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INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT PAPER

ON A

PROPOSED ADDITIONAL CREDIT

IN THE AMOUNT OF SDR 50.58 MILLION
(US\$78.4 MILLION EQUIVALENT)

TO THE

PEOPLE'S REPUBLIC OF BANGLADESH

FOR A

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

May 23, 2014

Sustainable Development Department
Energy Unit
South Asia Region

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CURRENCY EQUIVALENTS

(Exchange Rate Effective April 30, 2014)

Currency Unit = Bangladesh taka (BDT)

BDT 77.60 = US\$1

US\$ 1.54969 = SDR 1

FISCAL YEAR

July 1 – June 30

ABBREVIATIONS AND ACRONYMS

ADB	Asian Development Bank	kWh	Kilo-Watt hour
AF	Additional Financing	kWp	Kilo-Watt peak
BCCRF	Bangladesh Climate Change Resilient Fund	LED	Light-Emitting Diode
BDT	Bangladesh Taka	MPEMR	Ministry of Power, Energy and Mineral Resources
BEC	Bid Evaluation Committee	MW	Mega Watt
BERC	Bangladesh Energy Regulatory Commission	NCB	National Competitive Bidding
CAS	Country Assistance Strategy	NGO	Non-Government Organization
CDM	Clean Development Mechanism	NPV	Net Present Value
CFL	Compact Fluorescent Lamp	OHSAS	Occupational Health and Safety Advisory Services
CO2	Carbon dioxide	O&M	Operations and Maintenance
EIRR	Economic Internal Rate of Return	PBS	Palli Bidyut Samities (rural electricity cooperatives)
ESMF	Environment and Social Management Framework	PO	Participating Organizations
FIRR	Financial Internal Rate of Return	RAPSS	Remote Area Power Supply Systems
FM	Financial Management	SBDs	Standard Bidding Documents
FMR	Financial Monitoring Report	SMS	Short Message Service
FY	Fiscal Year	SRFPs	Standard Request for Proposals
GAAP	Governance and Accountability Action Plan	BREB	Bangladesh Rural Electrification Board
GHG	Greenhouse gas	RERED	Rural Electrification and Renewable Energy Development
GIZ	Gesellschaft für Internationale Zusammenarbeit	SEPA	Electronic Procurement and Monitoring System
GOB	Government of Bangladesh	SHS	Solar Home Systems
GPOBA	Global Partnership for Output-based Aid	SLA	Subsidiary Loan Agreement
ICB	International Competitive Bidding	SREDA	Sustainable and Renewable Energy Development Authority

ABBREVIATIONS AND ACRONYMS (Contd.)

ICS	Improved Cook Stoves	KfW	Kreditanstalt für Wiederaufbau
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
IRR	Internal Rate of Return	WHO	World Health Organization
IUFR	Interim Unaudited Financial Monitoring Report		

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BANGLADESH
RURAL ELECTRIFICATION AND RENEWABLE ENERGY DEVELOPMENT II
PROJECT

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ADDITIONAL FINANCING DATA SHEET

Bangladesh

RERED II Additional Financing (P150001)

SOUTH ASIA

SASDE

Basic Information – Parent									
Parent Project ID: P131263				Original EA Category: B - Partial Assessment					
Current Closing Date: 31-Dec-2018									
Basic Information – Additional Financing (AF)									
Project ID: P150001				Additional Financing Type (from AUS): Scale Up					
Regional Vice President: Philippe H. Le Houerou				Proposed EA Category: B - Partial Assessment					
Country Director: Johannes C.M. Zutt				Expected Effectiveness Date: 01-Oct-2014					
Sector Director: John Henry Stein				Expected Closing Date: 31-Dec-2018					
Sector Manager: Julia Bucknall				Report No: PAD1021					
Team Leader: Zubair K.M. Sadeque									
Borrower									
Organization Name			Contact		Title	Telephone		Email	
People's Republic of Bangladesh			Arastoo Khan		Additional Secretary, ERD	9180675		addl-secy2@erd.gov.bd	
Project Implementation Start Date: June 19, 2014					Project Implementation End Date: Dec 31, 2018				
Project Financing Data – Parent (Rural Electrification and Renewable Energy Development II (RERED II) Project-P131263)									
Key Dates									
Project	Ln/Cr/TF	Status	Approval Date	Signing Date	Effectiveness Date	Original Closing Date	Revised Closing Date		
P131263	IDA-51580	Effective	20-Sep-2012	23-Oct-2012	20-Feb-2013	31-Dec-2018	31-Dec-2018		
P131263	TF-15034	Effective	10-Jul-2013	15-Jul-2013	28-Jul-2013	30-Jun-2016	30-Jun-2016		
P131263	TF-15077	Effective	30-Sep-2013	30-Sep-2013	18-Dec-2013	31-Dec-2016	31-Dec-2016		
Disbursements									
Project	Ln/Cr/TF	Status	Currency	Original	Revised	Cancelled	Disbursed	Un-disbursed	% Dis-bursed
P131263	IDA-51580	Effective	USD	155.00	155.00	0.00	71.13	87.85	44.74
P131263	TF-15034	Effective	USD	3.76	3.76	0.00	2.50	1.26	66.43

P131263	TF-15077	Effective	USD	10.00	10.00	0.00	0.00	10.00	
Project Financing Data – Additional Financing RERED II Additional Financing (P150001)									
<input type="checkbox"/>	Loan	<input type="checkbox"/>	Grant	<input type="checkbox"/>	IDA Grant				
<input checked="" type="checkbox"/>	Credit	<input type="checkbox"/>	Guarantee	<input type="checkbox"/>	Other				
Total Project Cost:		151.6		Total Bank Financing:		78.4			
Financing Gap:		0.00							
Financing Source –Additional Financing (AF)								Amount	
BORROWER/RECIPIENT								10.0	
International Development Association (IDA) – (new)								48.4	
International Development Association (IDA) – (recommitted)								30.0	
LOCAL BENEFICIARIES								12.7	
Non-Government Organization (NGO) of Borrowing Country								35.5	
Global Partnership for Output Based Aid								15.0	
Total								151.6	
Policy Waivers									
Does the project depart from the CAS in content or in other significant respects?							No		
Does the project require any policy waiver(s)?							No		
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Locations					
Country	First Administrative Division	Location	Planned	Actual	Comments
Institutional Data					
Parent (Rural Electrification and Renewable Energy Development II (RERED II) Project-P131263					
Sector Board					
Energy and Mining					
Sectors / Climate Change					
Sector (Maximum 5 and total % must equal 100)					
Major Sector	Sector	%	Adaptation Co-benefits %	Mitigation Co- benefits %	
Energy and mining	Other Renewable Energy	100		100	
Total		100			
Themes					
Theme (Maximum 5 and total % must equal 100)					
Major theme	Theme			%	
Rural development	Rural services and infrastructure			98	
Social dev/gender/inclusion	Gender			2	
Total				100	

Additional Financing RERED II Additional Financing (P150001)				
Sector Board				
Energy and Mining				
Sectors / Climate Change				
Sector (Maximum 5 and total % must equal 100)				
Major Sector	Sector	%	Adaptation Co-benefits %	Mitigation Co-benefits %
Energy and mining	Other Renewable Energy	100		100
Total		100		
<input type="checkbox"/> I certify that there is no Adaptation and Mitigation Climate Change Co-benefits information applicable to this project.				
Themes				
Theme (Maximum 5 and total % must equal 100)				
Major theme	Theme	%		
Rural development	Rural services and infrastructure	100		
Total		100		

I. Introduction

1. This project paper seeks the approval of the Executive Directors to provide an additional credit in the amount of US\$78.4 million equivalent to the Bangladesh Rural Electrification and Renewable Energy Development II (RERED II) Project (P131263). The additional financing is required to scale up the access to electricity component supporting installation of solar home systems (SHS) in rural areas of Bangladesh.

2. This project paper also seeks approval for a Level I restructuring of the RERED II project to: (1) close Component C (energy efficient lighting), (2) reallocate the US\$17 million from Component C to Component A (\$12 million - Access to electricity) and Component D (\$5 million - Sector technical assistance), and (3) revise the RERED II Project Development Objective (PDO) to “increase access to clean energy in rural areas through renewable energy” to reflect the closure of Component C (the results indicators would also be revised in this regard). The original PDO was “to increase access to clean energy in rural areas through renewable energy and to promote more efficient energy consumption.”

3. The proposed additional financing (US\$78.4 million) and the proposed re-allocation (US\$12 million) to the access to electricity component is primarily aimed at supporting the continued growth of the SHS which has emerged as a viable option for increasing access to electricity in the rural areas of Bangladesh where grid electricity is not viable or will take years to reach. The proposed re-allocation of US\$5 million to the sector technical assistance is aimed at continuing with the sector reform and capacity building activities.

II. Background and Rationale for Additional Financing and Restructuring

Sector Background

4. The Bangladesh energy sector faces many challenges, including acute shortage of electricity supply; dependence on high-cost liquid fuel run plants for mitigating supply shortages; shortage of natural gas, which is the dominant primary fuel for power generation; 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. Peak electricity demand is about 8,000 MW, and the available generation capacity is in the range of 6,500-7,500 MW. The rural areas connected to the grid face a disproportionate share of load-shedding, and the remaining rural areas may have to wait several years for a grid connection. Natural gas is in short supply, which currently fuels about 75% of power generation. Renewable energy constitutes less than 1% of total generation capacity.

5. Recognizing the challenges, the Government of Bangladesh (GOB) has adopted a multi-pronged strategy in the energy sector covering energy conservation, load management, grid and off-grid electrification approaches, promotion of private sector investment in short and longer-term power supply measures, exploitation of alternative energy resources to diversify the fuel mix, power import from neighboring countries, and improved sector governance and efficiency. In Vision 2021, the GOB articulated its objectives: i) universal access by the year 2021 with

improved reliability and quality; ii) stabilizing the sector's financial status and increasing its efficiency; and iii) operating the sector on commercial principles and increasing private sector participation. The GOB's Renewable Energy Policy (2008) further targets meeting 5% of total power demand from renewable energy sources by 2015 and 10% by 2020.

6. To address power 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 2018. 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. The GOB provided subsidies of BDT 50 billion (US\$640 million) in FY13, BDT 63 billion (US\$800 million) in FY12, and BDT 40 billion (US\$550 million) in FY11 to the power sector to cover the high costs of liquid fuel-run plants. These subsidies were needed even after retail tariff adjustments of over 60% since FY10. Going forward, the subsidy requirements are projected to increase without further tariff increases.

7. Despite 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, relying on the grid alone will not achieve the GOB vision of universal access by 2021¹. Furthermore, the dispersed nature of rural settlements and the numerous rivers that crisscross the country make grid electrification in many areas difficult and expensive.

8. Off-grid renewable energy is thus the only near-to-medium-term option left for millions of people in the remote areas of the country. 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 a 5-year project period. The program far exceeded its goals and is currently installing over 50,000 systems per month, making it one of the fastest growing SHS programs in the world. More than 2.8 million SHS have already been installed with support from IDA and other development partners².

9. 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 NGOs) procure and install the systems. Consumers sign purchase contracts under a micro-finance scheme with the POs under which households put in 10-15% down payment and the rest are repaid to the POs in 2-3 years at market interest rates of 12-15%. The POs procure and install the systems

¹ A separate rural grid augmentation and rehabilitation project (US\$600 million IDA) was recently approved by the Bank Board with the objectives of reducing systems losses and enhancing capacity of the rural distribution network in eastern Bangladesh. Against the backdrop of generation constraints and over-loaded distribution network, the project is aimed at improving network efficiency and augmenting the network capacity to deliver more power to grid-connected rural consumers when additional power generation is available.

² The SHS program has a buy-back arrangement where the Partner Organizations (POs) are obligated to buy back the SHS at a depreciated price if the grid arrives within a year of SHS installation. In addition, given the unreliability of grid supply, households have continued to use SHS as a back-up in the limited cases where the grid arrived before the SHSs were paid off. Given the country's generation constraints, SHS is likely to be the only option for many households in rural Bangladesh for the next several years.

following technical standards set by IDCOL. After the systems are installed, the POs receive concessional financing from IDCOL for up to 80% of micro-credit extended to the households, conditional on technical and other verifications by IDCOL. For small SHS (up to 30Wp), POs also receive a subsidy of US\$20 per system that helps lower the price to the consumers.

