>	<i>FY11</i>	<i>FY12</i>
Appraisal estimate (US\$M)	2.0	4.6	8.2	10.3	11.5	12.0	12.0	12.0	12.0	12.0
Actual (US\$M)	0	0.0	0.9	1.8	2.7	5.3	9.7	11.2	12.7	12.7
Actual as % of appraisal	0	1	11	18	24	44	81	94	106	106
Date of last disbursement: September 7, 2010										

### Project Dates (P071794)

	Original	Actual
Appraisal	02/26/2002	02/26/2002
Board approval	06/25/2002	06/25/2002
Effectiveness	12/31/2002	12/31/2002
Closing date	06/30/2008	12/31/2012

**Project Dates (P074040)**

	Original	Actual
Appraisal	06/06/2001	06/06/2001
Board approval	06/25/2002	06/25/2002
Effectiveness	01/15/2003	12/31/2002
Closing date	12/31/2007	12/31/2009

**Staff Time and Cost**

<i>Stage of Project Cycle</i>	<i>Staff Time and Cost (Bank Budget Only)</i>	
	No. of staff weeks	USD '000 (including travel and consultant costs)
<b>Lending</b>		
FY01	48	131.35
FY02	52	290.77
FY03		-0.31
FY04		0.00
FY05		0.00
FY06		0.00
FY07		0.00
FY08		0.00
<b>Total:</b>	<b>100</b>	<b>421.81</b>
<b>Supervision/ICR</b>		
FY01		0.00
FY02		0.00
FY03	52	167.82
FY04	48	111.33
FY05	31	107.36
FY06	22	63.12
FY07	20	137.70
FY08	17	88.15
FY09	45	0.00
<b>Total:</b>	<b>235</b>	<b>675.48</b>

**Task Team Members**

<i>Names</i>	<i>Title</i>	<i>Unit</i>	<i>Responsibility/ Specialty</i>
<b>Lending</b>			
Subramaniam V. Iyer	Sr. Financial Analyst		TTL
Chandrasekar Govindarajalu	Energy Specialist		
Md. Iqbal	Energy Specialist		
Chrisantha Ratnayake	Sr. Power Engineer		
Kishor Uprety	Sr. Counsel		
Suraiya Zannath	Sr. Financial Management Specialist		
Mohammad Sayeed	Disbursement Officer		
Sumith Pilapitiya	Sr. Engineer		
Douglas Barnes	Sr. Energy Specialist		
Zafrul Islam	Sr. Procurement Specialist		
Raihan Elahi	Energy Finance Specialist		
Tuntivate Voravate	Consultant		
Hasna Khan	Consultant		
Anwar Hossain	Consultant		
Adam Harvey	Consultant		
Paul Van Aalst	Consultant		
Alfred Friendly	Consultant-Editor		
Zibun Nessa Pinu	Team Assistant		
Anna Goodman	Program Assistant		
<b>Supervision/ICR</b>			
Aminur Rahman Chowdhury	Consultant	SARFM	
Arun Banerjee	Consultant	SASDI	
Ashok Sarkar	Senior Energy Specialist	SEGEN	
Burhanuddin Ahmed	Sr Financial Management Specia	SARFM	
Chrisantha Ratnayake	Consultant	AFTG1	
Christopher James Warner	Sr Technical Spec.	CPFCF	
Erik Magnus Fernstrom	Senior Energy Specialist	AFTG2	
Fabio Pittaluga	Senior Social Development Spec	LCSSO	
Katherine Deaton Steel	Energy Specialist	AFTG2	
Malcolm Cosgrove-Davies	Sector Manager, Energy	LCSEG	
Md. Abul Fayez Khan	Program Assistant	SASDO	
Md. Faijul Islam	Information Analyst	SARIM	
Md. Iqbal	Senior Energy Specialist	SASDE	
Mildred Gonsalvez	Program Assistant	EASPW	
Mohammad Abdullah Sadeque	Consultant	SASDA	
Mohammad Mahbubur Rahman	Financial Management Specialist	SARFM	
Nilufar Ahmad	Consultant	SASDU	
Nusrat Jahan	Consultant	SARFM	
Prasad V. S. N. Tallapragada	Consultant	AFTG1	

