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PROJECT APPRAISAL DOCUMENT

ON A

PROPOSED CREDIT

IN THE AMOUNT OF SDR 102.8 MILLION  
(US\$155 MILLION EQUIVALENT)

TO THE

PEOPLE'S REPUBLIC OF BANGLADESH

FOR A

RURAL ELECTRIFICATION AND RENEWABLE ENERGY DEVELOPMENT II  
(RERED II) PROJECT

August 16, 2012

Sustainable Development Department  
Energy Unit  
South Asia Region

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## CURRENCY EQUIVALENTS

(Exchange Rate Effective July 31, 2012)

Currency Unit = Bangladeshi taka (BDT)

BDT 81.92 = US\$ 1

US\$ 1.50833 = SDR 1

FISCAL YEAR

July 1 – June 30

## ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank	LED	Light-Emitting Diode
BCCRF	Bangladesh Climate Change Resilient Fund	MPEMR	Ministry of Power, Energy and Mineral Resources
BDT	Bangladesh Taka	MW	Mega Watt
BERC	Bangladesh Energy Regulatory Commission	MPEMR	Ministry of Power, Energy and Mineral Resources
CAS	Country Assistance Strategy	NGO	Non-Government Organization
CDM	Clean Development Mechanism	PBS	Palli Bidyut Samities (rural electricity cooperatives)
CFL	Compact Fluorescent Lamp	PO	Participating Organizations
ESMF	Environment and Social Management Framework	PSDTA	Power Sector Development Technical Assistance
ELIB	Efficient Lighting Initiatives of Bangladesh	RAPSS	Remote Area Power Supply Systems
FMR	Financial Monitoring Report	REB	Rural Electrification Board
FY	Fiscal Year	RERED	Rural Electrification and Renewable Energy Development
GIZ	Gesellschaft für Internationale Zusammenarbeit	SGA	Subsidiary Grant Agreement
GDP	Gross Domestic Product	SHS	Solar Home Systems
GOB	Government of Bangladesh	SLA	Subsidiary Loan Agreement
ICS	Improved Cook Stoves	SREDA	Sustainable and Renewable Energy Development Authority
IDA	International Development Association	TA	Technical Assistance
IDB	Islamic Development Bank	USAID	US Agency for International Development
IDCOL	Infrastructure Development Company Limited	Wp	Watt Peak
KfW	Kreditanstalt für Wiederaufbau	WHO	World Health Organization
kWh	Kilo-Watt hour		

Regional Vice President:	Isabel M. Guerrero
Country Director:	Ellen A. Goldstein
Sector Director:	John Henry Stein
Sector Manager:	Jyoti Shukla
Task Team Leader:	Zubair K. M. Sadeque

**BANGLADESH**  
**Rural Electrification and Renewable Energy Development II (RERED II) Project**

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## PAD DATA SHEET

Bangladesh

Rural Electrification and Renewable Energy Development II (RERED II) Project (P131263)

### PROJECT APPRAISAL DOCUMENT

SOUTH ASIA

SASDE

Basic Information			
Date:	11-Jul-2012	Sectors:	Other Renewable Energy (78%), General energy sector (12%), Energy efficiency in power sector (10%)
Country Director:	Ellen A. Goldstein	Themes:	Rural services and infrastructure (78%), Other public sector governance (12%), Climate change (10%)
Sector Manager/Director:	Jyoti Shukla/John Henry Stein	EA Category:	B - Partial Assessment
Project ID:	P131263		
Lending Instrument:	Specific Investment Loan		
Team Leader(s):	Zubair K.M. Sadeque		
Joint IFC: No			
Borrower: People's Republic of Bangladesh			
Responsible Agency: Infrastructure Development Company Limited (IDCOL)			
Contact:	Mr. S. M. Formanul Islam	Title:	Director
Telephone No.:	9103881	Email:	fislam@idcol.org
Responsible Agency: Power Cell			
Contact:	Mr. Mahboob Sarwar-E-Kainat	Title:	Director General
Telephone No.:	955-6040	Email:	dg@powercell.gov.bd
Responsible Agency: Rural Electrification Board			
Contact:	Brig. General Moin Uddin	Title:	Chairman
Telephone No.:	7911334	Email:	chairman@reb.gov.bd
Project Implementation Period:	Start Date: 01-Jan-2013	End Date:	31-Dec-2018
Expected Effectiveness Date:	01-Jan-2013		
Expected Closing Date:	31-Dec-2018		
Project Financing Data(US\$M)			
<input type="checkbox"/> Loan	<input type="checkbox"/> Grant	<input type="checkbox"/> Other	
<input checked="" type="checkbox"/> Credit	<input type="checkbox"/> Guarantee		
<b>For Loans/Credits/Others</b>			
Total Project Cost (US\$M):	386.0		
Total Bank Financing (US\$M):	155.0		
Financing Source		Amount(US\$M)	
BORROWER/RECIPIENT		3.5	
International Development Association (IDA)		155.0	
US Agency for International Development (USAID)		7.6	

Bangladesh Climate Change Resilience Fund (BCCRF)	24.5
GERMANY KREDITANSTALT FUR WIEDERAUFBAU (KFW)	12.9
LOCAL BENEFICIARIES	53.4
Non-Government Organization (NGO) of Borrowing Country	90.2
IDCOL Own Financing	38.8
Total	386.0

### Expected Disbursements (in USD Million)

Fiscal Year	2013	2014	2015	2016	2017	2018	2019		
Annual	7.9	25.9	51.5	33.1	13.1	10.0	13.5		
Cumulative	7.9	33.8	85.3	118.4	131.5	141.5	155.0		

### Project Development Objective(s)

The proposed project development objectives are to increase access to clean energy in rural areas through renewable energy and promote more efficient energy consumption.

### Components

Component Name	Cost (USD Millions)
Access to Electricity	309.2
Household Energy	46.3
Energy Efficient Lighting	19.0
Sector Technical Assistance	6.5
Un-allocated	5.00

### Compliance

#### Policy

Does the project depart from the CAS in content or in other significant respects?	Yes [ ]	No [X]
Does the project require any waivers of Bank policies?	Yes [ ]	No [X]
Have these been approved by Bank management?	Yes [ ]	No [X]
Is approval for any policy waiver sought from the Board?	Yes [ ]	No [X]
Does the project meet the Regional criteria for readiness for implementation?	Yes [X]	No [ ]

#### Safeguard Policies Triggered by the Project

	Yes	No
Environmental Assessment OP/BP 4.01	X	
Natural Habitats OP/BP 4.04		X
Forests OP/BP 4.36		X
Pest Management OP 4.09		X
Physical Cultural Resources OP/BP 4.11		X
Indigenous Peoples OP/BP 4.10		X
Involuntary Resettlement OP/BP 4.12		X
Safety of Dams OP/BP 4.37		X
Projects on International Waterways OP/BP 7.50		X

Projects in Disputed Areas OP/BP 7.60			X
<b>Legal Covenants</b>			
<b>Name</b>	<b>Recurrent</b>	<b>Due Date</b>	<b>Frequency</b>
National guidelines on disposal and recycling of CFLs		Prior to distribution of CFLs under Part C.1 of the Project	
<b>Description of Covenant</b>			
The Recipient shall undertake all measures to ensure that national guidelines for the safe disposal and/or recycling of CFLs are adopted prior to the distribution of CFLs procured under Part C.1 of the Project			
<b>Name</b>	<b>Recurrent</b>	<b>Due Date</b>	<b>Frequency</b>
Project Management Unit for Part B of the Project		By three months after the Effective Date	
<b>Description of Covenant</b>			
IDCOL shall establish and maintain, throughout the period of Project Implementation, a Project Management Unit responsible for the implementation of Part B of the Project			
<b>Name</b>	<b>Recurrent</b>	<b>Due Date</b>	<b>Frequency</b>
Operating Guidelines, ESMF and GAAP	X		
<b>Description of Covenant</b>			
IDCOL shall ensure that Parts A, B and C.2 of the Project are carried out in accordance with the provisions of the Operating Guidelines, Environment and Social Management Framework (ESMF) and the Governance and Accountability Action Plan (GAAP)			
REB shall ensure that Part C.1 of the Project is carried out in accordance with the provisions of the Environment and Social Management Framework (ESMF) and the Governance and Accountability Action Plan (GAAP)			
<b>Conditions</b>			
<b>Name</b>			<b>Type</b>
Subsidiary loan agreement with IDCOL			Effectiveness
<b>Description of Condition</b>			
To facilitate the carrying out of Part A of the Project, the Recipient shall make part of the proceeds of the Credit available to IDCOL under a subsidiary loan agreement.			
<b>Name</b>			<b>Type</b>
Subsidiary grant agreement with IDCOL			Effectiveness
<b>Description of Condition</b>			
To facilitate the carrying out of Part B of the Project, the Recipient shall make part of the proceeds of the Credit available to IDCOL under a subsidiary grant agreement.			
<b>Name</b>			<b>Type</b>
Subsidiary grant agreement with REB			Effectiveness
<b>Description of Condition</b>			
To facilitate the carrying out of Part C.1 of the Project, the Recipient shall make part of the proceeds of the Credit available to REB under a subsidiary grant agreement.			
<b>Name</b>			<b>Type</b>
Settlement of outstanding audit observations of REB			Disbursement

<b>Description of Condition</b>			
No withdrawal shall be made under Category (4) until and unless REB has carried out measures, satisfactory to the Association, to remedy all of the outstanding material audit observations with respect to REB's financial statements for the RERED project.			
<b>Name</b>			<b>Type</b>
Appointment of Assistant Director (Accounts)			Disbursement
<b>Description of Condition</b>			
No withdrawal shall be made under Category (5) until and unless an Assistant Director (Accounts) with qualification and terms of reference satisfactory to the Association has been appointed by Power Cell			
<b>Team Composition</b>			
Bank Staff			
<b>Name</b>	<b>Title</b>	<b>Specialization</b>	<b>Unit</b>
Shakil Ahmed Ferdausi	Senior Environmental Specialist	Environmental Safeguards	SASDI
Junxue Chu	Senior Finance Officer	Disbursement	CTRLN
Koffi Ekouevi	Senior Economist	Technical Specialist	SEGEN
Md. Iqbal	Senior Energy Specialist	Technical Specialist	SASDE
Md. Abul Fayez Khan	Program Assistant	Program Assistant	SASDO
Zubair K.M. Sadeque	Financial Analyst	Team Lead	SASDE
Luis Alejandro Lara Lopez	Program Assistant	Program Assistant	SASDO
Burhanuddin Ahmed	Sr Financial Management Specialist	Financial Management	SARFM
Tanvir Hossain	Senior Procurement Specialist	Procurement	SARPS
Ashok Sarkar	Senior Energy Specialist	Technical Specialist	SEGEN
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Sabah Moyeen	Social Development Specialist	Social Safeguards	SASDS
Mohammad Anis	Energy Specialist	Energy Specialist	SASDE
Ishtiak Siddique	Procurement Specialist	Procurement	SARPS
Non Bank Staff			
<b>Name</b>	<b>Title</b>	<b>Office Phone</b>	<b>City</b>
Anil Cabraal	Renewable Energy Consultant	94-11-230-7665	Colombo
Shirin Jahangeer	Consultant, Gender Specialist	8159001	Dhaka
M. Khaliqzaman	Consultant, Household Energy	8159001	Dhaka
Iqbal Ahmed	Consultant, Environment	8159001	Dhaka

<b>Institutional Data</b>				
<b>Sector Board</b>				
Energy and Mining				
<b>Sectors / Climate Change</b>				
Sector (Maximum 5 and total % must equal 100)				
Major Sector	Sector	%	Adaptation	Mitigation Co-benefits



			Co-benefits %	%
Energy and mining	Other Renewable Energy	78		100%
Energy and mining	General energy sector	12		
Energy and mining	Energy efficiency in Heat and Power	10		
Total		100		
<b>Themes</b>				
Major theme	Theme			%
Rural development	Rural services and infrastructure			78
Public sector governance	Other public sector governance			12
Environment and natural resources management	Climate change			10
Total		100		
<b>Public Private Partnership</b>				
Private Capital Mobilization				
Yes				
<b>Gender Flag</b>				
<input checked="" type="checkbox"/> Analysis and/or consultation on gender related issues	<input checked="" type="checkbox"/> Specific actions to address the distinct needs of women and girls, or men and boys, or positive impacts on gender gaps	<input checked="" type="checkbox"/> Mechanisms to monitor gender impact to facilitate gender-disaggregated analysis		



## I. STRATEGIC CONTEXT

### A. Country Context

1. Bangladesh, with a population of about 150 million and a land area of 147,570 square kilometers, is amongst the most densely-populated countries in the world. The country is vulnerable to natural disasters and extremely sensitive to climate change impacts. Despite the challenges, Bangladesh has managed to graduate to a higher growth trajectory and maintain an average GDP growth rate above 6 percent in recent years. Poverty has also decreased in recent years, keeping Bangladesh on track to meet the Millennium Development Goal of halving extreme poverty by 2015. Total export of the country increased at a rate of about 14 percent since 2005. However, the infrastructure deficits in a number of areas but especially in energy are emerging as the main threats to maintain its growth in exports and GDP. In the latest Investment Climate Assessment (ICA), the highest number of firms (78%) expressed their concern about the lack of adequate power.

2. A large segment of the population of Bangladesh has little or no access to electricity or to clean energy sources. Access to electricity in Bangladesh is about 55% and in the rural areas, the access rate is only 43% with about 13 million rural households yet to be electrified.<sup>1</sup> The per capita electricity consumption of about 236 kWh per year is one of the lowest in the world.

3. Out of the total 30 million households in Bangladesh, about 90% use traditional biomass fuels such as fuelwood, dung, and agricultural residues for cooking in low-efficiency stoves (5 to 15 percent fuel efficiency). The incomplete combustions of these fuels in inefficient stoves produce smoke composed of large amount of particulate matter and gaseous pollutants. Indoor air pollution resulting from this smoke is linked with many illnesses including childhood pneumonia and chronic obstructive pulmonary disease representing a significant health hazard. Daily exposure to particulate matter for most Bangladeshis exceeds  $200\mu\text{g}/\text{m}^3$ , well above the daily standard of  $25\mu\text{g}/\text{m}^3$  established by the World Health Organization (WHO). The health impact is particularly acute for women and children who are the most exposed groups to indoor air pollution. According to WHO estimates, about 32,000 children below the age of 5 years and 14,000 adults die every year from pulmonary diseases caused by indoor air pollution in Bangladesh.

### B. Sector and Institutional Context

4. The energy sector of Bangladesh is facing many challenges, which include, among others: acute shortage of electricity supply to meet demand; heavy reliance on natural gas for power generation, which itself is in short supply; inadequate investments in power generation and natural gas exploration and production; inadequate tariff to cover costs; weak governance and inadequate autonomy of the corporatized public sector entities; limited human resources capability; and inadequate capacity of the regulator. The peak electricity demand in the country is about 7,000 MW and the available generation capacity is about 5,300 to 6,400 MW, resulting in supply disruptions to those having access to electricity. The rural areas connected to the grid face a disproportionate share of load-shedding. The average system losses of the distribution

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<sup>1</sup> Source: Household Income Expenditure Survey 2010.

utilities are below 13%. Natural gas is the primary fuel for more than 80% of power generation, which itself is in short supply. Renewable energy currently constitutes less than 1% of total power generation in the country.

5. Recognizing the challenges, the Government of Bangladesh (GOB) 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, exploiting alternative energy resources to diversify the fuel mix, looking actively for power import from neighboring countries, and improving sector governance and efficiency. The GOB articulated a Vision 2021, which includes the objectives of: 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.

6. The Renewable Energy Policy (2008) of GOB laid out the target of meeting 5% of total power demand from renewable energy sources by 2015 and 10% by 2020. The Remote Area Power Supply Systems (RAPSS) guideline of 2007 allows for private sector participation in development, operation, and maintenance of electricity generation system and distribution networks in remote rural areas including isolated islands to supplement GOB efforts at achieving universal access by 2020. However, there has not been much progress in implementing the RAPSS schemes. GOB has prepared the legislation to establish a Sustainable and Renewable Energy Development Authority (SREDA) as an autonomous body to lead its efforts in promoting renewable energy and energy efficiency in the country. The Cabinet has approved the legislation and this will be placed in the Parliament for approval.

7. To address the generation shortages, GOB has embarked upon an ambitious generation expansion plan that envisages adding more than 11,500 MW to the national grid by the year 2015. As part of that plan, a number of large power plants have recently been awarded to the private sector. As an interim measure, GOB has contracted about 2,300 MW of plants run on liquid fuel for 3-5 year terms. These short-term plants running on expensive liquid fuel, however, are aggravating the deteriorating financial position of the power sector. To cope with the increased costs of the short-term plants, the Bangladesh Energy Regulatory Commission (BERC) increased the bulk supply tariff by 70% and the retail tariff by about 35% in phases since February 2011 in response to the tariff adjustment requests by the utilities. Even with these adjustments, tariff remains below full cost-recovery. GOB subsidy to the sector stood at BDT63 billion (US\$800 million) in FY12 up from BDT40 billion (US\$550 million) in FY11. This was in addition to the subsidy to the petroleum sector to the tune of BDT90 billion (US\$1.15 billion) in FY12, up from BDT40 billion (US\$550 Million) in FY11.<sup>2</sup> These are clearly unsustainable.<sup>3</sup> In the long run, GOB expects the cost of power generation to come down gradually once the large power plants start to come into operation replacing the costly liquid fuel plants. GOB plans to reduce the budget support requirements to a more sustainable level by FY15 with gradual adjustments in tariff.

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<sup>2</sup> GOB subsidy in petroleum increased by more than double due to a combination of high fuel prices in the international market as well as a sharp increase in petroleum imports due to increased demand from short-term power plants.

<sup>3</sup> In its efforts to reduce the need for subsidy, during the last quarter of FY12, GOB had to resort to restricting generation from the short term plants to the evening hours only when demand is at its peak.

8. Despite all the short and long-term efforts at increasing power generation and demand side management, it will take years to fully close the demand-supply gap. Consequently, it will not be possible to achieve the government vision of universal access by 2021 relying only on the grid. Furthermore, the dispersed nature of rural settlements and the numerous rivers that crisscross the country make grid electrification in many areas difficult and expensive. Off-grid renewable energy is the only near-to-medium-term option left for millions of people in the remote areas of the country.

9. The Solar Home Systems (SHS) program of Bangladesh, supported principally by the Bank with other development partners, has emerged as a viable electrification option for lighting and other basic services in areas without grid access. The SHS program started in 2003 with a target to install 50,000 SHS over the 5-year project period under the on-going Rural Electrification and Renewable Energy Development (RERED) project. The program has far exceeded its goals. It is currently installing over 50,000 systems per month making it one of the fastest growing SHS programs in the world. The SHS program is implemented by the Infrastructure Development Company Limited (IDCOL), a government owned infrastructure finance company. The program is a successful public-private partnership model where the Partner Organizations (POs) (mostly Non-government Organizations) procure and install the systems as per technical standards set by IDCOL. Consumers sign SHS purchase contracts under a micro-finance scheme with the POs. After the systems are installed, the POs apply for re-financing from IDCOL for a portion of the microfinance they extended to the households. After technical and other verifications, IDCOL releases the credit and a fixed subsidy (currently \$28 per system) to the POs. This refinancing provides the POs with funds to install more systems and reach even more remote areas.

10. Together with support from the Bank and other development partners, the program is expected to reach about 2 million SHS by end 2012 in rural off-grid areas, contributing to increasing access to electricity by 6%. Thanks to the SHS, women are spending productive time after dark (sewing, knitting etc) and students including girls are spending more time studying. The TVs run by SHS contribute to women education and empowerment<sup>4</sup>. Grameen Shakti and a number of other POs are providing training to village women for assembling some SHS components who are then becoming entrepreneurs running their own technology centers, assembling and providing maintenance services. Continuing with the successful installation of the SHS, IDCOL has set a target to reach another 4 million SHS by the year 2016, requiring support from the Bank and other development partners<sup>5</sup>.

11. In addition to the SHS, GOB is also exploring other renewable energy options for providing access to electricity in rural areas. There are pockets of off-grid areas and remote islands in Bangladesh where population concentrations are such that renewable energy based

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<sup>4</sup> A 2009 survey by the German International Cooperation (GIZ) that included 260 SHS related interviews in northwest Bangladesh found improved lighting and study conditions, improved access to information and communications, increased savings, and improved safety as the main benefits of SHS. It also noted a high degree of satisfaction among the SHS consumers (more than two-third of the respondents were satisfied with the services) while 80% of non-users stated they would like to buy an SHS. A more rigorous impact evaluation study is currently on-going under the RERED project.

<sup>5</sup> The target of 4 million households is based on SHS being affordable to top 40% of income earning households. With smaller lower cost SHS available, the program is reaching poorer households, which was not possible earlier.

mini-grid is the least-cost option for providing access to electricity. Providing grid-quality electricity from renewable energy sources in these areas will serve the commercial needs of the rural markets and small enterprises, where the potential consumption of electricity is much higher than the basic lighting and electricity needs of a typical rural household that could otherwise be met by SHS. The on-going Bank support has piloted three renewable energy-based mini-grid schemes for providing access to electricity in selected off-grid remote areas. Taking lessons learned from these pilots, GOB plans to scale-up these types of schemes under the scope of the RAPSS guidelines. Private operators, selected by IDCOL, would be investing in and generating power from the least-cost technology options (solar photovoltaic, biomass gasifier etc) for providing grid quality electricity in the selected locations on a fee-for-service basis. IDCOL will be managing a RAPSS fund to provide for a mix of credit and grant financing to keep the tariff affordable to the consumers, in addition to equity contribution by the private operators. In September 2011, the Government issued a concept note for supporting private sector investment in 1,000 mini-grid schemes by 2015, requiring 25 MW of renewable energy capacity.

12. Cooking by rural households is predominantly done in traditional stoves using traditional biomass fuels, the smoke of which is particularly harmful to women and children. The transition to modern, clean cooking fuels like natural gas, liquefied petroleum gas (LPG), and to some extent electricity, will take a long time, as access to these fuels are limited, and the appliances to use them are not affordable to the poor. Transitory clean cooking options for households include improved cook stoves (ICS), advanced combustion stoves, and biogas. An ICS with a well maintained chimney could (i) help save up to 50 percent of the traditional biomass fuels used by improving fuel combustion, and (ii) provide moderate reduction in health damaging pollutants by directing smoke through the chimney out of the kitchen. An advanced combustion stove can provide significantly higher fuel efficiency and reduce emissions. Similarly, biogas can provide clean cooking benefits in addition to household lighting and produce a valuable byproduct in the form of biogas-slurry for fertilizer. For both advanced combustion stoves and biogas, affordability is an important issue preventing a large scale introduction. The large scale dissemination of clean cooking solutions has the potential to yield co-benefits in terms of reduced fuel collection time, improved household health, local environmental quality, and regional climate.

13. Despite efforts by various organizations to introduce clean cooking solutions since the 1980s, in terms of coverage, only about 2 percent of households relying on traditional biomass fuels have access to ICS today. The main barriers for a scaling up of clean cooking solutions in the country are: (i) absence of wide-spread awareness campaigns ; (ii) limited funding to support scale-up activities; (iii) absence of a sustainable funding mechanism; and (iv) cost-revenue shortfall preventing the development of commercial enterprises to promote clean cooking solutions. There is an overall lack of leadership, oversight, coordination, and monitoring of household energy access activities in the country. This is preventing cross-fertilization of best practices. A recent USAID report identified the following seven areas for potential interventions on clean cooking solutions in Bangladesh: (i) market intelligence to remove market barriers; (ii) consumer education; (iii) technical standards, testing and certification; (iv) product development; (v) policy and regulation; (vi) business development support; and (vii) access to finance. The recent mobilization on clean stoves and fuels through the Global Alliance for Clean Cookstoves

(GACC) and the United Nations Sustainable Energy for All Initiative offers a unique opportunity that Bangladesh should explore to scale up the provision of clean cooking solutions to households.

14. As part of its efforts to reduce the existing demand-supply gap, GOB has embarked upon the Efficient Lighting Initiatives of Bangladesh (ELIB) program with Bank support to replace incandescent lamps with energy-efficient Compact Fluorescent Lamps (CFLs). The first-phase distribution of 10 million CFLs has been completed, though there have been quality issues with high levels of early lamp failure rates. The Rural Electrification Board (REB)<sup>6</sup> procured the CFLs while the distribution utilities and the rural cooperatives (Palli Bidhyut Samities or PBSs)<sup>7</sup> distributed the CFLs to the households in exchange for incandescent lamps. The second-phase distribution of about 7 million CFLs is being planned, including actions to overcome the quality issues. The ELIB program is registered under the Clean Development Mechanism (CDM) for claiming carbon credits with IDCOL as the Coordination and Managing Entity (CME).

15. To implement the power sector reform activities, Power Cell was established in 1996 as a technical arm of the Power Division of the Ministry of Power, Energy and Mineral Resources (MPEMR). It provides technical assistance for policy formulation, design and implementation of power sector reform activities, implementation support to sector agencies, and capacity building activities of the sector. In support of this service, the Power Cell has been receiving technical assistance funding through the ongoing Bank-supported Power Sector Development Technical Assistance (PSDTA) project, which is scheduled to close in December 2012. Implementation of the power sector reform activities need continued financial support beyond PSDTA closing.

### **C. Higher Level Objectives to which the Project Contributes**

16. The RERED II project is an important contributor to the GOB's vision of universal access to electricity by the year 2021. Recognizing that the vision cannot be achieved relying on grid electricity alone, GOB has been putting emphasis on renewable energy based off-grid options for providing access to electricity. The Project would also support the Renewable Energy Policy of the GOB by increasing the share of renewable energy in power generation.

17. The Project builds on the achievements of the RERED project, which has delivered gender responsive results by supporting the provision of energy services to facilitate social and productive activities undertaken by men and women in rural areas of Bangladesh. The RERED II Project would support the provision of renewable energy based electricity services and clean cooking solutions using social mobilization approaches of the NGOs and marketing techniques of the private sector. By leveraging the capacities of NGOs and the private sector, the Project would contribute to strengthening the on-going development of a commercial market for SHS, other renewable energy technologies, and clean cooking solutions, thus contributing to job creation in green technologies.

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<sup>6</sup> REB is the apex body responsible for planning, financing, and installation of the rural grid electrification network of the country.

<sup>7</sup> After constructing the rural distribution lines, REB transfers them to the rural cooperatives (PBSs), which are then responsible for retail service provision as well as the operation and maintenance of the rural grid network.

18. The Project is consistent with the Country Assistance Strategy (CAS) for FY11-14; it would make a positive contribution to human services through increased access to electricity in hard-to-reach areas and to Bangladesh's climate change agenda through the expanded use of renewable energy. Specifically, the proposed Project would contribute to achievement of outcome 1.3 under CAS Pillar 1 (increased infrastructure provision, access and efficiency) and outcome 2.3 under CAS Pillar 2 (reduced environmental degradation and strengthened natural resources management). In keeping with increased vigilance against fraud and corruption risks, the Project incorporates social accountability tools including third party monitoring, and aims at increased transparency through access-to-information and information technology based solutions.

## **II. PROJECT DEVELOPMENT OBJECTIVES**

### **A. PDO**

19. The project development objectives are to increase access to clean energy in rural areas through renewable energy and promote more efficient energy consumption.

### **B. Project Beneficiaries**

20. The Project is expected to reach electricity to 2.5 million people (half of which is women) living in the rural areas of Bangladesh where grid electricity has not reached or is not expected in years to come. Access to electricity has numerous economic and welfare benefits especially to women and children who spend greater proportion of time at home. The Project is expected to provide clean cooking solutions for over 1 million households. Access to clean cooking options especially benefits women and children by improving conditions under which meals are prepared, reducing respiratory diseases, reducing time spent on cooking, and saving money. Finally, by supporting a more effective energy-efficient CFL dissemination, the Project would, to some extent, help to make more electricity available for people in the rural areas who bear a disproportionate share of load-shedding.

### **C. PDO Level Results Indicators**

21. The following outcome indicators are proposed. The indicators marked (\*) are core sector indicators. The results framework is in Annex 1.

- Number of households, farmers, and businesses having access to clean energy services
- Generation capacity of renewable energy (other than hydropower) constructed (MW) (\*)
- Efficient energy consumption through introduction of energy efficient lighting (MW saved per year)
- Number of direct beneficiaries including female beneficiaries. (\*)



### III. PROJECT DESCRIPTION

#### A. Project Components

22. In support of GOB's vision of providing universal access to electricity by the year 2021, the Project would support the provision of renewable energy based electricity services using the capabilities of NGOs and the private sector. The Project would also provide support for increasing access to clean fuels and modern cooking methods. It will help reduce peak electricity demand by supporting an energy-efficient lighting program through dissemination of CFLs. Finally, the Project would provide technical assistance support for policy development and capacity building in the power sector in general, and renewable energy in particular. The components to be supported under the Project are described below. A more detailed description is in Annex 2.

#### **Component A: Access to Electricity (total US\$309.2 million, IDA US\$116 million)**

23. The component would support the Solar Home Systems (SHS) and other renewable energy options for increasing access to electricity. The component would also include technical assistance support to IDCOL for capacity building, inspection and monitoring, impact evaluation, training, and other related activities for ensuring effective implementation.

24. ***Sub-Component A.1 Solar Home Systems (SHS) (total US\$199.8 million, IDA US\$99.45 million)***: The Project would further scale up support to the successful SHS program of Bangladesh for providing access to electricity to households and shops in rural areas where grid electricity will not reach in the short to medium term. The target is to support 550,000 systems following the same implementation arrangement of the RERED project. Customers are expected to provide 10%-15% of the SHS prices as down payment. IDA funds (and IDCOL own funds) will refinance 60%-70% of the micro-finance extended by the POs to the households.

25. The funding requirement is based on the current market prices and a grant support of US\$20 for each of the smaller systems installed. The prices for solar panels and batteries (the two major cost components of SHS) are quite dynamic. While the prices for solar panels have fallen significantly in the international market in recent times, battery prices have risen sharply. Consequently, prices of SHS in the local market have remained relatively stable since 2006 (in current BDT per Watt peak). In the event that prices of batteries go down, resulting in a reduction in the end-user price for the SHS, this would allow IDCOL to support more systems with the available funding. The estimated costs are also based on the demand patterns of 2010-11 where about a quarter of the systems sold were of small size of 20Wp and less, about half of the systems in 40-50Wp range and the rest above 50 Wp. The funding requirements will change depending on the demand pattern – smaller systems will require less credit draw-down while larger systems will require more funds.

26. A grant of US\$20 per SHS is available only for 30 Wp and smaller SHS to increase their affordability as these are purchased by the poorest households.<sup>8</sup> USAID has expressed interest

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<sup>8</sup> The program started in 2003 with US\$90 per system of grant support, which was the difference in life-cycle costs of SHS and the kerosene lanterns that the SHS replaced. The grant support has since been gradually declined to US\$ 28 per system in 2012

to contribute US\$2.5 million for meeting the grant and technical assistance needs for the SHS program. The SHS program is at final stage of registration as a CDM project, and once registered, an existing Bank carbon fund (and a proposed new fund) is expected to purchase emission reductions from the program.

27. ***Sub-Component A.2 Remote Area Power Supply Systems (RAPSS) (total US\$109.4 million, IDA US\$16.55 million)***: The Project would support mini-grid schemes under the RAPSS guidelines to meet the electricity needs of rural household, enterprises, and businesses that could not otherwise be met with SHS. The implementation activities, including selecting the sponsors for establishing, operating, and maintaining the mini-grids, would be undertaken by IDCOL. Sponsor equity will be a minimum of 20% with IDCOL providing the balance (including credit and a capital buy-down grant to keep the end-user tariff affordable) for the mini-grid schemes. The least cost technology options (solar PV, biomass gasification etc.) will be used depending on the resource availability in the specific locations of the mini-grids, building on the lessons learned from the pilots under the on-going RERED project. The component would also support biogas based captive plants to supply electricity in rural areas. Depending on the demand and viability of the sub-projects, the component can support financing other applications such as solar cooling and drying or advanced hybrid brick kilns.

28. The component will also support solar irrigation pumps that would replace diesel-operated pumps thus contributing to increased access to clean energy by farmers. Similar to the mini-grid schemes, private sponsors would identify locations and reach agreements with groups of farmers on the selling rate for water and on the duration and quantity of water supply. Sponsors will be putting in equity of at least 20%, while the rest of the project cost will be financed through a combination of credit and grant to keep the tariff affordable to farmers. IDCOL will do site specific due diligence before approving the sub-projects. Carbon finance opportunities will be designed to overcome existing barriers, scale up support, and sustainability of these activities.

29. IDCOL market assessments and sponsor inquiries indicate that IDCOL could finance 42 solar mini-grids, 1,500 solar irrigation pumps, 450 biogas-based captive plants, and 28 biomass-based captive plants during the Project period<sup>9</sup>. This would require an estimated US\$45 million in credit support, US\$41 million in capital buy-down grant, and US\$1.9 million in technical assistance, in addition to sponsors' equity of US\$21.5 million. The credit finance requirements will be met from IDA and IDCOL own funds. The capital buy-down grant and technical assistance requirements will be met from USAID (US\$5 million) and the Bangladesh Climate Change Resilience Fund (BCCRF) (US\$24.5 million)<sup>10</sup> - both channeled through the Bank - and from KfW (US\$12.9 million).