10. In addition to the SHS, GOB is also exploring other renewable energy options for providing access to electricity in rural areas, including solar mini-grids, solar irrigation pumps, biomass gasifiers and other options under the Remote Area Power Supply Systems (RAPSS) Guidelines of 2007³. There are pockets of off-grid areas and remote islands in Bangladesh where population concentrations are such that renewable energy based 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. Under the mini-grid program, IDCOL selects sponsors for establishing, operating, and maintaining the mini-grids based on site-specific proposals. Sponsors provide 20% of the project cost as equity, while the rest is financed by IDCOL through a combination of concessional financing and capital buy-down grant (of a maximum of 50% of the project cost) to keep end-user tariffs affordable.

11. There are about 1.27 million diesel-run shallow pumps operating in the country covering about 2.43 million hectares of land for irrigation. GOB subsidizes diesel imports and the irrigation needs for diesel impose a significant fiscal burden on GOB exchequer. Considering the large fiscal cost and the pollution from diesel-run pumps, GOB has embarked upon a plan to replace diesel pumps with solar irrigation pumps under a private sector-led implementation arrangement. Under the arrangement, private sector sponsors enter into agreements with groups of farmers to irrigate their fields for a fixed amount for the season. Sponsors install the pumps and the water distribution network (channels or buried pipe) and are responsible for operation and maintenance of the pumps. Sponsors provide 20% of the project cost as equity and the rest is financed by IDCOL through a combination of concessional financing and capital buy-down grant (of a maximum of 40% of the project cost). Based on current costs, a solar irrigation pump in the range of 5.5-11 kWp for irrigating on average 4 hectares of land for 3 crops a year is the most economical compared to diesel-run pumps when the full cost of diesel is considered.

12. 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 including feasibility studies, and capacity building activities of the sector. Implementation of the power sector reform activities need continued financial support beyond the current allocation under RERED II.

³ All these off-grid activities for access to electricity other than SHS are categorized as RAPSS sub-component under the access to electricity component under the original credit, as these would require a private operator for installation, operation and maintenance under the 2007 RAPSS Guidelines of the GOB.

Implementation Status of Original Project

13. The original RERED II project (IDA US\$155 million equivalent) was approved by IDA Board in September 2012 and the credit became effective in February 2013. The project had the following components: i) Access to electricity (component A) supporting SHS sub-component and other renewable energy based options (RAPSS sub-component); ii) Household energy (component B) supporting dissemination of improved cook stoves and biogas digesters for cooking; iii) energy efficient lighting (component C) supporting deployment of compact fluorescent lamps (CFLs) in exchange of incandescent lamps; iv) sector technical assistance (component D) supporting sector reform and capacity building activities. The project is consistent with the Country Assistance Strategy (July 30, 2010, 54615-BD) and contributes to outcome 1.3 under Pillar 1 (increased infrastructure provision, access and efficiency).

14. *Achievement of PDO:* The project is on track to meet one of its two PDOs: increased access to clean energy. The project has already provided clean energy access to over 414,400 households (from inception on January 2013 through March 2014), well exceeding the original target of 321,100 households by June 2014⁴. However, there has been little progress towards the second objective of promoting more efficient energy consumption. Consequently, the overall rating for achievement of the PDO is rated Moderately Satisfactory.

15. *Disbursement:* The project has already disbursed US\$71 million in IDA credit (45% of the original project funds), well exceeding the appraisal estimates. The fast disbursement is due to the rapidly expanding SHS program. The latest projections from IDCOL suggest that the remaining allocation for the SHS sub-component will be fully utilized by early FY15.

16. The variety of trust fund support for the access to electricity component is also disbursing well. The first tranche of US\$3.8 million from USAID became effective in July 2013 and has already disbursed US\$2.5 million supporting about 100,000 SHS. The Global Partnership of Output-based Aid (GPOBA) trust fund for the SHS is fully disbursed. The GPOBA trust fund for mini-grids (US\$1.1 million) is expected to be fully disbursed by the revised closing date of June 30, 2015. The Bangladesh Climate Change Resilience Fund (BCCRF) trust fund for US\$10 million for solar irrigation pumps became effective in December 2013 and the fund utilization is expected to start in June 2014.

⁴ This has resulted in supporting about 14MW of capacity (against the target of 18 MW by June 2014). The capacity supported is less than the target because the SHS supported are of smaller size than earlier anticipated (under the demand-driven program, customers are buying smaller sized SHS with LED lights that are sufficient to satisfy their basic lighting needs).

**Table 1: Disbursement Status of Credit 5158-BD
(Amounts in US\$ as of May 20, 2014)**

Category	Category Description	Allocation	Disbursed	Disbursed as a % of Allocation	Undisbursed
1.	Sub-loans for Access to Electricity (SHS and RAPSS under Component A)	113,667,015	57,798,990	51%	55,868,025
2.	Goods, Consulting Services, Training, and Incremental Operating Costs under Access to Electricity (TA for Component A)	5,258,066	688,432	13%	4,569,634
3.	Goods, Consulting Services, Training, Incremental Operating Costs, and Sub-Grants under Household Energy (Component B)	12,371,920	378,507	3%	11,993,413
4.	Goods, Consulting Services, and Training for Efficient Lighting (Component C)	17,475,337	0	0%	17,475,337
5.	Goods, Consulting Services, Training, and Incremental Operating Costs under Sector Technical Assistance (Component D)	5,103,417	1,738,133	34%	3,365,284
6.	Un-allocated	5,103,417	0	0%	5,103,417
	Designated Account-A		9,201,923		-9,201,923
	Designated Account-B		657,280		-657,280
	Designated Account-C		0		0
	Designated Account-D		666,118		-666,118
Total		158,979,172	71,129,384	45%	87,849,788

17. *Implementation Status of SHS sub-component under Component A:* The SHS program continues to grow fast with monthly installations averaging 50,000 (it had picked up to 80,000 per month between July and September 2013 before coming down to the appraisal estimate of 50,000 due to the political situation). The monthly installations are expected to pick up again around June 2014.⁵ To be conservative, the monthly installation estimate of 50,000 has been used to project fund utilization under the proposed additional financing.

18. Regular inspection and monitoring by IDCOL ensures that quality equipment complying with the standards is installed by the POs with adequate warranty coverage (20 year for the panels, 5 year for the batteries). The scale of the program has already resulted in local entrepreneurs developing solutions for upgrading old CFL-based SHS to more efficient light emitting diode (LED) based systems; this is done on a purely commercial basis. The program is also achieving a scale large enough to offer good business opportunities for replacement demand for system accessories thus ensuring future sustainability of the program. Efforts are being made to transition the SHS program to full commercial funding without the need for concessional financing. A commercial financing study is currently on-going that is looking at options for full commercialization of the program while ensuring that poorer segments of the population are not left out of the program.

19. *Implementation Status of Solar Mini-grids under RAPSS sub-component under Component A:* The progress of the solar mini-grids under the Remote Area Power Supply

⁵ After the harvesting of the major crop is over providing for cash available in rural economy to allow for the down-payments to be made for purchasing SHS.

System (RAPSS) sub-component has been somewhat slower. Challenges were faced in selecting the right site (minimizing the risk of stranded assets in case grid came to the area earlier than expected), right sponsor with appropriate financial and technical ability, and the right technology (initial proposals by the sponsors were based on DC technology instead of the conventional AC technology, and due to safety concerns, the proposals had to be changed to AC pending safety tests of DC). To mitigate the risk of grid arrival, a mechanism has been agreed with GOB. If the grid arrives after five years of mini-grid operation, the utility extending the grid will be obligated to buy electricity from the mini-grid operator at a rate that would sufficiently compensate the mini-grid operator for its investment including a reasonable rate of return.⁶ Three mini-grids have recently been approved and the pipeline now comprises 8 projects with a combined capacity of about 1 MW. Considering the slow initial uptake and the remaining time before project closing, the original target of 42 no longer appears realistic and is proposed to be revised.

20. *Implementation Status of Solar Irrigation Pumps under RAPSS sub-component under Component A:* The initial uptake of solar irrigation pumps has also been slow; time and efforts were needed to inform and create interest amongst the private sector sponsors, to find suitable sites with large enough land requiring irrigation (4 hectares), and to motivate farmers to enter into agreement to buy water from the solar pumps instead of owning/renting individual diesel-pumps. Forty pumps have been installed currently and another 80 have been approved for financing.⁷ The success of the irrigation pumps require a change in behavior of farmers towards collective irrigation and the implementation design will be adjusted based on the experience of these initial pumps. Considering the slow initial uptake and the remaining time before project closing, the target of 1,500 irrigation pumps no longer appears realistic and is proposed to be revised.

21. *Implementation Status of Household Energy (Component B):* The preparatory works for the improved cook stoves (ICS) supported under the household energy component implemented by IDCOL is progressing well, with 30 Partner Organizations (POs) selected recently through a competitive process and suitable models selected for dissemination after adequate testing for efficiency and emission. Dissemination is expected to start from June 2014 with a target to disseminate 1 million improved cook stoves by 2018.⁸ The biogas program under the household energy component is continuing, with over 1,450 biogas plants already installed against the original target of 20,000.⁹ At current levels of production, the cost to households was found to be prohibitively high, and it was therefore agreed to increase the level of the capital buy-down grant (provided from the IDA credit) from BDT9,500 per system to BDT 13,500. As a result, the target of 20,000 is no longer achievable with available financing and needs to be revised. IDCOL

⁶ The minimum of five years of operation before compensation was chosen to ensure that mini-grid operators do sufficient due diligence in selecting remote sites where the electricity grid is unlikely to be extended in the near-term.

⁷ Out of the 40 pumps in operation, 8 were supported by IDA credit and matching grant support were provided by GPOBA and USAID trust funds under the Project. The rest were financed by credit funds from JICA and ADB under parallel financing and matching grant support from the German KfW. The pipeline consists of another 110 pumps.

⁸ The project is expected to provide support to the POs for demand creation (awareness, community mobilization, motivational campaign etc) and supply chain development (either develop their own facility to manufacture the indigenous models of the stoves or contract with the local entrepreneurs for manufacturing/importing the stoves). Households are supposed to buy the cook stoves for cash without any capital buy-down grant.

⁹ Biogas plants for cooking have significant economic benefits (avoided wood and fertilizer usage; reduced labor needs and improved health, particularly for women; and reduced CO2 emissions) and the potential to achieve significant economies of scale in production.

expects the biogas program to gain momentum and has requested additional capital buy-down support for another 15,000 biogas plants beyond the current allocation. The team is exploring the possibility of GPOBA funding for the capital buy-down support. The credit support is sourced from IDCOL own funds.

22. *Implementation Status of Efficient Lighting (Component C):* The implementation progress of the energy efficient lighting component is not satisfactory. The component targeted deployment of 7.25 million energy-efficient Compact Fluorescent Lamps (CFLs) in exchange for incandescent lamps, to reduce peak demand. The first phase of the CFLs supported under the predecessor RERED project had quality issues resulting in early lamp failures. Taking lessons learned from that phase, under the second phase under RERED II, the technical specifications were strengthened with requirements for adequate testing before bid submission. Bids were invited in two packages (6.55 million CFLs were planned to be procured through international competitive bidding (ICB) and another 0.7 million CFLs under national competitive bidding). However, all the bids under the ICB package were determined to be non-responsive by the tender evaluation committee due to major technical grounds related to test reports.¹⁰

23. The CFL awareness campaigns supported under the predecessor RERED project however has generated increased awareness and uptake of CFLs.¹¹ At the program inception in 2009, there were only two CFL manufacturers in the country; now there are 19. This is clearly an indication of increased market for CFLs. The already large and growing uptake of CFLs suggests that there is no longer a need for a demonstration effect from free distribution of CFLs. Considering this, the GOB has decided to drop the efficient lighting component and reallocate the funds to other components.¹²

24. *Implementation Status of Sector Technical Assistance (Component D):* The sector technical assistance component implemented by Power Cell is progressing well with US\$1.7 million already disbursed and another US\$1 million under commitment, within the US\$5 million allocation. Several critical feasibility studies are continuing or completed including feasibility studies for 400-kV backbone lines between the capital Dhaka and the Southwest and Southeast part of Bangladesh, and feasibility studies for Ghorasal Re-powering, etc. The component is also providing capacity building support to the Bangladesh Energy Regulatory Commission (BERC) in tariff study and regulations. To help promote renewable energy and energy efficiency, the Sustainable and Renewable Energy Development Agency (SREDA) Act has been approved by

¹⁰ Under the predecessor RERED project, immediately after distribution of 10.5 million CFLs under the first phase (before the quality issues emerged), a bidding was initiated for procurement of another 17.5 million CFLs in 4 packages. However, none of the contracts could be awarded due to non-submission of performance guarantees or submission of fake performance guarantees by the winning bidders. After that unsuccessful bidding, the second phase bidding was re-initiated under RERED II for procurement of lesser number (7.25 million CFLs). The number was reduced taking into account the increased customer uptake of CFLs, thanks to the awareness campaigns supported under the RERED project.