<i>Names</i>	<i>Title</i>	<i>Unit</i>	<i>Responsibility/ Specialty</i>
Ravindra Anil Cabraal	Consultant	SASDE	
Rosanna Chan	Economist	SASFP	
Saif Quadir	Temporary	SASDE	
Shahidur R. Khandker	Lead Economist	DECAR	
Shakil Ahmed Ferdausi	Senior Environmental Specialist	SASDI	
Sheikh Naveed Uddin Ahmed	Consultant	SASHN	
Subodh C. Mathur	Consultant	AFTG2	
Sumith Pilapitiya	Lead Environmental Specialist	SASDI	
Toufiq Ahmed	Senior Procurement Specialist	SARPS	
Voravate Tuntivate	E T Consultant	EASWE	
Zibun Nessa Pinu	Program Assistant	SARPS	
Zubair K.M. Sadeque	Senior Energy Specialist	SASDE	TTL

**Power Sector Development Technical Assistance Project**  
(IDA-39130, IDA-H0920)

**Key Project Data (amounts in US\$ million)**

	Appraisal estimate	Actual or current estimate	Actual as % of appraisal estimate
Total project costs	15.5	14.6	94%
Loan amount (IDA)	7.1	6.0	85%
Grant (IDA)	8.4	8.6	100%
Cofinancing	-	-	-
Cancellation	-	-	-

**Cumulative Estimated and Actual Disbursements**

	<i>FY03</i>	<i>FY04</i>	<i>FY05</i>	<i>FY06</i>	<i>FY07</i>	<i>FY08</i>	<i>FY09</i>	<i>FY10</i>	<i>FY11</i>	<i>FY12</i>
Appraisal estimate (US\$M)	2.0	4.6	8.2	10.3	11.5	12.0	12.0	12.0	12.0	12.0
Actual (US\$M)	0	0.0	0.9	1.8	2.7	5.3	9.7	11.2	12.7	12.7
Actual as % of appraisal	0	1	11	18	24	44	81	94	106	106

Date of last disbursement: September 7, 2010

**Project Dates**

	Original	Actual
Appraisal	03/03/2004	03/03/2004
Board approval	06/03/2004	06/03/2004
Effectiveness	10/31/2004	10/31/2004
Closing date	12/31/2008	12/31/2012

**Staff Time and Cost**

<i>Stage of Project Cycle</i>	<i>Staff Time and Cost (Bank Budget Only)</i>	
	No. of staff weeks	US\$ '000s (including travel and consultant costs)
<b>Lending</b>		
FY03	33	113.20
FY04	38	125.51
FY05		0.00
FY06		0.00
FY07		0.00
FY08		0.00
<b>Total:</b>	<b>71</b>	<b>238.71</b>
<b>Supervision/ICR</b>		
FY03		0.00
FY04		0.00
FY05	30	56.14
FY06	40	31.56
FY07	22	25.88
FY08	36	87.32
FY09	29	89.40
FY10	27	233.14
FY11	39	160.35
FY12	52	212.57
FY13	33	151.91
<b>Total:</b>	<b>308</b>	<b>1048.27</b>

Power Sector Development Policy Credit  
(IDA-44360)

**Key Project Data (amounts in US\$ million)**

	Appraisal estimate	Actual or current estimate	Actual as % of appraisal estimate
Total project costs	73.7	73.7	100%
Loan amount (IDA)	73.7	73.7	100%
Cofinancing	-	-	-
Cancellation	-	-	-

**Cumulative Estimated and Actual Disbursements**

	<i>FY03</i>	<i>FY04</i>	<i>FY05</i>	<i>FY06</i>	<i>FY07</i>	<i>FY08</i>	<i>FY09</i>	<i>FY10</i>	<i>FY11</i>	<i>FY12</i>
Appraisal estimate (US\$M)	2.0	4.6	8.2	10.3	11.5	12.0	12.0	12.0	12.0	12.0
Actual (US\$M)	0	0.0	0.9	1.8	2.7	5.3	9.7	11.2	12.7	12.7
Actual as % of appraisal	0	1	11	18	24	44	81	94	106	106

Date of last disbursement: September 7, 2010

**Project Dates**

	Original	Actual
Appraisal	03/03/2004	03/03/2004
Board approval	06/03/2004	06/03/2004
Effectiveness	10/31/2004	10/31/2004
Closing date	12/31/2008	12/31/2012