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(average USD 0.60/Wp compared to USD 2-5/Wp in other countries). From 2013, grant support will drop to USD 20 per system for smaller systems (30 Wp and less) with no grant for larger systems. An impact evaluation study is currently on-going that would assess, among others, the level of grant support necessary to make the systems affordable to poorer households.

<sup>9</sup> IDCOL is currently doing due diligence on a number of mini-grid proposals, and the outcome of these will make clearer the final composition of renewable technologies to be supported under the Project.

<sup>10</sup> Funding commitment of US\$24.5 million has been received from the BCCRF. US\$23 million is expected for capital buy-down grant for the irrigation schemes, while US\$1.5 million is expected for technical assistance including feasibility studies, site-specific due diligence, inspection and monitoring, and impact assessment etc for the irrigation schemes.

### **Component B. Household Energy (total US\$46.3 million, IDA US\$12 million)**

30. The proposed household energy component supports the efforts of various NGOs in providing rural households with clean cooking solutions. The activities supported would include: (i) awareness raising through social mobilization to ensure potential users are aware of the fuel saving and health benefits associated with clean cooking; (ii) research and development to enhance product quality, performance, safety and durability; (iii) setting up of performance standards, labeling system and testing facilities; (iv) support to selected POs to generate demand and to facilitate enterprise creation so that households are motivated to buy ICS or advanced combustion stoves; and (v) and capital buy-down grants for biogas plants for cooking. The target is to support commercial dissemination of about 1 million ICS and 20,000 biogas units within the implementation period of the Project. Implemented by IDCOL, the component will build on the success of Bangladeshi NGOs in the areas of community outreach in total sanitation programs. It will also build on the earlier work undertaken by local institutions in the areas of stove design and reduction of emission of toxic pollutants from incomplete combustion of wood fuels. To avoid duplication of efforts, the implementation of this component will be in close collaboration with on-going activities in the sector by NGOs, GIZ, USAID and upcoming activities that will be undertaken through the Global Alliance of Clean Cookstoves. With IDA supported activities creating demand and facilitating supply chain development, households are expected to buy the ICS from the market for cash. The biogas plants are expected to be installed by the POs on cash payments by households (net of capital buy-down grants).

### **Component C. Energy Efficient Lighting (total US\$19 million, IDA US\$17 million)**

31. This component will support the distribution of 7.25 million CFLs in predominantly rural areas where these energy efficient CFLs are not yet widely used. Under the ELIB program supported by the RERED project, about 10 million CFLs were distributed by various utilities to households in exchange for incandescent lamps in 2010. However, post-installation surveys within a few months of installations have indicated alarming levels (33%) of lamp failures. REB, the implementing agency, has claimed replacement of the poor quality bulbs from the supplier. The second-phase procurement of 17.5 million CFLs was initiated in late 2010 under the RERED project (before the post-installation survey results of the first phase was available), but due to various issues (including issues related to submission of fraudulent performance guarantees by the winning bidder) the procurement could not be completed.

32. GOB has expressed its strong commitment to continue with the second phase and intends to initiate a re-bidding, taking into account lessons learned from the poor quality in the first phase and the aborted second-phase procurement. REB will revise the bidding documents with the help of an international technical consultant to strengthen the clauses for quality assurances. Recognizing that many in the urban households have already switched to CFLs, the second phase distribution will be restricted mostly to rural areas where people cannot afford to pay for the high costs of CFLs. IDA funding of US\$17 million would cover the costs of CFL procurement including pre-award inspections, pre-shipment inspections and testing, post-shipment testing; costs of distribution including training for proper distribution and documentation to comply with

CDM requirements; customer awareness; impact evaluation etc. Funds from GOB and the utilities are expected to cover the costs of sockets<sup>11</sup> as well as the costs of PMU within REB.

#### **Component D. Sector Technical Assistance (total US\$6.5 million, IDA US\$5 million)**

33. The Project would provide continued technical assistance support to Power Cell beyond December 2012 when the on-going PSDTA project will close. This would include, among others, support for implementation of power sector reform, feasibility studies and environment and social impact assessments for various power sector projects in the pipeline, and capacity building of sector institutions. This would also include support for establishment and operationalizing SREDA through the provision of office equipment and furniture, consultant services, and training; and capacity building support for BERC. Finally, this would support developing national guidelines for safe disposal/recycling of CFLs and capacity building for ensuring safe disposal of CFLs financed under the Project.

### **B. Project Financing**

#### **1. Lending Instrument**

34. The Project is proposed as a Specific Investment loan (SIL) to the GOB at standard IDA terms. IDA funds for sub-loans for access to electricity component will be made available to the financial intermediary IDCOL under a Subsidiary Loan Agreement (SLA) with the Finance Division of the Ministry of Finance. Funds for the household energy component and technical assistance support for access to electricity component will be made available to IDCOL under a Subsidiary Grant Agreement (SGA) with the Finance Division. Funds for the energy-efficient lighting component will be made available to REB under an SGA with the Finance Division. No SLA will be required for Power Cell to receive project funds as it is a part of the Power Division of the MPEMR.

#### **2. Project Cost and Financing**

35. The total estimated cost of the project is US\$386 million out of which IDA financing proposed is US\$155 million (40%). For the SHS sub-component, IDA financing would leverage household down payments (US\$19 million), POs' share of the micro-credit (US\$69 million), and IDCOL own financing (US\$10 million). For the RAPSS sub-component, sponsors are expected to provide US\$22 million as equity while the rest would be provided by IDA and other donors (USAID, BCCRF, and KfW) in addition to IDCOL's own funds. For the household energy component, IDA financing of US\$12 million will support demand creation, supply chain development through the POs, and capital buy-down grants for the biogas plants, while households are expected to purchase the ICS and biogas for cash (net of grants) (US\$34 million). The estimated cost of the energy efficient lighting component is US\$19 million, of which IDA financing proposed is US\$17 million. The TA to Power Cell is estimated to cost US\$6.5 million, out of which IDA financing proposed is US\$5 million. A detailed cost table is in Annex 2.

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<sup>11</sup> The CFLs are planned to be screw-types that are better option than the pin-types that households typically use, requiring replacement of the sockets along with the incandescent lamps.

Project Components	Project cost	IDA	% IDA	USAID	BCCRF	KfW	GOB, Households, POs/ Sponsors	IDCOL Own financing
<b>A. Access to Electricity</b>	<b>309.2</b>	<b>116.0</b>	<b>38%</b>	<b>7.565</b>	<b>24.5</b>	<b>12.9</b>	<b>109.4</b>	<b>38.8</b>
A1. Solar Home Systems (SHS)	199.8	99.45	50%	2.5			87.9	9.9
A2. Remote Area Power Supply Systems (RAPSS)	109.4	16.55	15%	5.065	24.5	12.9	21.5	28.9
<b>B. Household Energy</b>	<b>46.3</b>	<b>12.0</b>	<b>26%</b>				<b>34.3</b>	<b>0.0</b>
<b>C. Energy Efficient Lighting</b>	<b>19.0</b>	<b>17.0</b>	<b>89%</b>				<b>2.0</b>	<b>0.0</b>
<b>D. Sector Technical Assistance</b>	<b>6.5</b>	<b>5.0</b>	<b>77%</b>				<b>1.5</b>	<b>0.0</b>
<b>Total Baseline Costs</b>	381.0	150	39%	7.565	24.5	12.9	147.2	38.8
Contingencies	5.0	5.0						
Total	386.0	155.0	40%	7.565	24.5	12.9	147.2	38.8

### C. Lessons Learned and Reflected in the Project Design

36. The single largest activity of the Project is the SHS sub-component. It builds on the success of the SHS component of the RERED project, which is considered the best practice. Success of the SHS program could be attributed to a number of factors: (i) a sense of ownership by consumers resulting in proper system care; (ii) access to financing and availability of grant assistance to increase affordability and to ensure that POs have adequate capital for investing in and operating the service infrastructure; (iii) customer training imparted by the POs enabling the customers to carry out regular, simple maintenance work themselves; (iv) social acceptability of the POs at the community level and the existence of a micro-credit culture in rural Bangladesh resulting in customer readiness to try the systems; (v) institutional set-up of the POs enabling them to reach remote customers in a cost-effective and efficient manner; (vi) setting technical standards and enforcing the standards through strong supervision and monitoring by IDCOL; (vii) risk sharing between IDCOL and the POs, proper customer selection, and attention by both IDCOL and the POs to collection efficiencies (the POs achieved an average collection efficiency of 94% and are servicing their debts owed to IDCOL on a timely basis); (viii) ability to achieve low costs - SHS costs including a five year warranty for batteries and three years of maintenance is US\$6-7/Wp (net of subsidy of US\$28 per system); and (ix) large customer base in relatively densely populated areas.

37. The Project also builds on the following key lessons from other Bank-financed SHS projects<sup>12</sup>:

- Product quality at entry must be complemented with quality assurance and enforcement. Technical standards established under the RERED project must be upgraded to reflect latest technological developments, including use of efficient light-emitting diode (LED) lamps. A testing lab is being established with support from the

<sup>12</sup> With Bank-financed SHS projects in about 30 countries, the Bank is the largest financier of SHS among the multilaterals and has considerable experience in this sector.

ongoing RERED project that will be used to monitor quality at entry and to undertake random testing to assure quality is maintained.

- Keeping the end-goal of fully commercial SHS sales; retain flexibility by how much and how fast grant support is reduced and when reduction takes place. Too quick and too deep a cut in grant assistance could compromise the ability of the POs to provide effective services and may reduce quality. It can also lead to consumer dissatisfaction as they may purchase smaller systems than desired, and the consumers may become unhappy with the level of service provided.
- Presently, the principal SHS customers are the less poor with only about a fifth below the poverty line<sup>13</sup>. As the market in a particular area becomes saturated, more dispersed and poorer consumers would need to be reached. While making lower cost SHS affordable to poorer households is inherently valuable, it also makes business sense. Deepening markets enables service centers to have sufficient critical mass of business. Market deepening to reach poorer consumers requires offering smaller and lower-cost systems, including solar LED lamps that poorer consumers can purchase without compromising quality. The proposed project will make such products eligible to receive assistance.
- An alternate approach to increasing affordability is to use a fee-for-service approach. In Peru, the distribution utilities receive a full cost-recovery tariff, comprised of a retail tariff paid by the customer and a subsidy from the national cross-subsidy fund. Prior experience in Bangladesh in a fee-for-service approach was not successful. REB was tasked with the fee-for-service approach under the RERED project, which was later discontinued. The fee-for-service approach will be used in the RAPSS component but not in the SHS.
- As customers become more dispersed, more efficient installation methods, such as using plug-and-play units, and lower cost fees/loan collection methods, such as using mobile phone payments, should be adopted. Otherwise, higher overhead costs will make products too expensive for consumers. The options for introducing IT-based solutions for increasing cost effectiveness in service delivery will be explored in the Project.
- Monitoring and evaluation and obtaining user feedback is essential. Currently, minimal monitoring and evaluation (M&E) is undertaken, only to confirm that product and installation meet standards and that the customers are trained. A third-party monitoring is being introduced under the RERED project that would be continued under the proposed project. The on-going impact evaluation study will provide recommendations for baseline M&E indicators, which will be incorporated in the Project.
- Donor funds for either grants or credit is insufficient to meet the government goals for off-grid electrification. Commercial sources of financing must be mobilized. A study is being initiated under the RERED project to find ways to leverage additional financing from commercial sources.

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<sup>13</sup> The 2009 survey of GTZ found that while there were considerable number of poorer people who purchased an SHS, only 23% could be classified as “poor” when applying the regional poverty line. SHS-owning households had a higher per capita incomes (BDT 2,400 per month) than the national average of BDT 1,485. In the northwest Rajshahi division, 48% live below the upper poverty line and 31% below the lower poverty line, compared to 23% of the SHS users in the sample who are living below the upper poverty line and 16% below the lower poverty line.

38. **Lessons from RAPSS program.** Some of the above lessons, in principle, also apply to the RAPSS investments with respect to meeting customers' expectations in quality and reliability of service, providing affordable service, responding to customer concerns, judicious and targeted use of grants to increase affordability, and working with credible partners who have effective management and financial discipline. Several additional lessons apply. As a mini-grid has constrained electricity supply (limited by renewable energy generator capacity, if expensive diesel back up is not used), ensuring fair allocation of electricity among users and using electricity efficiently are essential. Careful assessment of willingness to pay is important for the project to be financially viable. Irrespective of what customers were paying for electricity in the past, they will compare their service and cost of service to that available in the nearby grid customers. There must be reasonable certainty that in the near to medium term the grid will not reach the community or that the sponsor will be compensated for the stranded assets. If the grid does arrive, many customers will opt for grid service as the tariff would be much lower (even if reliability would be low), with a drastic reduction in revenue for the mini-grid sponsors.

39. **Lessons learned in the household energy program:** Bank experience of implementing household energy programs worldwide provides for the following lessons learned: i) a holistic approach to household energy issues is necessary; ii) public awareness campaigns are prerequisites for successful interventions; iii) local participation is fundamental; iv) consumer fuel subsidies often times do not reach those who deserve it most; v) both a market-based approach and public support are essential for commercialization of ICS; vi) the needs and preferences of stove users should be given priority; vii) durability of ICS is important to successfully expand their distribution; and viii) the poorest segment of the population might need microfinance to afford an ICS.

40. In the particular case of Bangladesh, lessons learned include: (i) engaging the local government, community leaders and health volunteers is beneficial for effective awareness raising, increased coordination and successful implementation; (ii) locally appropriate awareness-raising approaches for programs are crucial for uptake of household energy products; (iii) user training on maintenance and use of cookstoves should be extended to women, who are the main users; (iv) performance monitoring of cookstoves should be an important element of program design to ensure adequate feedback for enhancing stove designs; (v) reliable after-sales support and services produce great confidence among users and facilitate the adoption and use of technology; and (vi) the cookstove business must be sufficiently profitable to encourage credible firms and entrepreneurs to enter the business. These have been incorporated in the design of the Household Energy component of the Project.

41. **Lessons learned in the ELIB program:** The critical elements for the success of large scale CFL deployment programs include: i) strong ownership and commitment of the Government; ii) simple program design that makes free distribution of CFLs the preferred option to cost recovery; iii) strong planning and record keeping; iv) effective coordination amongst the key stakeholders; v) advance consumer awareness; and vi) high quality technical specifications and quality enforcement. Besides, for long-term continued use of CFLs, availability of high-quality CFLs at affordable costs must be ensured. This may require providing support for domestic sources of production, with adequate testing laboratories for quality assurance. Parallel

regulatory and policy efforts of removal of duties and taxes, phasing out of incandescent lamps, and effective recycling or end-of-life management programs, would be needed. The ELIB program has been designed to incorporate all these elements. The first-phase CFLs under the ELIB program were distributed in two single days across hundreds of distribution centers, which proved to be cumbersome in complying with the stringent CDM documentation requirements across the centers. Considering this, a door-to-door distribution is planned for the second phase of the program that would ensure better control over distribution and documentation. To ensure quality of CFLs procured, several modifications to the bidding procedure are envisaged that include, among others, stricter qualifications criteria to attract only genuine bidders and enhanced product testing before shipment.

#### IV. IMPLEMENTATION

##### A. Institutional and Implementation Arrangements

42. The main components of the Project (access to electricity and household energy) would be implemented by IDCOL, a government owned infrastructure finance company. IDCOL is run by professional management under effective oversight by a competent Board. As a company, IDCOL is able to offer market based incentive package to its management and staff. IDCOL has proven its capacity in managing the growing renewable energy program of GOB under the ongoing RERED project. The growing renewable energy portfolio however is going to put a strain on the capacity of IDCOL. Recognizing this, an institutional development consultant has been engaged by IDCOL to review the current organization structure and to proposed modifications for enhancing its capacity. It is expected that during the implementation of the Project, capacity of IDCOL will be enhanced with separate unit established to manage the renewable energy program. In addition, for the household energy component, a separate Project Management Unit (PMU) will be established for day-to-day management of the component.

43. IDCOL will implement the components with the help of POs who are mostly NGOs (for SHS and household energy) and NGOs/private sponsors (for RAPSS). The PO selection committee of IDCOL would select the POs as per the eligibility criteria outlined in the Operations Manual of the Project. Starting with 5 POs, the SHS program now has 29 POs, and IDCOL expects to engage more POs as part of its goal of achieving a commercially sustainable competitive market for SHS in Bangladesh. IDCOL has an independent Technical Standards Committee, which approves the standards for the SHS and RAPSS. For the household energy component, a separate technical committee comprising stove experts, technologists and relevant government officials will be set up to advise on design and certification standards and other relevant technological issues. IDCOL has a team of inspectors who would inspect and verify that the systems are installed as per approved technical standards before financing is released from the Project fund. For the RAPSS sub-component, the sub-project specific due diligence would be done by IDCOL based on project proposals from the POs. The Bank will review the appraisal reports of the first *five* sub-projects in each technology.

44. The energy-efficient lighting component will be implemented by REB using the same implementation arrangement of the RERED project. REB will procure the CFLs and distribute them to the relevant PBSs and other distribution utilities. PBSs and the distribution utilities will



be responsible for distributing the CFLs in exchange for incandescent lamps in the respective service territories, and destruction of the collected incandescent lamps. REB will be responsible for overall management of the component. IDCOL will be responsible for maintaining database and conducting post-installation surveys as part of CDM requirements.

45. Power Cell will be implementing the technical assistance to the sector following the same implementation arrangement of the PSDTA project.

46. A coordination committee has been set up at Power Division of the Ministry of Power, Energy and Mineral Resources (MPEMR) with representation of the relevant agencies and other ministries (Ministry of Environment, Ministry of Agriculture etc) for effective coordination during implementation of the Project.

## **B. Results Monitoring and Evaluation**

47. Monitoring and evaluation are fundamental to assess implementation progress and to provide necessary corrective measures during implementation. IDCOL has a well-established monitoring system in place for its SHS program that will be further strengthened for the growing SHS program and replicated for use in the other activities (RAPSS and household energy). Data for measuring the outcome and results indicators outlined in Annex 1 will be collected by the POs and reported in the refinancing applications to IDCOL.

48. A robust impact evaluation (IE) on the SHS program is currently on-going that will measure the impact of SHS on household income and socio-economic welfare. This evaluation will suggest M&E indicators that will be incorporated in the PO reporting under the Project. A similar impact evaluation study will be conducted for the access to electricity and household energy components of the Project during implementation. The study will be designed to attribute causality to project interventions. The proposed impact evaluation aims to determine whether the project has had a significant impact on income, employment, access to social services and socio-economic welfare of the beneficiaries. Results will be disaggregated by gender to measure the impact on female beneficiaries. A baseline survey for the IE will be carried out at project start and the follow-up survey at the project completion. The study will implement a difference-in-difference approach for comparison between treatment (beneficiaries of the project) and control (non-beneficiaries) groups. Annex 7 details out the methodology to be used.

49. To better assess customer feedback from electricity connections (through SHS and RAPSS) and from clean cooking solutions (ICS and biogas plants under the household energy component), several IT based options for enhanced reporting and feedback are being explored. Some of the POs in the SHS program already have a mobile text messaging system in place to track daily installation data of various field offices of the POs. The option of introducing this system for the whole SHS program and the other activities (RAPSS and household energy) would be explored which would allow for automatic update of the installation data in the database maintained at IDCOL. Customer satisfaction feedback via text messaging would be introduced that would allow for an easy and cost-effective method for collecting customer feedback, thus ensuring enhanced accountability of the POs for proper service delivery. As part of CDM validation, independent third party audits will be carried out annually for the SHS program.

50. For the energy-efficient lighting component, REB will collect data on the number of CFLs distributed by the PBSs/utilities and report through a progress report on a quarterly basis. Data on loads before and after the distribution in selected feeders will be collated to measure the impact of distribution of CFLs in terms of MW saved. Funding for this impact assessment is provisioned for in the sector technical assistance component implemented by Power Cell. As part of CDM validation, independent third party audits will be carried out annually to verify that the CFLs are working at households.

51. Power Cell will report on a semi-annual basis on the activities undertaken and track progress in creating an enabling policy for renewable energy development.

### **C. Sustainability**

52. The Project is aimed at making the SHS fully commercial with the POs eventually borrowing funds at market terms from commercial sources by the end of the implementation of the Project. With this goal in mind, IDCOL has been gradually reducing the refinancing rate from 80% initially to 70% currently. During the implementation of the Project, IDCOL will extend refinancing of only 60% of the micro-finance of the larger POs having a credit outstanding amount of more than BDT 250 million. A commercialization study is currently ongoing exploring options for full commercialization of the program while ensuring that poorer households are not left out of the program due to increased costs of commercialization.

53. The RAPSS sub-component will require investors to have equity contribution in the sub-projects and the tariff will be set to ensure a reasonable return to the investors to compensate for the commercial risks that the investors would take. Financial analyses of RAPSS sub-projects have identified that grants of 20 to 50 percent of capital costs would be needed today to make these projects viable at a tariff that is within the customers' ability to pay. IDCOL will closely monitor performance of ongoing and proposed sub-projects and adjust grant levels of future projects to the minimum required. IDCOL is also considering competitive award of grant funds to RAPSS projects based on minimum subsidy requirements.

54. By opting to support micro-enterprise development through training and capacity building through well established POs, the household energy component will pave the way for commercial dissemination of clean cooking solutions. By supporting large-scale dissemination of CFLs in exchange for incandescent lamps, the Project would have demonstrated the benefits of CFLs (savings in customer bills), which would motivate households to continue to use CFLs after expiration of the program CFLs. The Project would also provide support for relevant policy and regulations (e.g. gradual phase-out of incandescent lamps and reduction of taxes and duties on CFLs), which would help promote CFLs in the long-run.

## V. KEY RISKS AND MITIGATION MEASURES

### A. Risk Ratings Summary Table

Stakeholder Risk	Rating
<b>Implementing Agency Risk</b>	
- Capacity	Substantial
- Governance	Moderate
<b>Project Risk</b>	
- Design	Moderate
- Social and Environmental	Moderate
- Program and Donor	Low
- Delivery Monitoring and Sustainability	Moderate
<b>Overall Implementation Risk</b>	Moderate

### B. Overall Risk Rating Explanation

55. The Project is a repeater operation prepared by implementing agencies which are familiar with Bank procedures, and the main agency (IDCOL) has a proven track record. Therefore, the preparation risk has been rated as Moderate. With respect to implementation, key risks are related to capacity issues for IDCOL (due to scaling up of activities), project complexity (number of components), and sustainability of min-grids under RAPSS sub-component (related to willingness to pay). To address IDCOL's capacity constraints, an institutional assessment is underway to recommend capacity enhancements to meet the needs of the growing renewable energy portfolio. A separate PMU with adequate staff will be established for implementing the household energy component. With respect to project complexity, the components proposed under the Project are independent of each other, such that delays in one component will not impact on the implementation of the other components. With respect to tariff affordability and sustainability of the RAPSS mini-grids, a gradual approach will be undertaken with market testing with a few mini-grids first. In an event the anticipated demand for the mini-grids do not materialize as planned, the funding available will be utilized in the irrigation schemes or in the SHS program in support of achieving the objective of providing access to electricity.

## VI. APPRAISAL SUMMARY

### A. Economic and Financial Analyses

56. Economic and financial analyses were conducted for representative system configurations:

- SHS of varying sizes, displacing kerosene lighting and use of rechargeable batteries for operating small appliances such as TV. Weighted average size was 50 Wp supplying 6 kWh/month. SHS are used to provide electricity to dispersed customers

where a grid extension and establishment of the distribution network is either not feasible or not cost effective due to dispersed nature of customers, difficult terrain, or low load densities.

- RAPSS:
  - Solar mini-grid comprises of a solar photovoltaic array, batteries, inverter, back-up diesel (to increase reliability), and a distribution network. The representative system is 103 kWp supplying 23 kWh/month per customer to 500 customers. The alternative is a diesel mini-grid providing the identical level of service to the same set of customers. The tariff charged is based on the willingness to pay of the consumers as obtained from survey data.<sup>14</sup> A mini-grid is used where load density is high (larger number of customers densely located and/or meeting higher electricity demand beyond basic lighting and other services that could be met by a SHS).
  - Solar irrigation water pump with 6.5 kWp solar array, variable frequency inverter, submersible pump, and water distribution network irrigating about 30 acres for three seasons. It would displace a diesel pump and with the same water distribution network.
  - 200 kW biomass gasifier/generator comprising of a fuel handling system, biomass gasifier, gas cleaning equipment and a gas-powered generator will supply power to the sponsor's own facilities in place of a diesel generator of similar capacity supplying the same quantity of electricity.
- CFLs of 13 and 23W replacing incandescent lamps of 40/60W and 100W respectively. The national benefits are due to the avoided electricity consumption, reduction of peak load as well as the global benefits of avoided CO<sub>2</sub> emissions. The benefit to the consumer will be the reduction of electricity expenses and also avoiding more frequent replacement of incandescent lamps, had the consumer continued to use incandescent lamps.
- Household Energy comprises Improved Cookstoves (ICS) and biogas units replacing traditional biomass stoves. A biogas unit produces 2.8 m<sup>3</sup> of gas per day for cooking. The quantity of gas is sufficient to prepare three meals a day.

57. The results of the economic and financial analyses are summarized below and detailed in Annex 9.<sup>15</sup> All evaluated representative sub-projects are economically and financially viable. The exact number and combination of technologies to be supported under the Project is not known with certainty as it depends on market demand. Consequently the fund allocations across various investment categories may be different from that envisaged at appraisal. IDCOL will

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<sup>14</sup> Survey conducted at the 100 kWp solar mini-grid in Sandwip Island, the first project financed by IDCOL. The project is operating and customers are paying 32 BDT/kWh.

<sup>15</sup> Key assumptions used in the analyses were: solar PV module price of US\$ 1/Wp for large modules with positive tolerances; domestic installed cost of SHS of US\$7.25 on average including five year system-wide warranty and three years maintenance; other hardware costs are from IDCOL records; domestic retail price of diesel and kerosene of 61 BDT/liter; economic cost of diesel and kerosene (including domestic storage and distribution) of 82.5 and 69 BDT/liter respectively; real fuel cost escalation of 2 percent; marginal duty and tax rate on equipment of 24.4 percent, with PV modules duty and tax exempt; an exchange rate of 82 BDT/US\$; and a discount rate of 10 percent. Assumptions and details are in the economic and financial analysis report in the Project Files. In CFL analysis the standard tariff of 4.97 BDT/kWh was used in the financial analysis and an avoided cost of 3.6 BDT/kWh was used in the economic analysis. CFL failure rates were taken into account, using values recommended in UNFCCC CFL CDM Methodology.

conduct economic/financial assessments of each sub-project loan application prior to approving investments as part of its due diligence.

Components	Stand-alone	RAPSS			Efficient Lighting	Household Energy	
		Solar Mini-grid	Solar Irrigation	Gasifier Power		CFL	ICS
Technology	SHS						
Number of Units	550,000	42	1500	28	7.25 Mln	1 Mln	20,000
Project EIRR (%)	43				211	36.3	27.3
Economic Cost Effectiveness							
- Renewable Energy		38 BDT/kWh	1.7 BDT/m <sup>3</sup>	11 BDT/kWh			
- Diesel alternative		48 BDT/kWh	2.4 BDT/m <sup>3</sup>	34 BDT/kWh			
Project FIRR (%)	26	13.7	10-13	28	45	91	15.1
Financial Cost Effectiveness							
- Renewable Energy		31 BDT/kWh	1.2 BDT/m <sup>3</sup>	12 BDT/kWh			
- Diesel alternative		43 BDT/kWh	1.9 BDT/m <sup>3</sup>	25 BDT/kWh			
Sensitivities	Kerosene use must drop to one liter per month per household for EIRR to drop to 10%.	Breakeven levelized cost of electricity when diesel fuel cost is 30% less or if PV system cost 33% greater. FIRR is 10% when tariff is 20 BDT/kWh. If REB grid takes over 8 years to reach the area, the FIRR exceeds 12 percent.	Breakeven levelized cost of water when diesel economic cost is 64% of current cost. Financially, solar irrigation is lower cost till diesel fuel drops to half its current cost of 61 BDT/liter	Breakeven levelized economic cost of electricity when diesel fuel cost is 32% of current cost; or when biomass fuel cost is 3.8 times greater.	EIRR without carbon credits is 182%. FIRR without carbon credits is 43%	If biomass fuel cost is 80% of current cost, EIRR drops to 10%	If biomass fuel cost is 60% of current cost, EIRR drops to 10%.

58. **SHS.** Economic Internal Rate of Return (EIRR) and Financial Internal Rate of Return (FIRR) were used to assess the viability of SHS where it displaced kerosene lighting and rechargeable batteries. Sensitivity analyses were conducted to assess the robustness of the results. The SHS economic analysis took into account the economic value of avoided kerosene use as well as the avoided battery charging that a SHS customer would have been incurring prior to getting a SHS. CO<sub>2</sub> emissions reduction value was taken into account, but it is low compared to economic cost savings.

59. **RAPSS.** Economic cost effectiveness analysis was conducted for RAPSS applications - solar mini-grid, solar irrigation pumping and for biomass gasification captive power supply - against diesel generation as the alternative providing the same levels of service. Grid extension was not considered as an alternative as these RAPSS applications will be installed in areas unlikely to be served by the REB grid in the near to medium term. Cost effectiveness analysis, rather than EIRR computation, was undertaken as the type of service (electricity or water delivery), and the service levels (kWh or cubic meters of water supplied) from the renewable energy options and the diesel alternative are identical – thus the benefits are identical.

60. Electricity from a solar mini-grid is economically and financially lower cost than from diesels. The FIRR is 13.7 percent for the solar mini-grid when the retail tariff is 32 BDT/kWh. The equity IRR is satisfactory at about 18 percent as 50 percent of the project cost is grant funded. The results are robust – diesel fuel price must drop 30 percent or PV cost increase 33 percent for diesel to be a lower cost alternative. Both are highly unlikely.

61. A key risk to these mini-grid projects is that customers may not want to pay such a high tariff, especially if the national grid gets near to the mini-grid site. This risk would be mitigated if the mini-grid sites are carefully screened to select sites where there is a high willingness to pay and where the national grid will take a long time to reach. Areas where the grid would take over 8 years to reach would be suitable as the FIRR is about 12 percent or more after 8 years. The risk to the developer is also low as the financial cash flow is positive and FIRR is 12 percent by the sixth year. A key decision point is the sixth year where a significant investment has to be made in replacing batteries. If the grid is anticipated in the near future, the battery investment should not be made, rather interconnecting the solar array to the grid to supplement grid power and to offer voltage support can be considered. Early battery failure would hurt the project finances seriously and therefore enforceable battery warranties are required (SHS systems require 5 year warranties and they have been honored by all participating battery suppliers).

62. Solar irrigation is financially and economically viable. As the sponsors charge less for water from a solar irrigation scheme than from a diesel water supply scheme, water demand from farmers is expected to be strong. The financial results are robust – diesel fuel cost must drop to about 30 BDT/liter (or half its current subsidized financial cost) for diesel pumping to be less costly. It is unlikely that diesel fuel cost will drop so much.

63. The biomass gasifier power project has positive economic and financial returns. Economic cost of electricity from a gasifier is one third that from a diesel generator. Financial cost of electricity from the gasifier is about half that of diesel generation as diesel fuel is subsidized. To achieve attractive returns, the plant must operate reliably over the long term. Internationally, small biomass gasifier power plants have had a spotty performance record. Therefore this technical performance risk must be mitigated through careful design, well trained operators, and properly managed fuel supply. For diesel generation to be lower cost, biomass fuel cost would have to quadruple (in India, for example, biomass fuel price increased six-fold over a ten year period in areas with significant biomass power generation).

64. **CFL.** EIRR and FIRR were computed for CFLs and both are highly positive. Economic and financial cash flows are positive from the second year. Since the quality of lighting between a CFL and the incandescent light is not very different, consumer surplus from improved lighting was not calculated for the CFL component. Economic benefits of CO<sub>2</sub> emissions reductions were taken into account.

65. **Household Energy.** The Household Energy sub-components – Improved Cookstoves and Biogas Units - have attractive returns, both financially and economically. They have significant co-benefits in terms of improved health, socio-economic status, and reduced workload for women.<sup>16</sup> The benefits accrue principally to women and children who spent time in the home and in the kitchen and have responsibility of collecting fuelwood.<sup>17</sup> These co-benefits, though not explicitly valued in the EIRR will increase the EIRR of the ICS and biogas sub-components.

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<sup>16</sup> IDS, “Biogas User Survey”, Report to IDCOL, November 2011.