¹¹ The 10.5 million CFLs under the first phase supported under the RERED project were distributed in two single days nationwide where customers came to the 1,200 distribution centers (local schools, community centers) and collected the CFLs in exchange for the incandescent lamps they were using. Elaborate media campaigns were conducted to make people aware of the energy efficiency benefits of CFLs and to motivate them to come to the distribution centers on the designated days to collect the CFLs in exchange of the incandescent lamps. All these resulted in increased consumer awareness about CFLs. GOB had also reduced the import duties as part of its efforts to address barriers to CFL uptake.

¹² Energy efficiency goals are still likely to be achieved by the private sector as has been demonstrated by the increased uptake of CFLs by consumers. Project supported activities (extensive awareness campaigns, demonstration effect of the first phase CFL distribution, and reduction in import duties for CFLs) contributed to this increased customer uptake.

the National Parliament and a SREDA cell has been established within the ministry. The sector technical assistance component will provide support for SREDA operationalization (expected by FY15).

25. *Implementation of GAAP:* Implementation of the Governance and Accountability Action Plan (GAAP) is progressing well with several of the key actions already completed (market assessment to gauge the extent of competitiveness in the SHS market, assessment of PO performance, third party monitoring etc). Various audits (technical audit, procurement audit, and environment and social audits) are expected to be initiated soon with the selection of the auditors at final stages. A pilot on introducing IT based customer feedback system has been completed demonstrating call centers to be the most effective means of collecting customer feedback. IDCOL is planning to undertake a number of customer surveys through call centers to strengthen the program design. To strengthen bid evaluation of Bangladesh Rural Electrification Board (BREB) for procurement of CFLs, the tender evaluation committee had included two international experts. The bid evaluation was completed timely without any procurement related complaints.

26. *Performance of the Implementing Agencies:* The main implementing agency IDCOL successfully managed the renewable energy component of RERED and has been successfully managing the access to electricity and household energy components of RERED II. To meet the needs of the growing renewable energy program, IDCOL established a separate department and recruited additional staff. It has also added capacity to its regional offices and to its team of field inspectors to strengthen the inspection and monitoring of this fast growing program. Power Cell has also strengthened its capacity in procurement and financial management and is implementing sector technical assistance component satisfactorily.

Rationale for Additional Financing

27. *Scale-up of Access to Electricity Component (Component A):* The primary rationale for the additional financing is to scale-up support for a Project that is an important contributor to the Government's vision of providing universal access to electricity by 2021. Access to grid electricity in rural Bangladesh is low (currently about 42%), and the pace of new grid connections has slowed substantially due to power supply shortages. It will take years for the Government's generation capacity expansion to close the gap between supply and demand. Consequently, reliance on the grid alone will not achieve the Government's vision of universal access by 2021. 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 thus a critical component of the Bangladesh's access strategy.

28. The implementation model for the SHS has been highly successful and the program is becoming increasingly sustainable. Annual SHS installations (including those funded from non-IDA sources) have increased 8-fold, from 10,038 in 2003 to 853,070 in 2013. POs have had an average revenue collection efficiency of about 90%, and they service their debts to IDCOL on a timely basis. IDCOL expects to fund almost one-quarter of the loans it will give for SHS and RAPSS between now and 2016 with US\$134 million in reflows from PO repayments. The capital buy-down grant given to SHS has fallen from US\$90 per unit on all units at the beginning

of the program in 2003 to only US\$20 on units up to 30Wp currently, and the share of loan funding IDCOL provides to POs has fallen from 80% to 70% for larger POs.

29. The success of this approach has been due to: (i) a sense of consumer ownership; (ii) customer training by the POs; (iii) social acceptability of the POs at the community level; (iv) cost-effective and efficient institutional set-up of the POs; (iv) strong and well-enforced technical standards; (v) appropriate risk-sharing between IDCOL and the POs; (vi) effective selection of customers by the POs and attention by both IDCOL and the POs to collection efficiency; (vi) an ability to lower system costs over time¹³; vii) a large customer base in relatively densely populated rural areas.

30. The current pace of SHS installations (50,000 per month) will permit reaching another three million rural households by the year 2018, bringing the total to 6 million.¹⁴ There are about 13 million households (most of them in the rural areas) yet to be electrified. Even in a very ambitious scenario of power shortages easing soon to allow Bangladesh to make 1 million new grid connections annually through 2020, there will still remain around six million households that could be targeted through SHS or renewable energy mini-grids. With the smaller, lower-cost systems based on LED lights now available, poorer households can now afford an SHS ensuring that there is enough demand for reaching the target of another three million SHS.

31. The RAPSS sub-component is flexible to support other options for access to electricity including biogas and biomass based captive plants. More recently, solar PV micro-grids have emerged as another potential option to be eligible for financing under RAPSS sub-component. As with other sub-projects under the RAPSS sub-component, IDCOL will carry out due diligence on micro-grid proposals on a case-by-case basis before considering financing. Further details on micro-grid systems are in Annex 10.

32. Reaching the SHS and RAPSS targets would require an additional US\$20 million in SHS grants and US\$211 million in credit support. This difference is lower than it otherwise would be because IDCOL will invest at least US\$134 million reflows (from repaid PO loans) into its programs. An amount of US\$78.4 million equivalent in IDA support is proposed to meet part of the funding gap in the SHS program. The team is exploring the possibility of GPOBA funding of US\$15 million to meet part of the funding gap in capital buy-down support. It is expected that the remaining funding gap will be met from other sources.

Rationale for Restructuring

33. The increased uptake of CFLs in the market makes it unnecessary to repeat a second free distribution to create a demonstration effect. Consequently, the energy efficient lighting component is proposed to be dropped, which will also have the benefit of simplifying project design. Funds from Component C (Efficient Lighting) would be reallocated to the access to electricity component (US\$12 million) and the sector technical assistance component (US\$5 million). The rationale for scaling up allocations to the SHS program has already been discussed

¹³ The SHS cost including a five-year warranty for batteries and three years of maintenance is US\$6-9 per Wp (unsubsidized price); a comparable system in Sri Lanka is priced at about US\$14 per Wp with only a one-year battery warranty.

¹⁴ It is likely though that the monthly installation will pick up to the recent level of ~80,000, which will allow the target to be reached earlier.

in the preceding section. With respect to the sector technical assistance component, Power Cell has proposed additional priority activities that cannot be completed within the existing financial envelope. Among other activities, Power Cell would use the reallocated funds to lay the groundwork for stronger energy efficiency programs. This would involve feasibility studies for the introduction and promotion of LED lights including developing standards, implementing quality checks, and carrying out awareness campaigns. These activities would be closely coordinated with IFC's Lighting Bangladesh program, which would introduce LED-based solar lanterns and smaller SHS for poorer segments of the population who cannot afford an SHS.

III. Proposed Changes

34. The proposed changes to the project are summarized below.

35. *Revising the PDO:* Given the proposed dropping of the energy efficient lighting component, the PDO is proposed to be modified to "To increase access to clean energy in rural areas through renewable energy." To appropriately capture the intended impact of the household energy component (Component B), "access to clean energy" is defined in this context as using clean energy sources or using existing energy sources in a manner resulting in a cleaner environment.¹⁵

36. *Dropping Component C and re-allocating to other components:* The energy efficient lighting (component C) is proposed to be dropped. BREB will no longer be an implementing agency. The US\$17 million allocation is proposed to be reallocated to access to electricity (US\$12 million) and to sector technical assistance (US\$5 million).

37. *Scaling-up funding and installation targets for solar home systems:* Given the successful implementation of the SHS program, an amount of US\$78.4 million in additional financing and US\$12 million in re-allocated funds from the efficient lighting component (Component C) are proposed for the access to electricity component (Component A). As a result, the SHS target for the project will be scaled up by 480,000 (in addition to the 550,000 under the original credit).

38. *Expansion of Technologies Eligible under the RAPSS sub-component under Access to Electricity Component (Component A):* Solar PV micro-grids are proposed to be considered eligible for financing under component A. The team is coordinating with IFC and the UN Sustainable Energy for All (SE4ALL), which are exploring the development of a business model for micro-grid development in the private sector. In case concessional financing is needed to address initial market barriers, IDCOL is being equipped with the tools to analyze and extend support accordingly. Component A will continue to be flexible to support other technology options for access to electricity subject to economic and financial viability.

39. *Scaling down installation targets for RAPSS sub-component:* Considering the slower initial uptake and the remaining time before project closing, the targets for mini-grids to be supported under the project has been revised downward to 30 (from 42) and irrigation pumps to 1,250 (from 1,500).

¹⁵ The initial phase of the improved cook stoves program will support dissemination of indigenous stoves models with chimneys that would reduce exposure by households to particulate emissions, thus contributing to increasing access to clean energy.

40. *Scaling-up installation targets for biogas plants (Component B).* With the increased subsidy requirements for biogas plants, the target to be funded from the original IDA credit is proposed to be revised downward from 20,000 to 18,000. An additional 15,000 plants are proposed to be supported under the project and the team is exploring the possibility of GPOBA funding for the capital buy-down grants for the additional plants. Assuming that GPOBA funding is approved, the total revised target for biogas plants would be 33,000 (18,000 under the original credit and 15,000 from GPOBA funding).

41. *Revising the results framework to be consistent with the revised project scope and to include new core indicators.* The indicators related to the efficient lighting component are proposed to be dropped. Based on the implementation progress of the different components, the annual targets of the different components are proposed to be adjusted. Several new core sector indicators are proposed to be added to the results framework (Annex 1).

42. *Changed definition for the incremental operating costs:* The definition is proposed to be changed to the standard definition developed for projects in Bangladesh portfolio, to ensure greater clarity and consistency.

43. *Indigenous People’s Policy (OP/BP 4.10) triggered.* The SHS are reaching areas where tribal people (TP) live. Other sub-projects under RAPSS are also likely to reach TP areas. Considering these, the Indigenous People’s policy (OP4.10) has now been triggered. A Tribal People’s Development Framework (TPDF) has been developed and included in the updated Environment and Social Management Framework (ESMF) (para 61).

44. Table 2 summarizes the changes in proposed funding and installation targets under each project component.

Table 2: Proposed Changes

	Original IDA Funding	Original Targets	Revised IDA Funding¹⁶	Revised Targets
A. Access to Electricity	US\$116 million	N/A	US\$206.4 million	N/A
<i>A1. SHS</i>	<i>US\$99.45 million</i>	<i>SHS: 550,000</i>	<i>US\$185.6 million</i>	<i>SHS: 1,030,000</i>
<i>A2. RAPSS</i>	<i>US\$16.55 million</i>	<i>Solar pumps: 1,500 Mini-grid connections: 6,750</i>	<i>US\$20.8 million</i>	<i>Solar pumps: 1,250 Mini-grid connections: 7,500¹⁷</i>
B. Household Energy	US\$12 million	Improved cook stoves: 1,000,000 Biogas plants: 20,000	US\$12 million	Improved cook stoves: 1,000,000 Biogas plants: 33,000 ¹⁸
C. Energy Efficient Lighting	US\$17 million	Lamps: 7,250,000	Component is proposed to be dropped	
D. Sector Technical Assistance¹⁹	US\$5 million	SREDA operational	US\$10 million	SREDA operational

¹⁶ This includes both funding from re-allocations in the original credit and the proposed additional financing.