**Staff Time and Cost**

<i>Stage of Project Cycle</i>	<i>Staff Time and Cost (Bank Budget Only)</i>	
	No. of staff weeks	US\$ '000s (including travel and consultant costs)
<b>Lending</b>		
FY03	33	113.20
FY04	38	125.51
FY05		0.00
FY06		0.00
FY07		0.00
FY08		0.00
<b>Total:</b>	<b>71</b>	<b>238.71</b>
<b>Supervision/ICR</b>		
FY03		0.00
FY04		0.00
FY05	30	56.14
FY06	40	31.56
FY07	22	25.88

FY08	36	87.32
FY09	29	89.40
FY10	27	233.14
FY11	39	160.35
FY12	52	212.57
FY13	33	151.91
<b>Total:</b>	<b>308</b>	<b>1048.27</b>

### Task Team Members

<i>Names</i>	<i>Title</i>	<i>Unit</i>	<i>Responsibility/ Specialty</i>
<b>Lending</b>			
Ian Alexander	Consultant	FEUSE - HIS	
Raihan Elahi	Senior Energy Specialist	AFTG1	
Shawkat M. Q. Hasan	Senior Procurement Specialist	AFTPE	
Shamsul M. Hoque	Temporary	SASFP	
Md. Iqbal	Senior Energy Specialist	SASDE	TTL for implementation
Zafrul Islam	Lead Procurement Specialist	SARPS	
Shakila Parveen Khan	Senior Program Assistant	SACBD	
Chrisantha Ratnayake	Consultant	AFTG1	
Joseph Daniel Wright	Economist	SASDE	
Salman Zaheer	Program Director	SACRI	TTL for preparation
<b>Supervision/ICR</b>			
Burhanuddin Ahmed	Senior Financial Management Specialist	SARFM	
Mohammad Anis	Energy Specialist	SASDE	
Arun Banerjee	Consultant	SASDI	
Sudeshna Ghosh Banerjee	Senior Economist	SEGEN	
Raihan Elahi	Senior Energy Specialist	AFTG1	
Tanvir Hossain	Senior Procurement Specialist	SARPS	
Zafrul Islam	Lead Procurement Specialist	SARPS	
Md. Abul Fayez Khan	Program Assistant	SASDO	
Ashish Khanna	Lead Energy Specialist	SASDE	
Sabah Moyeen	Social Development Specialist	SASDS	
Zibun Nessa Pinu	Program Assistant	SARPS	
Fabio Pittaluga	Senior Social Development Spec	LCSSO	
Zubair K. M. Sadeque	Senior Energy Specialist	SASDE	
Ashok Sarkar	Senior Energy Specialist	SEGEN	
Alan F. Townsend	Senior Energy Specialist	EASWE	
Salman Zaheer	Program Director	SACRI	
Mohammad Sayeed	Consultant	SASDE	
Kristy Mayer	Energy Economist	SASDE	
Tomoyuki Yamashita	Senior Energy Specialist	SASDE	TTL for ICR