<sup>17</sup> Improved cookstoves and biogas stoves result in significant reduction of indoor air pollutants such as small particulates, and toxic pollutants. The WHO estimates that as much as 3.6 percent of the total burden of disease in Bangladesh is attributable to exposure to indoor air pollution; 32,000 children below 5 years of age die annually due to acute lower respiratory infections, and 14,000 adults die due to chronic obstructive pulmonary disease. ESMAP, “Improved Cookstoves and Better Health in Bangladesh: Lessons from Household Energy and Sanitation Programs, The World Bank, Final Report June 2010.

Even without considering the health and other benefits, the economic results are robust – biomass fuel prices have to drop to 60-80 percent of current prices before EIRR reduces to 10 percent. In households where fuel is gathered but not explicitly priced financially, there would be less incentive to adopt an ICS or biogas unit. Therefore consumer awareness and education proposed in the project is exceedingly important for adoption of these improved cooking devices.

## **B. Operational Policy 8.30 Compliance**

66. IDCOL, being a financial intermediary, is required to comply with World Bank's Operational Policy 8.30 for Financial Intermediary Lending (OP 8.30). An OP8.30 compliance review was carried out in June 2012 that found IDCOL to be in compliance with the requirements. IDCOL is in good financial position with adequate capitalization, has good loan recovery rate (collection performance of the POs has been over 96%), makes adequate loan loss provisions as per Bangladesh Bank's regulations, keeps its books of accounts in compliance with rules and regulations, and has a satisfactory profit margin and management capacity ensuring its sustainability as a financial intermediary. The cost of funds for the POs under the project is comparable with their other sources of financing – such as PKSF (Pally Karma Shahayak Foundation), the apex institution financing micro-finance organizations in Bangladesh - ensuring that there is no significant market distortion arising from implementation of the Project. The detailed OP 8.30 compliance review for the RERED II Project is provided in **Annex 8**.

## **C. Technical**

67. The project uses well established renewable energy technologies. The SHS sub-component use internationally sourced photovoltaic panels and locally sourced batteries, charge controllers and lights, all of which will be compliant with the standards set by the Technical Standards Committee of IDCOL. Before approving the sub-projects under the RAPSS sub-component, IDCOL due diligence will ensure that the technology used is the least cost option. For the household energy component, a separate Technical Standards Committee will be formed to advise on design and certification standards and other relevant technological issues.

68. Given the size and growth of the SHS program, it has now become imperative to build domestic capacity for testing of key components and systems to verify continued compliance, and to undertake performance testing of PV systems in the laboratory and in the field. The ongoing RERED project is supporting establishment of a testing facility in Bangladesh. Once established, the POs and manufacturers can avail the testing services for a fee. IDCOL would use the testing services to monitor quality and performance.

69. Regular inspections will be held by IDCOL to ensure the systems are installed as per the approved technical standards. In addition to the inspections, IDCOL will conduct annual technical audits by independent third parties to verify that approved products are used, and are installed as per the technical standards.

70. For the CFLs to be procured under the energy-efficient lighting component of the Project, the technical specifications will be strengthened with support from an international consultant to ensure that the procured CFLs are technically robust to withstand the wide voltage fluctuations

typically experienced in the Bangladesh system and can last the required life-time stipulated in the technical specifications.

#### **D. Financial Management**

71. A financial management assessment was carried out to evaluate the overall financial management environment prevailing in the country and within the implementing agencies of the Project in accordance with OP/BP 10.02. IDCOL, the implementing agency for the main investment components (access to electricity and household energy), has been implementing the SHS and other renewable energy programs with support of the eligible POs under the RERED project since 2003. IDCOL has acquired significant experience in IDA financial management procedures and requirements. IDCOL's FM organization and system are found to be adequate to manage its operation and to undertake project financial management activities. IDCOL is in the process of full-computerization of its accounting system that will allow for automatic generation of interim project reports without any scope for manipulation and errors. The Participation Agreement between IDCOL and the POs would include provisions requiring the POs/sponsors to maintain appropriate accounting and financial control as outlined in the Operating Guidelines of the Project.

72. The financial management organization of REB, the implementing agency for the energy-efficient lighting component, is a robust one and its entity financial management systems are also acceptable to IDA. However, there are some outstanding audit issues on the project accounts of REB under the RERED project. An action plan has been developed by REB and substantial progress made in settling the outstanding audit observations. Taking appropriate measures to remedy the outstanding observations has been made a disbursement condition for the efficient lighting component.

73. Power Cell has gained experience in Bank project implementation from their participation in the PSDTA project. There have however been issues with lack of FM staff at the Power Cell. A Deputy Director for Finance and HR has been appointed recently. Appointment of an Assistant Director (Accounts) is made a disbursement condition for the sector TA component implemented by Power Cell. Power Cell resolved all the outstanding audit observations under the PSDTA project that were identified as material to IDA and agreed to follow-up on a priority basis in the case of any audit observations that may arise in the future during implementation of the RERED II Project. A Project Audit Committee with composition and charter of duties acceptable to IDA will be established to monitor the follow-up on audit issues of REB and Power Cell.

#### **E. Procurement**

74. Procurement for the Project would be carried out in accordance with the World Bank's "Guidelines: Procurement under IBRD Loans and IDA Credits" dated January 2011 (Procurement Guidelines); and "Guidelines: Selection and Employment of Consultants by World Bank Borrowers" dated January 2011 (Consultant Guidelines) and the provisions stipulated in the Financing Agreement. The overall responsibility for implementation of the Project would be with IDCOL, REB and Power Cell. The sub-loans under the access to electricity component implemented by IDCOL would be under financial intermediary loan and the procurement for



these components will be the responsibility of the concerned POs. The POs are expected to follow established commercial practices ensuring economy and efficiency. A procurement audit by independent third parties will be conducted every alternate year to review the procurement practices of the POs to ensure they conform to commercial practices.

75. A procurement capacity assessment was carried out in all the three implementing agencies with the web-based Procurement Risk Assessment Management System (P-RAMS). REB has adequate staff with procurement knowledge in its Procurement Directorate. However, delays in awarding contracts and maintaining confidentiality during the bidding process are the key issues in REB. Power Cell has shortage of staff with procurement knowledge causing delays in procurement process. Being a financial intermediary, IDCOL is not involved in major procurement except for small value procurement of goods and consultant services. REB and Power Cell are not immune to systemic issues affecting procurement efficiency and performance. The Project is rated as “Substantial-Risk” from procurement operation and contract administration viewpoint.

76. As part of the procurement risk mitigation measures, all the three implementing agencies have agreed to identify a Procurement Focal Point to help the respective agencies in day-to-day procurement follow-up and preparation of periodic procurement reporting. For CFL procurement, an individual international consultant having technical knowledge on CFLs will be appointed to help strengthen the technical specifications and testing requirements. In addition, an individual international procurement consultant will support REB during bid invitation and evaluation as a member of the bid evaluation committee. A national procurement consultant will be appointed by Power Cell who can also assist IDCOL as and when needed basis. REB and Power Cell will prepare thorough terms of reference and a time bound action plan for the bid evaluation committee to ensure strict confidentiality of the bidding process and timely completion of the evaluation. Procurement Plans for the first eighteen months for all the three implementing agencies, acceptable to IDA, have been prepared.

#### **F. Social (including Safeguards)**

77. No public land will be used for the Project, and no land acquisition will be financed under the Project. Land required for the RAPSS sub-projects will be private lands made available by the sub-project sponsors via direct purchase or by leasing. IDCOL requires that the land for the sub-projects is free of disputes and encumbrances. All land for Project use, whether made available via direct purchase or leasing, will be screened to ensure that no physical or economic displacement of communities/persons will take place, and lands which are disputed or have encroachments on them (informal settlers, non-titled entities) will not be used for the Project. It may be mentioned that such encumbrances are rare in rural areas.

78. The project may extend facilities in areas where indigenous people (IPs) live. However, availing the facilities/services/products under the access to electricity and household energy components of the Project is purely on a voluntary basis for all paying customers (including IPs). No negative impacts are anticipated towards IPs. In cases of project activities in the IP areas like Chittagong Hill Tracts, the POs are well-versed in IP languages to offer adequate consultation on maintenance of products, awareness raising, and training.

79. A gender responsive social assessment for the Project was carried out to identify opportunities for gender responsive activities in the access to electricity and household energy components. The assessment involved focus group discussions, key informant interviews, and household observations in five different sites. The assessment identified that the SHSs supported under the on-going RERED project has increased women's safety, mobility and entrepreneurial ambitions. It has enabled children to study properly at night and do better in school. Several gender focused activities that would be further explored for implementation under the RERED II Project include consultation with women during installation of the SHS to ensure the locations of the light fixtures are at places that are more beneficial for women in their household chores. Women-centered training and consultations will be adopted to maximize the benefits of SHS for women. To expand the use of biogas plants, POs would explore options for employing both male and female employees who will have access to rural men and women to motivate and advice them for installing and using biogas plants. Consultation with women would be ensured before installation of ICS regarding location and height of the stove placement. More detailed recommendations are in Annex 10.

80. IDCOL will be responsible for monitoring of environmental and social safeguard compliance with support of the POs. An environmental management and social management framework (ESMF) was adopted under the original RERED project, which was updated during the two additional financing of RERED. The ESMF has been further reviewed and revised for the RERED II Project. The updated ESMF includes an assessment of the progress on the compliance of the activities undertaken in the ESMF of the RERED project. The updated ESMF along with its Bangla version has been disclosed in IDCOL website on July 18, 2012 and in World Bank Infoshop on July 20, 2012.

### **G. Environment (including Safeguards)**

81. The Project will promote and scale-up the use of renewable energy technologies and energy efficient bulbs. These interventions yield net positive environmental impacts. The project is designated as environmental Category B (partial assessment) according to OP/BP of the Bank and only one environmental safeguard policy OP/BP 4.01 has been triggered. No significant and/or irreversible adverse environmental and social issues are expected in the sub-projects financed under the project.

82. IDCOL has gained experience in implementing the ESMF under the Bank financed RERED project. It has made progress in establishing the Environment and Social Safeguards Management Unit (ESMMU) to institutionalize the environmental and social management in its operation. IDCOL now has a full-time environment staff member who is working with POs and battery manufacturers/suppliers to raise awareness about the importance of environmental and social safeguards. Visits are made by the staff to all battery recycling plants on half-yearly basis for ensuring environment compliance. To further strengthen the ESMMU, IDCOL is in the process of appointing an additional environmental consultant to guide the client in preparing and reviewing the environmental assessment/screening for subprojects.

83. The major environmental concerns of this project are: (i) risk of lead contamination from improper disposal/ recycling of lead-acid storage battery used in SHS; and (ii) risk of mercury contamination from improper disposal of CFL bulbs. Several measures have been undertaken by

IDCOL to strengthen SHS battery recycling including refinancing for battery replacement and enhanced incentives for POs and manufacturers for collection of expired batteries. IDCOL has required the compliance of ISO 14001:2004 and OHSAS 18001:2007 by all battery recyclers and battery suppliers. 12 out of the 13 battery suppliers have become ISO 14001 and OHSAS 18001:2007 compliant, and the remaining one is expected to be compliant soon. Also, out of the three battery recyclers of the country, one is already compliant and the other two are in the process of becoming compliant. It is expected that the remaining battery recyclers will be ISO 14001:2004 and OHSAS 18001:2007 compliant before the implementation of the Project begins. An annual environment audit by independent third parties will be undertaken to assess the adequacy of the current mechanism for ensuring proper recycling of batteries and to monitor implementation of the ESMF.

84. For the energy-efficient lighting component, national guidelines will be developed by a team of international and local consultants for the proper disposal of CFLs. These guidelines are required to be in place before the distribution of the CFLs financed under the Project can commence. The sector TA component of the Project will provide technical assistance support for capacity building for ensuring safe disposal of expired CFLs financed under the Project.

## Annex 1: Results Framework and Monitoring

### BANGLADESH: Rural Electrification and Renewable Energy Development II (RERED II) Project (P131263)

#### Results Framework

#### Project Development Objectives

PDO Statement

The proposed project development objectives are to increase access to clean energy in rural areas through renewable energy and promote more efficient energy consumption.

#### Project Development Objective Indicators

Indicator Name	Core	Unit of Measure	Baseline (Dec 2012)	Cumulative Target Values						Frequency	Data Source/ Methodology	Responsibility for Data Collection
				2013	2014	2015	2016	2017	2018			
Number of households, farmers, and businesses having access to clean energy services	<input type="checkbox"/>	Number	0	100,200	321,100	674,200	930,900	1,239,200	1,578,000	Quarterly	Project Progress Report capturing data collected from the POs	IDCOL
Generation Capacity of Renewable Energy (other than hydropower) constructed	<input checked="" type="checkbox"/>	MW	0	6	18	35	41	50	61	Quarterly	Data reported by the POs in refinancing applications	IDCOL
More efficient energy consumption through	<input type="checkbox"/>	MW saved per year	0	0	50	200	190	170	160	Quarterly	Project Progress Report capturing data collected from the PBSs and	REB

introduction of energy- efficient lighting											other utilities	
Direct project beneficiaries	<input checked="" type="checkbox"/>	Million	0	0.5	8.2	9.5	9.7	10.1	10.4	Quarterly	Project Progress reports capturing data reported by the POs in the refinancing applications	IDCOL/ REB
Female beneficiaries	<input checked="" type="checkbox"/>	Percentage	0	44	50	51	52	54	55	Quarterly	Project Progress reports capturing data reported by the POs in the refinancing applications	IDCOL/ REB

### Intermediate Results Indicators

Indicator Name	Core	Unit of Measure	Baseline (Dec 2012)	Cumulative Target Values						Frequency	Data Source/ Methodology	Responsibility for Data Collection
				2013	2014	2015	2016	2017	2018			
Number of solar home systems installed	<input type="checkbox"/>	Number	0	100,000	300,000	550,000	550,000	550,000	550,000	Monthly	Minutes of the Operations Committee meeting of IDCOL reporting data collected from sales records of the Partner Organizations	IDCOL
Number of connections made	<input type="checkbox"/>	Number	0	150	470	990	2,440	4,370	6,750	Quarterly	Mini-grid appraisal reports	IDCOL

through mini-grid systems and captive plants											and sub-project status update	
Number of solar irrigation pumps installed	<input type="checkbox"/>	Number	0	30	150	350	600	1,000	1,500	Quarterly	Sub-project status update	IDCOL
Number of improved cook stoves purchased by households	<input type="checkbox"/>	Number	0	0	20,000	120,000	370,000	670,000	1,000,000	Monthly	Minutes of the Operations Committee meeting of IDCOL reporting data collected from the POs	IDCOL
Number of biogas plants installed	<input type="checkbox"/>	Number	0	100	600	3,000	8,000	14,000	20,000	Monthly	Minutes of the Operations Committee meeting of IDCOL reporting data collected from the POs	IDCOL
Number of energy efficient lamps distributed	<input type="checkbox"/>	Number	-	-	0	7,250,000	7,250,000	7,250,000	7,250,000	Quarterly	Quarterly Progress Report	REB
Enabling policy for renewable energy development	<input type="checkbox"/>	Text	SREDA not operational	SREDA not operational	SREDA established	SREDA operational with core staff appointed				Semi-Annual	Project Progress Report	Power Cell

## Bangladesh: Rural Electrification and Renewable Energy Development II (RERED II) Project (P131263)

### Results Framework

<b>Project Development Objective Indicators</b>	
Indicator Name	Description (indicator definition etc.)
Number of households, farmers, and businesses having access to clean energy services	This includes access to electricity through Solar Home Systems (SHS) and other renewable energy options (mini-grids, biogas/biomass based captive plants, solar irrigation etc), and access to clean cooking solutions through improved cook stoves and biogas plants
Generation Capacity of Renewable Energy (other than hydropower) constructed	MW capacity added from the access to electricity component. Technologies include, among others, solar, biomass gasification, biogas etc.
More efficient energy consumption through installation of compact fluorescent lamps	The difference in capacity (Watt) of energy efficient lamps and the incandescent lamps that would be replaced
Direct project beneficiaries	People in the households getting electricity connection through SHS and mini-grids, Farmers getting water from solar irrigation pumps, number of captive plants, Females having access to clean cooking solutions, and people in the households getting energy efficient lamps.
Female beneficiaries	Women and girls in the households getting electricity connection through SHS and mini-grids, female-headed businesses/shops getting connection through mini-grids, females in the households getting access to clean cooking solutions, and females in the households getting energy efficient lamps.
<b>Intermediate Results Indicators</b>	
Indicator Name	Description (indicator definition etc.)
Number of solar home systems installed	Solar home systems of different capacities
Number of connections made through mini-grid systems and captive plants	This includes the number of connections from renewable energy based mini-grids, and captive plants based on biomass gasification, biogas and other technologies
Number of solar irrigation pumps installed	Irrigation pumps of different capacities
Number of improved cook stoves purchased by	Stoves with higher fuel and emission efficiencies compared to the traditional stoves

households	
Number of biogas plants installed	Biogas plants of different capacities for cooking
Number of energy efficient lamps distributed	The energy efficient lamps distributed to households in exchange of incandescent lamps
Enabling policy for renewable energy development	Establishment and operationalization of the Sustainable and Renewable Energy Development Authority (SREDA)



## **Annex 2: Detailed Project Description**

### **BANGLADESH: Rural Electrification and Renewable Energy Development II**

1. A large segment of the population of Bangladesh has little or no access to electricity or to clean modern energy sources. Access to electricity in Bangladesh is about 55% and the per capita electricity consumption of about 236 kWh per year is one of the lowest in the world. The access rate in the rural areas is about 43% with about 13 million rural households yet to be electrified. Even those with access to electricity experience supply disruptions because the available generation capacity is insufficient to meet demand. The GOB articulated a Vision and Policy Statement on Power Sector Reforms in 2002, which includes the objective of universal access to electricity by the year 2021 with improved reliability and quality. By expanding access to electricity, especially for rural households and communities, Bangladesh aims to accelerate economic growth and improve the quality of life.

#### **Component A: Access to Electricity (total US\$309.2 million, IDA US\$116 million)**

2. The Infrastructure Development Company Limited (IDCOL) has estimated that about 4 million households are likely candidates for Solar Home Systems (SHS) services; this is in addition to the 2 million households who would have already obtained an SHS by the end of 2012.<sup>18</sup> In September 2011, the GOB issued a concept note for supporting private sector investment in 1,000 mini-grid schemes by 2015 requiring 25 MW of renewable energy capacity. This Project supports the Government's strategy of expanding access by providing assistance to extending electricity coverage using renewable energy. The following interventions to be supported by the Project will advance the national electricity access goals:

- Promoting the use of solar home systems in rural areas where grid expansion is un-economic; and
- Facilitating development of renewable energy based applications such as decentralized mini-grids, water pumping etc., where feasible.

3. IDCOL is the implementing agency of the access to electricity component of the Project. IDCOL will continue its successful role in implementing the SHS and the Remote Area Power Supply Systems (RAPSS) sub-components using the same business model and operational plan as in the RERED project. IDCOL will provide financial intermediation to make longer term refinance and grants available to its Partner Organizations (POs), which are private firms, NGOs and Micro-finance Institutions (MFIs). IDCOL will also make available a credit line for investment and grant financing for project development to promote renewable energy mini grids and other renewable energy projects under the RAPSS sub-component. IDCOL will administer TA grant funds to support project supervision and oversight; product quality enhancement; introducing new products including low cost LED lamps; administer battery and CFL light recycling etc.

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<sup>18</sup> Based on data from the Household Income and Expenditure Survey (HIES) of 2010. The estimate of 4 million assumes that 50% of the un-electrified rural households with a minimum income of BDT 3,000 per month would be candidates for purchasing SHS based on affordability considerations. With income levels rising and smaller, lower cost SHS becoming available, the number of potential SHS customers is likely to be higher.

4. The access to electricity component comprises of the following:
  - a. **Sub-Component A1 Solar Home Systems (SHS) –USD 99.45 million in IDA credits for SHS Investments** comprising of approximately 550,000 SHS (ranging in capacity from 10 Wp and larger) including technical assistance support;
  - b. **Sub-Component A2 Remote Area Power Supply Systems (RAPSS) – About USD 16.55 million in IDA credits for Renewable Energy Investments** comprising mainly solar PV, biomass and other renewable energy mini-grids and captive plants, solar irrigation, and technical assistance support. Other applications for which investors are seeking support, such as solar cooling and drying as well as hybrid brick kilns could also be supported.

#### ***Co-financing from other Development Partners***

5. USAID has committed to provide US\$7.565 million in grant financing to provide subsidies for SHS (US\$2.4 million), RAPSS (US\$4.7 million) and technical assistance (US\$0.465 million). This will be channeled through a Bank-administered Trust Fund. An amount of US\$24.5 million from the Bangladesh Climate Change Resilience Fund (BCCRF) has been committed for funding the matching grant and technical assistance for the solar irrigation pumps under the RAPSS components. Besides, KfW is expected to provide US\$12.9 million in grant financing for the RAPSS components. An estimated 38.8 million is expected from IDCOL own financing (accumulated from repayments from earlier refinancing to the POs for the renewable energy program). Table 1 has the detailed cost estimate for the Project.

6. ***Sub-Component A1 Solar Home Systems (total cost US\$199.8 million, IDA Credit US\$ 99.45 million)***. Majority of the funding under the Project is expected to be channeled to the SHS program to support approximately 550,000 SHS to contribute to the national electrification goal. The SHSs will be supplied and serviced by the partner Organizations (POs) (NGOs and private companies) that provide micro finance loans for purchasing SHS. IDCOL will use the IDA credit to refinance a portion of the loans. A grant of USD 20 is available only for 30 Wp and smaller SHS to increase their affordability as these are purchased by the poorest and this grant will be sourced from the USAID funds (channeled by the Bank under a separate Grant Agreement).<sup>19</sup> The POs will identify and qualify customers for obtaining loans and will bear the full commercial risk of lending. The POs will supply SHS products that comply with technical quality standards set by the Technical Standards Committee set up by IDCOL. The indicative number of SHS to be supported under RERED II is given in Table 2.

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<sup>19</sup> The program started in 2003 with US\$90 per system of grant support, which was the difference in life-cycle costs of SHS and the kerosene lanterns that the SHS replaced. The grant support has since been gradually declined in to US\$ 28 per system in 2012 (average USD 0.60/Wp compared to USD 2-5/Wp in other countries). From 2013, grant support will drop to USD 20 per system for smaller systems (30 Wp and less) with no grant for larger systems. An impact evaluation study is currently on-going that would assess, among others, the level of grant support necessary to make the systems affordable to poorer households.

**Table 1: Estimated Project Costs with Financing Sources (US\$ Million)**

Project Components	Project cost	IDA Financing	IDA %	USAID		BCCRF		KfW	Households	POs/Sponsors	GOB/Utilities	IDCOL Own Financing
				Capital Buy-down Grant	TA	Capital Buy-down Grant	TA					
<b>A. Access to Electricity</b>	<b>309.2</b>	<b>116.0</b>	38%	7.1	<b>0.465</b>	<b>23.0</b>	<b>1.5</b>	<b>12.9</b>	<b>19.2</b>	<b>90.2</b>	<b>0.0</b>	<b>38.8</b>
A1. Solar Home Systems (SHS)	199.8	99.45	50%	2.4	0.1				19.2	68.7	0.0	9.9
A.2. Remote Area Power Supply Systems (RAPSS)	109.4	16.55	15%	4.7	0.365	23.0	1.5	12.9		21.5	0.0	28.9
<b>B. Household Energy</b>	<b>46.3</b>	<b>12</b>	<b>26%</b>						<b>34.3</b>			<b>0.0</b>
<b>C. Energy Efficient Lighting</b>	<b>19.0</b>	<b>17</b>	<b>89%</b>								<b>2.0</b>	<b>0.0</b>
<b>D. Sector Technical Assistance</b>	<b>6.5</b>	<b>5</b>	<b>77%</b>								<b>1.5</b>	<b>0.0</b>
<b>Total Baseline Costs</b>	381.0	150.0	39%	7.1	0.565	23.0	1.5	12.9	53.5	90.2	3.5	38.8
E. Contingencies	5.0	5.0										
<b>Total</b>	<b>386.0</b>	<b>155.0</b>	<b>40%</b>	<b>7.1</b>	<b>0.565</b>	<b>23.0</b>	<b>1.5</b>	<b>12.9</b>	<b>53.5</b>	<b>90.2</b>	<b>3.5</b>	<b>38.8</b>

**Table 2 Sub-Component A1: Indicative SHS Investments**

<b>Solar Home Systems Investments 2013 and 2014</b>									
Indicative System Type	Projected Market Share	Number of SHS	Unit Cost		Total Cost (USD Millions)	Sources of Financing (USD Millions)			
			BDT	USD		Down Payment	Grant	PO Loan	IDCOL Loan
20Wp	23%	127,024	14,600	174	22.1	2.0	2.5	7.0	10.6
40Wp	19%	105,155	24,800	295	31.0	3.1	-	11.1	16.8
50Wp	31%	171,948	30,500	363	62.4	6.2	-	22.3	33.9
85Wp	27%	145,873	45,500	542	79.0	7.9	-	28.3	42.8
<b>Total</b>		<b>550,000</b>			<b>194.6</b>	<b>19.2</b>	<b>2.5</b>	<b>68.7</b>	<b>104.1</b>

Note: This does not include the technical assistance support of US\$5.2 million required for the SHS program

7. Customers are expected to provide 10% of the SHS prices as down payment while the IDCOL loan will refinance 60%-70% of the micro-finance extended by the POs to the households. Out of US\$104 million credit funds requirements, IDA credit would provide US\$94 million while the rest will be met from IDCOL from its own sources accumulated from the repayments from the POs against the earlier credits.

8. The estimated costs are based on current market prices. The prices of solar PV prices in the international market have experienced a rapid decline in recent times. However, the SHS prices in Bangladesh have been relatively stable since 2006. The reduction in PV panel prices in the international market has been offset by increases in locally sourced battery prices and currency depreciation. Still, SHS prices in Bangladesh are among the lowest in the world ranging in price from US\$6-8/Wp without a grant, inclusive of installation, five year warranty, and three years of maintenance services. In the event that systems costs do go down in the future reflecting continuing decline in solar PV prices, the IDA funds can support more systems.

9. The estimated costs are based on the demand patterns of 2010-11 where about a quarter of the systems sold were of small size of 20Wp and less, about half of the systems in 40-50Wp range and a quarter were larger sizes of 85Wp. The funding requirements will change depending on the demand pattern – smaller systems will require less credit draw-down while larger systems will require more funds. With the rapid growth of the program, it is expected that the program will be penetrating deeper into the market, thus reaching poorer households demanding smaller systems. With the PV prices falling, it is expected that the smaller systems would be affordable to poorer households.

10. IDCOL has the target to make the program fully commercial with the POs eventually borrowing funds at market terms from commercial sources. With this goal in mind, IDCOL has been gradually reducing the refinancing rate from 80% initially to 70% currently for the large POs. During the implementation of the Project, IDCOL will extend only 60% of the micro-finance of the larger POs having a credit outstanding amount of more than BDT 250 million. A commercialization study is currently being undertaken to explore options for full commercialization of the program during the implementation of the Project period while ensuring that poorer households are not left out of the program due to increased costs of commercialization.

11. **Technical assistance (TA) support for SHS:** Monitoring of SHS and the POs/sponsors are an important function of IDCOL supported by RERED II Technical Assistance. The monitoring is to insure that: (a) grant funds are being used for the intended purpose; (b) the PO comply with established technical, after-sales service and consumer protection standards; and (c) customers are satisfied with the services. TA-supported monitoring methods would include: (a) end-user level audits of adequate number of systems sold by each PO to insure satisfactory product quality; (b) random, unannounced, independent end-user level audits of subsequent reported sales, as needed; (c) customer surveys using simple, short postcards and questionnaires; (d) small focus group sessions with companies and consumers in different regions conducted as part of the market monitoring; (e) complaint-based end-user audits and other data gathering in response to complaints or information received from customers or others; (f) reviews of documentation and reports provided by PV companies, local and international suppliers and others; (g) direct observation and verification during regular field visits; (h) annual reviews of the audited financial statements submitted by each company, including counter-audits as necessary to verify information; and (i) performance reviews with individual POs, their accountants, auditors and commercial banks as necessary; and (j) annual meetings with the POs to discuss ways to improve the compliance monitoring system.

12. In addition to the end-user audits and other compliance monitoring activities, IDCOL in partnership with testing laboratory set up under the RERED support, will conduct technical performance audits of PV systems or components. IDCOL will support the introduction of new and improved solar products, including LED lamps and in further expanding the portfolio of viable renewable energy applications. The TA for the SHS program is summarized in Table 3. Total funding needs for the TA is US\$5.2 million, out of which IDA will provide US\$5.1 million and USAID US\$0.1 million. The TA comprises of the following principal activities:

### **1.0 Quality Assurance**

- 1.1. PV Systems Testing Consulting Services to achieve ISO 17025 accreditation. The RERED Project is supporting the establishment of a testing laboratory in Bangladesh for testing PV systems and components to assure product quality. This TA will assist the laboratory obtain ISO 17025 quality certification.
- 1.2. PV Standards support, including stand-alone solar LED lamps. This TA will assist the technical Standards Committee update and improve upon the SHS standards used for quality assurance, including adoption of standards and test procedures for LED lighting. The LED lighting quality standards will build on the standards developed for the World Bank/IFC Lighting Africa program.
- 1.3. Technical SHS Inspection. This TA will support field inspection of SHS to ensure customers have received the products that comply with standards and to verify that users have been trained in SHs use.
- 1.4. Collection Efficiency Inspection. This TA will support IDCOL oversight to ensure that POs loan collection and loan collection procedures are in compliance.
- 1.5. Field and Lab SHS Audits & Testing will conduct random laboratory and field testing of SHS in continuing efforts to ensure products are delivering the promised levels of service at the required reliability. The laboratory set up with RERED funding will be used for conducting the testing and audits.

## **2.0 Training & Outreach**

- 2.1. Customer Training & Awareness. This TA will support IDCOL and PO efforts to train SHS users and to increase their awareness of SHS so that its value is enhanced.
- 2.2. Staff Training will support capacity building of PO technical, marketing and sales staff so that they will improve the quality and responsiveness of services offered to SHS customers. The scoping out of the training needs and design of the training program is supported under RERED.
- 2.3. Technician Accreditation Program. This TA will support the development of a SHS technician accreditation program at a national vocation training institution to verify that technicians have the necessary skills and expertise to undertake SHS installation and repair.
- 2.4. Technician Accreditation will support the implementation of the technician accreditation program
- 2.5. Training and Exposure Visits will fund study tours and field visits inside and outside of Bangladesh for IDCOL staff, POs and other renewable energy developers to gain from experiences in Bangladesh and other countries.
- 2.6. Lighting Bangladesh Program will begin implementation of the World Bank/IFC Lighting Global program in Bangladesh. Lighting Global Program is an expansion of the World Bank/IFC Lighting Africa Program (<http://www.lightingafrica.org>) that is catalyzing the market for renewable energy-based off-grid lighting that is highly efficient, reliable and low cost. The initial expansion outside of Africa is taking place in India and Bangladesh is expected to be next. Lighting Bangladesh will benefit the poorest consumers who continue to depend on kerosene and other fuel based lighting and who cannot afford SHS. Lighting Bangladesh will offer business and market development support for entrepreneurs interested in offering efficient renewable energy lighting products, build relationships between foreign suppliers and domestic distributors/ retailers and manufacturers, build awareness, help remove policy and regulatory barriers, among others.

## **3.0 Environment**

- 3.1. Battery Recycling Support to POs. This TA activity will support the POs to continue their battery recycling efforts and will cover the incremental cost of battery recycling.
- 3.2. CFL recycling program design. CFL bulbs contain a small amount of mercury and if the bulbs break and the mercury is not safely secured it can be a harmful contaminant. This TA will support IDCOL in its efforts to promote careful use and disposal of CFL bulbs until such time a national CFL recycling it program in introduced.

## **4.0 Studies and Planning**

- 4.1. Impact Evaluation. This TA will undertake an impact evaluation of SHS and other renewable energy technologies to assess user outcomes and benefits and to obtain user perceptions. This is necessary in order to evaluate the development outcomes of the programs and to provide feedback to product suppliers and the POs/sponsors.

## 5.0 Goods

- 5.1. SHS Implementation and Supervision Supplies. IDCOL will procure training manuals, customer training leaflets, inspection forms, toolkits, laptop computers required for SHS program implementation and supervision. IDCOL anticipates having to procure, 6,000 Staff Training Manuals, 550,000 each of Customer Training Leaflets and Inspection Forms, 1,200 Toolboxes, and 200 Laptop Computers
- 5.2. PV Testing Lab Equipment Upgrade. This TA will provide additional testing equipment necessary to upgrade the testing laboratory to be in full compliance with the requirements for testing SHS (and possibly solar PV mini-grids and solar water pumps) to ISO 17025 standard.