¹⁷ The average number of connections for each mini-grid was conservatively estimated at 160 during original project appraisal. This has been revised to 250 connections per mini-grid resulting in higher number of connections targeted compared to original project even with the reduced number of mini-grids to be supported under the project.

¹⁸ IDA target: 18,000; GPOBA target (if approved): 15,000

¹⁹ This is now Part C of the restricted Project.

45. **Proposed Components** for the additional financing (US\$78.4 million) and the proposed restructuring of the original project (US\$17 million to be reallocated) are as follows:

- a. **Component A: Scale up of the Access to Electricity Component (US\$78.4 million from additional financing and US\$12 million from reallocations).** This will provide credit support for installation of additional 480,000 SHS. This will also support other eligible RAPSS on an as and when basis. The proposed additional financing includes technical assistance support (US\$4.7 million) for the SHS and other RAPSS programs, including quality assurance, training and outreach, environmental protections, studies and planning, and goods. Together with support from IDCOL reflows and other funding sources, the target of the Project is 1,030,000 SHS (550,000 from the original credit and 480,000 from the additional financing/reallocation), 30 mini-grids, and 1,250 irrigation pumps under the access to electricity component.
- b. **Component C:²⁰ Sector Technical Assistance (US\$5 million).** In addition to continuing support for sector reform and capacity building through the Power Cell, this component will also provide support for promoting energy efficiency and developing and enforcing quality standards. It will fund a feasibility study for introduction and promotion of LED lights in the country. Support to SREDA and BERC will be continued through this component.

46. The original total project cost was estimated at US\$386 million, while the revised project cost is estimated to be US\$435 million, including an IDA additional financing of US\$78.4 million. The revised cost of US\$435 million reflects the decrease in costs of SHS, and the corresponding reduced refinancing requirements. The original project was based on the estimated average market price of US\$350 per system as opposed to the current estimate of US\$270 per system. The team is exploring the possibility of GPOBA grant financing of US\$15 million for solar home systems and solar irrigation pumps under Component A and for additional biogas plants under Component B (this amount is included in the revised project cost). After considering the GPOBA financing, there will be a grant financing gap of US\$6.2 million; it is expected to be met with funding from other donors. Also supplementing the additional IDA credit will be consumer down payments of 10% of the subsidized capital cost for SHS, and PO's own financing for 30% of the remainder. Table 3 shows the revised project cost.

²⁰ There are now only three components in additional financing and in the restructured project: Component A: Access to Electricity; Component B: Household Energy; and Component C: Sector Technical Assistance. The Sector Technical Assistance was Component D under the original project.

Table 3: Revised Project Cost (US\$ Million)

Project Components	TOTAL	IDA (Restructured Original Financing)	IDA (AF)	GPOBA ²¹	USAID ²²	BCCRF	KfW	IDCOL	Others (Private Sponsors/Beneficiaries)	Funding Gap (Grant)	For Reference IDA Original Financing
A. Access to Electricity	374.0	128.0	78.4	12.0	7.6	10.0	10.7	4.2	117.0	6.2	116.0
A.1. SHS	291.5	102.1	73.7	4.2	4.800	0.0	0.0	0.0	103.3	3.4	94.4
A.2. RAPSS	68.7	20.8	0.0	5.8	2.165	9.0	10.2	4.2	13.7	2.8	16.6
A.3. TA	13.9	5.1	4.7	2.0	0.600	1.0	0.5	0.0	0.0	0.0	5.1
B. Household Energy	46.1	12.0	0.0	4.1	0.000	0.0	0.0	9.9	20.1	0.0	12.0
C. Energy Efficient Lighting	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.0
D. Sector Technical Assistance	10.0	10.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0
Total Baseline Costs	430.1	150.0	78.4	16.1	7.565	10.0	10.7	14.1	137.0	6.2	150.0
Contingencies	5.0	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0
TOTAL FINANCING	435.1	155.0	78.4	16.1	7.565	10.0	10.7	14.1	137.0	6.2	155.0

²¹ This includes the existing GPOBA commitment of US\$1.1 million as well as the proposed new GPOBA funding of \$15 million.

²² USAID original allocation was: US\$2.4 million for SHS, US\$4.7 million for RAPSS and US\$0.465 million for TA for SHS and RAPSS. Considering the fast growth of the SHS program, the allocation is proposed to be revised to: US\$4.8 million for SHS, US\$2.165 million for RAPSS and US\$0.60 million to TA.

IV. Appraisal Summary

Economic and Financial

47. *Solar Home Systems:* An economic and financial analysis conducted for the increased SHS component finds it to be economically and financially sound with an Economic Internal Rate of Return (EIRR) and Financial Internal Rate of Return (FIRR) of 50% and 39% percent, respectively, even without considering the consumer surplus from increased lighting quality. It continues to be financially attractive for households and POs to participate in the SHS market. As noted previously, the demand-driven response to the SHS program has been highly positive and growing.

48. *RAPSS:* An economic and financial analysis was also conducted for micro-grids, which are proposed to be eligible for financing under the RAPSS sub-component of the project. The analysis assessed their cost-effectiveness relative to the alternative of a solar home system (as the two provide equal amount and quality of electricity service to households) and their financial attractiveness to both households and system owners. The cost and other characteristics of micro-grids are still somewhat uncertain, so definitive conclusions could not be reached about exactly when a micro-grid would be more cost-effective and attractive than solar home systems.

49. However, it is fairly likely that there are at least some areas in Bangladesh in which a micro-grid would be both (a) economically more cost-effective than SHS providing an equivalent amount of electricity and (b) financially more cost-effective for households than an SHS providing equivalent service under terms that provide an attractive IRR for micro-grid owners. Such areas may be where the grid are expected to arrive in 5-10 years and where households are fairly well clustered and can pay a large enough upfront connection charge to compensate micro-grid owners for their risk. In other situations, SHS likely will continue to be the most viable option. As micro-grids are relatively untested in Bangladesh, and important lessons are still being learned internationally, each micro-grid sub-project will be carefully reviewed by IDCOL to ensure they are financially viable and they equitably split benefits between households and micro-grid owners.

50. During the original project appraisal, the other RAPSS that can be funded under the access to electricity component (renewable energy mini-grids, solar irrigation pumps, biogas-based captive power plants, etc.) were found to be cost-effective relative to their diesel alternatives. Before sub-projects are approved, IDCOL does sub-project specific economic and financial cost-effectiveness analysis. The assumptions used in the original project appraisal for the framework analyses for these categories of sub-projects are still valid.

51. *Biogas Plants:* An economic and financial analysis was conducted for biogas plants, as IDCOL has determined they cost more than originally anticipated and thus require a larger subsidy and a higher selling price to be financially viable for POs to sell. With the higher cost, the biogas program (considering the original plants funded by IDA under RERED II and the additional plants to be funded with new GPOBA grants) is still economically viable, with an EIRR of 17%. The financial return for an average household is, at 11%, only slightly higher than the assumed 10% discount rate. However, households have shown persistent demand for biogas

plants, likely in recognition of their higher EIRR of 28% (which includes, in addition to the financial benefit of avoided wood purchases, the benefits of improved fertilizer, avoided domestic labor, and reduced indoor smoke).²³ The details of the economic and financial analysis are in Annex 4.

52. *Greenhouse Gas (GHG) Accounting:* The new systems supported under the additional financing and restructuring are conservatively estimated to offset 1.3 million tons of carbon dioxide (CO₂) emissions during the 20-year project lifetime, or 68,381 tons annually once all systems have been installed and are functioning properly. The details underlying this analysis are in Annex 4.

Financial Intermediary Assessment

53. IDCOL, being a financial intermediary, is required to comply with World Bank's Operational Policy 10.00/Financial Intermediary Financing. A review was carried out in June 2012 that found IDCOL to be in compliance with the requirements for financial intermediary financing. The review was updated as part of the appraisal of the proposed additional financing. The updated review found IDCOL to be in good financial position with adequate capitalization, having good loan recovery rate (the overall collection performance of IDCOL has been 96%), making adequate loan loss provisions as per Bangladesh Bank's regulations, keeping its books of accounts in compliance with rules and regulations, and 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 review for the proposed additional financing RERED II Project is provided in Annex 5.

Technical

54. 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 are required to be compliant with the standards set by the independent Technical Standards Committee of IDCOL. IDCOL has recently introduced refinancing facility for replacement of warranty-expired batteries to help customers continue to use the SHS with replacement batteries. To address the risk of lead contamination from improper disposal of batteries, IDCOL has introduced several measures including enhanced incentives for POs and manufacturers for collection of expired batteries and making the battery recyclers and manufacturers compliant with ISO 14001:2004 and Occupational Health and Safety Advisory Services (OHSAS) 18001:2007 certifications. Before approving the sub-projects under the RAPSS sub-component, IDCOL due diligence will ensure that the technology used is the least cost option.

²³ The household's economic returns are greater than the project's because the economic cost from the project perspective includes the full cost of the biogas plant, yearly maintenance costs, and a small amount of TA and program administration costs. The economic costs from the household perspective only include the subsidized price of the biogas plant and yearly maintenance.

55. 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. With support from the on-going project, a testing facility in Bangladesh is being established. Once operational, the POs and manufacturers can avail the testing services for a fee. IDCOL would use the testing services to monitor quality and performance.

56. Continuing with the current practice, 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 installed as per the technical standards.

Financial Management

57. The financial management rating of the Project is Satisfactory. 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. The Participation Agreement between IDCOL and the POs include provisions requiring the POs/sponsors to maintain appropriate accounting and financial control. With a dedicated financial management staff appointed as an effectiveness condition under the original RERED II credit, Power Cell now has adequate financial management capacity. Both IDCOL and Power Cell have been submitting the required financial reports (interim unaudited financial reports and audited financial statements) in a timely manner. There are no material audit observations for IDCOL or Power Cell.²⁴ More details are in Annex 6.

Procurement

58. The procurement performance rating of the project is Moderately Satisfactory due to the issues related to the CFL procurement under efficient lighting component. However, the procurement performances of IDCOL and Power Cell are satisfactory. Both IDCOL and Power Cell have experience and capacity in managing Bank financed procurement. Under the ongoing RERED II project and completed RERED project, there was no major procurement related issue observed in these organizations. The sub-loans under access to electricity component implemented by IDCOL would be under financial intermediary loan and the procurement for these sub-loans will be the responsibility of the concerned POs. The POs are expected to follow established commercial practices ensuring economy and efficiency. More details are in Annex 7.

²⁴ BREB had outstanding audit observations related to the first phase CFLs supported under the predecessor RERED project. A satisfactory resolution of the audit observations that are within BREB control was made a disbursement condition for the efficient lighting component. BREB has settled all the outstanding audit observations that are within its control meeting the disbursement condition. No disbursement however was made and the component is now proposed to be dropped.

Environment and Social Safeguards

59. 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 and one social safeguard policy OP/BP4.10 have been triggered. The renewable energy component yields net positive environmental impacts. Since the additional financing will be for further scaling up the renewable energy component, it is not anticipated that there will be any significant and/or irreversible adverse environmental and social issues. The discharge of lead sulphate in the local environment during recycling of used SHS batteries is the only environmental concern. 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 manufacturers.

60. No public land is used for the Project, and no land acquisition is 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, is 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) are not used for the Project.

61. The Project may extend facilities in areas where tribal people live although availing the facilities/services/products is purely on a voluntary basis for all paying customers (including tribal people). No negative impacts are anticipated towards the tribal people. Considering the fact that SHS are reaching the tribal areas and other sub-projects under RAPSS will reach the tribal areas, the indigenous People's policy (OP4.10) has now been triggered and a Tribal People's Development Framework (TPDF) has been adopted.