## Annex B. List of World Bank Energy Sector Activities in Bangladesh

No	ID	Project Name	Project Details							IEG Ratings					
			Approval FY	Closing FY	Sector	Instrument	Project Cost	Commitment	% for EI Sector	Outcome	Risk	Bank Perf	Implementn	Govt Perf	M&E Quality
1	P009506	POWER DIST. (16 TOWN	1989	1998	EMT	SIL	126	87	68%			S	U	U	
2	P009542	Third Rural Electrification	1990	2000	EMT	SIL	160	105	64%	HS		HS	HS	HS	
3	P009551	EGY SEC ADJ CREDIT SUPPLEMENT	1990		EMT	SAD	-	2	51%						
4	P044789	BD Private Sector Infrastructure Dev	1998	2007	EMT	SIL	866	235	27%	MU	SI	MU	MS	MU	N
5	P071794	BD: Rural Elect. Renewable Energy Dev.	2002	2013	EMT	SIL	290	191	66%						
6	P078707	BD: Power Sector Development TA	2004	2013	EMT	TAL	21	16	76%						
7	P095965	BD: Siddhirganj Peaking Power Project	2009	2016	EMT	SIL	470	350	74%						
8	P107797	Power Sector DPL	2008	2009	EMT	DPL	120	120	100%	MS	NL	MS	MU	MU	M
9	P112963	BD: Renewable Energy-AF	2010	2013	EMT	SIL	370	130	35%						
10	P126724	BD: RERED-AF II	2012	2013	EMT	FIL	255	172	67%						
11	P131263	RERED II	2013	2019	EMT	SIL	386	155	40%						
12	P065131	BD: Haripur Power Project	2000		EMT	NA	183	61	33%						
13	P074801	BD DSC IV/DPL	2007	2008	PS	DPL	200	200	100%	HS	M	S	S	S	SU
14	P081845	Development Support Credit	2003	2004	PS	SAL	300	300	100%	S	M	S	S	S	
15	P083887	Development Support Credit II	2005	2005	EP	SAL	200	200	100%	MS	M	S	S	S	
16	P089382	BD: Invst Promotion Financing Facility	2006	2016	FPD	FIL	105	50	47%						
17	P090832	Bangladesh Development Support Cr. III	2006	2006	EP	DPL	200	200	100%	S	M	S	MS	MS	SU
18	P108843	Bangladesh DSC IV-Supplemental Financing	2008	2008	PO	DPL	75	75	100%						
19	P110110	BD DSC IV-Supplemental Financing II	2008	2008	EP	DPL	100	100	100%						
20	P117542	BD: Invstmnt Prom & Financing Facility	2010	2016	FPD	FIL	272	257	94%						
<b>Non-lending Technical Assistance</b>															
21	P119547	GPOBA W3: Bangladesh Renewable Mini-grid	2010	2014	EMT	FIL	1	1	100%						
22	P119549	BD: GPOBA W3: Bangladesh Solar Home System	2010	2014	EMT	FIL	7	7	100%						
23	P121478	Bangladesh Gas Sector Capacity Building		2011	EMT										
24	P086409	BD - Pricing Reforms in Oil and Gas		2009	EMT										
25	P083745	BD: Power Sector Non-lending TA			EMT										
26	P108789	Power Sector Governance		2010	EMT										
27	P068200	Managing Transaction Advice			EMT										
28	P118605	BD: Efficient Lighting Initiative	2010	2015	ENV		15	15	100%						

## **Annex C. List of Persons Met**

### **Economic Relations Division, Ministry of Finance**

*Arastoo Khan*, Additional Secretary  
*Md. Anwar Hossain*, Deputy Secretary

### **Power Division, Ministry of Power, Energy and Mineral Resources**

*Monowar Islam*, Secretary,  
*Tapos Kumar Roy*, Additional Secretary  
*Md. Anwar Hossain*, Joint Secretary  
*Mohammad Hossain*, Director General, Power Cell  
*Md. Monwar Hasan Khan*, Senior Assistant Chief

### **Bangladesh Power Development Board**

*Md. Abduhu Ruhullah*, Chairman  
*Md. Shafique Uddin*, Director

### **Rural Electrification Board**

*Brig Gen Moin Uddin*, Chairman  
*Kaisar Ahmed*, Director, Program Planning  
*Rafiqul Alam*, Director, PBS Management Directorate (North)  
*Md. Imadul Islam*, Director, Personnel Directorate  
*Md. Nurul Islam*, Director, PBS Management

### **Bangladesh Energy Regulatory Commission**

*A.R. Khan*, Chairman  
*Md. Delwar Hossain*, Member (Power)  
*Salim Mahmud*, Member (Commissioner)  
*Mohammad Abu Faruque*, Director (Finance & Accounts); Deputy Secretary

### **Electricity Generation Company of Bangladesh**

*Md. Mostafa Kamal*, Managing Director  
*Santi Ram Roy*, Executive Director (Engineering)  
*Md. Siddiqur Rahman*, Project Director

### **Infrastructure Development Company Limited (IDCOL)**

*Mahmood Malik*, Executive Director and CEO  
*Md. Enamul Karim Pavel*, Head of Renewable Energy  
*Faiza Subaiha Bari*, Officer, Corporate Affairs