**Table 3**

Technical Assistance for SHS Program			
Item	Cost/unit (USD)	Number	Grant (USD mil.)
<b>1.0 Quality Assurance</b>			
1.1 PV Systems Testing Consulting Services to achieve ISO 17025 accreditation, visit to overseas lab	75,000	1	0.08
1.2 PV Standards support, including stand-alone solar LED lamps	25,000	1	0.03
1.3 Technical SHS Inspection	1.00	550,000	0.55
1.4 Collection Efficiency Inspection	0.18	825,000	0.15
1.5 Field and Lab SHS Audits & Testing	for 3 years		0.50
<b>2.0 Training &amp; Outreach</b>			
2.1 Customer Training & Awareness	2.00	550,000	1.10
2.2 Staff Training	20	6,000	0.12
2.3 Technican Accreditation Program Design	30,000	1	0.03
2.4 Technician Accreditation	300	1,200	0.36
2.5 Training and Exposure Visits	10,000	25	0.25
2.6 Lighting Bangladesh Program	200,000	1	0.20
<b>3.0 Environment</b>			
3.1 Battery Recycling Support to POs	10	100,000	1.00
3.2 CFL recycling program design	50,000	1	0.05
<b>4.0 Studies and Planning</b>			
4.1 SHS Impacts Evaluation	150,000	1	0.15
<b>5.0 Goods</b>			
5.1 Goods (training manuals, customer training leaflets, inspection forms, toolkits, laptop computers)	Varous	Various	0.32
5.2 PV Testing Lab Equipment Upgrade	300,000	1	0.30
<b>Total</b>			<b>5.20</b>

13. **Sub-Component A2 Remote Area Power Supply Systems (RAPSS) (total cost US\$109.4 million, IDA Credit US\$ 16.55 million).** IDA funding is made available to private firms and NGOs to finance other renewable energy investments. These are principally expected to be solar

water pumping and mini-grids serving households and small enterprises in areas not served by the grid<sup>20</sup>. The technology to be used will be based the least cost option depending on the resource availability in the specific locations for the sub-projects. Batteries and back up diesel generators may be part of the power supply system to increase reliability and availability. IDCOL will verify the technical, financial and economic viability of the applications and ensures they comply with environmental and social safeguards. IDCOL will consider financing other applications such as solar cooling and drying or advanced hybrid brick kilns, depending on demand and the project's viability. Capital cost buy-down grants of 20 to 50 percent will be given to support these emerging classes of projects. IDCOL will bear the full commercial risk of the loans. The indicative portfolio of renewable energy investments to be supported by RERED II is given in Table 4.

**Table 4 Sub-Component A2: Indicative Investments**

RAPSS Renewable Energy Investments (2013-2016)							
RAPSS Technology	Average Capacity	Number	Cost per unit (US\$)	Total (US\$ million)	Equity (US\$ million)	Grant (US\$ million)	Loan (US\$ million)
Solar Mini Grid	150 kWp	42	600,000	25.2	5.0	12.6	7.6
Solar Water Pump - Irrigation	500m3/day	1,500	40,000	60.0	12.0	24.0	24.0
Biogas based Power Plant	20 KW	450	32,000	14.4	2.9	2.9	8.6
Biomass Gasification Plant	200 KW	28	285,000	8.0	1.6	1.6	4.8
<b>Total</b>		<b>2,020</b>		<b>107.6</b>	<b>21.5</b>	<b>41.1</b>	<b>45.0</b>

Note: This does not include the technical assistance support of US\$1.865 million required for the RAPSS program

14. The targets for mini-grids can be more realistically assessed once the initial few mini-grids are implemented. Even after capital buy-down grants up to 50%, the mini-grids will have to charge considerably higher tariff than what the PBSs charge to its consumers. The tariff of the 100kW mini-grid at Sandwip island financed under RERED is BDT32/kWh compared to the maximum tariff for households of BDT 9.38/kWh (for consumption beyond 500 kWh per month). Potential customers surveyed by sponsors and IDCOL have an ability to pay and expressed a willingness to pay a higher tariff than the rate charged by the PBSs. There is nevertheless a risk that customers may start to complain at paying higher rates for an extended period of time.

15. The mini-grid investors also face the risk that the REB grid may reach their customers before the sponsor has recovered his investment. Since the PBS tariff charged would be significantly less than that charged for mini-grid service, their customers may stop purchasing electricity from the mini-grids and the sponsor is left with a stranded asset. As part of its due diligence, IDCOL will seek from MPEMR and BERC assurances that the mini-grid area franchise would not be violated for a minimum number of years and devise a mechanism for compensating the sponsor in case the grid does reach the mini-grid service area and customers do migrate.

<sup>20</sup> The RERED project piloted three renewable energy based mini-grid schemes for providing access to electricity in selected off-grid remote areas and several solar water pumping projects.



16. IDCOL is currently doing due diligence on a number of mini-grid proposals for financing under the Project. Once the initial mini-grid sub-projects are implemented, the willingness to pay by the customers would become clearer. In the event the mini-grids do not materialize as planned, the funding available can be utilized in the irrigation schemes (where willingness to pay is less of an issue as the tariff to be charged is expected to be comparable to what the farmers would otherwise be paying for diesel pumps) or in the SHS program in support of achieving the objective of providing access to electricity.

17. For the indicative targets set for the RAPSS sub-component, funding requirement is US\$109.4 million (including TA of US\$1.865 million), out of which POs/sponsors are expected to provide 20% equity amounting to US\$21.5 million. The capital buy-down grant and TA requirements will be met from the USAID trust fund (US\$5 million), Bangladesh Climate Change Resilience Fund (BCCRF) (US\$ 24.5 million), and KfW (US\$12.9 million). The credit funding is expected to be met from IDA and from IDCOL own funds.

18. The On-lending terms for SHS and RAPSS are summarized below:

	SHS	RAPSS
Customer/sponsor down payment	10-15 percent	20 percent
Grant	USD 20 for 30 Wp and smaller	20-50 percent of sub-project cost
Loan portion refinanced by IDCOL	60-80 percent depending on PO size	30-60 percent of sub-project cost
IDCOL loan interest	6-9 percent depending on PO size	6 percent
IDCOL loan tenor	5-6 years depending on PO size	6-10 years
IDCOL loan grace period	6 months-1 year	9 months - 2 years
IDCOL loan securitization method	Bank guarantees/mortgages for minimum 20% of outstanding liability and one year repayments in reserve account	Bank guarantees/mortgages for minimum 30% of the sub-project cost
PO loan terms to customers	Market rate (typically 12-15 percent)	N/A
PO loan tenor to customers	2-3 years	N/A

19. Disbursements of the SHS sub-loan and grant will take place only after the installation has been completed and the customer has documented his/her satisfaction with submission of a Customer Acceptance Receipt. In order to administer the credit sub-component, IDCOL will: (i) enter into separate Participation Agreements with the borrower (i.e., POs and other renewable energy investors), specifying the binding covenants; (ii) process disbursement requests for loans approved by the borrowers based on the evidentiary documents to be formalized in the Participation Agreements; (iii) maintain separate disbursement records and accounts with respect to each borrower under the Project; (iv) keep on file supporting disbursement documents as well as bank accounts relating to disbursements; and (v) maintain a project account. All records, documents and accounts are to be maintained in accordance with sound accounting practices for independent audits and for review by IDA missions. In addition, IDCOL will maintain statistical records, incorporating, among other things, approval of sub-loans and disbursements made and provide IDA with regular reports.

20. **Technical assistance (TA) support for RAPSS:** The TA for renewable energy investment support is summarized in Table 5. Total funding needs for the TA is US\$1.865 million, out of

which USAID will provide US\$0.365 million and BCCRF US\$1.5 million. The TA comprises of the following principal activities:

### 1.0 Studies and Planning

- 1.1. Additional Renewable Energy Projects Development. This TA will support the GOB goal of achieving 10 percent renewable energy use in the power sector by 2020 by identification and development of new renewable energy applications.
- 1.2. Identification and pre-feasibility of mini-grids and captive plants. This TA supports IDCOL efforts of encouraging the development and investment in solar and biomass power generation, solar cooling and drying, and hybrid Hoffman brick kilns – applications where investors are beginning to seek IDCOL assistance.
- 1.3. Renewable Energy Projects Awards Support. The renewable energy applications require specialized expertise beyond that currently available at IDCOL to undertake their due diligence. This TA will permit IDCOL to obtain such expertise until such time, IDCOL builds in-house expertise.

### 2.0 RAPSS Irrigation Support

- 2.1. Staff and office facilities for 10 regional offices and the head office of IDCOL for the first three years of the program
- 2.2. Consultancy services for Upazilla level solar irrigation planning and site-specific due diligence support
- 2.3. Field inspections and monitoring for the irrigation schemes that would cover the costs of transport and travel allowances of the field inspectors and head office staff and establishment of solar irrigation pump testing capabilities in the national PV testing lab
- 2.4. Training, outreach and communications to farmers and the sponsors
- 2.5. Impact assessment including consulting services, surveys, and instrumentation

**Table 5**

Technical Assistance for RAPSS Program				
	Item	Cost/unit (USD)	Number	Grant (USD mil.)
<b>1.0</b>	<b>Studies and Planning</b>			
1.1	Additional RAPSS Projects Development	20,000	10	0.20
1.2	Identification and prefeasibility of other RE	10,000	10	0.10
1.3	RAPSS Awards Support	65,000	1	0.065
<b>2.0</b>	<b>RAPSS Irrigation Schemes</b>			
2.1	Project implementation and monitoring (staff and office costs for first 3 years)	200,000	3	0.60
2.1	Consultancy services for planning and due diligence	200,000	1	0.20
2.3	Field inspection and monitoring	300,000	1	0.30
2.4	Training, outreach and communications	100,000	1	0.10
2.5	Impact assessment (baseline, mid-term and final)	100,000	3	0.30
	<b>Total</b>			<b>1.865</b>

21. **Component B Household Energy (total cost US\$46.3 million, IDA credit US\$12 million).** The proposed household energy component aims to scale-up the efforts being undertaken by various NGOs in providing rural households with clean cooking solutions. These solutions include improved cook stoves (ICS), advanced combustion stoves, and biogas. Their large scale dissemination has the potential to yield co-benefits in the following areas: (i) household health; (ii) local environmental quality; and (iii) regional climate. The focus on these clean cooking solutions is dictated by the fact that modern cooking fuels like natural gas, liquefied petroleum gas (LPG), and to some extent electricity, and the appliances to use them will take a long time to be accessible and affordable to the majority of the rural population. Traditional biomass fuels such as wood, twigs, leaves, agricultural and plant residues, paddy husk, bagasse, jute sticks and dried animal dung are the dominant fuels used by about 90% of the population of Bangladesh. The incomplete combustion of these fuels in inefficient stoves produces smoke containing large amount of particulate matter and gaseous pollutants. Indoor air pollution resulting from this smoke is linked with many illnesses including childhood pneumonia and chronic obstructive pulmonary disease representing a significant health hazard.

22. Despite efforts since the 1980s to introduce clean cooking solutions by many organizations including the Village Education Resource Center (VERC), the Institute of Fuel Research and Development of the Bangladesh Council of Scientific and Industrial Research (BCSIR), Grameen Shakti, Bright Green Energy Foundation, Practical Action, and the GIZ, in terms of coverage, only about 2 percent of households relying on traditional biomass fuels has access to improved cookstoves (ICS). The main barriers for a scaling up of clean cooking solutions in the country are: (i) absence of massive awareness campaigns ; (ii) limited funding to support the scale-up activities; (iii) absence of a sustainable funding mechanism; and (iv) cost-revenue shortfall preventing the development of commercial enterprises to promote clean cooking solutions. There is an overall lack of leadership, oversight, coordination, and monitoring of household energy access activities in the country. This is preventing cross-fertilization of best practices. A recent USAID report identified the following seven areas for potential interventions on clean cooking solutions in Bangladesh: (i) market intelligence to remove market barriers; (ii) consumer education; (iii) technical standards, testing and certification, (iv) product development; (v) policy and regulation; (vi) business development support; and (vii) access to finance.

23. ***The strategic approach*** of this component includes: (i) awareness raising through social mobilization to ensure potential users are aware of the fuel saving and health benefits associated with clean cooking; (ii) research and development to enhance product quality, performance, safety and durability; (iii) setting up of performance standards, labels and testing facilities; and (iv) support to selected partner organizations to generate demand and to facilitate enterprise creation. It will build on the success of Bangladeshi NGOs in the areas of community outreach in total sanitation programs. It will also build on earlier work undertaken by local institutions in the areas of stove design and reduction of emission of toxic pollutants from incomplete combustion of woodfuels. The implementation of this component will be in close collaboration with on-going activities in the sector by NGOs, GIZ, USAID and upcoming activities that will be undertaken through the Global Alliance of Clean Cookstoves. It will integrate lessons learned from past and on-going clean energy solutions programs such as : (i) engaging the local government, community leaders and health volunteers in effective awareness raising; (ii)

adopting locally appropriate awareness-raising approaches for uptake of household energy products; (iii) extending user training on maintenance and use of cookstoves to women, who are the main users; (iv) ensure that performance monitoring of clean cooking products is an important activity of the programs to ensure feedback susceptible to enhance stove designs is provided; and (v) ensure reliable after-sales support and services to produce great confidence among users and facilitate the adoption and use of technology.

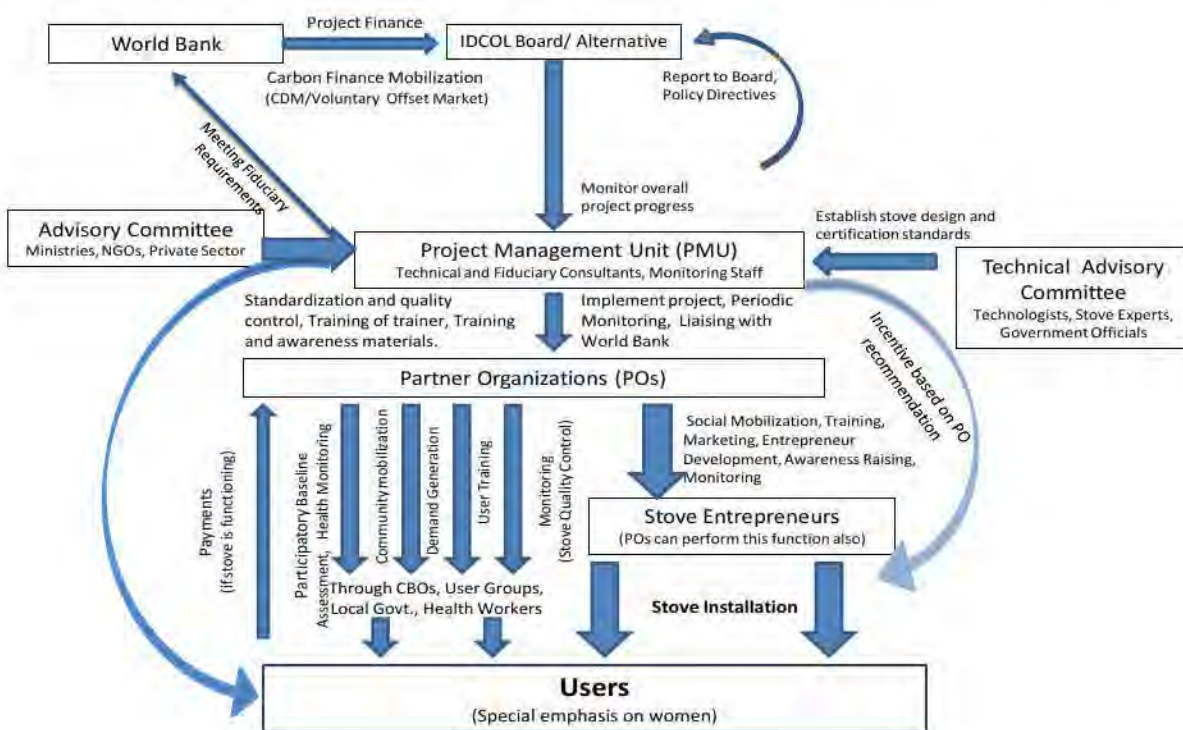
24. The component is structured around three main sub-components:

- **Sub-component 1: Awareness raising and community outreach (\$0.8 million).** As it stands, the majority of the population in Bangladesh is not aware that the use of traditional biomass fuels is associated with health hazards through indoor air pollution. Massive and well targeted awareness campaigns are needed on the health damaging effects of indoor smoke from incomplete combustion of biomass. Activities will include: (i) massive campaigns to educate households on the health hazards associated with indoor wood smoke; (ii) demonstrations of the benefits of clean cooking solutions as compared to the traditional stove; and (iii) support of a variety of media avenues to promote and market clean cooking products. These activities will capitalize on the successful experiences on social mobilization by the NGOs in the country.
- **Sub-component 2: Capacity strengthening of national institutions (\$1.9 million).** Many sector assessments indicate an overall lack of leadership, oversight, coordination, and monitoring of household energy access activities in the country. These assessments also indicate a real need to create performance standards characterization and to conduct systematic testing, certification and monitoring activities to enhance the quality, performance, safety and durability of improved cookstoves and to give thereby confidence to customers and financiers. Activities will include: (i) research and development to enhancement of product quality, performance, safety and durability; (ii) setting up of performance standards, labels and testing facilities; (iii) strengthening of managerial skills of targeted entrepreneurs; (iv) development of sub-projects eligible for carbon finance; (v) build capacity of policy makers; (vi) develop local capacity for monitoring of carbon finance projects. (vii) design output-based disbursement procedures to support POs; and (viii) develop innovative and pragmatic funding procedures to attract new players into the sector capitalizing on carbon finance.
- **Sub-component 3: Financing to support Partner Organizations and local entrepreneurs (\$8.5).** There is a need to scale up household energy access activities using a market based model to develop enterprise development initiatives by attracting new entrepreneurs into the sector while strengthening the capacity of the existing ones. Activities could include: (i) support clean cookstoves subprojects through POs to commercially disseminate one million clean cookstoves by the end of the project; and (ii) support biogas subprojects proposed by the POs to disseminate 20,000 biogas plants by the end of the project. Selection criteria of the POs will include their field presence and institutional capacity in disseminating ICS or similar other rural activities (e.g., Sanitation, SHS, Biogas). The POs are expected to generate saturation demand for ICS in defined areas through social mobilization, and develop and train local entrepreneurs

for the supply chain for ICS and their components. These POs could be NGOs and/or micro-finance institutions, which will be responsible for supporting and overseeing the work of the entrepreneurs, technicians and manufacturers of stove appliances engaged in the supply chain side.

25. **Implementation arrangements:** *Overall advisory oversight will be provided by SREDA.* SREDA will be responsible for the formulation of a long term national strategy on household energy access and design mechanisms to coordinate its monitoring, evaluation, and impact assessment. An advisory committee comprising of members from SREDA and other relevant Government Agencies, NGOs and private sector stakeholders will be formed to review the activities and provide feedback to improve its implementation.

26. *Day to day implementation will be under the responsibility of IDCOL.* IDCOL will establish a specific project management unit (PMU) for the implementation of the component. The IDCOL PMU will be responsible for day to day management of the component following Bank’s fiduciary guidelines and procedures. It will also be responsible for the monitoring of the component’s activities and results. The Project will finance the PMU’s operating costs to implement this component. It will also finance sub-projects to the undertaken by the POs.



27. **Basic implementation principles of sub-projects on the clean cookstoves:**

1. The project will finance IDCOL’s operating costs to implement this component.

2. It will finance sub-projects to be undertaken by POs. Each sub-project will consist of a package of aggregate units of 10,000 households roughly covering 2 to 3 Union Parishads.
3. A request for proposal will be made to select POs based on their past experience and current field presence.
4. A fixed estimate of staffing costs, training, field promotion, and PO overhead per 10,000 clean cookstoves was developed in consultation with key POs and will be applied. IDCOL will have the flexibility to review periodically these estimates based on implementation experience.
5. Promotion activities will be organized to make demonstrations of advanced combustion stoves to segments of the rural population depending on affordability.
6. Development of standards, testing protocols, and certification.

28. Particular emphasis will be placed in the development of standards, certification of clean cooking products, and testing protocols. These will include technological assessments, updating and certifications of clean cooking products; and adaptation of testing protocols to local conditions. A Technical Committee comprising of stove experts, technologists and relevant government officials under IDCOL's guidance will be set up to advice on design and certification standards and other relevant technological issues. Table 1 shows the improvement in emission reductions already achieved over the traditional stove. A continuation of this work will be supported by this component to reach optimal levels of fuel efficiency, emission reduction efficiency, durability, and safety. Implementation of these activities will be done in close collaboration with the USAID financed Catalyzing Clean Energy in Bangladesh Project.

**Table 1: Average 48 hour emission data in households using different stove models and comparison with 1 pot traditional model.**

	Stove type	PM ( $\mu\text{g}/\text{m}^3$ )	% reduction over traditional stove emissions	CO (ppm)	% reduction over traditional stove emissions
1.	BCSIR 1 pot portable model	127.51	84.4	0.367821	98
2.	BCSIR 2 pot fixed model w/ chimney	237.66	71	0.205486	99
3.	VERC Grihalaxmi	503.11	39	2.460658	65.2
4.	VERC 3 pot model	463.85	44	1.062352	85
5.	VERC 1 pot portable w/ 2 grates	133.07	36.8%	0.20285	99

Source: Winrock and USAID (2009). Commercialization of improved cookstoves for reduced indoor air pollution for urban slums of Northwest Bangladesh.

29. **Basic implementation principles of sub-projects on biogas:** Sub-projects on biogas will disseminate 20,000 domestic biogas plants in rural areas with the ultimate goal to establish a sustainable and commercial biogas sector in Bangladesh. Gas produced in these plants will be used for cooking purposes and lighting of rural households. In addition, the slurry, by-product of biogas plants, being a very good organic fertilizer will be used to maintain soil fertility and increase crop production. The slurry is also used as fish feed.

30. A fixed dome design biogas plant is promoted under this program. The design is basically of two types; i) design for cattle dung and human excreta; and ii) design for poultry droppings. Each design has 6 sizes of plants of different gas production capacities (1.2, 1.6, 2.0, 2.4, 3.2 and 4.8 m<sup>3</sup>). The bigger sized plants (3.2 and 4.8 m<sup>3</sup>) are used for multiple households whereas other sizes are used for single household.

31. IDCOL currently has a biogas program funded by the Netherlands Development Organization (SNV), and the proposed IDA support is geared towards scaling up the program following the same implementation arrangement. IDCOL currently has 38 POs in the biogas program. POs install biogas plants as per the specifications and standard set by IDCOL. Each plant receives BDT 9,000 (US\$110) capital buy-down grant on an average that will be financed from the Project. IDCOL will provide the refinancing (covering 80% of the loans to households) from its own sources. IDA funds under the project will be used to cover PMU costs, training, monitoring and evaluation etc in addition to the capital buy down grant.

32. Credit requirement per plant based on 2.4 m<sup>3</sup> average size is:

	Item	BDT
1.	Average investment cost per plant	36,000
2.	Average Subsidy	9,000
3.	User down payment (15%)	4,050
4.	MFIs contribution (20%)	4,590
5.	Average IDCOL credit per plant	18,360

33. Distribution of installed plants through the on-going program according to their sizes:

Size	Installation	%
1.2	122	0.52%
1.6	959	4.06%
2.0	5,265	22.31%
2.4	7,808	33.09%
3.2	5,387	22.83%
4.8	4,058	17.20%
<b>Total</b>	<b>23,599</b>	<b>100.00%</b>

34. Implementation constraints include:

- Need of working capital requirement for the POs
- Cattle retention – In many cases, the customers sell their cattle due to financial difficulties
- Bird Flu – a regular phenomenon every year is causing shut-down of a large number of potential domestic poultry farms. Consequently, these customers are not able to pay the loan installments
- It is not possible to withdraw a biogas plant from the household premise when the household fails to make the installments
- Biogas plant construction is hindered during the 3-4 months of monsoon season

35. *Detailed Budget of the Household Energy Component*

<b>Sub-component 1: Awareness raising and community outreach</b>	<b>Cost USD</b>
1.1 ICS promotion	610,000
1.2 Biogas Promotion	206,000
Sub Total	816,000
<b>Sub-component 2: Capacity strengthening of national institutions</b>	
2.1 ICS IDCOL PMU Cost including M&E	1,118,000
2.2 Biogas PMU cost	274,000
2.3 Biogas quality control	132,000
2.4 Biogas slurry Management	252,000
2.5 Biogas Training	98,000
2.6 Monitoring and Evaluation	71,000
Sub Total	1,945,000
<b>Sub-component 3: Financing to support local entrepreneurs and to attract new entrants</b>	
3.1 PO Cost for ICS	6,330,000
3.2 Biogas subsidy	2,195,000
Sub Total	8,525,000
4. Contingency (Price and Physical)	714,000
<b>Grand Total</b>	<b>12,000,000</b>

36. **Component C Energy Efficient Lighting (total cost US\$19 million, IDA credit US\$17 million).** Given the power generation shortages, GOB has embarked upon the Efficient Lighting Initiatives of Bangladesh (ELIB) program in 2009 aimed at reducing the peak demand in the country to minimize the existing supply-demand gap. A GIZ study in 2008 estimated that a total of 28 million incandescent lamps were used in households in the country. In order to replace the incandescent lamps at households, the ELIB program targeted to distribute 10.5 million CFLs in the first-phase and another 17.5 million in the second phase, thus replacing the incandescent lamps used in all the households in the country. The first phase of the program financed under the RERED project had distributed about 10 million CFLs to households in exchange for incandescent lamps. The program was implemented by the Rural Electrification Board (REB) with the help of the distribution utilities and the Palli Bidyut Samities (PBSs). REB was responsible for procurement of the CFL and the utilities/PBSs were responsible for distribution of the CFLs in exchange of the incandescent lamps and destruction of the collected incandescent lamps. The first phase distribution was completed in two single days in 2010. Customers came to the hundreds of distribution centers (local schools, utility offices, community centers etc) on the designated days and collected CFLs in exchange of the incandescent lamps. The program was registered as a Clean Development Mechanism (CDM) project with IDCOL as the Coordinating and Managing Entity (CME).



37. The first phase would have resulted into savings in peak demand of at least 200MW. However, post installation surveys have indicated alarming levels of lamp failure rates (33%) within a few months of installations. Interim test reports of a re-testing at the Bangladesh Standards and Testing Institution (BSTI) has confirmed the high failure rates of the first phase CFLs. The lamp failure rates have seriously undermined achievement of the program objectives. REB has claimed replacement of the poor quality CFLs from the supplier and Bank is closely following-up on the issue.

38. Procurement of the second phase CFLs was also initiated by REB under the RERED project immediately after first phase distribution (and before the lamp failure issue began to surface). Procurement of 17.5 million CFLs in 8 lots was awarded but contracts could not be signed as the winning bidders either did not submit the performance guarantees acceptable to REB, or submitted fake ones. REB has taken steps against the delinquent bidders including debarring them from future procurement. GOB intended to re-bid but there remained limited time before RERED closing to conclude the re-bid.

39. GOB has expressed its strong commitment to continue with the ELIB program taking into account lessons learned from the poor quality in the first phase and the aborted second-phase procurement. The second phase procurement and distribution of CFLs has been proposed to be included in RERED II project. The technical specifications for the second phase will need to be strengthened to allow for the procured CFLs to withstand wide voltage fluctuations that are common occurrence in Bangladesh systems. Adequate testing needs to be ensured before product shipment and appropriate penalty clauses introduced to ensure procurement of quality CFLs. An international technical consultant will be appointed to provide suggestions for strengthening the technical specification and the bidding documents. In addition, an international procurement consultant will support REB during bid invitation and evaluation.

40. Thanks to the awareness campaigns from the first-phase distribution, many households in the urban areas have already switched to CFLs. However, uptake in the rural/semi-urban areas has been slow because of the high costs of CFLs compared to incandescent lamps. The second phase CFLs will be distributed in the predominantly rural areas. The estimated number to be distributed is about 7.25 million. IDA funding would cover the costs of CFL procurement including pre-award inspections, pre-shipment inspections and testing, post-shipment testing; costs of distribution including training for proper distribution and documentation to comply with CDM requirements; customer awareness; impact evaluation etc. GOB funds will cover the costs of PMU within REB. Because the CFLs to be procured are expected to be screw-types that are technically better than the pin-types that are households typically use, replacement of sockets will be undertaken along with the installation of the CFLs. The costs of sockets will be borne by the utilities distributing them. Finally, IDCOL will be responsible for maintaining database of households receiving the CFLs, and conducting post-installation surveys to claim carbon credits under the CDM.

41. **Component D Technical Assistance to Power Sector (total cost US\$6.5 million, IDA credit US\$5 million).** Power Cell was established in 1996 as a technical arm of the Power Division of the Ministry of Power, Energy and Mineral Resources with the objective of

supporting implementation of the power sector reform program. It has been receiving technical assistance support from the Bank-financed Power Sector Development Technical Assistance (PSDTA) project, which is scheduled to close in December 2012. Under the PSDTA project, various technical assistance activities were undertaken by Power Cell, which include: formulation of power sector policies including RAPSS rules and regulations; development and implementation support for power sector reform roadmap; development of strategy and implementation of private sector participation in power generation including transaction advisory support for the Independent Power Producer (IPP) program; formulation and implementation support for the financial restructuring and recovery plan for power sector; installation of power system interface metering; support for feasibility studies including environment and social impact assessments for various projects in power generation, transmission, and distribution; training, workshops, and capacity building etc.

42. In continuation of the above activities beyond PSDTA closing, an amount of US\$5 million in technical assistance support implemented by Power Cell is proposed in the RERED II Project. The activities to be supported under the Project would include:

1. **Support for establishment and operationalizing the Sustainable and Renewable Energy Development Authority (SREDA)** through the provision of office equipment and furniture, consultant services, and training.
2. **Support to the Bangladesh Energy Regulatory Commission (BERC)** for capacity building in power sector regulations including tariff methodologies and regulations.
3. **New and On-going activities** including implementation of power sector reform roadmap; transaction advisory support for the IPP program; feasibility studies for power plant rehabilitation and re-powering; feasibility studies for Liquefied Natural Gas (LNG) import; Environment and Social Impact Assessments for power generation, transmission, and distribution projects in the pipeline; bid process consultant support for high-voltage transmission links; design and implementation support for performance improvements of power plants; support to utilities for cost-based tariff analysis and tariff-filing; project preparation support for public private partnership; development of national guidelines for safe disposal/recycling of CFLs and capacity building support for safe disposal of CFLs procured under ELIB; impact assessment for the CFLs distributed under the Project; consultant support for technical, financial, legal, MIS, HR and management of Power Cell.
4. **Training, road shows, workshops, seminars, and study tours** for power sector capacity building.
5. Selective **monitoring, evaluation, and coordination activities** related to the Project.
6. **Office equipment support and incremental operating costs** for Power Cell. Incremental operating costs will include honoraria, travel and travel allowances, rental of communication equipment and vehicles, operation and maintenance of vehicles and office equipments, office utilities, office supplies and consumables, bank charges, and salaries of contracted Project staff but excluding salaries of GOB civil servants.

## **Annex 3: Implementation Arrangements**

### **BANGLADESH: Rural Electrification and Renewable Energy Development II**

#### **Project Institutional and Implementation Arrangements**

1. IDCOL is responsible for overall implementation of the access to electricity and the household energy components. The procedures followed by IDCOL in the ongoing RERED Project will be followed in RERED II. Presently there are 30 POs appointed by IDCOL to support SHS program. Additional POs will be appointed for the access to electricity component as required as per the selection criteria detailed in the Operating Guidelines. A separate Operating Guideline has been prepared for the household energy component.
2. POs obtain grants and loan refinancing from IDCOL upon satisfactory evidence of SHS installation and customer satisfaction. Private firms and NGO seeking financing for other renewable energy investments will be evaluated by IDCOL based on the credit worthiness of the borrower, loan securitization along with the technical and financial viability of the sub-project. IDCOL will ensure that the sub-projects comply with environmental and social safeguards as outlined in the Environment and Social Management Framework (ESMF) adopted for the Project.
3. IDCOL, a government owned infrastructure finance company, is run by professional management under an effective oversight by a competent Board. As a company, IDCOL is able to offer market based incentive package to its management and staff. IDCOL has proven its capacity in managing the renewable energy program of GOB under the on-going RERED project. The growing renewable energy portfolio however is going to put a strain on the capacity of IDCOL. Recognizing this, an institutional development consultant has been engaged by IDCOL to review the current organization structure and to proposed modifications for enhancing its capacity. It is expected that during the implementation of the Project, capacity of IDCOL will be enhanced with separate unit established to manage the growing renewable energy program.
4. IDCOL has a team of inspectors who would inspect and verify that the systems are installed as per approved technical standards, and financing would be released from the project fund. For the RAPSS sub-component, the sub-project specific due diligence would be done by IDCOL based on project proposals from the POs. Bank will review the appraisal reports of the first *five* sub-projects in each technology (solar PV based mini-grid, biomass gasification based mini-grid, solar irrigation pumps, biogas based captive plant, biomass based captive plant etc).
5. SREDA, once operational, will provide for leadership and overall advisory oversight for the national household energy program. SREDA will be responsible for the formulation of a long term national strategy on household energy access and design mechanisms to coordinate its monitoring, evaluation, and impact assessment. An advisory committee comprising members from SREDA and other relevant Government Agencies (i.e., Power Division, Ministry of Local Government and Rural Development, Ministry of Environment and Forests, and Ministry of Science and Technologies), NGOs and private sector stakeholders will be formed to review components' activities and provide feedback to improve on the implementation.