62. IDCOL has gained experience in implementing the Environment and Social Management Framework (ESMF). An updated ESMF for the proposed additional financing has been prepared and disclosed in country on April 20, 2014 and at the InfoShop on April 21, 2014. Environment and social screening will be undertaken for each sub-project according to the ESMF and appropriate environment and social management plans including tribal people's plan will be adopted. A separate Environment and Social Safeguards Management Unit (ESMMU) is now part of IDCOL organogram. IDCOL has a full-time environment staff member and another specialist will join from May 2014. Visits are made by the staff to all battery recycling plants on half-yearly basis for ensuring environment compliance. Annex 8 includes an update of the ESMF implementation and lessons learned during the implementation of the original credit.

Gender Responsive Social Assessment

63. A Gender Responsive Social Assessment for the RERED II Project was carried out during appraisal of the original project in 2012. The detailed assessment design was based on the experience of the predecessor RERED project taking into account the learning and feedback from the project beneficiaries. Using a gender lens of analysis, the assessment report explored

the impacts, problems and opportunities in the SHS, improved cook stoves (ICS) and biogas plants for cooking in the lives of women living in remote rural areas. Based on those findings and recommendations, IDCOL has introduced several measures including incorporating requirements in its SHS installation manual to consult with the women in the households before putting in the light connections, training female motivators to market the biogas plans door-to-door, introducing cook stove models that are suitable for women etc. These activities will continue to be followed up during the proposed additional financing. More details are in Annex 9.

Key Risks and Mitigation Measures

64. Given the long and successful history of the SHS program supported under the project, the preparation and implementation risks are assessed as Moderate. IDCOL has recently strengthened its capacity to implement the growing renewable energy program. The sustainability of the SHS program in the long run is a risk. However, the program has reached a scale large enough for private sector to come forward with efficiency solutions (replacing old SHS with CFL lights with energy efficient LED lights) on a purely commercial basis. IDCOL has recently introduced refinancing facility for battery replacement. All these measures are helping to ensure program sustainability in the long-run.

Annex 1: Results Framework and Monitoring
BANGLADESH: Additional Financing for the Rural Electrification and Renewable
Energy Development II (RERED II) Project
Results Framework

LIST OF REVISIONS TO THE RESULTS FRAMEWORK

Revisions to the Results Framework		Rationale for Change
PDO		
<i>Current (PAD)</i>	<i>Proposed</i>	
The project development objectives (PDO) are to increase access to clean energy in rural areas through renewable energy and to promote more efficient energy consumption.	The project development objective is to increase access to clean energy in rural areas through renewable energy.	The proposed additional financing will close the energy efficient lighting component.
PDO indicators		
<i>Current (PAD)</i>	<i>Proposed change*</i>	
Number of households, farmers, and businesses having access to clean energy services	Increase in target values	The proposed additional financing will scale-up the access to electricity and household energy components.
Generation Capacity of Renewable Energy (other than hydropower) constructed, of which	Increase in target values	The proposed additional financing will scale-up the access to electricity components.
Generation Capacity of Renewable Energy (other than hydropower) constructed – Solar	New indicator	New core sector indicators required
More efficient energy consumption through introduction of energy- efficient lighting	Drop indicator	The proposed additional financing will close the energy efficient lighting component.
Direct project beneficiaries	Increase in target values	The proposed additional financing will scale-up the access to electricity and household energy components.
Female beneficiaries	Revised upward	The proposed additional financing will scale-up the solar home system and biogas plant programs, which benefit relatively more females than the other programs.
People provided with access to electricity under the project by household connections	New indicator	New core sector indicators required
People who gained access to more energy-efficient cooking and/or heating facilities	New indicator	New core sector indicators required
People who gained access only through switching of cooking and/or heating systems	New indicator	New core sector indicators required

Revisions to the Results Framework		Rationale for Change
Intermediate Results indicators		
<i>Current (PAD)</i>	<i>Proposed change*</i>	
Number of solar home systems installed	Increase in target values	The proposed additional financing will scale-up the solar home system program.
Number of connections made through mini-grid systems and captive plants	Decrease in target values	The initial uptake of mini-grid systems has been slower than expected.
Number of solar irrigation pumps installed	Decrease in target values	The initial uptake of solar irrigation pumps has been slower than expected.
Number of improved cook stoves purchased by households	No change in final-year target value; increase and decrease in other years' target values	The program had a slower start than anticipated but is still expected to achieve its final targets.
Number of biogas plants installed	Increase in target values	The proposed additional financing will scale-up the biogas plant program.
Number of energy efficient lamps distributed	Drop indicator	
Collection Efficiency of POs	New indicator	The indicator is proposed to be added to reflect the program sustainability.
Enabling policy for renewable energy development	No change	

REVISED PROJECT RESULTS FRAMEWORK

Project Development Objectives

PDO Statement

The proposed project development objective is to increase access to clean energy in rural areas through renewable energy.

Project Development Objective Indicators

Indicator Name	Core	Unit of Measure	Baseline (Dec 2012)	Progress to Date (March 2014) ²⁵	Cumulative Target Values					Frequency	Data Source/ Methodology	Responsibility for Data Collection
					2014	2015	2016	2017	2018			
Number of households, farmers, and businesses having access to clean energy services	<input type="checkbox"/>	Number	0	416,152	529,000	935,000	1,322,000	1,663,000	2,069,000	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	13.95	20	33	43	49	56	Quarterly	Data reported by the POs in refinancing applications	IDCOL
Generation Capacity of Renewable Energy constructed – Solar	<input checked="" type="checkbox"/>	MW	0	13.95	20	33	43	49	56	Quarterly	Data reported by the POs in refinancing applications	IDCOL
Direct project beneficiaries	<input checked="" type="checkbox"/>	Millions	0	2.22	2.4	3.8	4.8	5.3	5.7	Quarterly	Project Progress reports capturing data reported by the POs in the	IDCOL

²⁵ For new indicators introduced as part of the additional financing, the progress to date column is used to reflect the baseline value.

											refinancing applications	
Female beneficiaries	<input checked="" type="checkbox"/>	Percentage	0	46	51	50	54	55	59	Quarterly	Project Progress reports capturing data reported by the POs in the refinancing applications	IDCOL
People provided with access to electricity under the project by household connections	<input checked="" type="checkbox"/>	Millions	0	2.21	2.4	3.7	4.5	4.7	4.7	Quarterly	Project Progress Report capturing data collected from the POs	IDCOL
People who gained access to more energy-efficient cooking and/or heating facilities	<input checked="" type="checkbox"/>	Millions	0	0	0.0	0.1	0.3	0.6	1.0	Monthly	Minutes of the Operations Committee meeting of IDCOL reporting data collected from the POs	IDCOL
People who gained access only through switching of cooking and/or heating systems	<input checked="" type="checkbox"/>	Millions	0	0	0.0	0.1	0.3	0.6	1.0	Monthly	Minutes of the Operations Committee meeting of IDCOL reporting data collected from the POs	IDCOL

Intermediate Results Indicators												
Indicator Name	Core	Unit of Measure	Baseline (Dec 2012)	Progress to Date (March 2014)	Cumulative Target Values ²⁶					Frequency	Data Source/ Methodology	Responsibility for Data Collection
					2014	2015	2016	2017	2018			
Number of solar home systems installed	<input type="checkbox"/>	Number	0	414,480	524,000	824,000	1,001,000	1,030,000	1,030,000	Monthly	Minutes of the Operations Committee meeting of IDCOL reporting data collected from sales records of the Partner Organizations	IDCOL
Number of connections made through mini-grid systems and captive plants	<input type="checkbox"/>	Number	0	0	250	1,000	2,500	4,500	7,500	Quarterly	Mini-grid appraisal reports and sub-project status update	IDCOL
Number of solar irrigation pumps installed	<input type="checkbox"/>	Number	0	8	40	190	440	790	1,250	Quarterly	Sub-project status update	IDCOL
Number of improved cook stoves purchased by households	<input type="checkbox"/>	Number	0	0	0	100,000	300,000	600,000	1,000,000	Monthly	Minutes of the Operations Committee meeting of IDCOL reporting data collected from the POs	IDCOL

²⁶ The choice of systems to finance under Component A is demand-driven, so it cannot be known in advance exactly how many systems of each type will be funded. Thus, the intermediate results indicator targets are only indicative. It is possible that some targets would be under-achieved but others over-achieved.

Number of biogas plants installed	<input type="checkbox"/>	Number	0	1,453	4,400	10,220	18,340	29,700	33,000 ²⁷	Monthly	Minutes of the Operations Committee meeting of IDCOL reporting data collected from the POs	IDCOL
Collection Efficiency of the SHS POs	<input type="checkbox"/>	Percentage	96%	90%	90%	90%	90%	90%	90%	Monthly	Minutes of the Operations Committee meeting of IDCOL reporting data collected from the POs	IDCOL
Enabling policy for renewable energy development	<input type="checkbox"/>	Text	SREDA not operational	SREDA cell established at the Ministry	SREDA established as a separate entity	SREDA operational with core staff appointed	SREDA operational with core staff appointed	SREDA operational with core staff appointed	SREDA operational with core staff appointed	Semi-Annual	Project Progress Report	Power Cell

²⁷ IDA: 18,000 and GPOBA: 15,000 (if approved)

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

Results Framework

Project Development Objective Indicators	
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.
Generation Capacity of Renewable Energy constructed – Solar	MW capacity added from the solar technologies under the access to electricity component.
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, people having access to clean cooking solutions.
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.
People provided with access to electricity under the project by household connections	People in the households getting electricity connection through SHS and mini-grids.
People who gained access to more energy-efficient cooking and/or heating facilities	People in the households having access to clean cooking solutions.
People who gained access only through switching of cooking and/or heating systems	People in the households having access to cleaner cooking solutions than their previous cooking model.
Intermediate Results Indicators	
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 households	Stoves with higher fuel and emission efficiencies compared to the traditional stoves
Number of biogas plants installed	Biogas plants of different capacities for cooking
Collection efficiency of the SHS POs	The amount collected by the POs from households for SHS sales as a ratio of the amount due from customers
Enabling policy for renewable energy development	Establishment and operationalization of the Sustainable and Renewable Energy Development Authority (SREDA)

Annex 2: Operational Risk Assessment and Framework (ORAF)
Operational Risk Assessment Framework (ORAF)
Bangladesh: RERED II Additional Financing (P150001)
Stage: Appraisal

Risks

Project Stakeholder Risks

Stakeholder Risk

Risk Description:

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.

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.

Rating Moderate

Risk Management:

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. Extensive review of the willingness to pay has been conducted for the mini-grid proposal currently under review by IDCOL. Field surveys have confirmed the ability and willingness to pay by potential consumers in the mini-grid area.

Re Client Stage: Imple	Recurrent:	Due	Frequency	Status: In Progress
sp: menta		Date:	:	
	tion			

Risk Management:

A gradual approach is taken with market being tested with a few mini-grids first. IDCOL is currently reviewing a number of mini-grid proposals. Market response from the implementation of these initial sub-projects will help guide the way for the remaining mini-grids.

Re Client Stage: Imple	Recurrent:	Due	Frequency	Status: In Progress
sp: menta		Date:	:	
	tion			

Risk Management:

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 will be provided to the mini-grid investors for the stranded asset. An arrangement to this effect has been agreed with Power Division. In case the area is not declared RAPSS area under the 2007 guideline,

the stranded risk will be mitigated by having sufficient security clauses in the loan agreement between the sponsor and IDCOL so that both the loan and credit fund are secured.

Re Client Stage: Imple	Recurrent:	Due	Frequency	Status: In Progress
sp: menta		Date:	:	
tion				

Risk Description:

Farmers may not agree to buy water from the operators of the solar irrigation pumps supported under RAPSS sub-component.

Risk Management:

Private sponsors responsible for installation, operation, and maintenance of the pumps will have to enter into agreements with farmers to buy water from the pumps before submitting financing proposal to IDCOL. IDCOL due diligence of the pumps require reviewing/confirming the agreements reached with the farmers. The success of the irrigation pumps require a change in behavior of farmers towards collective irrigation and the implementation design will be adjusted based on the experience of the first few pumps that have recently started operations.