### **Consumer Association of Bangladesh**

*Shamsul Alam*, Energy Advisor

**Prokaushali Sangsad Limited** (Mini-grid operator)

*Asma Huque*, Managing Director

**Japan International Co-operation Agency (JICA), Bangladesh Office**

*Yushi Nagano*, Representative

*Ahmad Mukammeluddin*, Senior Program Manager

**World Bank Dhaka Office**

*Johannes Zutt*, Country Director

*Zahid Hussain*, Lead Economist

*Md. Iqbal*, Senior Energy Specialist

*Zubair Sadeque*, Senior Energy Specialist

*Mainul Huq*, Consultant

**World Bank Head Office**

*Raihan Elahi*, Senior Energy Specialist

# Annex D

**Table 1 Bangladesh Macroeconomic Indicators**

<i>Description</i>	<i>FY07</i>	<i>FY08</i>	<i>FY09</i>	<i>FY10</i>	<i>FY11</i>	<i>FY12</i>	<i>FY13 (P)</i>
<b>Growth Rates (%)</b>							
GDP Growth	6.4	6.2	5.7	6.1	6.7	6.2	6.0
GDP Growth Per Capita	5.3	5.2	4.7	5.0	5.6	5.0	4.8
Per Capita GDP (current US\$)	467	538	598	664	732	750	830
Per Capita GNI (current US\$)	502	585	652	726	799	823	913
Per Capita GNI Atlas Method (US\$)	516	574	627	703	782	843	901
<b>Inflation (%)</b>							
Rate of Inflation (CPI, %) (year on year)**	9.4	12.3	7.6	6.8	10.9	8.7	6.8
Inflation (GDP deflator)	6.8	8.8	6.6	6.4	7.4	8.5	6.6
<b>Saving &amp; Investment (% of GDP)</b>							
Gross Domestic Saving	20.4	20.3	20.1	20.1	19.3	19.3	19.3
Gross National Saving	25.8	25.7	26.7	27.7	25.9	27.5	29.0
Private Investment	19.0	19.3	19.7	19.4	19.5	20.0	19.0
Public Investment	5.4	5.0	4.7	5.0	5.6	6.5	7.9
<b>Central Govt. Budget (% of GDP)</b>							
Total Revenue	10.4	11.4	10.4	10.9	12.1	12.5	13.1
Total Expenditure	13.5	15.0	14.3	14.6	16.1	16.6	18.0
Overall Budget Deficit	3.1	3.6	3.9	3.7	4.0	4.1	4.9
Total Public Debt	46.8	46.8	45.4	42.9	44.2	42.8	41.2
<b>Balance of Payments (% of GDP)</b>							
Trade	40.3	42.3	40.1	37.6	47.9	49.6	46.6
Exports	17.6	17.7	17.4	16.2	20.5	20.9	20.8
Imports	22.7	24.7	22.7	21.4	27.4	28.7	25.8
Services & Income (net)	-3.2	-3.2	-3.5	-2.7	-3.8	-3.9	-4.2
Current Transfers	9.6	11.1	11.4	11.6	11.1	11.56	11.55
Current Account Balance (including transfers)	1.4	0.9	2.7	3.7	0.8	-0.4	1.9
<b>External Indicators</b>							
External Debt (US\$ b.)	19.6	21.0	23.0	22.4	25.4	25.8	26.0
Ext. Debt as % of GDP	28.7	26.4	25.7	22.3	22.7	22.2	20.0
BB Gross Reserves (US\$ b.) (end of period)	5.1	6.2	7.5	10.75	10.9	10.3	15.3
BB Gross Reserves (in months of imports)	3.4	3.4	3.7	5.4	3.9	3.3	4.6
<b>Money and Credit</b>							
M2 Growth (% , year-on-year)	17.1	17.6	19.2	22.4	21.3	17.4	16.7
Net Domestic Asset Growth (% , year-on-year)	12.6	18.1	17.8	19.1	25.0	18.5	11.8
Ratio of Private Sector Credit to GDP (%)	32.2	34.8	38.6	39.1	42.8	44.4	43.6
<b>Exchange Rate</b>							
Nominal Period Average (TK/US\$)	69.1	68.6	68.8	69.2	71.2	79.1	79.9
Nominal End of Period (TK/US\$)	68.8	68.5	69.0	69.5	74.2	81.8	77.8
Real Effective Exchange Rate Index (IMF)	96.5	95.8	105.5	108.3	108.9	105.2	111.6
<b>Memorandum Items</b>							
GDP at Current. Prices (Taka bill.)	4,725	5,458	6,148	6,943	7,967	9,181	10,380
GNI at Current. Prices (Taka bill.)	5,077	5,942	6,707	7,589	8,692	10,074	11,425
Population (mill.)*	146.5	148.0	149.5	151.1	152.9	154.7	156.6
Population growth Rate	1.1	1.0	1.0	1.1	1.1	1.2	1.2

\* Population data is from DECPG.