6. IDCOL will establish a specific PMU for the implementation of the household energy component. The IDCOL PMU will be responsible for day to day management of the component following Bank's fiduciary guidelines and procedures. It will also be responsible for the monitoring of the component's activities and results. IDCOL PMU will engage in activities to support the POs which can be done more efficiently at central level. These will include technological assessments, updating and certifications of clean cooking devices; production of awareness and consumer education materials. A Technical Committee comprising stove experts, technologists and relevant government officials under IDCOL's guidance will be set up to advise on design and certification standards and other relevant technological issues.

7. The energy-efficient lighting component will be implemented by REB, which will procure the CFLs and distribute it to the relevant PBSs and other distribution utilities. PBSs and the distribution utilities will be responsible for distributing the CFLs in exchange of incandescent lamps in the respective service territories. REB will be responsible for overall management of the component. Consultants for impact assessment for the component will be supported under the sector technical assistance component implemented by the Power Cell. As the Coordinating and Managing Entity (CME), IDCOL will be responsible for maintaining database of households receiving the CFLs, conducting post-installation surveys, and taking other steps necessary for CDM.

8. Power Cell will be implementing the technical assistance to the sector following the same implementation arrangement of the PSDTA project. Support in the form of consulting services will be channeled to the SREDA and to the Bangladesh Energy Regulatory Commission (BERC) for creating enabling environment for renewable energy development.

## **Financial Management, Disbursements and Procurement**

### **Financial Management**

9. A financial management (FM) assessment was carried out to evaluate the overall financial management environment prevailing in the country and within the implementing agencies of the Project. More specifically the assessment aimed at assessing the financial management risks underlying the Project, the FM capacity of the implementing agencies, and the FM systems in place. The purpose of the assessment is to identify the financial management arrangements under the Project that would need to be in place to meet the Bank's fiduciary requirements in accordance with its OP/BP 10.02. The FM assessment was carried out keeping into perspective the lessons learnt during the implementation of the on-going RERED and the PSDTA projects.

10. The Project will be implemented by three agencies and the financial management capacities of each are summarized below:

- a. Infrastructure Development Company Limited (IDCOL), a government owned infrastructure finance company, has been implementing the Bank supported SHS and other renewable energy programs with support of the eligible Participating

Organizations (POs) under the RERED project since 2003. The major investment components – Access to Electricity and Household Energy Components will be implemented by IDCOL that has acquired significant experience in IDA financial management procedures and requirements. IDCOL's FM organization and system are found to be adequate to manage its operation and to undertake project financial management activities.

- b. The Rural Electrification Board (REB), an autonomous body under the Power Division of the Ministry of Power Energy and Mineral Resources (MPEMR), has been implementing the CFL component under the RERED project and it will continue to implement the energy-efficient lighting component under the RERED II Project following the same implementation arrangement. Financial Management Organization of the REB is a robust one and its entity financial management systems are also acceptable to IDA. However, there have been outstanding audit issues on the project accounts of REB.
- c. Power Cell, a technical arm of the Power Division of MPEMR, provides technical assistance for design and implementation of power sector reform activities and has been receiving technical assistance funding through the ongoing Bank-supported PSDTA project. The PSDTA project is scheduled to close in December 2012 and continued TA support to Power Cell is expected to be provided through the RERED II Project. Power Cell has gained experience in Bank project implementation from their participation in the PSDTA project. There have however been issues with lack of FM staff at the Power Cell.

11. ***Disbursements and Flow of Funds.*** Disbursement of IDA funds will be transaction based. The applicable disbursement methods include: Advance, Reimbursement, Direct Payment, and Special Commitment. Each implementing agency will open a Segregated Designated Account in the form of Convertible Taka Special Account (CONTASA) in a commercial bank acceptable to IDA, except for IDCOL which will manage two Designated Accounts – one for electricity access and the other for household energy component. Each agency will independently operate its designated account(s) including submitting withdrawal applications for advances/replenishments and documentation.

12. IDA funds sub-loans for the Access to Electricity component will be made available to IDCOL under a Subsidiary Loan Agreement (SLA) with the Finance Division of the Ministry of Finance. Funds for Household Energy component and technical assistance for the Access to Electricity component will be made available to IDCOL under a Subsidiary Grant Agreement (SGA) with the Finance Division. Funds for the Energy Efficient Lighting component will be made available to REB under an SGA with the Finance Division. No SLA will be required for Power Cell to receive project funds as it is a part of the Power Division of the MPEMR. For the IDCOL implemented Access to Electricity and Household Energy components, funds will flow from IDCOL to the POs through sub-loans under Participation Agreements between IDCOL and the POs.

13. **Disbursement Table**

Category No	Category Name	US\$ Million Equivalent	
1	Sub-Loans for Access to Electricity	110.9	100% (inclusive of Taxes)
2	Goods, Services, training, and incremental operating costs for IDCOL for Access to Electricity	5.1	100% (inclusive of Taxes)
3	Goods, Services, training, incremental operating costs, and Sub-Grants for Household Energy	12.0	100% (inclusive of Taxes)
4	Goods, Services, training, and incremental operating costs for Energy Efficient Lighting	17.0	100% (inclusive of Taxes)
5	Sector Technical Assistance	5.0	100% (inclusive of Taxes)
6	Un-allocated	5.0	
	Total	155.0	

14. **Book Keeping and Accounting** arrangements under the RERED Project will continue to apply for IDCOL and REB under the RERED II Project. Power Cell will follow accounting and reporting arrangements prescribed under the on-going PSDTA project. Each agency will continue to maintain the Books of Accounts for its part of the project activities on cash basis using double entry book keeping principles. Cash and Bank Book, General Ledger, Payment Register, Inventory and Fixed Assets Register, and Bank Reconciliation will be maintained on a regular basis. All the implementing agencies will follow GOB's Project Accounting Manual in maintenance of project books and reporting to various monitoring and control agencies of GOB. IDCOL will use its entity computerized accounting system for processing project financial transactions and financial reporting. Power Cell shall procure a reputed and tested off-the-shelf accounting software to ensure timeliness and accuracy of its accounting and financial reporting

15. IDCOL's records and financial statements should continue to reflect the amount payable to the Government and receivable from the POs/sponsors. In ensuring accounting and financial control of transactions of the Project, IDCOL shall maintain adequate FM systems within the entity and in the POs. The Participation Agreement between IDCOL and the POs would include provisions requiring the POs/sponsors to maintain appropriate accounting and financial control as outlined in the Operating Guidelines of the Project.

16. **Financial Reporting.** All three implementing agencies will submit Interim Unaudited Financial Reports (IFRs) to IDA. The format, contents and periodicity (within 45 days of the completion of quarters) under the on-going RERED project, with customization as appropriate, will apply to IDCOL and REB under the RERED II project. Power Cell will continue to submit IFRs to IDA as provided under PSDTA with customization of formats and contents to be agreed. Under the on-going RERED project, IFRs have been received in a reasonably timely manner and acceptable quality. However, for IDCOL, IFRs are still produced from stand-alone excel spreadsheet rather than from the entity accounting system making them vulnerable to error and manipulations. Although IDCOL has developed a comprehensive software solution to automate

its activities, the system is yet to generate IFRs from the entity accounting system automatically without manual processing. IDCOL has agreed to incorporate necessary modification in its computerized accounting systems so that IFRs can be automatically generated from the entity accounting system itself without manual processes.

17. **Internal Control.** The Operating Guidelines of the Project includes provisions requiring the POs/sponsors to maintain adequate FM arrangements, and to submit financial reports and audited financial statements to IDCOL in a timely manner. These provisions would be included in the Participation Agreements between IDCOL and the POs/sponsors. IDCOL would intensify its follow-up measures to ensure that POs comply with the agreed terms of the Agreements. IDCOL has strengthened its field level monitoring by engaging its staff for inspection and auditing POs records and to carry out FM assessment of the POs.

18. REB will ensure adequate control and transparency in its procurement and distribution of CFLs through requisite track records and through inclusion of stock and flow of CFLs in the quarterly IFRs. Power Cell will undertake internal control measures such as having adequate FM staffing to exercise internal check on transactions processing, payments to providers of goods and services through direct bank transfer, regular maintenance of books and records, due diligence on contracts administration, regular preparation of bank reconciliations and submission of claims for documentation of project expenditures through designated account.

19. **External Audit.** Audited financial statements of IDCOL do not report project activities undertaken, cost thereof, IDA funding to the cost and unspent IDA fund. Also, the Management Letter does not report adequately on the assessment of internal control measures e.g., accounting issues, governance, risk management etc, which are material to IDA. IDCOL agreed to address these deficiencies in the FY2012 accounts.

20. There are six outstanding audit observations by Foreign Aided Project Audit Directorate (FAPAD) on the project accounts of REB, which are being followed-up for resolution under the on-going RERED project. An action plan for addressing these observations has been developed by REB. Most of these observations are irregularities reported in respect of individual transactions, which are currently in the status of 'Questionable Expenditures'. The nature of these issues as reported include irregularities in awarding contracts, supply of broken and/or defective materials by suppliers, overstating of expenditures and resources in the financial statements, auditors not being provided with supporting documentation. It will take some more time to determine if any or some of these would turn into ineligible expenditures. Taking satisfactory measures to remedy these audit observations have been made a condition for disbursement for the REB implemented efficient lighting component.

21. Power Cell has been submitting annual audit reports within the deadline but there were some delays in following up on the outstanding audit observations. All the agencies agreed to adhere to the deadlines for submission of audited financial statements and be responsive to address the audit findings on a priority basis. A Project Audit Committee with composition and charter of duties acceptable to IDA will be established to monitor the follow up on audit issues of all the implementing agencies.

22. The audit requirements under the proposed project are mentioned below, and these requirements will be tracked through the Audit Report Compliance System (ARCS):

<b>Implementing Agencies</b>	<b>Audit</b>	<b>Auditors</b>
IDCOL	Project Financial Statements	Private Auditor
IDCOL	Entity	Private Auditor
REB	Project Financial Statements	Foreign Aided Project Audit Directorate (FAPAD)
REB	Entity	Private Auditor
Power Cell	Project Financial Statements	Foreign Aided Project Audit Directorate (FAPAD)

23. **FM Risks.** The overall FM fiduciary risk for the proposed project is assessed *Moderate* considering that all the three implementing agencies have previously participated in the implementation of Bank-financed projects and the agreed project financial management arrangements would be adequate to address the weaknesses identified. The following matrix presents the risk associated with this project and their respective mitigation measures.

<b>Identified FM Risk</b>	<b>Rating</b>	<b>Mitigation measures</b>	<b>Rating Post Mitigation</b>
The Interim Financial Report (IFRs) of IDCOL are produced from stand-alone excel spreadsheet making it vulnerable to inaccuracy and manipulation	M	Further modification to the already developed computerized accounting system is on-going so that IFRs can be automatically generated from the entity accounting system without any scope for outside interference	M
Delay in the submission of audited accounts and Management Letters (ML) and inadequacy of ML might impair the audit assurance	S	Continued follow-up has resulted in timely submission of audited accounts in FY11. Management Letter would be made an integral part of the audit report as per the audit TOR and this will be enforced through recording this agreement in the Minutes of Negotiations	M
Provisions in the Participation Agreement between IDCOL and the POs may not be fully complied with	M	IDCOL has agreed to intensify its follow-up measures to ensure that POs comply with the agreed terms of the Agreement from FY2012 onward	M



Identified FM Risk	Rating	Mitigation measures	Rating Post Mitigation
Power Cell may not have agreed FM staff on board as was the case in the PSDTA project	S	A Deputy Director (Finance & HR) has recently been appointed. Appointment of an Assistant Director (Accounts) is made a condition for disbursement of the component implemented by Power Cell	M
There are unsettled audit observations by FAPAD on the project accounts of Power Cell	M	Power Cell resolved all outstanding audit observations that were identified as material to IDA. In the event of any audit observations in the future, Power Cell agreed to follow-up with FAPAD on a priority basis to settle those observations	M
There have been outstanding audit observations by FAPAD on the project accounts of REB	M	An action plan was agreed with REB for addressing audit observation of FAPAD on REB project account which has resulted in the settlement of a substantial number of observations. REB agreed to a revised timeline (by October 30, 2012) to settle the remaining observations that are within its control.	M
	M		M

24. The agreed financial management arrangement for the Project including the risk mitigation measures provide for a reasonable assurance that the Project funds will be used for the intended purposes.

25. **Supervision Plan.** The initial supervision will focus on compliance with all actions, identifying any FM or disbursement issues in project implementation, and agreeing on redress measures. Preparation of first IFRs from computerized accounting systems of IDCOL on time, having in operation a computerized accounting system in Power Cell, and use of internal controls on FM functions of all the implementing agencies will be closely reviewed by IDA's FM unit.

## Procurement

26. Procurement for the Project would be carried out in accordance with the World Bank's "Guidelines: Procurement Under IBRD Loans and IDA Credits" dated January 2011 (Procurement Guidelines); and "Guidelines: Selection and Employment of Consultants by World Bank Borrowers" dated January 2011 (Consultant Guidelines)) and the provisions stipulated in the Financing Agreement.

27. All expected major procurement of works and consultants' services will be announced in the General Procurement Notice (GPN), published in the Bank external website and United Nations Development Business (UNDB).

28. **Procurement Responsibility:** The overall responsibility of project implementation would be with IDCOL, REB and Power Cell. The access to electricity component implemented by IDCOL would be under financial intermediary loan and the procurement for this component will be the responsibility of the concerned POs. The POs are expected to follow established commercial practices ensuring economy and efficiency.

29. **Particular Methods of Procurement of Goods and Works:** Except as otherwise agreed in the procurement plan, works and goods may be procured on the basis of International Competitive Bidding. Procurement of Goods and Works having estimated value less than the ceiling stipulated in the Procurement Plan may follow National Competitive Bidding (NCB) and Shopping. Direct Contracting (Goods/Works) and Single Source Selection (Consultants) may be allowed under special circumstances with prior approval of the Bank. NCB would be carried out under Bank Procurement Guidelines following procedures for Open Tendering Method (OTM) of the People's Republic of Bangladesh (Public Procurement Act 2006 - PPA, 1st amendment to PPA (2009) and The Public Procurement Rules 2008, as amended in August 2009) using standard bidding documents satisfactory to the Bank. The "Request for Quotation" document based on PPA is acceptable to IDA for shopping. For the purpose of NCB the following shall apply:

- a. Post bidding negotiations shall not be allowed with the lowest evaluated or any other bidder;
- b. Bids should be submitted and opened in public in one location immediately after the deadline for submission;
- c. Rebidding shall not be carried out, except with the Association's prior agreement;
- d. Lottery in award of contracts shall not be allowed;
- e. Bidders' qualification / experience requirement shall be mandatory;
- f. Bids shall not be invited on the basis of percentage above or below the estimated cost and contract award shall be based on the lowest evaluated bid price of compliant bid from eligible and qualified bidder; and
- g. Single-stage two-envelope procurement system shall not be allowed.

30. **Procurement of non-consulting services:** Except as otherwise agreed in the procurement plan, non-consulting services may be procured on the basis of International Competitive Bidding. Procurement of non-consulting services having estimated value less than the ceiling stipulated in the Procurement Plan may follow National Competitive Bidding (NCB). The agencies will carry out such procurement using Bank Guidelines.

31. **Methods of Procurement of Consultants' Services:** Selection of Consultants will follow the Bank Consultant Guidelines. The following methods will apply for selection of consultants: Quality- and Cost-Based Selection (QCBS), Quality-based selection (QBS), Fixed Budget Selection (FBS), Consultants' Qualification (CQ), Least-Cost Selection (LCS), Individual Consultants (IC) and Single-Source Selection (SSS). Shortlist of consultants for services estimated to cost less than US\$300,000 equivalent per contract may be composed entirely of national consultants. The Procurement Plan will specify the circumstances and threshold under which specific methods will be applicable.

32. **Methods of Procurement of Consultants' Services:** Single-source selection of consulting firms and individuals (paragraphs 3.8 (b) and 5.6, respectively, of the Consultant Guidelines) may be used only if it presents a clear advantage over competition for the required consulting services.

33. **Consultants' Qualification Selection (CQS)** may be an appropriate method for small assignments. The selection is carried out in accordance with paragraph 3.7 of the Consultant Guidelines.

34. **Country Procurement Regulations and Capacity:** Bangladesh has a nodal procurement policy agency and a Public Procurement Act (PPA) 2006 with associated Public Procurement Rules 2008 (PPR) and bidding documents. It created a critical mass of about 63 procurement professionals and, as of now, provided training to over 4,200 staff of about 300 organizations. To sustain the reform, with Bank's assistance, the Government has been implementing a second procurement reform project since late 2007, focusing largely on the implementation and monitoring of PPA including introduction of e-government procurement at key sectoral agencies.

35. Notwithstanding the above progress over the past years, the current Government made a few amendments to the PPA part of which were found to be inconsistent with the Bank's Guidelines, and as such the Bank for its projects allowed for local procurement the use of PPA / PPR with those exceptions.

36. **Assessment of the Agency's Capacity to Implement Procurement:** The procurement capacity assessment was carried out in all the three implementing agencies, viz. REB, IDCOL and Power Cell with the web-based Procurement Risk Assessment Management System (P-RAMS), findings of which are summarized below.

37. REB has adequate staff with procurement knowledge in its Procurement Directorate. However, delays in awarding contracts and maintaining confidentiality during the bidding process are the key issues in REB. Power Cell has shortage of staff with procurement knowledge causing delays in procurement process. Being a financial intermediary, IDCOL is not involved in major procurement except for small value procurement of goods and consultant services. REB and Power Cell are not immune to systemic issues affecting procurement efficiency and performance. For all the three implementing agencies, in addition to adequate staffing for procurement needs, emphasis also needs to be laid out on areas of internal control, documentation, information dissemination, administration of contract including delivery follow up, payments, handling complaints etc. The Project is rated as "Substantial-Risk" from procurement operation and contract administration viewpoint.

38. In order to minimize the procurement associated risks, the following measures have been agreed upon with the concerned agencies. Parts of these measures are already in place, while the remaining shall be in place during implementation of the Project.

39. **Identify procurement focal points (PFP) in REB, Power Cell and IDCOL.** Each of the three implementing agencies shall nominate a procurement focal person for their part of the Project. The appointed focal person will take necessary training, both on PPR 2008 and Bank

Procurement Guidelines. The focal persons will help the respective agencies in day-to-day procurement follow-up and preparation of periodic procurement reporting.

40. *Services of an individual international technical expert and an individual international procurement expert for REB.* The technical expert will be appointed to support REB during bidding document preparation, evaluation, and post-award inspections for its CFL contracts. His/her service will be staggered time based; during specification preparation, bid evaluation, and post-award inspections. The procurement expert will support REB during bid evaluation, and will be a member of the bid evaluation committee for the CFLs.

41. *Pre-shipment testing for CFL procurement.* A statistically viable sample under each production lot will be tested from renowned international testing lab, and if the result is satisfactory, only then the shipment will be allowed. The list of the internal testing lab needs to be acceptable by the Bank.

42. *Service of a national Procurement Consultant (for Power Cell and IDCOL).* Power Cell would hire a full time national Procurement Consultant with sound knowledge in the Bank Procurement Guidelines and Recipient's Public Procurement Act / Rules. This consultant would also assist IDCOL as and when needed basis. The consultant should have sound knowledge in the Bank Procurement Guidelines and Recipient's Public Procurement Act / Rules. This consultant will be a member of the bid evaluation committee for all procurements.

43. *Bid Evaluation Committee (BEC).* The BEC will have at least five members with two experts from outside the procuring entity with proven track record of experience in procurement; depending on the type of procurement, such experts shall be either from public offices and/or from professional bodies/individual of known probity and/or individual consultants. Formation of such BEC shall be in conformity with the Bank's Guidelines and be acceptable to the Bank. REB and Power Cell will prepare thorough terms of reference and a time bound action plan for the bid evaluation committee to ensure strict confidentiality of the bidding process, unauthorized access of the confidential document and timely completion of the evaluation.

44. *Establish/upgrade a functional webpage (regularly updated) for REB, IDCOL and Power cell with procurement related information accessible to the public.* All information pertaining to bidding and procurement above the specified thresholds, as per PPR, will be published in Central Procurement Technical Unit's (CPTU's) website. In addition, the implementing agencies will publish procurement information on their own website. This information will include: invitation to bid, bid documents and RFPs (wherever applicable); latest information on procurement plan/contracts; status of evaluations once completed; contract award information; and information covering the poor performance of contractors, suppliers and consultants, including a list of debarred firms. The website would be accessible to all bidders and interested persons equally and free of charge.

45. *Establish a system for handling complaints and a database for recording, monitoring and follow up on all the procurement activities under the project in REB, IDCOL and Power cell.*

46. *Adopt a procurement risk mitigation plan (PRMP), individually by REB, IDCOL and Power cell that would have the following features.* The agencies will report to IDA on a periodic (semi-annual) basis on the implementation of PRMP. Specific reporting requirements will be finalized during project implementation.

- a. *Alert bidders in pre-bid meeting:* Implementing agencies (*REB, IDCOL and Power cell*) individually through a notification will alert bidders during pre-bid meeting on consequences of corrupt practices (fraud and corruption, collusion, coercion, etc.). The alert message, among others, will include that if bidders are found to have adopted such practices, there may be remedial actions including debarment from bidding processes in conformity with the Bank's Guidelines. For national competitive bidding, national bidders debarred, if any, under the PPA will not be able to participate. In addition, in the pre-bid meeting, the bidders will be clarified for preparation of bids correctly.
- b. *Alert internal officers/staff:* Implementing agencies (*REB, IDCOL and Power cell*) will issue alert letter(s) notifying on the fraud and corruption indicators and the possible consequences of corrupt and similar behavior in procurement practices and action to be taken against the official staff if they are involved in such practices. Moreover, agencies will highlight that, in case of noncompliance or material deviation from IDA's Procurement Guidelines, IDA may take remedial actions (i.e., withdrawal of funds, declaration of mis-procurement) for concerned contracts.
- c. *Multiple dropping:* Multiple dropping of bids (bids submitted in more than one location and opened in one location) will not be permissible for any procurement under this project.
- d. *Maintain high level oversight throughout the process of CFL procurement by a Government team committed to the integrity of the process.*
- e. *Bid opening minutes:* During the same day of bid opening, photocopies of the Bid Opening Minutes (BOM) with readout bid prices of participating bidders will be submitted by BEC for circulation to all concerned. For prior review packages, such BOM will be shared with the IDA.
- f. *Low competition among bidders and high price of bids:* The case(s) of low competition (not solely based on number of bidders) in ICB and NCB cases, coupled with high-priced bids will be inquired into and further reviewed by the implementing agency. The review and decision in this regard would be in the context of qualification criteria, the contract size (too small or too large), location and accessibility of the site, capacity of the contractors, etc.
- g. *Measures to reduce coercive practices:* Upon receiving allegations of coercive practices resulting in low competition, implementing agency will look into the matter and take appropriate measures. For prior review contracts, observations of implementing agency will be shared with IDA, along with the evaluation reports.

- Implementing agency may seek assistance from law enforcing agencies to provide adequate security for bidders during bid submission. For ICB contracts, provision for bid submission through international/national courier services will be allowed and confirmation of the receipt of the bid will be informed to the bidders through e-mail.
- h. *Rebidding*: In case of re-bidding, implementing agency will inquire into the matter, record and highlight the grounds of re-bidding (i.e. corruption or similar, high bid prices etc.) along with recommended actions to be taken. For prior review of cases, all such detailed reports will be sent to IDA.
  - i. *Filing and record-keeping*: implementing agency will preserve all records and documents regarding their public procurement in accordance with provisions of the Bank guideline. These records will be made readily available on request for audit/investigation/review by the Development Partners and the Government.
  - j. *Publication of award of contract*: implementing agency will publish contract award information within two weeks of contract award on its website, dgMarket/UNDB online, and CPTU's websites with the following information: identity of contract package, date of advertisement, number of bids sold, number of submitted bids along with names, bid prices as read out at bid opening, name and evaluated price of each bid, number of responsive bids along with name of bidder, name of bidders whose bids were rejected and brief reasons for rejection of bids, name of the winning bidder and the price it offered, proposed completion of date of contract, as well as a brief description of the contract awarded.

47. **Procurement Plan**: A Procurement Plan for the first eighteen months of the Project has been prepared. It will be made available in the Project's database and in IDA's external website for this project. The Procurement Plan will be updated in agreement with REB, IDCOL and Power Cell, at least annually, to reflect the actual project implementation needs and adjustments thereof.

48. **Review by IDA of Procurement Decisions**: The review by IDA of procurement decisions and selection of consultants will be governed by Appendix 1 of the Bank's Guidelines. For each contract to be financed by credit, the threshold for prior review requirements and post review contracts will be identified in the Procurement Plan. During the first 18 months of the project, IDA will carry out prior review of the following contracts. This prior review threshold will be updated annually based on the performance of the implementing agency:

- a. For Goods. All the ICB Contracts and Direct Contracts irrespective of estimated cost. The NCB Contracts estimated cost equivalent or more than US\$600,000.
- b. For Works. All the ICB contracts and Direct Contract irrespective of estimated cost. The NCB Contracts estimated cost equivalent or more than US\$400,000.
- c. For Non-consulting service. The Contracts estimated cost equivalent or more than US\$600,000.
- d. For Consultant's Services. Prior review will be required for consultants' services contracts estimated to cost USD 300,000 equivalent or more for firms and USD

100,000 equivalent or more for individuals. All single-source contracts will be subject to prior review by and in agreement with IDA. All Terms of References of the consultants are subject to the IDA's prior review.

#### 49. Detailed Procurement Arrangements

##### Goods

Ref No.	Contract Description	Estimated Cost (US\$ 000)	Selection Method	Review By Bank	Expected Bid Opening Date
<b>REB</b>					
G-1	CFL, Output lumen-715 (13~14 Watt) & 1350 (20~23 Watt)	9,075	ICB	Prior	Jan 2013
G-2	CFL, Output lumen-715 (13~14 Watt) & 1350 (20~23 Watt)	1,800	ICB	Prior	Jan 2013

##### Services

Ref No.	Contract Description	Estimated Cost (US\$ 000)	Selection Method	Review By Bank	Expected proposal Opening Date
<b>Power Cell</b>					
S-01	IT Consultant for ERP Selection	100	IC	Prior	Nov 2012
S-02	Legal (Technical & Financial) Advisor for IPP Project	300	IC	Prior	Nov 2012
S-03	Feasibility Study on Re-powering of existing power plants of BPDB	300	QCBS	Prior	Nov 2012
S-04	Study for Performance Improvement of BPDB's old Power Plant	100	QCBS	Post	Nov 2012
S-07	Cumulative Environment Study on Siddhirgonj-Haripur-Meghnaghat Generation Hub	100	QCBS	Post	Jun 2013
S-08	Business Process Consultant for EGCB	100	SS	Prior	Jun 2013
S-09	Business Process Consultant for GTCL	200	QCBS	Prior	Jun 2013
S-10	CFL Bid Technical Consultant	125	IC	Prior	Nov 2012
S-11	Assistance to the Implementation of REB reform programs	261	QCBS	Prior	Feb 2013
S-12	Technical and Financial advisory support to implement RAPSS project in private sector	300	IC	Prior	Feb 2013
S-13	Capacity development of the utilities for cost based tariff analysis and tariff filling before BERC	100	QCBS	Post	Feb 2013

Ref No.	Contract Description	Estimated Cost (US\$ 000)	Selection Method	Review By Bank	Expected proposal Opening Date
S-16	Project Preparation consultants for PPP	300	IC	Prior	Feb 2013
S-17	Procurement Consultant to Assist Power Cell	100	IC	Prior	Nov 2012
S-19	CFL Procurement Consultant	125	IC	Prior	Nov 2012
S-20	CFL Disposal Guideline – Int'l	100	IC	Prior	Nov 2012
S-21	CFL Disposal Guideline- Local	14	IC	Post	Oct 2012
<b>IDCOL</b>					
S-04	Lighting Bangladesh Program Design	100	IC	Prior	Sep 2013
S-05	Lighting Bangladesh Program Implementation Support	100	IC	Prior	Dec 2013
S-08	Individual Consultant for SHS Impact Evaluation	150	IC	Prior	Jun 2014

### **Environmental and Social (including safeguards)**

50. *No public land will be used for the Project, and no land acquisition will be financed under the Project.* Land required for the RAPSS sub-projects will be private lands made available by the sub-project sponsors via direct purchase or by leasing. IDCOL requires that the land for the sub-projects is free of disputes and encumbrances. All land for Project use, whether made available via direct purchase or leasing, will be screened to ensure that no physical or economic displacement of communities/persons will take place, and lands which are disputed or have encroachments on them (informal settlers, non-titled entities) will not be used for the Project. It may be mentioned that such encumbrances are very rare in rural areas. The three mini-grid pilots under the RERED project have been using this approach. Bank policy OP 4.12, Involuntary Resettlement was not triggered for the pilot projects under the RERED project; since the same approach will be adopted for the RERED II Project, it will not be triggered in this case either.

51. The project may extend facilities in areas where indigenous people (IPs) live. However, availing the facilities/services/products under the access to electricity and household energy components of the Project is purely on a voluntary basis for all paying customers (including IPs). No negative impacts are anticipated towards IPs. In cases of project activities in the IP areas like Chittagong Hill Tracts, the POs are well-versed in IP languages to offer adequate consultation on maintenance of products. proper usage of facilities offered, awareness raising, and training. Bank policy OP4.10 related to IP was not triggered under the RERED project. Since the same approach will be followed for the RERED II project, OP4.10 is also not triggered under RERED II project.



52. A Gender Assessment and Plan has been prepared that specifically identifies the opportunities for gender responsive activities in the access to electricity and the household energy components (Annex 10).

53. ***Applicable Environmental Category and Safeguard Policies:*** The Project is designated as Environmental Category B as there is no significant and/or irreversible adverse environmental and social issues in the sub-projects financed under the project and which is consistent with the provisions of OP/BP 4.01. Under the RERED project, an Environmental and Social Management Framework (ESMF) was adopted which provides general policies, guidelines, and procedures to be integrated into the implementation of development intervention. The original ESMF was updated twice during two additional financings of the RERED project. The RERED II adopts an updated ESMF to comply with World Bank Policies and environmental legislation of the Government of Bangladesh (GOB). This updated ESMF defines the environmental requirements needed for processing the financing of each sub-component and includes consequence impacts due to the proposed new activities (RAPSS and household energy).

54. ***Approach to Address Environmental Safeguard Issues:*** The Environmental and Social Management Framework (ESMF) of the RERED project has been updated for the RERED II Project to include consequence impacts due to the proposed new activities (RAPSS and household energy). The updated ESMF includes an assessment on the compliance of the activities undertaken in the ESMF under the on-going RERED project.

55. The SHS component has environmental impacts due to improper disposal/ recycling of lead-acid storage battery. Under the on-going RERED project, several measures have been undertaken by IDCOL to strengthen the battery recycling that includes refinancing for battery replacement and enhanced incentives for POs and manufacturers for collection of expired batteries. IDCOL has required the compliance of ISO 14001:2004 and OHSAS 18001:2007 by all battery recyclers and battery suppliers. Already 12 battery manufacturers out of the 13 are ISO 14001 and OHSAS 18001:2007 compliant, while the rest is expected to be compliant soon. Also out of three battery recyclers in the country, one is already ISO 14001:2004 and OHSAS 18001:2007 compliant. IDCOL will make sure that remaining two battery recyclers are compliant before the implementation of the RERED II Project begins. IDCOL agreed to continue awareness raising campaign for the POs and the users about the adverse impact of improper management of expired battery.

56. For the CFLs under the efficient lighting component, risk of exposure to mercury from improper disposal of CFLs is the main environmental concern. REB is committed to minimize the risk of mercury contamination by adopting technical specifications that require minimum mercury in each CFL (less than 5 milligrams). REB will also require that each CFL packet contains instructions, both in Bengali and in English, about the precautions to be taken by customers in case the CFLs are accidentally broken. Although it was agreed to prepare a national guideline for safe disposal of CFLs under the on-going RERED project, it has been delayed due to several reasons. Proper guidelines are made a condition before the distribution of CFLs financed under RERED II can commence. Capacity building support is provisioned for in

sector technical assistance component to ensure safe disposal of CFLs financed under the Project.

57. ***Recipient's capacity on environmental safeguard:*** IDCOL has gained experience in implementing environmental management framework under the on-going RERED project. IDCOL has made progress in institutionalizing environmental and social management by having a full-time environment staff in the Environment and Social Safeguards Management Unit (ESMMU). The environment staff is working with the POs and battery manufacturers/suppliers to raise awareness about the importance of environmental and social safeguards and to discuss the environmental impacts of improper disposal or recycle of lead-acid batteries. The environmental staff visits all battery recycling plants on half-yearly basis for ensuring environment compliance. To strengthen the ESMMU, IDCOL is in the process of appointing an additional environmental consultant to guide the client in preparing and reviewing the environmental assessment/screening for subprojects.