Re Client Stage: Imple	Recurrent:	Due	Frequency	Status: In Progress
sp: menta		Date:	:	
tion				

Implementing Agency (IA) Risks (including Fiduciary Risks)

Capacity

Rating Moderate

Risk Description:

Risk Management:

IDCOL has good institutional capacity but there is a risk that the growing renewable energy program may put a strain on its institutional capacity.

IDCOL has established a separate renewable energy unit to manage the growing renewable energy portfolio.

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

Bank no-objection is 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.

Financial Management: No major issues.

IDCOL and Power Cell have been submitting audited reports on time with no material audit observations.

Procurement: Being a financial intermediary, IDCOL did not have adequate procurement experience, which has been addressed recently with a procurement staff appointed supported by a procurement consultant. The procurement consultant also supports Power Cell.

Re Client Stage: Imple Recurrent: Due Frequency Status: In Progress
 sp: menta tion Date: :

Governance

Rating Low

Risk Description:

Risk Management:

IDCOL is run by professional management with adequate oversight from a competent Board. It has been successfully managing the renewable energy program.

Re Client Stage: Imple Recurrent: Due Frequency Status:
 sp: menta tion Date: :

Project Risks

Design

Rating Low

Risk Description:

Risk Management:

Too many activities within IDCOL may create issues with coordination.

A separate Project Management Unit has been established at IDCOL to manage the household energy component. Regular coordination meeting is chaired by Power Division is held to ensure effective coordination between off-grid activities (mini-grids) and grid expansion by the other utilities.

Re Client Stage: Imple Recurrent: Due Frequency Status: In Progress
 sp: menta tion Date: :

Social and Environmental

Rating Moderate

Risk Description:

Risk Management:

The safeguard category of the project is B since there are no significant and/or irreversible adverse social and

IDCOL has strengthened the SHS battery recycling procedure with increased incentives for returning expired batteries to approved recycling centers, introduced a monitoring system to track collection of expired batteries by the POs, and made it mandatory for all the battery manufacturers and recyclers to have ISO and OHSAS

environmental issues in the project. Discharge of lead sulphate in the local environment during recycling of used SHS batteries is a concern. The project does not support any land acquisition. The project activities will be in areas where tribal people live.

Program and Donor

Risk Description:

A number of successful but small scale improved cook stoves (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.

Delivery Monitoring and Sustainability

Risk Description:

Fast growth of the SHS program may outstrip IDCOL's capability of oversight and monitoring. Fast growth may impact on the quality of SHS installations

Sustainability of the SHS program beyond project closing is an issue after IDCOL discontinues financing the SHS program.

certification to ensure safe disposal of lead sulphate during battery recycling.

Appropriate environment and social screening and assessment requirements have been introduced for the different sub-projects (mini-grids, solar irrigation pumps etc). Consultations with the tribal people are held in local languages and project services are extended to tribal people on a willing-buyer willing-seller basis.

Re Client Stage: Prepa Recurrent: Due Frequency Status: In Progress
sp: ration Date: :

Rating Low

Risk Management:

The household fuel component was designed after thorough consultation with all the stakeholders. Close coordination with other development partners (especially GIZ and USAID) is being ensured through mission meetings and through IDCOL.

Re Bank Stage: Prepa Recurrent: Due Frequency Status: In Progress
sp: ration Date: :

Rating Moderate

Risk Management:

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. Strict enforcement of standards compliance by IDCOL (rigorous inspection and monitoring and withholding of disbursement for new installations until inspection findings are adequately addressed) ensures that POs continue to comply with quality standards. Technical audits are undertaken regularly by independent third parties in addition to the regular inspection and monitoring by IDCOL inspectors. IDCOL continues to expand its inspection and monitoring capacity to meet the growing needs of the program.

To assess the market potential and to allow for a smooth transition of the SHS program towards commercial financing, a study on-going 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.

The program has reached a scale large enough for private sector to come forward with efficiency solutions (replacing old SHS with CFL lights with energy efficient LED lights) on a purely commercial basis. IDCOL has recently introduced refinancing facility for battery replacement. All these measures are helping to ensure program sustainability in the long-run.

Re Client Stage: Prepa Recurrent: Due Frequency Status: In Progress
sp: ration Date: :

Overall Risk

Overall Implementation Risk: Moderate

Risk Description: The project will further scale up the on-going SHS program run successfully by an effective implementation agency. IDCOL has recently strengthened institutional capacity to manage the growing renewable energy program. The components proposed under the project are independent of each other, such that delays in one component will not necessarily impact on the implementation of the other components.

Annex 3: Governance and Accountability Action Plan (GAAP)

Introduction

1. Improving governance and fighting corruption are central to the Government of Bangladesh's development agenda set forth in the 6th Five Year Plan and the Bank's mission of promoting sustainable growth and reducing poverty. This updated Governance and Accountability Action Plan (GAAP) for the proposed additional financing to 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 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 agency to take into account its concerns and perspectives.

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 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 two implementing agencies²⁸. 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. *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. Both the agencies have gained experience in implementing Bank projects through their involvement with the on-going RERED II Project, the predecessor RERED project and the

²⁸ With the efficient lighting component proposed to be dropped, the Bangladesh Rural Electrification Board (BREB) is no longer an implementing agency for the project.

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 49 POs. Still, the market is dominated by only a few players with the largest PO (Grameen Shakti) having 45% market share with the second largest PO (Rural Services Foundation) having 15% 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 is supporting 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 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.

Actions to Mitigate Governance and Corruption Risks

8. To mitigate the service delivery and capacity risks in the implementing agencies of the Project, the following measures were proposed as part of implementation of the on-going RERED II project and these are at various stages of implementation.

9. To mitigate the service delivery risk, an assessment of the market competitiveness of the SHS program was carried out in early 2013. Out of a randomly selected 10 upazillas, it was found out that Grameen Shakti with its 92 unit offices in the selected upazillas had over 40% market share. There was adequate presence of other POs in the same upazillas with RSF, Srizony and UBOMOS having 54, 32 and 25 unit offices with a market share of 18%, 4% and 4% respectively. An impact evaluation study of the SHS program was conducted in early 2013 that indicated no discernible differences in the service delivery quality across the POs. Both the assessments indicate an adequately competitive marketplace with options for customers to choose from the POs.

10. Both the implementing agencies have duly appointed designated officers to fulfill obligations for proactive and reactive disclosure under Bangladesh's Right to Information Act. Adequate training and capacity building will be provided under the on-going project. A program for proactive provision of information about the agencies' services, performance, and financing is being designed. Project management and the designated officer will monitor feedback through helpline calls, the Short Message Service (SMS) system, and other complaints mechanisms listed below and accordingly adjust proactive disclosure of information to meet more closely what interests the public.

11. A third party monitoring has been introduced to supplement IDCOL's efforts of appropriate feedback and monitoring of PO activities for ensuring effective service delivery by the POs²⁹. A field survey was conducted amongst 600 SHS users and about 67% of the survey respondents were highly satisfied with the SHS and another 30% were moderately satisfied. A technical audit by an independent third party is planned to 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.

12. 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 is being 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. A pilot was conducted for IT based customer feedback system where 15,000 SHS users randomly selected from the IDCOL database which keeps records of the details of

²⁹ This was funded under the Citizen Action for Results, Transparency and Accountability (CARTA) program. The third party monitoring is planned to be continued under the Project with funding from the TA allocation under the project.

SHS customers including their mobile numbers³⁰. The selected customers were targeted through different channels (SMS, interactive voice response (IVR), and call center). The pilot has revealed that while mobile penetration is high in rural areas, mobile literacy is not that high resulting in poor response rate in SMS and interactive voice response channels. The phone calls however were effective with high response rate, which has established itself as an easy and cost-effective method for collecting customer feedback. IDCOL is now in the process of contracting with call centers to conduct periodic customer surveys to ensure enhanced accountability of the POs for proper service delivery.

13. To address the capacity risks, a new organogram was approved by IDCOL board in early 2013 after a professional assessment of the organizational structure of IDCOL and its suitability in the context of the growing renewable energy portfolio. The additional positions are being filled; the staff shortage has largely been addressed by now. A separate Project Management Unit (PMU) has been established for the household energy component of the Project.

14. 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 equipment 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. The process of selecting the auditor is currently ongoing. All procurement information as required by Bangladesh's procurement framework, including the procurement plans and information about awards, will promptly be made publicly available.

15. The Power Cell has appointed dedicated staff for procurement and financial management supported by a procurement consultant to implement the activities under the sector technical assistance component.

16. 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.

17. The GAAP matrix proposes actions for each of these issues, timeline for each action, and responsible agency for implementation.

Monitoring arrangements

18. The GAAP is being monitored regularly during the Bank implementation review missions. A Governance Specialist has been included in the Bank supervision team to strengthen

³⁰ This was funded by a Bank-executed trust fund managed by the Bank's ICT Unit (TWICT).

the dialogue on the governance and accountability issues with the respective implementing agencies.

Bank Supervision and Surveillance

19. Regular supervision missions are being held for the original RERED II credit. The Bank is also conducting regular monitoring between supervision missions through its field based task team.

20. 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
Governance and Accountability Action Plan

Issues/Risks/ Objective	Actions	Agency responsible	Timeline	Early Warning Indicators to Trigger Additional Action	Current Status
Service Delivery Risk					
Ensure adequately competitive market for effective service delivery	Carry out a market assessment to gauge the extent to which customers have options in choosing the service provider	IDCOL	Early in project implementation	Delays in initiating the assessment	Assessment completed. It indicates adequate competition in the market.
	Complete impact evaluation study that includes an assessment of PO performance	Study consultant	Early in project implementation	Delays in report submission	Study completed. The study did not indicate any discernible differences in service delivery quality across the POs.
	Based on the assessments, take appropriate interventions for ensuring an adequately competitive market	IDCOL	Early in project implementation	Delays in implementing appropriate interventions	IDCOL has strengthened its focus on ensuring quality particularly given the growth of the program and introduction of new POs.
	Conduct Technical audit by an independent auditor on installation quality	IDCOL appointed auditor	Every year during project implementation	Delays in appointing auditor, non-cooperation by the POs	EOI issued for selection of the technical auditor.
Ensure enhanced reporting and feedback	Undertake regular reporting by the implementing agencies on implementation	IDCOL/ Power Cell	Quarterly	Lack of focal point or frequent replacement	The financial monitoring reports are submitted timely by the agencies.
	Ensure RTI Designated Officer in place and proactive information dissemination conducted	IDCOL /Power Cell	Within three months of effectiveness	No designated officers in place; check of websites reveals lack of information	The implementing agencies have the designated officers in place.
	Introduce third party monitoring system	IDCOL	Within the first year of project implementation	No initiative by the implementing agency	A third party monitoring under a Bank-executed trust fund submitted its report indicating 97% satisfaction rate amongst consumers. Follow-up survey is being planned.

Issues/Risks/ Objective	Actions	Agency responsible	Timeline	Early Warning Indicators to Trigger Additional Action	Current Status
	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	A small pilot from a Bank-executed trust fund was completed. IDCOL is planning for scaling up.
Capacity Risk					
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	Revised organogram approved by IDCOL Board with a separate department established for renewable energy. Recruitment for most of the positions completed.
	Develop a credible and time-bound action plan for strengthening BREB/PBS program	BREB	Within the first year of project implementation	Delays in finalizing the action plan	Action plan developed and under implementation. This is being followed up under a separate project (T&D). This is proposed to be dropped from the GAAP for the proposed additional financing as BREB is no longer expected to be an implementing agency.
	Appointment of Assistant Director (Accounts)	Power Cell	Before disbursement of the component	Delays in initiating selection process	Appointment completed.
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	Response to EOI received on December 12, 2013. Short-listing ongoing.
	For the energy-efficient lighting component, develop i) a time bound action plan with close monitoring by BREB and the Power Division; (ii) a thorough terms of reference for the bid evaluation committee; (iii) appointment of a competent	BREB	Before initiating CFL procurement	Delays in developing the action plan and terms of reference, delays in appointment of the international technical specialist, complaints received	Tender evaluation committee was strengthened with inclusion of international technical and procurement consultants. Bid evaluation process was completed in short time with no complaints received. The action item is proposed to be dropped as the

Issues/Risks/ Objective	Actions	Agency responsible	Timeline	Early Warning Indicators to Trigger Additional Action	Current Status
	international technical specialist to support BREB during bid invitation, evaluation, and post-award inspections; iv) appointment of a competent international procurement consultant to support BREB 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.				efficient lighting component is proposed to be cancelled.
	Appointment of a procurement consultant and training for procurement focal point	Power Cell	Early in project implementation	Delays in initiating selection process	Procurement consultant on board.