Source: Bangladesh Bureau of Statistics, Bangladesh Bank, Ministry of Finance, The World Bank and IMF

**Table 2 Summary of BPDB Finances 2007-13**  
**Compiled from Consolidated Financial Statements (Taka million)**

	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13
<b>Balance Sheet</b>						
Fixed assets less depreciation	188,453	186,606	187,203	232,145	257,790	263,396
Investment	17,546	19,927	33,570	13,965	15,880	17,533
Current Assets	83,986	92,141	91,458	109,059	124,183	154,165
of which: accounts receivable	53,088	58,279	60,124	55,299	77,870	90,690
<b>Total Property and Assets</b>	<b>289,985</b>	<b>298,673</b>	<b>312,231</b>	<b>355,169</b>	<b>398,033</b>	<b>435,095</b>
Paid up capital	90,808	92,965	96,469	118,131	135,906	142,836
Net surplus / (deficit)	(94,382)	(100,781)	(111,241)	(157,118)	(222,008)	(272,141)
Other reserves	123,065	123,238	123,451	125,246	130,623	138,014
<b>Total Shareholders' Equity</b>	<b>119,491</b>	<b>115,422</b>	<b>108,679</b>	<b>86,259</b>	<b>44,521</b>	<b>8,709</b>
Long term loans	65,505	73,085	80,324	133,805	206,317	251,640
Medium term liabilities	7,151	6,079	13,759	14,606	15,392	16,986
Current liabilities	93,471	100,521	109,445	120,400	131,793	157,758
Clearing accounts	4,367	3,567	24,075	99,653	10,441	1,062
<b>Total Capital &amp; Liabilities</b>	<b>289,985</b>	<b>298,673</b>	<b>312,231</b>	<b>355,169</b>	<b>398,033</b>	<b>435,095</b>
<b>Income Statement</b>						
Operating Revenue	55,943	63,633	71,158	81,606	120,007	168,827
Operating Expenses	62,510	70,151	75,122	121,294	176,213	206,769
<b>Operating Income</b>	<b>(6,567)</b>	<b>(6,519)</b>	<b>(3,964)</b>	<b>(39,686)</b>	<b>(56,206)</b>	<b>(37,942)</b>
Non-operating expenses	3,254	1,767	2,394	6,520	10,727	12,496
<b>Net income / (loss)</b>	<b>(9,821)</b>	<b>(8,286)</b>	<b>(6,358)</b>	<b>(46,206)</b>	<b>(66,933)</b>	<b>(50,438)</b>
Ave revenue (Tk/kWh)	2.36	2.56	2.68	2.85	3.70	4.90
Ave cost (Tk/kWh)	2.76	3.07	2.82	4.24	5.43	6.01
Ave operating income (Tk/kWh)	<b>(0.40)</b>	<b>(0.51)</b>	<b>(0.14)</b>	<b>(1.39)</b>	<b>(1.73)</b>	<b>(1.11)</b>
<b>Cash Flow Statement</b>						
Net cash flow from operating activities	(3,284)	(6,523)	(6,204)	(46,549)	(59,604)	Na
Net cash flow from investing activities	(8,687)	(7,913)	(13,637)	(31,753)	(36,331)	Na
Net cash flow from financing activities	14,221	17,834	16,904	77,558	95,831	Na
Cash opening balance	16,567	18,817	22,215	19,277	18,533	18,429
Cash closing balance	18,817	22,215	19,277	18,533	18,429	30,567
Change in cash position	2,250	3,398	(2,938)	(744)	(104)	12,138
<b>Select Performance Indicators</b>						
Return on net fixed assets (%)	(3.51)	(3.49)	(2.12)	(18.8)	(22.9)	(13.8)
Accounts receivable (months)	11.4	11.0	10.1	8.1	7.8	6.5
Debt as % of total capital	25%	26%	30%	42%	55%	61%
<b>Memorandum Items</b>						
Nominal Period Average (TK/US\$)	68.6	68.8	69.2	71.2	79.1	79.9
Total Energy supplied (GWh)	22,622	24,757	26,627	28,627	32,443	34,400
Purchased energy - liquid fuel rentals (GWh)	44	1,214	2,261	3,928	4,911	6,868
Purchase cost – liquid fuel rentals (Tk M)		6,979	9,638	50,764	83,696	137,360
Ave cost of liquid fuel rentals (Tk/kWh)		5.75	4.27	12.92	17.04	20.00
Budgetary support from Government (Tk M)		10,061	9,931	40,000	63,561	44,060