58. ***Environmental Safeguard Supervision and Monitoring:*** IDCOL will monitor the environmental and social safeguard compliance with the support of the POs. An annual environment audit will be undertaken by an independent third party to assess the adequacy of the current mechanism for ensuring proper recycling of batteries and to monitor implementation of the ESMF.

59. ***Consultation and Disclosure:*** IDCOL has carried out consultation with battery manufacturers/recyclers, POs and beneficiary of the Project. Their comments and concerns have been included in the ESMF. The updated ESMF along with a Bangla version has been disclosed in IDCOL website (<http://www.idcol.org>) on July 18, 2012 and in World Bank Info shop on July 20, 2012.

## **Monitoring & Evaluation**

60. Monitoring and evaluation are fundamental to assess implementation progress and to provide necessary corrective measures during implementation. IDCOL has a well-established monitoring system in place for its SHS program that will be further strengthened for the growing SHS program and will be replicated for use in the other activities (RAPSS and household energy). The Operations Committee of IDCOL having representation of IDCOL management and PO representatives have monthly meetings to discuss the results and issues involved in the SHS program. The refinancing applications by the POs include details of the SHS installations (address of households, systems size, price etc), which are then integrated into IDCOL database for selecting random samples for inspections and verifications by IDCOL field inspectors. Several new indicators like household size (including number of females), household income would be included in the refinancing application of the POs during the implementation of the Project that would provide for data measuring the outcome indicators (number of households, number of people including number of females) benefiting from access to electricity. An impact evaluation study for the SHS program is currently on-going and the final report (expected towards end 2012) would be used for strengthening the monitoring mechanisms for SHS and also to develop a baseline for subsequent impact evaluation.

61. For the RAPSS sub-component, sub-project specific appraisal reports would include information related to number of connections, beneficiaries (including female) to provide for the data measuring the outcome and results indicators. Periodic sub-project status reports will inform on the progress on the number of connections and beneficiaries.

62. For the household energy component, IDCOL will design a monitoring and evaluation system to track performance of beneficiary POs based on its successful experience with the SHS program. IDCOL will support the POs to strengthen their own monitoring and evaluation systems to facilitate reporting and quality control.

63. To better assess customer feedback from connections (through SHS and RAPSS) and from clean cooking solutions (ICS and biogas plants), several IT based options for enhanced reporting and feedback are being explored for implementation during the Project. Some of the POs already have a mobile text messaging system in place to track daily installation data of various field offices of the POs. The option of introducing this system for the whole program would be explored which would allow for automatic update of the installation data in the database maintained at IDCOL to avoid false claims. Using the technology, the staff of a PO could record a geo tagged, time and date stamped picture of the SHS or RAPSS connections, which could be automatically updated in the database of IDCOL and the concerned PO. Similarly, customer satisfaction feedback via text messaging would be introduced that would allow for an easy and cost-effective method for collecting customer feedback, thus ensuring enhanced accountability of the POs for proper service delivery.

64. For the energy-efficient lighting component, REB will collect data on the number of CFLs distributed by the PBSs/utilities and report through a progress report on a quarterly basis. Data on loads before and after the distribution in selected feeders will be collated to measure the impact of distribution of CFLs in terms of MW saved. Funding for this impact assessment is provisioned for in the sector technical assistance component implemented by Power Cell. As part of CDM validation, independent third party audits will be carried out annually to verify that the CFLs are working at households.

65. Power Cell will report on a semi-annual basis on the activities undertaken and track progress in creating an enabling policy for power sector development particularly renewable energy development.

### **Role of Partners**

66. USAID is expected to provide matching grant funds to the access to electricity component through a trust fund to be established with the Bank as the administrator. Grant financing for the solar irrigation pumps under the RAPSS sub-component is expected to be provided from the multi-donor trust fund Bangladesh Climate Change Resilience Fund (BCCRF) for which on-principal approval has been obtained. These funds will be provided to IDCOL under separate grant agreements. KfW will be providing matching grant for the RAPSS sub-component on a parallel co-financing.

**Annex 4: Operational Risk Assessment Framework (ORAF)**  
**BANGLADESH: Rural Electrification and Renewable Energy Development II**  
**Stage: Board**

<b>Project Stakeholder Risks</b>		<b>Rating</b>	<b>Substantial</b>			
<p><b>Description :</b> Despite the softer credit terms and the capital buy down grants, the tariff to be charged by the mini-grid operators under the RAPSS component would be higher than the subsidized tariff paid by the grid consumers, which is likely to create resentment among consumers in the RAPSS areas. This may act as a deterrent for potential investors to invest in the schemes.</p> <p>There is a risk that the PBS grid would reach the RAPSS areas and customers would migrate to PBS service (as the PBS charges are significantly lower albeit at lower level of service). This will leave the mini-grid investor with a stranded asset.</p>		<p><b>Risk Management:</b> Awareness campaigns would be needed to inform consumers that the RAPSS schemes are the least cost options for them. In many of the rural markets in the potential RAPSS areas, there are diesel genset operators who charge a fixed amount per lamp that translates into a tariff as high as Tk 60-70kWh (USc 70-85/kWh). After the softer credit terms and capital buy down grants, the tariff would be lower than the tariff charged by the diesel genset operators. A gradual approach will be taken with market being tested with a few mini-grids first. IDCOL already has a few mini-grid proposals on which due diligence is being carried out. Market response from the implementation of these initial sub-projects will help guide the way for the remaining mini-grids. In the event that the mini-grids or captive plants under the RAPSS component does not get materialized, the funding allocation can be used for SHS program in achievement of the project objective of increasing access to electricity.</p> <p>The stranded asset risk would be mitigated by designating the mini-grid area as “RAPSS Area” under the RAPSS guidelines of 2007 that would give the mini-grid operator the exclusive right to generate and distribute electricity in the area for the specified number of years. In the event that the PBS grid does reach the area, compensation rules will be promulgated and issued by BERC that would compensate the mini-grid investor for the stranded asset.</p>				
		<b>Resp:</b>	<b>Client</b>	<b>Stage: Implementation</b>	<b>Due Date :</b>	<b>Status: Not yet Due</b>
<b>Implementing Agency Risks (including fiduciary)</b>						
<b>Capacity</b>		<b>Rating:</b>	<b>Substantial</b>			
<p><b>Description:</b> IDCOL has good institutional capacity but there is a risk that the growing renewable energy program may put a strain on its institutional capacity.</p> <p>The different sub-projects under the RAPSS component would require careful due diligence by IDCOL to ascertain the proper level of grant support. Given the potentially large number of sub-projects with different technologies involved, there is a risk that the quality of due diligence process is compromised due to over-stretched institutional capacity of IDCOL. SREDA, the coordinating agency for the household energy component, is yet to be established.</p>		<p><b>Risk Management :</b> An institutional development consultant has been appointed by IDCOL to assess the organizational structure and to propose modifications to meet the growing needs of the renewable energy portfolio of IDCOL. The consultant report is expected soon and the implementation of the report will be followed-up by the Bank team during implementation of the Project.</p> <p>Bank no-objection will be required on the appraisal reports of the first five sub-projects in each technology. If necessary, Bank will require no-objection for sub-projects beyond the first five.</p>				
		<b>Resp:</b>	<b>Client</b>	<b>Stage: Implementation</b>	<b>Due Date : Early in project implementation</b>	<b>Status: Not yet due</b>
		<p><b>Risk Management :</b> Necessary legislation for SREDA has been drafted and Cabinet approval obtained. It will be placed in the Parliament for approval. The Project will finance technical assistance support for operationalization of SREDA. A SREDA cell has been created in the ministry to carry out the preliminary activities of establishment of SREDA. While SREDA is envisaged to be providing</p>				

Weak institutional capacity at REB stemming from inadequate human resources increases the risk of implementation delays for the energy-efficient lighting component.

Power Cell has experience in implementing Bank project but it has vacancies at critical staff positions. All the Assistant Director level positions are currently vacant leaving little support for mid-level functionaries.

*Financial Management:* Some delays in the submission of audited accounts have been observed in case of all the implementing agencies. The audited accounts are issued without any management letter.

The Financial Monitoring Reports (FMRs) of IDCOL are produced from stand-alone spreadsheet with scope for manipulation and errors.

There have been outstanding audit observations by the Foreign Aided Project Audit Directorate (FAPAD) on the project accounts of REB.

There were outstanding audit observations by FAPAD on project accounts of Power Cell. Power Cell remained non-compliant throughout the PSDTA project period in having the required FM staff on board.

*Procurement:* Being a financial intermediary, IDCOL does not have adequate procurement experience.

leadership and overall oversight of the household energy program, the component would be implemented by IDCOL that has experience of implementing a similar domestic biogas program and the successful SHS program. Delays in operationalization of SREDA would therefore have minimal impact on the implementation of the household energy component.			
<b>Resp:</b>	<b>Client</b>	<b>Stage: Implementation</b>	<b>Due Date :</b>
<b>Status: Not yet due</b>			
<b>Risk Management :</b> The component is a high priority project of the GOB resulting in MPEMR keeping a close watch and providing guidance for timely implementation of the component. REB will have the responsibility of doing the one-time procurement (that too is a re-bidding under close guidance of MPEMR), and as such excessive delays are not expected. The distribution utilities have gained experience from the first phase in distributing the CFLs. A separate dialogue is on-going with all the stakeholders of REB for improving institutional capacity of REB, and a time-bound and credible action plan is being formulated by GOB for strengthening REB.			
<b>Resp:</b>	<b>Client</b>	<b>Stage: Implementation</b>	<b>Due Date :</b>
<b>Status: Not yet due</b>			
<b>Risk Management :</b> Recruitment process for the vacant positions has been initiated. The key positions are expected to be filled in by credit effectiveness.			
<b>Resp:</b>	<b>Bank</b>	<b>Stage: Preparation</b>	<b>Due Date : Credit effectiveness</b>
<b>Status: In Progress</b>			
<b>Risk Management :</b> Continued follow-up with the implementing agencies have reduced delays in submission of audited accounts. FY11 audited accounts of IDCOL included a management letter.			
A computerization of accounting system at IDCOL is on-going that would allow for automatic generation of FMRs from the system without manual processes.			
An action plan was agreed with REB for addressing the audit observations of FAPAD on REB project accounts and substantial progress has been made on addressing the observations. Taking satisfactory measures to remedy these observations is made a condition for disbursement of the efficient lighting component implemented by REB.			
Power Cell has resolved all outstanding audit observations that were identified as material to IDA. In the event of any audit observations in the future, Power Cell agreed to follow-up on a priority bases to settle those observations. A Deputy Director (Finance and HR) has recently been appointed. Appointment of an Assistant Director (Accounts) is made a condition for disbursement of the sector TA component implemented by Power Cell.			
<b>Resp:</b>	<b>Client</b>	<b>Stage: Preparation</b>	<b>Due Date : Credit Effectiveness</b>
<b>Status: In Progress</b>			
<b>Risk Management :</b> An IDCOL staff will be designated to act as procurement focal point with adequate training provided to manage the small-value procurement under the Project. A procurement			

	consultant appointed by Power Cell will support IDCOL as and when needed basis.			
Delays in concluding procurement and breach of confidentiality are common in REB. REB has adequate staff with procurement knowledge, but disagreement over issues (e.g., seeking clarifications from bidders during bid evaluation) is common.	<b>Resp:</b>	<b>Client</b>	<b>Stage: Implementation</b>	<b>Due Date : Implementation</b>
	<b>Status: Not Yet Due</b>			
	<b>Risk Management :</b> Due to close follow-up by the Bank, the second phase CFL procurement experience was much better compared to the first phase in terms of complaints received (only one complaint in the second phase compared to 19 complaints in the first phase). Although the second phase CFL procurement could not be concluded (due mostly to issues related to the bidders), REB recognizes the need to have a clean and fair re-bidding for the second phase. The risk mitigation measures would include: (i) a time bound action plan with close monitoring; (ii) a thorough terms of reference for the bid evaluation committee; (iii) appointment of a technical specialist for providing support during bid invitation, evaluation, and post-award inspections; iv) appointment of a procurement consultant for providing support during bid invitation and evaluation; v) selection of competent bid evaluation committee members with inclusion of the procurement specialist; and (vi) establish strict confidentiality arrangements for bid evaluation.			
Power Cell has shortage of staff with procurement knowledge causing delays in procurement process under the on-going PSDTA project.	<b>Resp:</b>	<b>Client</b>	<b>Stage: Implementation</b>	<b>Due Date : Before procurement begins</b>
	<b>Status: Not Yet Due</b>			
	<b>Risk Management :</b> Proposed risk mitigation measures would include: (i) service of a full time procurement consultant throughout the project period; (ii) designate one staff as procurement focal person with sound knowledge in GOB and Bank procurement.			
	<b>Resp:</b>	<b>Client</b>	<b>Stage: Implementation</b>	<b>Due Date : Early in project implementation</b>
	<b>Status: Not Yet Due</b>			
<b>Governance</b>	<b>Rating:</b>	<b>Moderate</b>		
<b>Description :</b> REB has weak governance structure in place. There is no separate policy making Board for REB and no formal accountability mechanism for REB top management.	<b>Risk Management:</b> Strengthening the governance structure of REB has been a major focus of the REB action plan. A credible and time-bound action plan for strengthening the REB and the PBSs is a condition for further investment support of the Bank to REB beyond the energy-efficient lighting component supported under the Project. Some changes have already been made in REB top management as a first step towards introducing professionalism at REB.			
<b>Description :</b> Selection of non-qualified operators for the RAPSS areas may lead to inferior quality services at higher tariff. There is a potential of misuse of subsidy in the RAPSS schemes.	<b>Resp:</b>	<b>Client</b>	<b>Stage: Implementation</b>	<b>Due Date :</b>
	<b>Status: In progress</b>			
	<b>Risk Management:</b> IDCOL has been managing the SHS program transparently and effectively, mobilizing about 30 POs and supervising them well. It is expected that the same due diligence will be applied in mini-grid awards and supervision under RAPSS. Surveys and consultations as part of the sup-project specific feasibility studies will assess the ability and willingness to pay in the RAPSS areas. There will be a gradual approach with a few sub-projects implemented first, which will provide for the lessons learned for the subsequent areas. Subsidy needs in the form of capital buy-down grant will be assessed after sub-project specific feasibility studies and appraisal by IDCOL.			
	<b>Resp:</b>	<b>Client</b>	<b>Stage: Implementation</b>	<b>Due Date :</b>
	<b>Status: Not Yet Due</b>			
<b>Project Risks</b>				
<b>Design</b>	<b>Rating:</b>	<b>Moderate</b>		
<b>Description :</b> Numerous implementing agencies with diverse components may cause delays in project preparation.	<b>Risk Management :</b> A co-ordination committee is set up at the Ministry headed by the Additional Secretary, Power Division with representation from the implementing agencies to ensure effective			

	coordination during project preparation. Coordination during the implementation phase would be less of an issue as the different components are independent of each other, such that delay in implementation of one component would not impact on the implementation of the other components.			
	<b>Resp: Client</b>	<b>Stage: Preparation</b>	<b>Due Date : Appraisal</b>	<b>Status: Done</b>
<b>Social &amp; Environmental</b>	<b>Rating: Moderate</b>			
<b>Description :</b> The safeguard category of the project is B since there are no significant and/or irreversible adverse social and environmental issues in the project. Discharge of lead sulphate in the local environment during recycling of used SHS batteries is a concern. CFLs contain mercury and safe disposal of CFLs is also a concern.	<p><b>Risk Management :</b> The 2009 additional financing of the RERED project required the battery manufacturers to adopt ISO 14001-2004 (Environmental Management Standard) and OHSAS 18001:1999 (Occupational Health &amp; Safety Management Systems) certifications by June 2011 for proper handling of recycled batteries. Out of the 13 battery manufacturers supplying batteries to the SHS program, 12 have already complied with the requirements and the remaining one is expected to comply soon. Out of the three battery recycling facilities, one is compliant with the certification requirements and the rest are expected to comply soon. Several incentives have been introduced by IDCOL to ensure that the expired batteries are sent to the approved recycling centers and not by backyard smelters. To further strengthen the monitoring of battery recycling and to strengthen the overall monitoring social and environmental monitoring of the renewable energy program of IDCOL, the capacity of the Environmental and Social Safeguards Monitoring Cell (ESSMU) is being strengthened with inclusion of a second environment consultant.</p> <p>An Environment and Social Management Framework (ESMF) was adopted under the RERED project. The ESMF has been updated to include the activities related to RAPSS and household energy.</p> <p>An annual environmental audit would be undertaken to check compliance with the environmental safeguards measures outlined in the ESMF and the report will be submitted to IDA by June 30 of every year.</p> <p>The technical specifications for the CFLs will require minimum mercury content (less than 5 milligrams per unit) as was done in the first phase CFLs financed under the RERED project. CFL packets will contain instructions for precautions in case the CFLs are accidentally broken. National guidelines for safe disposal/recycling of the CFLs will be in place before distribution of CFLs financed the Project can commence. Capacity building support is provisioned for in the sector TA component to ensure safe disposal of CFLs financed under the Project.</p>			
	<b>Resp: Client</b>	<b>Stage: Implementation</b>	<b>Due Date :</b>	<b>Status: In progress</b>
<b>Program &amp; Donor</b>	<b>Rating: Low</b>			
<b>Description :</b> A number of successful but small scale improved cookstoves (ICS) program are currently being implemented by various NGOs. Bank's involvement in the household cook stove sector may cause resentment amongst the existing players.	<p><b>Risk Management :</b> The household energy component has been designed after thorough consultation with the key stakeholders. The oversight by SREDA will ensure effective coordination with other cookstoves program implemented in the country. The team will closely coordinate with the USAID financed project on Catalyzing Clean Energy in Bangladesh. Project implementation will also pay particular attention to initiatives to be developed through the Global Alliance for Clean Cookstoves in the country. Collaborative avenues will also be created with on-going Bank financed projects such as the Local Governance Support Project (LGSP-II) to allow for reaching the bottom of the pyramid.</p>			
	<b>Resp: Bank</b>	<b>Stage: Implementation</b>	<b>Due Date :</b>	<b>Status: Not yet due</b>

<p>Co-financing from donors (USAID, BCCRF, and KfW) may be delayed or unavailable creating uncertainties in project implementation.</p>	<p>Firm commitment has been received from USAID for channeling the grant funds through a trust fund administered by the Bank. Necessary formalities are expected to be completed soon to establish the trust fund. On-principal commitment has been received from BCCRF and final approval is contingent upon approval of IDA funds for the Project. KfW fund is approved by the Government of Germany and necessary formalities for agreement signing will soon be initiated by KfW.</p>				
	<b>Resp:</b>	<b>Bank</b>	<b>Stage: Appraisal</b>	<b>Due Date : Appraisal</b>	<b>Status: Done</b>
<p><b>Delivery Monitoring &amp; Sustainability</b></p>	<p><b>Rating:</b> <b>Moderate</b></p>				
<p><b>Description:</b> Fast growth of the SHS program and introduction of RAPSS and household energy components to be implemented by IDCOL may outstrip its capability of oversight and monitoring.</p> <p>Sustainability of the SHS program is an issue after IDCOL discontinues financing the SHS program.</p>	<p><b>Risk Management :</b> IDCOL has strengthened its inspection and monitoring capacity by establishing four new regional offices and hiring additional inspectors in addition to the existing six regional offices. An independent third party monitoring will be introduced to improve the monitoring of quality of service delivery. IT based customer feedback options are being explored for the program to ensure effective and real-time feedback from customers that will be used to strengthen service delivery. To assess the market potential and to allow for a smooth transition of the SHS program towards commercial financing, a study is being undertaken by IDCOL that will assess the sources of commercial financing available, constraints to raising commercial financing, and provide recommendations for the transition to commercial financing for the SHS program.</p>				
	<b>Resp:</b>	<b>Client</b>	<b>Stage: Implementation</b>	<b>Due Date :</b>	<b>Status: Not yet due</b>
<p><b>Implementation Risk Rating</b></p>					
<p>The implementation risk is rated Moderate considering the track record of the main implementing agency IDCOL in successfully implementing the renewable energy program of the on-going RERED project.</p>					



## **Annex 5: Implementation Support Plan**

### **BANGLADESH: Rural Electrification and Renewable Energy Development II**

1. The Implementation Support Plan (ISP) provides the support required for implementation of all the mitigation measures identified in the ORAF and the GAAP in order to ensure that all the major risks are addressed. The design of the Project contains safeguards against each of these risks. The ISP is designed to review and ensure that those safeguards are effective and to reinforce them where necessary. The ISP will be undertaken by World Bank staff and is based on three major principles: (i) frequent field-based supervision of project activities including consultation with the Project beneficiaries, (ii) consistent review of fiduciary procedures and controls within the implementing agencies; and (iii) continual high-level policy dialogue on improving institutional capacity of the implementing agencies.
2. IDCOL, the implementing agency of the access to electricity and household energy components, has a proven track record of managing the renewable energy program of GOB. The components will be implemented by IDCOL with partnership of the POs (which are mostly NGOs for the SHS and household energy, and NGOs/private sponsors for the RAPSS). IDCOL has developed a well-functioning inspection, monitoring, and oversight mechanism to ensure proper service delivery. However, the growing the renewable energy program and introduction of new components (RAPSS sub-component and the household energy) are expected to put a strain on the institutional capacity of IDCOL. IDCOL has already initiated an organizational review by institutional consultant and is in the process of establishing a separate unit for renewable energy with additional capacity. The Bank team will be closely following-up for early signs of organizational stretch, and provide advice and support as necessary. The third-party monitoring and IT-based customer feedback mechanisms that are envisaged under the Project will strengthen the implementation support of the renewable energy program. Enhanced technical support will be ensured in the Bank team to provide for the necessary technical guidance and due diligence required for the new and varied technologies introduced under the RAPSS sub-component.
3. The institutional and governance issues of REB are expected to have a limited impact on the efficient lighting component because of the ring-fencing of the one-time CFL procurement supported under the Project (international technical and procurement consultants supporting REB in bid invitation and bid evaluation etc). The implementation support team will however continue to engage in a policy dialogue with GOB, REB, and other stakeholders to help improve on the institutional capacity and governance issues at the REB and the PBSs, which are critical institutions for the country's rural grid electrification program. The team will closely follow-up progress in development of the action plan for REB/PBS strengthening.
4. Taking lessons learned from the PSDTA project implemented by Power Cell, several up-front measures are already introduced for strengthening capacity in areas of financial management and procurement. The implementation support team will continue to monitor and intervene as necessary for improving the capacity of Power Cell for effective implementation of the sector TA component.

5. Given the number of components and implementing agencies, the implementation of the Project would be challenging. Based on the experience of the RERED and PSDTA projects, several actions have been agreed that will facilitate implementation support:

- Third party monitoring by independent third parties will be introduced to monitor quality of customer service delivery, response time in case of customer complaints, compliance with the environment and social safeguards standards and framework etc.
- IT based customer feedback options and will be explored in addition to the customer hotline in place to ensure effective and real-time feedback from customers that will be used to strengthen the program delivery
- An annual technical audit by independent third parties will be undertaken every year to test if the quality of installations conform to the technical standards
- A procurement audit by an independent third parties of the PO procurement practices will be undertaken every alternate year during project implementation
- An annual environment audit by independent third parties will be undertaken to check compliance with the environmental safeguards measures outlined in the ESMF
- A separate PMU will be established at IDCOL with adequate capacity to implement the household energy component

6. The Bank team will undertake field visits on a regular basis and have focus group discussions with Project beneficiaries about service quality and responsiveness of the POs. This information will be used to continually improve project practice.

7. The Bank team will undertake regular and comprehensive fiduciary review. This will include thorough reviews including the assessment of interim financial management reports. Particular attention will also be given to the findings of the annual procurement post review of contracts, technical audit, procurement audit, environmental audit, and financial audit and implementation of the audit recommendations/observations.

#### **A. Implementation Support Plan**

8. The Bank's supervision team will include a Task Team Leader based in Dhaka supported by Washington based Lead Specialist to ensure close follow-up on implementation issues supported by international/regional technical specialists. The fiduciary and environment safeguards staff providing support will be all Dhaka based.

9. **Technical Support:** The following technical specialists will be part of the Bank team in support of implementation review of the Project:

- a. An international/regional renewable energy specialist having vast knowledge on renewable energy technologies and international best practices to support due diligence of the sub-projects under the RAPSS sub-component, follow-up on the transition of the SHS towards commercialization, and to provide guidance and support on strengthening technical standards and compliance of the access to electricity component.

- b. An irrigation specialist (field-based) to review the feasibility studies and site-specific appraisal reports of IDCOL on the irrigation schemes to be supported under the access to electricity component. This will require on average 10 staff weeks per year through the life of the Project.
- c. An international/regional technical specialist supported by a field-based technical specialist to review implementation of the household energy component in line with international best practices tailored to local conditions. This will require on average two missions and an input of four staff-weeks by the international/regional specialist and ten staff-weeks by the field-based specialist.
- d. An international/regional technical specialist for due diligence on technical specifications and bidding documents and procedures for the procurement of CFLs under the efficient lighting component.
- e. A sector technical specialist (field-based) to monitor and follow-up on implementation issues of the sector TA component by Power Cell
- f. A gender specialist to assess progress in implementation of the gender-responsive activities proposed under the social assessment of the Project. The specialist will monitor the adequacy and effectiveness of PO consultations during installations of SHS and RAPSS connections, and provide support in effective implementation of the gender-responsive household energy component. The specialist will carry out field visits for consultations with women beneficiaries of the Project. This input will require on average 8 staff weeks per year through the life of the project.

10. **Financial Management (FM):** A financial management specialist based in the Bank's office in Dhaka will conduct two or more FM supervision missions every year throughout the life of the project. The initial supervision will focus on compliance with FM actions, identifying any FM or disbursement issues in project implementation, and agreeing on redress measures. Preparation of the first Interim Financial Reports (IFRs) from computerized accounting systems of IDCOL on time, having in operation a computerized accounting system in Power Cell, and use of internal controls on FM functions of all the implementing agencies will be closely reviewed by the FM specialist.

11. **Procurement supervision:** A procurement specialist based in the Bank's office in Dhaka will be a member of the project team throughout the Project period. The procurement specialist will provide due diligence services for procurement documents and will join the implementation support missions. The frequency of missions is expected to be twice per year. The specialist will review the red flags required to be checked for all procurement under the project; implementation of the procurement risk mitigation framework; and implementation of recommendations provided in the various audit reports.

12. **Environmental Safeguards supervision:** An environmental specialist based in the Bank's office in Dhaka will be a member of the project team throughout the Project period. Besides supervision of compliance with environmental safeguards, the specialist will provide support to IDCOL in strengthening the Environment and Social Safeguards Management Unit (ESMMU) for effective implementation of the ESMF. The specialist will assess performance of the unit and monitor implementation of recommendations of the annual environment audit and third party monitoring reports.

13. **Social Safeguards supervision:** A social development specialist based in the Bank’s office in Dhaka will be a member of the project team throughout the project period. Besides supervision of compliance with social safeguards, the specialist will provide support to IDCOL on implementation of the ESMF. The specialist will monitor implementation of recommendations of the third party monitoring reports.

14. **Implementation of GAAP:** A Governance specialist based in the Bank’s Dhaka office will be a member of the project team throughout the Project period to support implementation of the GAAP and the risk mitigation measures related to governance and corruption.

**B. Skills Mix Required**

Skills Needed	Number of Staff Weeks	Number of Trips	Comments
Task management Dhaka-based	25	10	Field-based
Co-Task management International	5	4	International Trip
Renewable energy specialist	10	4	International Trip
Irrigation specialist	10	10	Field-based
Household energy specialist - International	4	2	International Trip
Household energy specialist – Local	10	5	Field-based
CFL specialist	5	2	International Trip
Sector technical specialist	5		Field based
Gender specialist	8	5	
Procurement specialist	4		Field-based
Financial management Specialist	5		Field-based
Environment specialist	5	2	Field-based
Social development specialist	5	2	Field-based
Governance Specialist	3	1	Field-based

## **Annex 6: Governance and Accountability Action Plan (GAAP)**

### **BANGLADESH: Rural Electrification and Renewable Energy Development II**

#### **Introduction**

1. Improving governance and fighting corruption are central to the Government of Bangladesh's development agenda set forth in the 6<sup>th</sup> Five Year Plan and the Bank's mission of promoting sustainable growth and reducing poverty. This Governance and Accountability Action Plan (GAAP) for the Rural Electrification and Renewable Energy Development II (RERED II) Project contributes to these efforts by outlining a framework for actions, institutional arrangements, and additional specific measures to minimize governance and corruption risks in the project. The project is largely a repeater of an on-going project. The experience from the on-going project has been incorporated in the assessment of the critical governance and corruption risks and in designing the action plan for mitigating the risks. This GAAP has also been consulted with the implementing agencies to take into account their concerns and perspectives. Consultations with the POs will be done to ensure that they are fully aware of the principles and requirements set forth in the GAAP.

#### **Country Context and Background**

2. Bangladesh is a high risk environment for governance. The judiciary system is hampered by weak conflicts-of-interest regulations. The implementation of Bangladesh's Right to Information Act 2009 has been slow, partly because of poor records, lack of public awareness, and weak capacity. Despite some attempts to enhance accountability in the legal framework for corporate governance and public sector regulation, there is still a perception of poor performance and abuse of office in the public sector including state-owned enterprises. The Bank's Country Assistance Strategy (FY11-14) for Bangladesh has also defined weak governance as a binding constraint to inclusive growth and committed the Bank to embedding more systematic approaches to governance challenges across the portfolio.

3. Governance in the energy sector has had particular challenges. There is a perception of corruption in large value procurements. The sector remains affected by political considerations, short-term planning horizons of successive governments, poor incentive structure for managers and regulators, and a not-yet-mature regulatory body. However, these problems in the sector overall have had limited effect on the renewable energy program of the government. This program is implemented by the Infrastructure Development Company Limited (IDCOL), a government-owned company with a performance-oriented corporate culture. Besides, IDCOL as a financial intermediary is not involved in large value procurement minimizing the risk of outside interference.

4. The proposed project involves three implementing agencies. The major components of the project (access to electricity through renewable energy and access to modern energy for cooking) would be implemented by the *Infrastructure Development Company Limited (IDCOL)* through a number of Non-government Organizations (NGOs) and private sponsors. The *Rural Electrification Board (REB)* would be responsible for procurement and deployment of Compact Fluorescent Lamps (CFLs) through the rural cooperatives (PBSs) and other distribution utilities.

*Power Cell*, a technical arm of the Ministry of Power, Energy and Mineral Resources (MPEMR) would be responsible for supporting sector reform activities through a sector technical assistance component. All the three agencies have gained experience in implementing Bank projects through their involvement with the on-going Rural Electrification and Renewable Energy Development (RERED) and Power Sector Development Technical Assistance (PSDTA) projects. Because of this ongoing engagement, institutional weaknesses and major governance and corruption risks for the proposed project are mostly known which has contributed to the detailed risk assessment and design of the mitigation measures in this GAAP.

## **Governance and Corruption Risks**

5. The governance and corruption risks in the proposed project fall into two major categories: i) Service Delivery Risk; and ii) Capacity Risk.

6. **Service Delivery Risks:** The major allocation of the Project is for solar home systems (SHS), which is implemented under a market-based public-private partnership model where NGOs (called Partner Organizations or POs) sell the systems to rural households/businesses under a micro-credit scheme. The NGOs later get refinancing of the micro-credit part from project fund after IDCOL verifies that the systems installed by the POs conform to the technical standards of IDCOL. Because of the growing size of the program, 100% verification of installation by IDCOL's inspectors is not possible. Inspection and verification of a certain percentage of systems on a random selection basis are done before funding is released by IDCOL. The program is based on the assumption that because the POs operate in a competitive market of selling SHS, each has an incentive to perform and deliver on quality supply, installation, and maintenance of the SHS. This market mechanism is also the principle means to counter rent-seeking and other types of corruption, since such behavior would undermine competitiveness and quickly lead to failure of the business. For this market based incentive to work, there would have to be options for consumers to buy systems from competing POs. IDCOL is gradually introducing more POs to the program (that meet the eligibility criteria) to ensure adequate competition in the market. Starting with just 5 POs when the program started in 2003, IDCOL currently has 30 POs, and more are planned to be added. Still, the market is dominated by only a few players with the largest PO (Grameen Shakti) having 40% market share with the second largest PO (Rural Services Foundation) having 11% share. This high concentration of a limited number of players increases the risk of market imperfections including potential collusion in certain areas.

7. **Capacity Risks:** The renewable energy program of IDCOL is growing at a fast rate overstressing IDCOL's capacity for inspection and monitoring. In addition to further supporting the scale-up of the SHS program, the Project would support renewable-energy based mini-grids and captive plants, and solar irrigation pumps under the Remote Area Power Supply Systems (RAPSS) sub-component. Approval of these sub-projects would require location-specific due diligence by IDCOL. The Project would also support introducing clean energy for cooking to be implemented by IDCOL with the help of POs. All these activities are going to put additional burden on IDCOL's already overstretched institutional capacity for due diligence, inspection, and monitoring thus aggravating the risks that the refinancing and grant facilities are abused (POs submitting false claims of systems/connections to avail project funds), that sub-

standard equipment are used resulting in poor service quality, and that the after-sales services are not provided in a satisfactory manner.