Annex 4: Economic and Financial Analysis

Solar Home Systems Component

Table 1. Summary of Solar Home System Indicators

Households Benefited	<i>Households</i>	1,030,000
PV installed	<i>MWp</i>	24,461
National Benefits		
Economic & Financial Indicators		
Economic NPV w/o consumer surplus	<i>BDT Mn</i>	23,642
Economic IRR w/o consumer surplus	%	50%
Financial NPV	<i>BDT Mn</i>	21,026
Financial IRR	%	39%
Fuel Usage		
Annual kerosene avoided	<i>Million liters/year</i>	62.11
Economic value of avoided kerosene	<i>BDT Mn/year</i>	4223.33
Fiscal Impact		
NPV of net fiscal impact	<i>BDT Mn</i>	1,348
NPV of taxes earned	<i>BDT Mn</i>	2,065
NPV of SHS grants provided	<i>BDT Mn</i>	718
Global Benefits		
CO2 emissions offset annually	<i>thousand tons CO2/year</i>	149.68

1. **Proposed SHS Investment and Alternative.** The Solar Home System (SHS) comprises a solar panel sized between 10 and 120 Wp or more, appropriately sized controller and batteries, wiring, efficient LED lamps (number varies with system size), 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, 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, in addition to the financial benefit of avoided fuel costs, users gain considerable benefits from superior lighting. Specific benefits are improved reading conditions, general illumination and removal of the 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 about 1,030,000 solar home systems of varying capacities for a period of about two and a half years beginning January 2013 (this includes the 550,000 systems targeted under the original credit and about 480,000 supported under the proposed additional financing). IDA supported installations are assumed to be about 25,000 per month (monthly installations are supported by IDA and other development partners). The product mix is assumed to be similar to that during 2013, when just over half of sales were 20Wp systems, 20% about 40Wp and about 12% were 50Wp and 85Wp or higher.³¹

³¹ This is a change from the 2011 sales mix (20Wp=25%, 40Wp=20%, 50Wp=30% 85Wp=25%), used in the original project economic and financial analysis.

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 Operations and Maintenance (O&M) services. Analyses are done in constant 2014 BDT. The benefits are accrued due to avoided cost of kerosene for lighting and charging batteries, as well as the avoided cost of replacement lamps and batteries themselves. Kerosene consumption data was based on a survey undertaken by IDCOL as part of a survey conducted to establish baseline for the purpose of carbon financing. Kerosene price used was 68 BDT/liter. Kerosene costs are conservatively estimated to remain unchanged in real terms. The analysis also considers the (relatively small) benefit from reduced CO₂ emissions. As the economic returns are already high, the consumer surplus described above was not valued; see the original project appraisal document for an estimation of the consumer surplus returns.

4. 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 50%. The financial IRR is 39%. Average kerosene fuel consumption per household needs to fall below 1.3 liters per month (compared to data currently suggesting weighted average consumption of over 5 liters per month) before the economic Net Present Value (NPV) reduces to zero at a 10% discount rate.

5. **PO and Household Perspective.** At the PO and household level, the only change in their analysis since the original project appraisal is a reduction in the upfront system cost, which will only improve the attractiveness of participating in the SHS market. The previous analysis found that the SHS business is financially attractive to POs and that the purchase of an SHS is financially attractive to households. Thus, that analysis was not updated for this Additional Financing.

6. **Global Benefits.** The reduction in emissions from kerosene use is 150 thousand tons of CO₂ annually. Additional CO₂ emissions reductions also occur as recharging batteries using fossil fuel generators are avoided; that was not valued in this analysis.

7. **National Benefits.** The SHS will offset the use of 62 million liters of kerosene. The Government will earn BDT 2,069 million in taxes on SHS components on a NPV basis. The grants for SHS sales are valued at an NPV of BDT 718 million. The Government consequently has positive fiscal returns of BDT 1,348 million on an NPV basis. Income and other taxes that POs and IDCOL have to pay will further increase fiscal revenues.

RAPSS Component

8. The solar micro-grid concept has recently been introduced in Bangladesh as a potential application under the Government's Rural Area Power Supply System (RAPSS) guidelines. If demand exists and projects are viable, IDCOL may consider financing these systems under the RAPSS component of this project. As with the broader RAPSS component, the portfolio to be financed by IDCOL is demand-driven and expected to include a variety of RAPSS options, so specifying precisely the types and quantities of projects to be financed is not possible.

9. Economic and financial analysis was conducted on a typical solar micro-grid system to verify its viability for potential inclusion in the RAPSS sub-component. Similar analysis was

conducted for the other systems during the original project appraisal, and conditions for those systems have not significantly changed since. Thus, there is no need to update that analysis here. The cost effectiveness is considered against a variety of solar home systems as the alternative providing the same level of service. Cost effectiveness analysis, rather than EIRR computation, was undertaken as the type of service (electricity delivery), and the service levels (kWh) from the micro-grid and the solar home system are identical – thus the benefits are identical.

10. In a solar micro-grid system, a single entity operates both generation assets and a distribution network to service multiple homes. In contrast to a mini-grid, micro-grids typically serve less than 250 customers and have between 1 and 10 kWp of total capacity. Thus, they are typically alternatives to individual solar home systems. The distribution network is not necessarily built to the AC-grid network standard (though it should still comply with safety standards) and therefore may not be usable by the utility upon grid arrival. Because of this and other uncertainties, payback periods for the owner must be fairly short (6-7 years, far less than the traditional mini-grid model). There can be energy metering, but it is not essential; energy sales can be in tiered packages with time-based access or per metered kW or kWh. They are typically financed as “pay-as-you-go” packages, where households pay for the service, rather than the generation asset. The packaging typically needs to be flexible and expandable to allow for load and generation growth (in contrast to solar home systems).

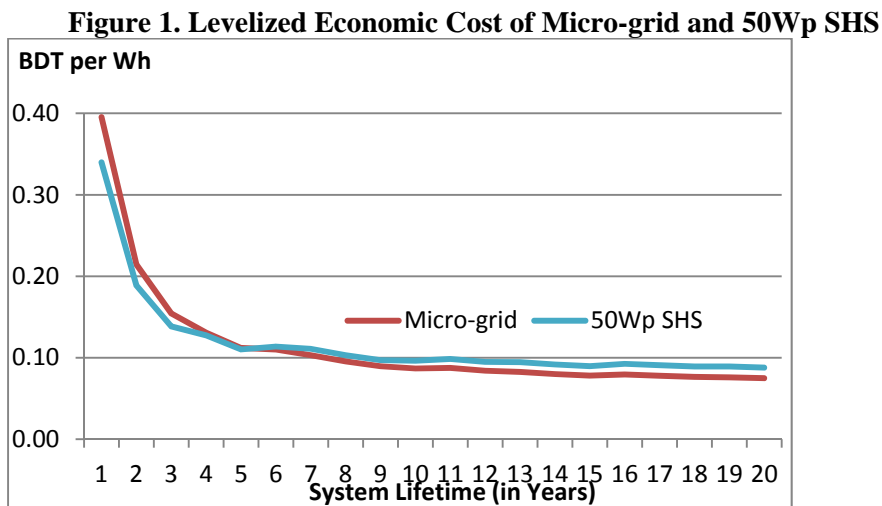
11. For a representative system, this analysis examined the economic cost-effectiveness and financial cost-effectiveness (levelized economic and financial cost of electricity) relative to an equivalent amount of solar home systems and the FIRR for a micro-grid project. It also examined whether there is a tariff and connection charge structure that would provide both system owners/operators and households sufficient incentive to own and demand a micro-grid system. Importantly, such systems are still relatively untested in Bangladesh, so data on the cost (particularly the ongoing operating cost) of micro-grid systems, feasible business models, the lifetime of the components, and consumer and system owner willingness to accept various payment and risk schemes are fairly unknown. For this analysis, baseline assumptions were made and broad sensitivity analysis was conducted to ascertain if there are likely situations in which a micro-grid is most cost-effective. Before funding any such systems, IDCOL would conduct sub-project specific due diligence.

12. **Micro-grid Assumptions.** Analysis was undertaken for a representative micro-grid serving 50 consumers using an average of 4.8 kWh per month. Assuming 80% capacity utilization, the system size would need to be 3 kWp with one day of battery storage and a 3kW diesel generator backup. Given the capacity utilization, it is assumed the diesel generation would step in for 10% of the monthly generation for 6 months of the year, that the generator’s specific fuel consumption would be 0.44 liters per kWh and that the price of diesel would start at 68 BDT per liter (the subsidized price; the economic cost is 83 BDT per liter) and increase by 2%, in real terms, per year. The full system for 50 households is assumed to have an economic cost of 1.12 million BDT, which covers project identification (of site, operator, and customer), materials (72% of the total cost), and a typical dealer markup. This assumes all 50 households are within a 1km radius. Including taxes, the financial system cost is 1.3 million BDT. In addition, the system is assumed to incur a (financial and economic) operating cost of 40,000 BDT per year plus the escalating cost of a small amount of diesel fuel. In addition, the system is assumed to replace its batteries every 5 years (at a total of 288,400 BDT with taxes; 231,884 BDT without) and its

controllers every 3 years (at a total cost of 15,000 BDT with taxes; 12,061 BDT without), and households would have to replace their LED lights every 3 years.

13. **SHS Assumptions.** The SHS alternative would be 50 systems with an average size of about 50Wp each. The upfront economic cost of these 50 systems would be 0.84 million BDT, with a financial cost of 1.03 BDT. The yearly operating cost would be 47,000 BDT. As with the micro-grids, the batteries are assumed to be replaced every 5 years, and controllers and LED lights every 3 years. Replacement of all 50 systems batteries would cost 422,500 BDT with taxes (339,705 BDT without taxes) – significantly more than the cost of replacing micro-grid batteries (if replaced at the same rate) because a single micro-grid uses a smaller battery bank than 50 SHS would use. Replacement of all 50 systems charge controllers would cost about 27,500 BDT with taxes (22,111 BDT without); this is another area where micro-grids achieve economies of scale over SHS. Broadly, then, these assumptions suggest SHS could have a lower upfront cost but micro-grids could have significantly lower annual operating and maintenance costs. Calculations of the levelized cost of electricity from an SHS assume that, if households stop using the SHS in less than 20 years, they can sell the system for 90% of its depreciated value.

14. **Cost Effectiveness.** From the country’s perspective, under these assumptions of higher upfront cost but lower operating costs, a micro-grid would be more cost effective than the equivalent amount of SHS if either system will be used for more than five years. Figure 1 compares the levelized economic costs of a micro-grid and a 50Wp solar home system for lifetimes ranging from 1 to 20 years. A comparison of financial levelized costs of the two systems yields similar results.



15. **Cost Effectiveness Sensitivity.** These findings are fairly sensitive to the assumptions made about the cost of a micro-grid; IDCOL has not yet received micro-grid proposals, so there is significant room for movement in the system costs estimated here. Both the upfront and operating costs could vary for a variety of reasons. Upfront and/or operating costs could be higher if households are widely dispersed, their electricity consumption patterns are more similar, or parts need to be replaced more often than assumed here. Alternatively, costs could be lower if the efficiencies from creating a single system instead of multiple systems are larger than those assumed here. In addition, the life of the batteries and other components in both micro-grids and SHS is still relatively unknown and could be very different in the two systems due to

different usage patterns. Batteries account for over 20% of the upfront cost in a micro-grid and almost 30% in an average SHS, so their lifetimes have a significant bearing on the total cost. Table 2 shows how the comparison between a 3 kWp micro-grid and 50 50Wp SHS compares over different system lifetimes if the micro-grid costs are significantly different than those assumed here. Broadly, this suggests that there are situations in which the micro-grid is more cost-effective even under different assumptions than those used here.