8. The procurement of first phase CFLs by REB under the on-going RERED project had difficulties (numerous complaints from bidders, disagreement with the Bank on the bid evaluation reports etc). The second phase procurement experience under the RERED project was much better (relatively clean bid evaluation report and only one complaint from bidders). However, the procurement could not be concluded due to issues related to performance guarantee by the winning bidders. Delays in awarding contracts and maintaining confidentiality during the bidding process are issues in REB.

9. The Power Cell, the technical arm of the Power Division under MPEMR, has shortage of staff in procurement and financial management to ensure proper utilization of project fund.

### **Actions to Mitigate Governance and Corruption Risks**

10. To mitigate the service delivery and capacity risks in the implementing agencies of the Project, the following measures are proposed.

11. To mitigate the service delivery risk, an assessment of the market competitiveness of the SHS program will be carried out early in project implementation and appropriate interventions would be taken to ensure proper functioning of the market based model. The assessment will look at the number of field offices of different POs in different geographic areas as an indicator of market competitiveness. An impact evaluation study of the SHS program is currently ongoing that includes, among others, an assessment of the performance of a selected POs in terms of service delivery. This report is expected by project effectiveness. Appropriate interventions based on these assessments will ensure a smooth transition towards the goal of a full commercialization of the SHS program during the implementation of the Project.

12. Transparency measures will feature prominently in the project. All three implementing agencies will have duly appointed designated officers to fulfill obligations for proactive and reactive disclosure under Bangladesh's Right to Information Act. These persons will be ensured adequate training and capacity to carry out their duties. A program for proactive provision of information about the agencies' services, performance, and financing will be designed and executed. Project management and the designated officer will monitor feedback through helpline calls, the SMS system, and other complaints mechanisms listed below and accordingly adjust proactive disclosure of information to meet more closely what interests the public.

13. A third party monitoring is being introduced under the on-going RERED project to supplement IDCOL's efforts of appropriate feedback and monitoring of PO activities for ensuring effective service delivery by the POs. This third party monitoring mechanism will be continued under the RERED II Project focusing on collecting feedback from the beneficiaries on service quality. A technical audit by an independent third party will be undertaken every year to test if the quality of the installations conforms to the technical standards set by IDCOL. IDCOL has a hotline for customers to call directly and report any problems, which are then followed up by IDCOL with the concerned POs.

14. Several IT based options for enhanced reporting and feedback are being explored that will be implemented in the proposed project. Some of the POs already have an SMS based system in place to track daily installation data of various field offices of the POs. The option of introducing this system for the whole program would be explored which would allow for automatic update of the installation data in the database maintained at IDCOL to avoid false claims. Using the technology, the staff of a PO could record a geo tagged, time and date stamped picture of the SHS, which could be automatically updated in the database of IDCOL and the concerned PO. Similarly, customer satisfaction feedback via SMS would be introduced that would allow for an easy and cost-effective method for collecting customer feedback, thus ensuring enhanced accountability of the POs for proper service delivery.

15. To address the capacity risks, an institutional development consultant has been appointed by IDCOL to assess the organizational structure of IDCOL and to propose modifications to meet the needs of the growing renewable energy portfolio. It is expected that IDCOL will establish a separate unit with adequate staff to ensure effective implementation of the access to electricity component of the Project. Support for the Project Management Unit (PMU) for the household energy component has been provisioned for in the Project.

16. Procurement of goods and services for the access to electricity component is the responsibility of the concerned POs. POs are required to conform to commercial practices and ensure economy and efficiency in procurement of the systems components. It is important to ensure that the POs are procuring the equipments at a competitive price, which in turn would ensure that the end-user prices are reasonable and fair. For this, a procurement audit by an independent auditor will be undertaken every alternate year during Project implementation to assess the procurement practices of the POs. All procurement information as required by Bangladesh's procurement framework, including the procurement plans and information about awards, will promptly be made publicly available.

17. To address the institutional and governance issues at REB, a Bank-supported study was initiated in 2009 that identified the problems/issues and provided recommendations for addressing them. After extensive consultations with various stakeholders (including staff and management of REB and the PBSs), GOB is at the final stage of developing a credible and time-bound action plan for strengthening the REB and the PBSs. GOB has already made some positive changes in the top management of REB in its efforts towards introducing professional management at REB.

18. For the second phase CFL procurement proposed under the project, the following 'ring fencing' measures were discussed and agreed: i) a time bound action plan with close monitoring by REB and the Power Division; (ii) a thorough terms of reference for the bid evaluation committee; (iii) appointment of a competent international technical specialist (with adequate knowledge on commercial and technical issues on CFLs) to support REB during bid invitation, evaluation, and post-award inspections; iv) appointment of a competent international procurement consultant to support REB during bid invitation and evaluation; v) selection of competent bid evaluation committee members with inclusion of the international procurement specialist; and (vi) establishing strict confidentiality arrangements for bid evaluation.



19. The Power Cell has initiated recruitment to fill-in the vacant positions and to strengthen its procurement and financial management capacity. Appointment of the Assistant Director (Accounts) has been made a condition for disbursement for the sector TA component implemented by Power Cell. A procurement consultant would support Power Cell throughout the implementation period of the proposed project, and a staff of Power Cell would be designated as procurement focal person with adequate training provided.

20. The Bank will apply sanctions as per its guidelines if it determines incidences of fraud, corruption, collusion and coercive practices. These sanctions may include fines, blacklisting, suspension of disbursements, or ultimately cancellation with respect to that contract. The Bank will seek first to remedy cases of corruption through cooperation with the implementing agencies. Any entity that is found to have misused funds may be excluded from subsequent funding. Information regarding such cases, where lessons are learnt and funds are retrieved, will be widely disseminated.

21. The GAAP matrix proposes actions for each of these issues, timeline for each action, and responsible agency for implementation. There are also some “early warning indicators” which, if monitored properly, would enable timely actions for course correction.

### **Monitoring arrangements**

22. GAAP will be monitored regularly through indicators and reflected in progress reports by the implementing agencies, as well as in World Bank implementation supervision reports and aide memoires for supervision missions. The GAAP matrix will be used widely for monitoring purposes. Any ‘early warning’ indicators of governance and accountability risks will be monitored regularly so that corrective measures could be carried out promptly. A Governance Specialist will also be included in the Bank supervision team to strengthen the dialogue on the governance and accountability issues with the respective implementing agencies.

### **Bank Supervision and Surveillance**

23. The project will require intensive supervision by Bank staff. Supervision arrangements for this project, particularly for procurement and financial management, are extensive. Bank supervision missions will be more frequent at the start of the project and would involve qualified staff in all disciplines, including procurement and financial management. The Bank will also conduct regular monitoring between supervision missions.

24. The GAAP will be adjusted as necessary during implementation to reflect governance issues which may emerge and/or to add actions. Considering the track record of the main implementing agency, fund flow and oversight arrangements and subject to meeting the agreed GAAP, the implementing agencies will have adequate systems to account and report for the project resources and expenditures accurately, and ensure that the project funds are utilized for the intended purpose.

**Matrix of Actions**  
**RERED II Project Governance and Accountability Action Plan**

<b>Issues/Risks/ Objective</b>	<b>Actions</b>	<b>Agency responsible</b>	<b>Timeline</b>	<b>Early Warning Indicators to Trigger Additional Action</b>
<b>Service Delivery Risks</b>				
Ensure adequately competitive market for effective service delivery	<p>Carry out a market assessment to gauge the extent to which customers have options in choosing the service provider</p> <p>Complete impact evaluation study that includes an assessment of PO performance</p> <p>Based on the assessments, take appropriate interventions for ensuring an adequately competitive market</p> <p>Conduct Technical audit by an independent auditor on installation quality</p>	<p>IDCOL</p> <p>Study consultant</p> <p>IDCOL</p> <p>IDCOL appointed auditor</p>	<p>Early in project implementation</p> <p>Early in project implementation</p> <p>Early in project implementation</p> <p>Every year during project implementation</p>	<p>Delays in initiating the assessment</p> <p>Delays in report submission</p> <p>Delays in implementing appropriate interventions</p> <p>Delays in appointing auditor, non-cooperation by the POs</p>
Ensure enhanced reporting and feedback	<p>Undertake regular reporting by the implementing agencies on implementation</p> <p>Ensure RTI Designated Officer in place and proactive information dissemination conducted</p>	<p>IDCOL/REB/Power Cell</p> <p>IDCOL/REB/Power Cell</p>	<p>Quarterly</p> <p>Within three months of effectiveness</p>	<p>Lack of focal point or frequent replacement</p> <p>No designated officers in place; check of websites reveals lack of information</p>

<b>Issues/Risks/ Objective</b>	<b>Actions</b>	<b>Agency responsible</b>	<b>Timeline</b>	<b>Early Warning Indicators to Trigger Additional Action</b>
	Introduce third party monitoring system	IDCOL	Within the first year of project implementation	No initiative by the implementing agency
	Introduce IT based systems for reporting installation data and for collecting customer feedback	IDCOL/POs	Within the first year of project implementation	No initiative by the implementing agency, non-cooperation by the POs
<b>Capacity Risks</b>				
Strengthen institutional capacity for effective implementation	Complete review of the organization structure of IDCOL	Institutional Development Consultant	Early in project implementation	Delays in implementation of the study recommendations
	Develop a credible and time-bound action plan for strengthening REB/PBS program	REB	Within the first year of project implementation	Delays in finalizing the action plan
	Appointment of Assistant Director (Accounts)	Power Cell	Before disbursement of the component	Delays in initiating selection process
Reduce risk of corruption in procurement.	Conduct procurement audit by an independent auditor on PO procurement practices	IDCOL appointed auditor	Every alternate year during implementation	Delays in appointing auditor, non-cooperation by the POs
	For the energy-efficient lighting component, develop i) a time bound action plan with	REB	Before initiating CFL procurement	Delays in developing the

<b>Issues/Risks/ Objective</b>	<b>Actions</b>	<b>Agency responsible</b>	<b>Timeline</b>	<b>Early Warning Indicators to Trigger Additional Action</b>
	<p>close monitoring by REB and the Power Division; (ii) a thorough terms of reference for the bid evaluation committee; (iii) appointment of a competent international technical specialist to support REB during bid invitation, evaluation, and post-award inspections; iv) appointment of a competent international procurement consultant to support REB during bid invitation and evaluation; v) selection of competent bid evaluation committee members with inclusion of the international procurement specialist; and (vi) establishing strict confidentiality arrangements for bid evaluation.</p> <p>Appointment of a procurement consultant and training for procurement focal point</p>	Power Cell	Early in project implementation	<p>action plan and terms of reference, delays in appointment of the international technical specialist, complaints received</p> <p>Delays in initiating selection process</p>

## **Annex 7: Impact Evaluation Methodology**

### **BANGLADESH: Rural Electrification and Renewable Energy Development II**

1. An Impact Evaluation will be designed to attribute causality to project interventions. The proposed Impact Evaluation (IE) aims to determine whether the project has had a significant impact on income, employment, access to social services and socio-economic welfare of the beneficiaries. Results will be disaggregated by gender to measure the impact on female beneficiaries. A baseline survey will be carried out at the project start and the follow-up survey at the project completion. The study will implement a difference-in-difference approach for comparison between treatment (beneficiaries of the project) and control (non-beneficiaries) groups. The impact evaluation would be based on a diverse set of data sources: primary data collection through baseline surveys, participatory focus group discussions, consumer satisfaction surveys, and selected secondary data sources (household surveys, census, and other types of secondary information).

2. **Research Questions for the Impact Evaluation.** The proposed IE aims to determine whether the project has had a significant impact on the earnings and socio-economic welfare of beneficiaries. The evaluation seeks to answer the questions of whether the intervention impacted households': i) Mid-term earnings 18 months after being intervened (in particular, by farm and non-farm sector to identify transition between sectors); ii) consumption, iii) behavioral changes due to the availability of electricity (e.g time use); iv) gender differential in the outcomes; v) health outcomes (in particular for women and children who are the most exposed groups to indoor air pollution); vi) educational outcomes such as study hours, school attendance and grade completion (by gender).

3. **Control Group and Identification Strategy.** Ideally, one would have two groups to be compared that would be as identical as possible before the intervention (ex-ante) in both observable and unobservable characteristics and factors. In order to secure the similarities between these groups, the IE will be designed as a randomized controlled trial (RCT). This design constitutes the best strategy to ensure that the impact analysis is conducted in rigorous fashion and enables causal inference. If this is achieved, the single difference between the two groups after the intervention could be attributed to the impact of the program's implementation. For doing this, eligible beneficiaries that will be willing to participate in early stages of the program will be randomly assigned to intervention and control groups. Randomization ensures that any source of bias is properly isolated. The expected demand for the project will determine the final design of the IE. Information on this demand is expected to be refined before the program becomes effective. In the most likely scenario of excess demand for the program, a lottery would be used as a fair and transparent option for giving every woman the same chances to be first (or last) in the program. This, as well as other alternatives, will be agreed with the GoB upon project approval and the concept of the evaluation will further reviewed as a stand alone analytical piece following the standard quality enhancement procedures.

4. **Data.** The baseline survey will be conducted in the first six months of project implementation. The surveys will be implemented at household and village level. The follow-up survey will take place 18 months after the first batch of households are implemented and be

applied to the same sample used for the baseline. Qualitative data, at household and community levels (focus groups), will be included as part of the baseline survey data collection. The gathering of qualitative information can provide information to refine the analysis of the diffusion mechanisms of the impact identified in the evaluation as well as potentially capture additional spillovers effects.

**5. Methodology of analysis.** In case the randomized intervention is difficult to implement (for practical reasons), alternate cross-sectional estimation techniques can be explored such as Propensity Score Matching (PSM) and Instrumental Variable (IV) technique. Furthermore, the study can implement a difference-in-difference (DiD) approach for comparisons between treatment and control groups, drawing on data from both the baseline and the follow-up surveys. The DiD methodology consists of measuring the average change in a given indicator between two periods (before and after the intervention, for both treatment and control groups) and then comparing the changes for the two groups. The differences between two groups reflect the isolated effect of the program. The DiD econometric analysis will allow for verification of the effectiveness of the randomization strategy in creating comparable groups. It will also facilitate correction of some potential “contamination” of the data, as the before–and–after difference for each group corrects for any remaining fixed differences between treatment and control while the difference between groups deals with external factors that affect the target population during the interval of analysis. Moreover, controlling for initial conditions in the DiD implementation can correct for biases due to pre-existing differences between the treatment and control group.

## **Annex 8: Operations Policy 8.30 Compliance Review**

### **BANGLADESH: Rural Electrification and Renewable Energy Development II**

#### **I. Introduction**

1. This is a review of the Rural Electrification and Renewable Energy Development II (RERED II) Project, to ascertain its compliance with WB OP 8.30 requirements. This review is based on study of the available background documents, discussions with the Project task team and the client, and examination of documents submitted by Infrastructure Development Company Limited (IDCOL), the financial intermediary (FI) for the project.

#### **II. The Project: Financial Sector Context and Objectives**

2. The ongoing RERED Project, scheduled to close in December 31, 2012, has been under implementation with the objective of increasing access to electricity in rural areas of Bangladesh through installation of Solar Home Systems (SHSs), a renewable energy solution. The experience of the RERED Project has been encouraging, as it is making real impact in off-grid remote areas in the country. The RERED II Project will expand the outreach of the SHS and also introduce new component of private sector led mini-grid schemes, solar irrigation pumps, and captive plants for rural areas. The renewable energy components of RERED II will be implemented by IDCOL, which on-lends to selected partner organizations (POs) across the country. The RERED II Project aims at increasing access to clean energy in rural areas through renewable energy sources to in rural areas through renewable energy and promote more efficient energy consumption.

3. Availability of electricity not only improves quality of livelihood but enhances delivery of social services like education and health in rural areas. As such, it promotes inclusive growth as stated in the third pillar of the CAS 2010 - 2013. On the other hand, financing real sector investment in affordable power in environmentally friendly manner and promoting development of participating organizations are real benefits derived from a financial intermediary loan (FIL), which is consistent with the first pillar of CAS 2010 - 2013. Thus, the proposed new FIL, RERED II Project is consistent with the country's poverty reduction objectives.

#### **III. Policy Framework for the FIL**

4. The macroeconomic pressures intensified in Bangladesh over the past 18 months, resulting in a marked deterioration in the country's external position. These pressures stem mainly from large oil and capital imports associated with new fuel intensive power stations, oil price-driven terms-of-trade shock, and expansionary fiscal and monetary policies.<sup>21</sup> The near term, and possibly the medium term, outlook continues to remain challenging, with risk posed by external, fiscal, and inflation pressures.

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<sup>21</sup> Different background papers prepared by IMF in 2011 – 12 while processing extended credit facility (ECF) for Bangladesh

5. The overall situation in the financial market remains volatile. While financial soundness indicators (FSIs) have improved in recent years, banking system stability could be undermined by systemic risks emanating from rising liquidity pressures, limited prudential oversight, and weak bank governance and risk management controls, most notably at the state owned commercial banks. Rapid growth in the banking sector and equity markets has strained supervisory capacity of the regulators and heightened systemic risks. Instability looms large in the capital market with aversion to long term equity investment by the institutional investors, whose capacity to invest is partly constrained by the current liquidity crunch.

6. The ongoing global economic/financial crisis appears far from being over; a number of economies in the European Union are going through severe fiscal and monetary turmoil. Private sector confidence in the market is yet to be restored in the USA and in other leading economies. Amidst all these, Bangladesh continues to be one of the least affected countries and remains on the path of 6% growth in GDP. Small size of the economy, relatively low integration with global financial markets, and entrepreneurial zeal in the domestic private sector continue to be the primary reasons for this apparent insulation and resilience. However, remittance flow and export of readymade garments – Bangladesh’s two main channels of integration to the global economy – have been challenged by the consumer behavior and investment activities in the western economies. Especially, the export earnings through the trade channel appears more vulnerable in the short to medium term. On the domestic real economy front, lack of new investments due to infrastructure bottleneck accumulated over the years remains a source of concern. Together with relatively high probability of double digit inflation (mainly non-food), the financial sector activities and parameters such as interest rates will continue to be restrictive for financial market players and the business of financial intermediation is going to be affected in the near to medium term.

7. One important aspect of compliance review is likelihood of Government intervention in the market through the Project, leading to distortion in the process of financial intermediation. As in the ongoing RERED Project, approach of implementation would remain the same for the new financing through RERED II; i.e. IDCOL would provide financing to the POs (NGOs, micro-finance institutions, cooperatives, and private organizations) to sell the SHSs to consumers using a micro finance scheme. The POs have greater access as well as acceptability at the community level. Hands on expertise and experience in implementing micro-finance operations would also be a criterion. The POs would extend micro-finance for consumers to buy the SHSs and would, in turn, get re-financing from IDCOL for 60-80% of the micro-finance extended to consumers. The POs’ operation would be at the market determined interest rate, as in other microfinance services they provide. Currently the POs’ interest rate varies between 12% -15% (nominal rate) with a repayment period of 2-3 years. The POs receive re-financing from IDCOL at 6% - 9% interest rate with a repayment period of 5 - 6 years including the grace period. The cost of funds for the POs under the RERED II Project is comparable to other sources of financing – such as PKSF (Pally Karma Shahayak Foundation, the microfinance apex). Thus there would be no significant market distortions arising from implementation of the RERED II Project.

8. There is, however, some subsidies to make the services affordable to the poor. A small subsidy of US\$ 20 per SHS per household (initially the subsidy was US\$ 90) on the selling price is provided to buy down the capital cost of SHS. The RAPSS component has the provision to



have upto 50% of the project cost as subsidy to make the tariff affordable to the rural community. The household energy component likewise has a subsidy element for the biogas installations. For the SHS program, it is expected that the need for subsidy would continue to decrease as the remaining market barriers are overcome, competition is enhanced in the market, and the rapid decline in the PV prices in the international market continues. The ultimate target is to withdraw the subsidy component and make SHS a fully market based commercial solution.

#### **IV. Eligibility of the FI**

##### **1. Implementation Progress**

9. Implementation progress of the renewable energy component implemented by IDCOL is rated satisfactory consistently. Against initial project target of 50,000 households, over 236,000 households were provided with SHS-based electricity under the original credit. Under the first additional financing, over 300,000 SHS were supported. Under the second additional financing approved in 2011, another 630,000 systems are targeted to be supported by the credit closing in December 2012. Currently over 50,000 households are getting SHS installed per month. The pace of growth suggests that there is demand for SHS at the household level and IDCOL can utilize additional resources needed for satisfying the market demand.

##### **2. Financial Performance of IDCOL**

**(i) Capitalization:** In terms of capitalization, IDCOL stands well. As of January 2012 its share capital was raised to BDT 1,200 million and total equity is BDT 1,656 million, which is around 82% and 73% higher than what these were during the last OP8.30 review in 2011. In terms of Paid-up Capital, IDCOL is over the top of the BASEL II requirement of 1,000 million. The share capital and total equity is around 10.6% and 14.63% respectively of the loans and advances outstanding (these were 9% and 14% respectively during the last OP8.30 review in 2011). The recent drop in the historically high capitalization to loans and advances ratio is due to significant increase in long term loans extended to power sector, especially to the renewable energy sector.

**(ii) Recovery Performance:** IDCOL's overall loan recovery rate has improved to 98.69% from previous 96% (June 2010). This signifies that implementation of the IDCOL approach has proven to be sustainable and without compromising with the loan recovery rate.

**(iii) Loan Loss Provisioning:** IDCOL does abide by provisioning guidelines of Bangladesh Bank - the central bank of the country. The financial intermediary has been provisioning 1% for unclassified loans and 20% for the classified part of the portfolio, as per the regulation.

**(iv) Accounts Keeping:** Accounting documents and financial statements of the Company have been audited by renowned audit firms over the last three fiscal/accounting years. It

appears that adequate numbers of disclosures (mandatory and voluntary) have been made in the company annual reports and those were approved by the auditors.

**(v) Profitability:** As per the audited financial statements, IDCOL has been earning profits, which is adequate to support sustainability and business continuity of the FI. In FY 11, net profit of the company was 44.85% of its operating income.

**(vi) Management:** The policy affairs of IDCOL are set and overseen by an independent Board, represented by personnel from both government and the private sector. The day-to-day business of the FI is run by trained professionals hired from the market. As far as the Project is concerned, a technical standards committee approves the standards and an operations committee monitors the POs' technical and financial performance.

### **3. Exemptions**

10. As per Bangladesh Bank Circular IDCOL is exempted from compliance of sections 4(d), 6,9,14(1)(b), 14(1)(d),14(1)(e),14(1)(f), 16, 17, 18, 19, and 25(3) of the Financial Institutions Act 1993. These exemptions provide Government guarantees and enhance IDCOL's capacity to sustain as a viable non-banking financial institution in Bangladesh.

11. Under the original RERED and during the two additional financing, IDCOL received OP8.30 clearance at the appraisal stage.

### **V. Key Risks and Challenges**

12. IDCOL's investment portfolio has major concentration risk in terms of single sector/product exposure. At present about 69% of its portfolio holds lending/assets in renewable energy sector. This indicates inability of the FI to diversify its portfolio into different sectors/products; IDCOL official reported that the organization's mandate has been a limiting factor in product diversification. However, this assessment stresses that IDCOL immediately embarks on devising strategic plan for diversification and balancing its portfolio.

13. Given the cautious outlook for investment, at least in the near term, IDCOL is facing a big challenge of reinvesting its proceeds from the existing investments outside renewable energy and of maintaining the growth required for sustainability. Once again, a strategic plan for short, medium, and long term investment is imperative to address this challenge.

### **VI. Recommendations**

14. Considering the issues covered in the previous sections and based on other available information, it appears that IDCOL, the financial intermediary for the RERED II Project, is compliant with the Bank's OP 8.30 requirements. However, it is recommended that adequate care and due diligence be carried out as regards the following aspects:

- (a) In order to be compliant to CAS pillars and outcomes, RERED II Project would remain focused on poor households' demand satisfaction and adequate importance would be given to the newly introduced components to have a greater development impact.
- (b) The project team would need to keep a close eye on the overall financial sector parameters and monitor impact of the same on the FI as well as domestic capital and on the POs.
- (c) The standards and criteria used for selecting POs by IDCOL should be maintained and, if necessary, be revised for improving quality of implementation.
- (d) It is understood that the amount of subsidy component is less than significant and is required for increasing awareness among the poor households in the rural areas. IDCOL should continue to have guard on use of the subsidy component in terms of benefit going to those meeting the project criteria.
- (e) As far as the mini-grid component is concerned, market based private sector principles will be maintained.
- (f) It is imperative that IDCOL initiates formulating a strategic plan for investment, with a clear objective of diversifying and balancing its portfolio of assets. After all, sustainability and growth of IDCOL should not be made too much dependent on donor supported renewable energy products.

## Annex 9: Economic and Financial Analysis

### BANGLADESH: Rural Electrification and Renewable Energy Development II

#### Solar Home Systems Component

Summary SHS Program Performance Indicators		
SHS Households Benefitted	550,000	
PV modules used	28	MWp
<b><u>National Benefits</u></b>		
Economic NPV (w/o consumer surplus) @10%	16,489	Millions of BDT
Economic NPV (w/ consumer surplus) @10%	225,031	Millions of BDT
Economic IRR ( w/o consumer surplus)	43%	
Financial NPV @12%	9,765	Millions of BDT
Financial IRR	26%	
Annual Kerosene Saved	40	million liters/year
Value of kerosene saved to nation	2,713	millions BDT per year
NPV Kerosene subsidies offset	2,560	millions BDT
NPV Taxes Earned (from hardware sales)	1,879	millions BDT
SHS grants provided	740	millions BDT
NPV net fiscal impact	3,699	millions BDT
<b><u>Household Benefits</u></b>		
PV electricity delivered	45,568	MWh/year
NPV net financial benefits for households	4,405	Millions BDT
Financial IRR for Households	25%	
Value of Kerosene Saved for households	2,413	millions BDT per year
<b><u>Benefits to Partner Organizations</u></b>		
NPV @ 10%	2,656	Millions BDT
Financial rate of return	16%	
<b><u>Global Benefits</u></b>		
CO2 emissions offset	95,325	tons CO2/year

1. **Proposed SHS Investment and Alternative.** The Solar Home System (SHS) comprises of a solar panel of varying sizes from 10 to more than 100 Wp each, with appropriately sized controller and batteries, wiring, and efficient CFL or LED lamps and outlet(s) for supplying power to small appliances such as a radio or TV. The amount of electricity produced is directly proportional to the size of the solar panel. The SHS replaces fuel based lighting, most often kerosene lighting, and disposable or rechargeable batteries for operating small appliances. The light quality from CFL or LED lamps is far superior to lighting from kerosene lamps so users gain considerable benefits from superior lighting, especially for reading, general illumination and removing a fire hazard posed by kerosene lamps.

2. **Project Economic and Financial Viability.** The economic and financial analysis is based on the supply and installation of 550,000 solar home systems of varying capacities for a period of about 15 months beginning January 2013. The pace of installation is conservatively assumed to be the same as it is today, about 38-40,000 a month, with about 25,000 SHS a month directly funded from RERED II and the balance using other sources of funds available to IDCOL and the Partner Organizations. For analysis purposes, the product mix is assumed to be similar to that from January 2010 to December 2011, though the share of systems up to 20 Wp is assumed to increase slightly to 23 percent from 21.5 percent as subsidy for SHS larger than 30 Wp will no longer be available.

3. Economic internal rates of return were used to assess the viability of SHS where it displaced kerosene lighting and rechargeable batteries. The economic analysis took into account the economic cost of the SHS, the replacement costs of key components and O&M services. Analyses are done in constant 2012 BDT. The benefits are accrued due to avoided cost of kerosene for lighting and charging batteries. Kerosene consumption data was based on a survey undertaken by IDCOL as part of establishing baseline for the CDM. Kerosene retail price used was 61 BDT/liter and the economic price was 69 BDT/liter. Fuel price escalation was based on US Energy Information Administration's medium term forecast. The SHS is expected to deliver 4.5 Wh/Wp of electricity daily.

4. Consumer surplus valued only the additional benefits accrued due to greater quantity of electric lighting available from the SHS (measured in lumen-hours) compared to kerosene lamps. The local environmental and safety benefits of switching from kerosene to electric lighting or the improved quality of lighting were not taken into account. The consumer surplus calculation is done using financial costs (since these are the costs actually seen by the consumer).<sup>22</sup> The consumer surplus benefit, though calculated, was not used in computing EIRR as its inclusion resulted in no negative cash flow values. CO2 emissions reduction value was taken into account, but it is low compared to economic cost savings.

5. From both an economic and financial viewpoint the project has high and robust internal rates of return (IRR). Even without considering consumer surplus benefits, the economic IRR is 43%. The financial IRR is 26%. Average kerosene fuel consumption per household needs to drop to 1 liter per month before the economic NPV reduces to zero at a 10% discount rate. Such low levels of consumptions have not been observed in Bangladesh among households considering purchasing SHS.

6. **PO Viewpoint.** From the viewpoint of the POs<sup>23</sup>, the SHS business is financially attractive, with Modified Financial IRR<sup>24</sup> for the POs of 16% (assuming a finance rate of 9

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<sup>22</sup> The consumer surplus estimation approach used was from Peter Meier, *An Economic Analysis of Solar Homes Systems: A Case Study for the Philippines*, February 3, 2003, The World Bank. See <http://go.worldbank.org/8SFC140Z10>.

<sup>23</sup> POs obtain 60 percent of loan amount from IDCOL at 9 percent and on-lend to SHS customers while retaining a margin of about 13-15 percent.

<sup>24</sup> Modified IRR (MIRR) avoids the problem associated with the standard IRR calculation formula, which assumes that interim positive cash flows are reinvested at the same rate of return as that of the project that generated them. This is usually an unrealistic scenario. The Modified IRR calculation assumes that that the funds are reinvested at a rate closer to the firm's cost of capital and negative cash flows are financed at the firm's cost of borrowing. This

percent and reinvestment rate of 15 percent). It assumes IDCOL financing of 60% of debt at 9 percent with loan tenor of 6 years with a 2 year grace period. The PO extends loans to the households at 15 percent.

7. **Household viewpoint.** The market response, in this demand driven project in itself provides a high degree of confidence that the individual households find that the SHS are attractive investments. The 20 Wp SHS offers 6 hours of lighting from two 7 Wp SHS (12 light-hours). The larger systems offer 12 to 20 light-hours per day. The larger systems also offer an additional 20-30 hours of TV viewing or other equivalent services.

8. A detailed financial analysis for individual systems finds that SHS are financially attractive with positive IRR and highly positive NPV for all systems (Table 1).

**Table 1 Financial Viability of Individual SHS**

SHS Financial Viability for Households				
	20 Wp	40 Wp	50 Wp	85 Wp
Levelized Electricity Cost (BDT/Wh)	0.100	0.084	0.085	0.079
Financial NPV @ 10% (BDT)	13,151	8,728	14,036	13,206
FIRR	47%	22%	25%	20%

9. The costs to households include the initial cost of supply and installation, O&M and replacement of battery, and controller over time. The benefits to a household comprise of avoided purchase of kerosene lanterns, batteries, kerosene fuel, and battery recharging costs.

10. **Global Benefits.** The reduction in emissions from kerosene use is 95 thousand tons of CO<sub>2</sub> annually. Additional CO<sub>2</sub> emissions reductions also occur as recharging batteries using fossil fuel generators are avoided. The economic value of global benefits if assumed to accrue only for ten years is BDT 243 million on a NPV basis (at USD 5/ton CO<sub>2</sub> avoided).<sup>25</sup>

11. **National Benefits.** The SHS offsets the use of 40 million liters of kerosene. The kerosene subsidy saved (estimated as the difference between the economic cost of kerosene and its financial cost), is BDT 2,560 million on a net present value basis over 20 years, assuming that the real price of kerosene does not increase and retail price remains unchanged. The Government will earn BDT 1,879 million in taxes on SHS components on a NPV basis. The grants for SHS sales are valued at BDT 740 million. The Government consequently has positive fiscal returns of BDT 3,699 million on a NPV basis. Income and other taxes that POs and IDCOL have to pay will further increase fiscal revenues.

## RAPSS Component

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avoids the problem with the IRR giving an unduly optimistic picture of the project. MIRR also avoids the problem with the standard IRR method where more than one IRR can be found in projects with alternating positive and negative cash flows. MIRR finds only one value.

<sup>25</sup> CO<sub>2</sub> emissions avoidance value from World Bank Carbon Finance Unit.

12. The RAPSS portfolio to be financed by IDCOL is expected to include solar photovoltaic (PV) powered mini-grids, irrigation pumping, and biomass gasification power plants. If demand exists and projects are viable, IDCOL may consider other applications such as solar cold storage; solar dryers; biogas power plants; and hybrid Hoffman brick kilns (see Table 2). As this is a demand driven program, specifying precisely the types and quantities of projects to be financed is not possible. For planning purposes, the RERED II Project is expected to finance 42 solar PV minigrids, 1,500 solar PV irrigation pumps, 450 biogas power plants and 28 biomass gasification power plants. Other sources of financing that IDCOL is mobilizing will finance the other investments.

**Table 2 Indicative Portfolio of RAPSS to be Financed under RERED II**

RAPSS Renewable Energy Investments (2013-2016)					Equity	Grant	Loan
Mini-grid Type	Average Capacity	Number	Cost per unit (USD)	Total	(USD million)	(USD million)	(USD million)
Solar Mini Grid	150 kWp	42	600,000	25.2	5.0	12.6	7.6
Solar Water Pump - Irrigation	500m3/day	1,500	40,000	60.0	12.0	24.0	24.0
Solar PV based cold storage	1000 m3	-	230,000	-	-	-	-
Solar dryer	80 kg	-	370	-	-	-	-
Biogas based Power Plant	20 KW	450	32,000	14.4	2.9	2.9	8.6
Biomass Gasification Plant	200 KW	28	285,000	8.0	1.6	1.6	4.8
Hybrid Hoffman Brick Kiln		-	1,000,000	-	-	-	-
<b>Total</b>		<b>2,020</b>		<b>107.6</b>	<b>21.5</b>	<b>41.1</b>	<b>45.0</b>

13. Economic cost effectiveness analysis was conducted for RAPSS applications - solar mini-grid, solar irrigation pumping and for biomass gasification captive power supply - against diesel generation as the alternative providing the same levels of service. Grid extension was not considered as an alternative as these will be installed in areas unlikely to be served by the REB grid in the near to medium term. Cost effectiveness analysis, rather than EIRR computation was undertaken as the type of service (electricity or water delivery), and the service levels (kWh or cubic meters of water supplied) from the renewable energy options and the diesel alternative are identical – thus the benefits are identical.

### Solar Mini-grids

14. A solar photovoltaic mini-grid comprises of a large, typically ground-mounted solar PV array, batteries, a back-up diesel generator and a distribution network connecting customers. An example of such a mini-grid is the 100 kWp Sandwip Island solar PV system to serve up to 400 consumers (but presently serving 165 customers) that include the small shops, school, health center and 4-5 residences surrounding Enam Nahar Market.<sup>26</sup>

15. Average consumption per customer from a solar mini-grid is significantly greater than from a SHS. For example, average consumption per customer in the Sandwip Island scheme currently could be about 1000 kWh per year (when all 400 customers are connected, the average would be up to 400 kWh/year). This level of consumption would be suitable for small enterprises and industry. In contrast a 50 Wp SHS delivers only 80-90 kWh per year suitable for providing

<sup>26</sup> Sandwip 100 kW Solar Mini Grid, [http://www.lged-rein.org/archive\\_file/brief\\_on\\_Sandwip\\_100kW\\_solar.pdf](http://www.lged-rein.org/archive_file/brief_on_Sandwip_100kW_solar.pdf)

basic lighting and electricity services. However, a solar mini-grid, or even a biomass gasifier or diesel mini-grid require certain pre-requisites to be fulfilled – there should be a significant number of customers located in a relatively compact area which can be connected by a grid network at low cost. The electricity demand per customer should be high including daytime loads, which implies significant business or industry demand, rather than only household demand. The mini-grid location should also be far from the grid, if not, it would be more economic to meet the demand through an REB grid extension.<sup>27</sup>

16. Since the quality and level of electricity service from a solar mini-grid would be the same as from an appropriately sized diesel mini-grid, an economic cost-effectiveness analysis was undertaken to verify that electricity from a solar mini-grid is less costly than from a diesel mini-grid providing the same level of service. The financial analysis of the solar mini-grid estimated the financial internal rate of return for the investment and the levelized financial cost of electricity from each mini-grid alternative.

17. An analysis was conducted for a representative mini-grid serving 500 customers using 0.77 kWh/day/customer based on expected maximum demand at the Manikgonj project. Required PV system size is 103 kWp with a 5 kW diesel serving as a backup to recharge the batteries for exceptionally cloudy/rainy periods. The alternative diesel generators are 2 x 80 kW assuming peak coincident load per customer of 130 W and diesels operate at 80% of their rated capacity. Two diesels are used to ensure adequate availability and reliability comparable to a solar mini-grid. Specific fuel consumption is 0.35 liters/kWh and 2% real fuel cost escalation<sup>28</sup> is assumed. Solar PV installed economic cost of \$3.72/Wp inclusive of distribution cost and BDT 0.66/Wp for taxes. Battery accounts for \$0.81/Wp (exclusive of taxes). Distribution network adds \$0.59/Wp to the cost. A back-up diesel is included to provide greater reliability. It is assumed that the back-up supplies 2.5 percent of the electricity. Life of electronic components, batteries is 5 years and diesel generator is 10 years. For financial analysis a 50% grant and tariff of 32 BDT/kWh is assumed based on Sandwip experience, with tariff escalation equal to half the diesel fuel escalation, plus a fixed monthly charge of BDT 100/customer. The diesel-only generators installed cost is 20,000 BDT per kW plus cost of distribution which is the same as for the solar mini-grid.

18. The analysis demonstrated that the solar PV minigrids can supply electricity cheaper than with diesels (economic levelized costs: 38 BDT/kWh for solar vs. 48 BDT/kWh for diesel). The financial levelized cost of electricity from the solar mini-grid is 30.8 BDT/kWh due to the 50% subsidy which partly offsets the taxes and duties paid on all components, except PV modules; compared to 42 for the diesel mini-grid that uses subsidies fuel. The switching value at which diesel electricity economic cost equals that of solar electricity is 30% less than the current cost of about \$1/liter. With a capital grant of 50 percent and a tariff of 32 BDT/kWh, the project has a Modified FIRR of 13.7 percent. The results are summarized in Table 3.

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<sup>27</sup> For a discussion of the options and trade-offs between grid, mini-grid and stand-alone electricity systems, see, Chapter 3 in: The World Bank, “Addressing the Electricity Access Gap”, Background Paper for the World Bank Group Energy Sector Strategy, June 2010 at [http://siteresources.worldbank.org/EXTESC/Resources/Addressing\\_the\\_Electricity\\_Access\\_Gap.pdf](http://siteresources.worldbank.org/EXTESC/Resources/Addressing_the_Electricity_Access_Gap.pdf)

<sup>28</sup> US EIA medium term forecast for diesel cost escalation.



**Table 3 Solar PV Mini-grid Economic and Financial Results**

Criteria	Condition	Diesel	Solar	Units
Levelized economic cost of electricity	Base case	47.7	38.4	BDT/kWh
Project FIRR			13.7%	
Financial Levelized Cost		42.7	30.8	BDT/kWh
Levelized economic cost of electricity	Real fuel escalation 0%	44	38	BDT/kWh
Project FIRR			13.7%	
Breakeven PV system cost			4.95	USD/Wp
			33%	higher
Breakeven diesel fuel domestic economic cost when economic cost of diesel and solar electricity are same.			30%	Less than current economic cost of US\$ 1/liter

19. A tariff of 32 BDT/kWh is significantly greater than the tariff charged by a BPS, however, in the Sandwip Island solar PV mini-grid, consumers are paying a tariff of 32 BDT/kWh. A significant risk in these projects is that customers may not want to pay such high tariffs if nearby PBS customers are paying a much lower tariff. This risk may limit the demand for solar mini-grids. Willingness to pay assessments are crucial.

20. It is also important to locate the solar mini-grid (or any other mini-grid) in areas where the likelihood of REB extending its grid in the near future is low. In the case of a solar mini-grid, a key decision point is in about the sixth year where significant investment is needed for battery replacement. By the end of the seventh year the project should begin to have positive cumulative cash flow and after the 8<sup>th</sup> year the financial IRR should be more than 12 percent. See Figure 1.

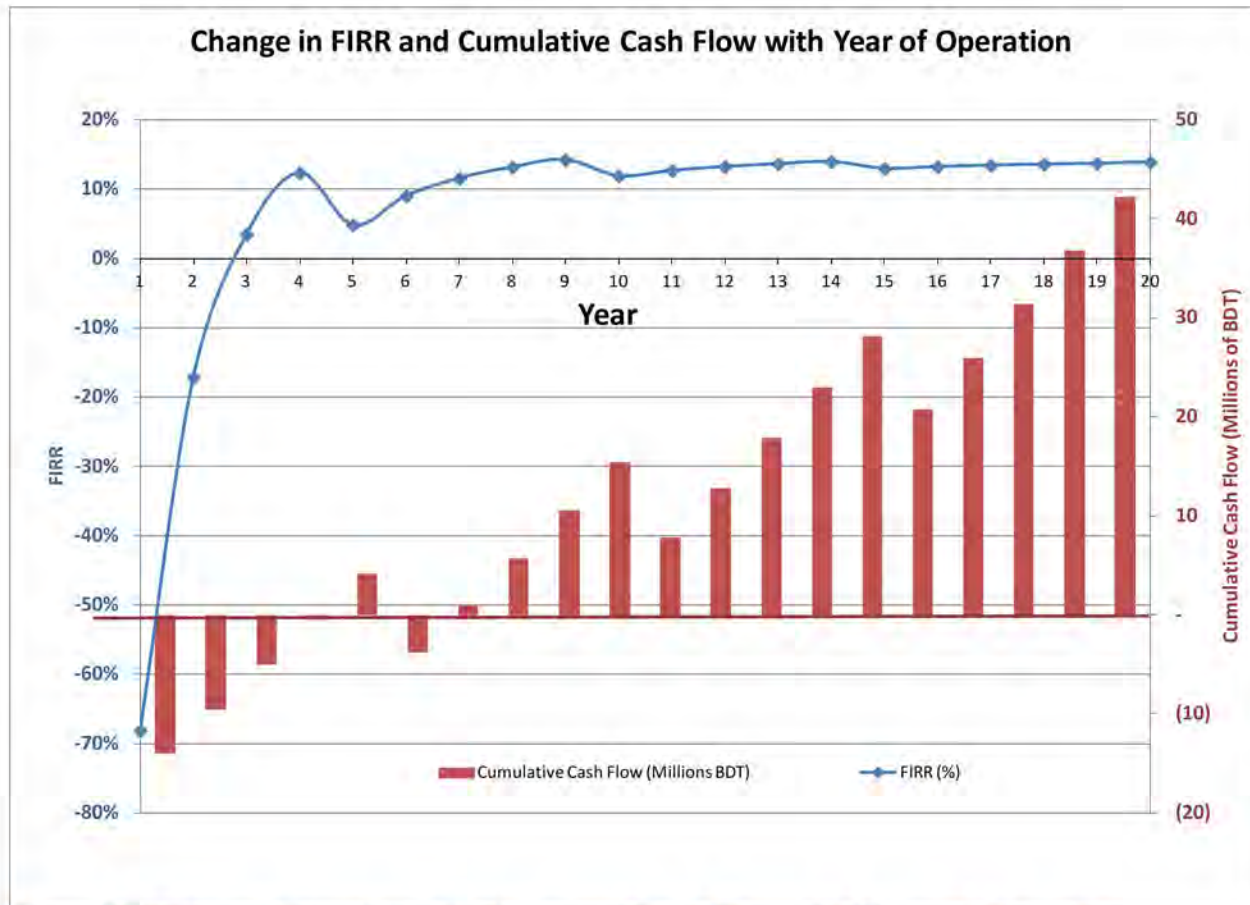


Figure 1 FIRR and Cumulative Undiscounted Cash Flow with Years of Operation

### Solar PV Irrigation Pumping Sub-Component

21. Solar PV irrigation pumping scheme comprises of a PV array on fixed or tracking supports powering a deep well irrigation pump through a variable frequency inverter. Located centrally among the fields to be irrigated, water is distributed through PVC pipes and open channels to the fields. Owned and operated by a PO, the farmers are charged an annual fee based on the area of land to be irrigated. These PV pumps displace diesel pumps. IDCOL has financed a number of such schemes and the response from POs and from farmers are said to be positive. An example of such a pumping scheme is the 3.5 million BDT, 8.4 kWp solar PV array powering a 7.5 kW submersible pump located in Thamrai Upazila in Village Rehatet, Post Shreapur, Dhaka District. It provides irrigation water to 100 bighas (33 acres) and charges farmers 5,000 BDT/bigha/year.

22. The alternative to a solar irrigation system is a diesel generator powered deep well irrigation pump in the same location delivering water to the same fields. There are millions of diesel irrigation pumps operating in Bangladesh.

23. An economic cost effectiveness analysis verified that solar PV irrigation pumping was lower cost compared to diesel pumping when delivering the minimum quantity of water required

by the farmers. As the solar PV array has greater capacity than the requirements of the farmers, given their current irrigation practices, the cost of water, should the full capacity of the solar pumping system be usefully utilized, was also computed. The results are summarized below in Table 4. The 6.5 kWp solar pump can potentially deliver 184 thousand cubic meters of water though the cost effectiveness analysis is based on using 147 thousand cubic meters of water as this is the quantity of water required by the farmers.

**Table 4 Solar PV Irrigation Pumping Summary Results**

	Units	Diesel Irrigation	Solar Irrigation
Economic capital cost	Thous. BDT	20	2,139
Quantity of Water Delivered	m3/year	147,168	147,168
Economic Cost of Water	BDT/m3	2.36	2.11
Financial Cost of Water	BDT/m3	1.89	1.20
Breakeven diesel fuel cost			
- Economic	BDT/liter	49.5	
-Financial	BDT/liter	30.5	

24. The financial results shown below are from actual projects that IDCOL appraised and approved for financing. The projects irrigated 9-41 acres each, had project costs ranging from 1-3.5 million BDT. Their FIRR ranged from 10-13 percent range after accounting for 40 percent capital cost buy-down (Table 5).

**Table 5 Solar PV Pumping Financial Analysis Results**

Irrigation Project	Rice Acres Irrigated	Vegetable Irrigation (Hours/Year)	Total Cost (BDT)	Revenue/Bigha (rice/year, veg per hour) BDT	FIRR	DSCR Minimum
RCSNL	9	513	1,025,000	1700-2000, 32	10.60%	1.14
RSF	31	414	3,379,500	2600, 80	13.36%	1.82
Representative: 1 cusec solar pump cost BDT 3.38 m						
NUSRA						
Dhamrai	30	Multi-crops: rice, jute, maize, heat, vegetables included in acres	3,500,000	1000-3000, 90	13.36%	1.82
Shailkupa	41		3,500,000			
Kumarkhali	26		3,500,000			
Chirirbandar	36		2,413,010			
Bogra Sadar	35		2,593,170			
All projects received 40% grant, 30% IDCOL loan. Loan terms were 6% interest, 8 year tenor and 9-12 month grace.						
Source: IDCOL Appraisal Reports						

## Biomass Gasification Power

25. Producer gas from a biomass gasifier, after cleaning can be fed into an internal combustion engine to generate electricity. IDCOL has financed two projects to-date. Sustainable Energy & Agro-Resource Limited (SEAL) invested in a 64.25 million BDT, 400-kW rice husk gasification based power generation facility along with a precipitated silica plant at Chilarong, Thakurgaon sadar, Thakurgaon. The plant uses rice husk as fuel for power generation. The plant

at present is supplying electricity to the adjacent silica production plant with a captive consumption of 75kW. The project is expected to also supply power to a nearby poultry hatchery (minimum requirement 300kW), thirty irrigation pumps (10kW each) and/or numerous rice mills in the area. The second project, a rice husk-fueled 250 kW developed by Green Power Private Ltd., in 2007 was designed to supply up to 300 household and small business customers in Kapasia, Gazipur. The 25 million BDT project stopped operation in December 2011. It is not functional for a variety of reasons from failed distribution lines due to inadequately treated poles, higher than expected rice husk costs, inability to meet customers' price expectations as the REB grid is relatively close.

26. An economic and financial cost effectiveness analysis was conducted for a representative 200 kW biomass gasifier plant. The economic analysis demonstrated that the gasifier is cost effective compared to a diesel generator supplying the same quantity of electricity. The economic levelized cost of electricity from the gasifier is estimated at 11.4 BDT/kWh compared to 33.7 BDT/kWh from a diesel generator where the specific fuel consumption of the diesel is 0.35 liters/kWh. See Table 6.

27. On a financial basis, as diesel fuel is subsidized, the avoided cost is also less. The levelized financial electricity cost for the gasifier is 12.0 BDT/kWh compared to 25.34 BDT/kWh from a diesel generator. The breakeven economic cost of diesel, when the electricity cost from diesel is equal to that from the gasifier is 26.4 BDT per liter of diesel (compared to the economic cost of diesel fuel of 82.5 BDT per liter. On a financial basis the breakeven diesel fuel cost is 27.6 compared to financial cost of diesel of 61 BDT per liter.

**Table 6 Summary results for Biomass Gasification Power**

	Units	Diesel Electricity	Biomass Gasification Electricity
Economic capital cost	Thous. BDT	4,000	18,105
Quantity of Electricity Delivered	kWh/year	1,168,000	1,168,000
Economic Cost of Electricity	BDT/kWh	33.68	11.44
Financial Cost of Electricity	BDT/kWh	25.34	12.03
Breakeven diesel fuel cost			
- Economic	BDT/liter	26.4 compared to 82.5	
- Financial	BDT/liter	27.6 compared to 61	
Breakeven biomass fuel cost	BDT/kg	13.3	

28. To obtain the attractive returns for biomass gasifier generated power requires the plant to operate reliably over the long term, with access to predictably priced biomass fuel, and to be well managed. Internationally, small biomass gasifier power plants have had a spotty record, therefore careful design, well trained operators/managers and fuel that is dry and properly managed is essential to its reliable operation. Biomass financial fuel cost needs to be four times higher for its electricity cost to equal that of diesel electricity (in India, for example, biomass fuel

price increased six-fold over a ten year period in areas with significant biomass power generation).<sup>29</sup>

29. The biomass gasifier would not be a net emitter of CO<sub>2</sub>. However, as they are mainly expected to use agricultural residues, a sustainable source of biomass fuels, they may not qualify for full carbon credits. Common available biomass gasifiers do require some amount of water consumption for cleaning the gas prior to sending it to the engine-generator. The effluent has to be carefully treated and safely disposed.

### **Household Energy Component**

30. Improved cookstoves and biogas stoves that displace traditional stoves save considerable amount of biomass cooking fuels. Importantly, they have very significant environmental and health benefits, especially for women and children. Improved cookstoves and biogas stoves result in significant reduction of indoor air pollutants such as small particulates, and toxic pollutants. The WHO estimates that as much as 3.6 percent of the total burden of disease in Bangladesh is attributable to exposure to indoor air pollution; 32,000 children below 5 years of age die annually due to acute lower respiratory infections, and 14,000 adults die due to chronic obstructive pulmonary disease.<sup>30</sup>

31. An IDE survey<sup>31</sup> conducted for IDCOL identified very significant benefits for biogas plants in terms of improved health, socio-economic status, reduced workload for women, and enhanced agriculture and environment. The users have reported significant health benefits resulting from reduced air pollution and the associated eye and respiratory infections. One notable benefit is the reduction of fire-induced accidents resulting from non-use of firewood and other traditional fuels. There were significant benefits from time savings. Though acknowledged, the economic analysis did not quantify the health and environmental benefits due to using improved cookstoves or biogas stoves.

### **Improved Cook Stoves**

32. The analysis is conducted at the national and household level for a program that would support the replacement of traditional wood burning stoves with improved cook stoves (ICS). The economic analysis uses project TA costs and household investment and maintenance as costs and the value of fuel savings and health expenditure savings as benefits. The financial analysis from the household perspective takes into account only the direct investment and maintenance cost to the household and fuel savings. The ICS program has positive economic and financial benefits as shown below in Table 7.

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<sup>29</sup> Krishna Mohan, "Rising fuel costs make biomass energy unattractive", Business Standard, October 20, 2009. <http://www.business-standard.com/india/news/rising-fuel-costs-make-biomass-energy-unattractive/373664/>

<sup>30</sup> ESMAP, "Improved Cookstoves and Better Health in Bangladesh: Lessons from Household Energy and Sanitation Programs, The World Bank, Final Report June 2010.

<sup>31</sup> IDE, "Annual Biogas Users Survey 2010" prepared for IDCOL, November 2011.

**Table 7 Economic and Financial Analysis Results for Improved Cook Stoves**

Millions BDT	Project (Economic)	Households (Financial)
Cost	2,319	2,140
Net Benefit	740	1,459
NPV	419	820
EIRR and MIRR	36.4%	39.7%

33. A modified IRR is computed in the financial analysis as the traditional IRR would overstate the project attractiveness. The economic and financial results are robust though sensitive to avoided fuel costs. Rural biomass expenses have to decline to BDT 2.43/kg (compared to assumed cost of BDT 3/kg) for the financial net present value (at 10%) to be zero.

### **Biogas Plant with Biogas Stove**

34. The analysis is conducted at the national and household level for a program that would support the replacement of traditional wood burning stoves with 20,000 biogas plants and biogas stoves. The analysis is based on households acquiring a biogas plant with a daily gas production of 2.8 m<sup>3</sup> required to cook three meals a day. It would require daily feeding rate of 60 kg of dung per day.<sup>32</sup> Households with 5 or more head of cattle would have sufficient dung to support a gasifier producing 2.8 m<sup>3</sup>/day of biogas. The number of such households is about one million.

35. The economic analysis uses project capital and TA investments and household investment as costs and the value of fuel savings, along with value of nutrients (displacing purchased fertilizer), domestic labor savings, value of CO<sub>2</sub> emission reductions, and health expenditure savings due to reduced indoor air pollution as benefits. The biogas displaces purchased fuelwood burned in a traditional cook stove. The financial analysis done from a household perspective uses only the direct cost to households as costs, and the fuel savings as benefits. The project is economically and financially viable. The results are summarized in Table 8:

**Table 8 Biogas Economic and Financial Results**

Millions BDT	Project (Economic)	Households (Financial)
Cost	265	540
Net Benefit	1,254	1,519
NPV	356	535
IRR	27.3%	15.1%

36. The project is economically viable with an EIRR 27.3 percent. The EIRR drops to 26 percent if CO<sub>2</sub> emissions reduction benefits are not available. This analysis may be conservative; a biogas user survey conducted in 2010 for IDCOL found that the cost of biomass fuels displaced by a biogas unit was significantly greater than HIES2010 fuel consumption data indicated -

<sup>32</sup> SNV, "Feasibility of a national programme on domestic biogas in Bangladesh," August 2005.

average of BDT 1400/month, compared to HIES2010 estimate of cooking fuel costs of BDT 418/month for rural households.

37. The project is financially viable with an FIRR of 15 percent. The cost of purchased biomass fuels prior to acquiring a biogas plant would have to drop to 252 BDT/month (compared to HIES2010 estimate of 418 BDT/month) for the financial NPV to become zero (10 percent FIRR).

### **Energy Efficient Lighting Component**

38. The CFL Program Goal is to supply 7.25 million CFLs through REB to reduce electricity use and peak demand. As these CFLs will be displacing thermal generation, it will reduce the carbon footprint and be eligible to obtain CDM credits. The REB will distribute the first replacement CFL free (limit of four per family) and therefore there will be no cost to the consumers.

39. The national benefits are due to the avoided electricity consumption and peak demand reduction as well as the global benefits of avoided CO<sub>2</sub> emissions. The benefit to the consumer will be the reduction of electricity expenses and also avoiding more frequent replacement of incandescent lamps, had the consumer continued to use incandescent lamps.

40. The analysis focuses on the original CFLs distributed by the program and not on any CFLs that the consumer will purchase to either replace burnt CFLs or to add more light points in the home.<sup>33</sup> The analysis is therefore conservative, as a successful demonstration of CFL use is expected to create more demand for CFLs thus further reducing electricity consumption and costs.

41. The cost of the CFL Program is the cost of CFLs itself, CFL distribution costs (including transportation costs associated with taking CFLs from the head offices to zonal offices/distribution centers), cost of implementing consumer awareness programs, and monitoring and evaluation. The benefits of the Program for the nation are reduction in electricity demand, reduction in peak demand, and contributing to the global goal of CO<sub>2</sub> emissions reduction. The sale of certified emissions reduction (CERs) through CDM, in the global carbon market will bring additional revenues to the Government.

42. The Program has very robust and significant benefits with Economic NPV exceeding BDT 3 billion and Financial NPV about BDT 4 billion with and without CDM credits. The EIRR is 182 and 211 percent and FIRR is 45 and 43 percent with and without CDM credits, respectively. The direct benefits to a household is BDT 2,033 and for all households, BDT 3.3 billion, on a net present value basis. Financial benefit to a household per year ranges from 339 to 535 BDT per complete year of operation of the CFLs supplied by the program. Electricity savings range from 312 (year 2 – the first full year) to 198 (Year 7) GWh per year. The decline in savings is due to CFLs burning out over time. The results are summarized in Table 9.

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<sup>33</sup> UNFCCC CDM methodology for CFLs provides a schedule for lamp burnouts. This is taken into consideration in estimating the electricity avoided. The burnout schedule is Year 1 -6.39%, Year 2 - 12.78%, Year 3 - 19.16%, Year 4 - 25.55%, Year 5 - 31.94%, Year 6 - 38.33% and Year 7 - 44.71%.

**Table 9 Summary Economic and Financial Analysis Results for CFL Program**

Category	Economic		Financial	
	NPV @10%	EIRR	NPV @10%	FIRR
	Million BDT	Percent	Million BDT	Percent
With Carbon Benefits	3,482	211%	4,263	45%
Without Carbon Benefits	3,190	182%	3,970	43%
NPV Financial Benefits to all Households			3,316	Million BDT
NPV Financial Benefit to individual Household			2,033	BDT
Electricity Saved at 33 kV (GWh/year) range from		312 in Year 2 to 198 in Year 7, if CFLs are not replaced		

43. There will be increase in reliability of the supply due to the availability of freed up capacity resulting in lower number of power cuts (load shedding) particular in rural areas resulting in avoidance and/or reduction of consumer outage costs. The CFLs will also reduce cooling loads as CFLs are more efficient than incandescent lamps. The reduction in peak demand (MW), is also valued, especially as Bangladesh electricity system is demand constrained.

44. The analysis takes into account the energy savings due to replacement of incandescent lamps with CFLs. This energy savings is valued using the Bulk Supply tariff for financial analysis and the avoided economic generation costs for economic analysis. The lifetime savings of energy from using CFL is the only benefit considered for the purpose of this analysis. The analysis does not take into account the avoided transmission losses, replacement costs of burnt CFLs, consumer outage costs.



## **Annex 10: Social Assessment**

### **BANGLADESH: Rural Electrification and Renewable Energy Development II**

1. A Gender Responsive Social Assessment for Bangladesh Rural Electrification and Renewable Energy Development II (RERED II) Project has been carried out by the BRAC University. The detailed assessment design is based on the experience of the RERED I project, and learning and feedback from the project beneficiaries. Using a gender lens of analysis, the assessment report explores the impacts, problems and opportunities in the Solar Home Systems (SHS), improved cookstoves (ICS) and biogas plants for cooking in the lives of women living in remote rural areas. The main objectives of the assessment are to help make the project design more gender responsive in its focus by analyzing and determining the measure to be adopted for meeting the needs of the potential beneficiaries in general and female beneficiaries in particular. The assessment included focus group discussions, key informant interviews, and household observations in five different sites over a period of a month by a team of 20 researchers.

2. The key findings and recommendations of the report are summarized below.

#### **Solar Home Systems (SHS)**

3. The Solar Home System (SHS) has vastly increased mobility and entrepreneurial ambitions among women. It enables women to send their children to school and ensure that their children can study properly at night. It has increased women's safety out of the household in remote areas and within the household (by reducing burn related injuries out of kerosene lamps that the SHS replace). There are greater awareness and interest among women regarding renewable energy. In many households, it is the women and children who are creating the need among the men to avail the SHS.

4. However, the assessment team identified that the POs follow a male-oriented approach to marketing and coverage of SHS. The specific findings are:

- In order to expand the use of the SHS, Partner Organizations (POs) arrange meetings at local markets to reach out to the male members. Females of the community are not considered a part of such inception meetings. Women usually came to know about SHS from neighbors' houses when they saw them installed.
- Many poor households, including female-headed households, are finding it difficult to afford the SHS and/or keep up with the monthly installments.
- Though women are the key to securing the micro-loans to buy the SHS, their opinion is rarely sought regarding its usage.
- Training for operation and maintenance of SHS are provided at locations which are inconvenient for women to travel to.
- Many rural women have some misinformed notions such as SHS takes away energy and power from the sun's rays, and as a result the crops do not get enough sunlight and the yields from the fields suffer. Moreover, many women also believe that solar panels attract thunderbolts.

5. **Recommendations:**

- Explore options for easing the system of one-time down payment for the female-headed households and the female-run enterprises. Ensure continuation of subsidies for the smaller systems to make it affordable to the poorer households.
- Women should be consulted about their preferred usage at the time of installation of the SHS so that women can benefit from the light locations for specific activities like sewing, knitting, or cooking.
- Organize women-friendly training sessions—place, time, and content of the training—should be designed in a way that considers the special needs of a woman in households.
- Adequate and appropriate awareness raising is needed to dispel misconceptions about solar power and its harmful effects on crops.

**Biogas Plants for Cooking**

6. Biogas plants provide an alternative source of fuel, primarily for cooking stoves in rural areas where government-subsidized natural gas is not available. The main beneficiaries of biogas plants are rural women who spend a huge portion of the day cooking for the household. The assessment found that the biogas plants financed by IDCOL under a separate program improved the lives of women as well as have opened up several entrepreneurial avenues for women. These plants have given rural women access to clean energy. Women, who use biogas, are feeling healthier and have more time to spend on activities other than cooking. It has increased their safety, as they do not suffer from burns and health hazards from clay-stoves any longer. On a larger scale, biogas plants has decreased the dependence of wood and dry leaves for fuel and reduced carbon emissions within the community level. At the same time, these biogas plants have opened up multiple entrepreneurial opportunities for women as they can rent out extra stoves, sell the by-product compost as fertilizer or fish-food. However, very few women in the communities studied have experienced the benefits of biogas plants. Hence, the assessment team has focused on some recommendations that would ensure that a larger community of women could avail biogas.

7. Specific finding regarding biogas plants are

- Insufficient supply of cow-dung and poultry litter may restrict usage, though the benefits to women are many.
- Different social protection programs (e.g. BRAC's TUP, CARE's Shouhardo, CLP etc) are training and helping women set up cattle or poultry farms. These farms may be able to resolve the supply of raw materials problems for biogas plants.
- Many women reported that at times even after having a bio-gas plant is set up, the men of the household would sell of the cows in the house, which is the primary ingredient for biogas.
- The POs do not have adequate male and female employees to access rural women, publicize and advocate about biogas plants. A good mix of male and female employees is highly likely to significantly increase the usage of biogas plants.

8. **Recommendations:**

- Introduce cooperative bio-gas plants with women leading and managing them. Encourage those who own larger cattle or poultry farms and if required provide them with financial

support in order to assist them in building up larger biogas plants and supply the rest of the village with biogas from these plants.

- POs need to employ educated female employees who will have the access to the women in the rural community and advice them properly for installing biogas plants.
- Biogas can enhance the quality of life for women in the household and that should be acknowledged by the male counterpart in the family, so raising awareness among men is also important.

### **Improved Cookstoves (ICS)**

9. There are several advantages of improved cooking stoves (ICS). Traditional cooking stoves produce a huge amount of smoke which is harmful for women, as most women are involved in taking care of the cooking purposes within the household. The smoke from the traditional stoves also harms the corrugated iron sheets' (popularly known as tin) roof of the house, cooking utensils, and cause several kinds of skin or eye irritations in women and children. ICS is a welcome change, as it does not produce a huge amount of smoke within the house. Though the ICS are supposed to perform better than that of the traditional stove, the assessment found that many of the ICS are not working properly due to technical problems and in some cases are not proving to be fuel efficient.

10. The specific findings are

- The space between the two stoves is not sufficient and as a result, one cannot place two cooking pots at the same time or use large cooking pots.
- One cannot cook in these stoves during the monsoon season as the pipes attached to the stoves are usually installed on the roof of the house. When it rains, the water drains into the stove, making it non-usable.
- The POs especially Grameen Shakti has almost no female employees, as a result, the consumers, most of whom are women, face uneasiness in dealing with the PO officials.
- In many houses, these stoves are installed a feet above the ground, many women who squat on the floor to cook find it difficult to maintain their balance and suffer from back pain.

11. **Recommendations:**

- POs would need to improve the technical aspects of ICS and ensure that it does indeed use less fuel than that of traditional clay-stoves. Otherwise, fuel costs would offset the benefits of ICS. A wider assessment is needed to improve the capacity of these stoves and address the technical shortfalls.
- Women should be consulted before installation is done regarding location and height of the stove placement.

# BANGLADESH

- DISTRICT CAPITALS
- ⊙ DIVISION CAPITALS
- ⊗ NATIONAL CAPITAL
- RIVERS
- MAIN ROADS
- RAILROADS
- DISTRICT BOUNDARIES
- DIVISION BOUNDARIES
- - - INTERNATIONAL BOUNDARIES



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