Table 2. Sensitivity Analysis of Micro-grid Levelized Economic Cost

	<i>System Used for:</i>	Micro-grid levelized cost	SHS levelized cost	Which is lower?
Baseline	<i>5 Years</i>	0.112	0.110	SHS
	<i>10 Years</i>	0.087	0.096	Micro
	<i>20 Years</i>	0.075	0.088	Micro
Micro-grid Upfront + replacement costs 20% higher	<i>5 Years</i>	0.130		SHS
	<i>10 Years</i>	0.098		SHS
	<i>20 Years</i>	0.083		Micro
Micro-grid Upfront + replacement costs 10% lower	<i>5 Years</i>	0.103		Micro
	<i>10 Years</i>	0.081		Micro
	<i>20 Years</i>	0.071		Micro
Micro-grid Operating cost 20% higher	<i>5 Years</i>	0.115		SHS
	<i>10 Years</i>	0.090		Micro
	<i>20 Years</i>	0.078		Micro
Micro-grid Operating cost 10% lower	<i>5 Years</i>	0.110		SHS
	<i>10 Years</i>	0.085		Micro
	<i>20 Years</i>	0.073		Micro
SHS battery life twice as long	<i>5 Years</i>	0.112	0.110	SHS
	<i>10 Years</i>	0.087	0.086	SHS
	<i>20 Years</i>	0.075	0.077	Micro

16. Owner (or PO) perspective. The financing of a micro-grid is very different from that of a solar home system. In a micro-grid, a single owner/operator takes almost all of the financing risk. This analysis assumes households pay an upfront connection fee of 4,000 BDT each, covering about 17% of the upfront cost; 25% of the upfront cost is covered by equity from the owner; and the remainder is covered by a loan from IDCOL on the same terms as SHS receive (6% interest rate, 1 year grace period, and five-year loan tenor). On a yearly basis, the owner has to cover operating expenses, and replacement parts, and he receives a tariff from households. The owner's financial returns are highly sensitive to the upfront connection fee and tariff he receives from households.

17. Household perspective. For the household also, the financial analysis of a micro-grid is very different from that of a solar home system. With a micro-grid, the household only pays the upfront connection fee and a tariff based on the service it receives. This assumes households pay per kWh consumed, which is one of a few possible pay-as-you-go models. The household's financial decision is thus also highly dependent on the tariff and connection fee. If a household is using micro-grid service instead of an SHS (as opposed to in addition to an existing SHS), the benefits it receives from each are the same, and it can choose the level of service it desires (e.g.,

service equivalent to 20Wp, service equivalent to 50Wp, etc.). Thus, to model the household's financial decision, this analysis considers the financial levelized cost of electricity to the household for the different systems.

18. **Tariff and Connection Charge.** There are a variety of tariffs and connection charges that make the micro-grid more financially appealing for households than a solar home system and still provide an IRR greater than the 10% discount rate for the operator. The greatest uncertainties, however, are (a) how large of an IRR operators would need to achieve and how quickly operators to be willing to take on the risk of owning a micro-grid and (b) how many households would be able to pay the upfront connection fee required to generate that return. The tariff is less of an uncertainty as this analysis suggests that even at fairly high tariffs, there are cases in which micro-grid service is financially more cost-effective for households than an SHS. For example, a tariff of 100 BDT per kWh and connection charge of 4,000 BDT per household gives the operator a 45% IRR over only 3 years. For households, micro-grid service at that price is more financially cost-effective than an SHS if they would only own the SHS for 5-15 years. However, that connection charge is almost double the average down payment for an SHS. If the connection charge were only 2200 BDT – the average SHS down payment – it would take 7 years for micro-grid operators to see a positive IRR.

19. **Overall Viability.** This analysis suggests micro-grids become the least-cost economic option over longer potential lifetimes, relative to SHS, due to their high upfront cost and lower operating costs. However, because of the differences in the SHS and micro-grid financing models, they are most financially appealing to households over shorter system lifetimes. This analysis suggests there may be a medium-term “sweet spot” for micro-grids in areas where the electricity grid will arrive in 5-10 years. The actual cost of micro-grids is still somewhat unknown, so this sweet spot may be different in reality, but such a spot likely exists somewhere. Other pre-conditions that would be necessary are sufficiently clustered households, households that can afford the necessary connection charge, and operators that are willing to take the upfront risk of a micro-grid system

20. **Subsidy.** Finally, the new consideration of micro-grids raises questions about the subsidy IDCOL gives to solar home systems. Micro-grids and solar home systems provide equivalent service and thus it is critical to maintain a level playing field for all technologies. It is particularly important in situations where either micro-grids or SHS are the most economically efficient option for the country, that they should not be financially disadvantaged from unequal subsidy treatment. Currently, only 20 and 30 Wp SHS receive subsidies. IDCOL should consider if a subsidy is still necessary at all, and if it is, consider extending an equivalent subsidy to micro-grid systems providing equivalent service and possibly also to larger SHS. It may also consider other factors, such as the fact that solar home systems are an incumbent technology that have benefitted from subsidies for several years, whereas micro grids are new to the market, and initial owners/operators would be taking significant risk by entering a relatively untested area.

Household Energy Component

21. An economic and financial analysis was conducted for the biogas plants that would be financed under the Household Energy Component of this project. The updated analysis was required because IDCOL has increased the selling price and subsidy level for the plants due to a

re-evaluation of the cost of a biogas plant. As a result, additional funds will be allocated to this component, and the numbers of plants projected to be financed will increase to about 33,000.

22. The economic rationale for including biogas plants in this project is the same as it was during original project appraisal. Specifically: An IDE survey³² 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. At the same time, biogas plants, though fairly expensive now, are likely to achieve significant cost savings once produced at scale. Thus, this project provides a subsidy for biogas plants to make the initial high cost affordable for consumers; as demand picks up and plants are produced at greater scale, the subsidy required is expected to be phased out.

23. The analysis is conducted at the national and household level for a program that would support the replacement of traditional wood burning stoves with 33,000 biogas plants and stoves. The analysis is based on households acquiring a biogas plant with a daily gas production of 2.8 m³, the amount of fuel required to cook three meals a day. It would require daily feeding rate of 60 kg of dung per day.³³ Households with 5 or more head of cattle would have sufficient dung to support this. There are about one million of such households in Bangladesh.

24. The analysis assumes that a biogas plant costs about 48,000 BDT. Just over half of that cost is materials and installation, 30 percent of the cost is masonry and dealer salaries, and the remainder of the cost of parts and appliances provided with the plant (stove, mixer, gas tap, main valve, etc.), other dealer operating expenses, and a provision for repairs during construction. IDCOL has calculated that households can afford to pay about 34,500 BDT per stove and thus provides a subsidy of 13,500 BDT per stove. In addition, TA for the biogas program works out to an average of 3,791 BDT per plant. It assumes the annual maintenance cost is 2.5% of the selling price.

25. For economic benefits, this analysis considers the value of fuel savings, along with value of the improved fertilizer a biogas plant produces (valued at the cost of purchasing fertilizer), domestic labor savings, the value of CO₂ emission reductions, and improved health from reduced indoor air pollution. At the project level, the analysis considers all of the benefits previously listed and the full system cost as well as the cost of the TA grant and the ongoing maintenance costs. At the household level, the financial analysis uses only the selling price and maintenance costs as costs and the fuel savings as benefits. The household economic analysis uses the same costs and all of the project-level benefits except reduced CO₂ emissions.

26. The biogas program is economically viable with an EIRR of 17%. The average household's financial rate of return, at 11%, is only slightly higher than the assumed 10% discount rate; however, its economic return, which considers benefits that exist but cannot be clearly monetized, is a much higher 28%. The persistent household demand suggests that either households consider the non-monetary economic benefits when purchasing a plant or that this financial analysis excludes some quantifiable benefits (e.g., avoided health care expenditures).

³² IDE, "Annual Biogas Users Survey 2010" prepared for IDCOL, November 2011.

³³ SNV, "Feasibility of a national program on domestic biogas in Bangladesh," August 2005.

Table 3 summarizes the project economic returns and the households' financial and economic returns.

Table 3. Biogas Economic and Financial Results

	Project Economics (BDT Mn)		HH Financial Analysis (BDT)	HH Economic Analysis (BDT)
Upfront Cost	1,742		34,357	34,357
Net Benefit	1,663		29,003	79,769
NPV	306		1,240	26,982
IRR	16.8%		10.8%	28.20%

GHG Accounting

27. Greenhouse gas (GHG) emissions accounting was performed for the new electricity systems to be financed under the additional financing and restructuring of the original financing. The analysis applied the Clean Development Mechanism (CDM) methodologies for electricity generated by users, as specific Bank methodology is not available for the small-scale technologies financed under this project. GHG accounting did not need to be performed for the additional biogas plants.

28. For solar home systems, the project is assumed to have zero emissions (per the GHG accounting framework, upstream and operational emissions are assumed to be negligible relative to other emissions). Analysis is done for a representative 50 Wp SHS, which is the expected weighted average of SHS to be installed under the project (as assumed in the economic analysis). The alternative to an SHS is assumed to be kerosene lights. Based on prior analysis of SHS in Bangladesh, a 50 Wp SHS conservatively offsets about 60 liters of kerosene per year, and, using the Intergovernmental Panel on Climate Change (IPCC) emissions factor of 2.41 tons of CO₂e per kilo liter, about 0.14 tons of CO₂ per year. The project anticipates supporting an additional 480,000 SHS, which would together offset 69,753 CO₂ emissions annually once all the systems are installed and are functioning properly.

29. For solar irrigation pumps, the project is assumed to have zero emissions (per the GHG accounting framework, upstream and operational emissions are assumed to be negligible relative to other emissions). Analysis is done for a representative 6.5 kWp pump, to which the alternative is 6 horsepower diesel generator. The alternative diesel generator would be expected to use about 2,920 liters of diesel per year, which, using an emissions factor for diesel of 2.4 kilograms of CO₂ per liter, produces 7 tons of CO₂ per year. The new funding under the project anticipates supporting 375 solar irrigation pumps, which together would offset 2,628 tons of CO₂ annually.

30. Considering that installation of these systems would occur gradually over three years, the project is conservatively estimated to offset 1.4 million tons of CO₂ emissions during the 20-year project lifetime. Table 4, below, shows the year-wise GHG emissions offset by this project.

Table 4. GHG Accounting Results

Year	SHS			Irrigation Pumps			Total CO2 Avoided (tons)
	SHS installed	Kerosene avoided (kl)	CO2 avoided (tons)	Pumps	Diesel avoided (kl)	CO2 avoided (tons)	
2015	274,781	16,569	39,931	60	175.2	420	40,352
2016	452,391	27,279	65,741	135	394.2	946	66,688
2017	480,000	28,943	69,754	240	700.8	1,682	71,436
2018	480,000	28,943	69,754	375	1095	2,628	72,382
...	480,000	28,943	69,754	375	1095	2,628	72,382
2034	480,000	28,943	69,754	375	1095	2,628	72,382
Total		564,829	1,361,238		19,885	47,724	1,408,963

Annex 5: Financial Intermediary Assessment

I. Introduction

1. This is a review of the proposed additional financing to the Rural Electrification and Renewable Energy Development II (RERED II) Project, to ascertain its compliance with the requirements of Bank financing of projects involving financial intermediaries. This review is based on study of the available background documents and discussions with the Infrastructure Development Company Limited (IDCOL), the financial intermediary (FI) for the project.

II. The Project: Financial Sector Context and Objectives

2. The ongoing REREDII Project, scheduled to close in December 31, 2018, has been under implementation since early 2013 with the major objective of increasing access to clean energy in rural areas of Bangladesh through installation of Solar Home Systems (SHSs) and other renewable energy based solutions. The repeater RERED II project was approved by IDA Board in September 2012 continuing with support to the successful SHS program initiated under the predecessor RERED project. The RERED II project introduced new options for private sector led mini-grid schemes, solar irrigation pumps, and renewable energy based captive plants for increasing access to electricity. The project also introduced support for dissemination of improved cooking solutions in support of increasing access to clean energy in rural areas. The project is being implemented successfully and the proposed additional financing is primarily aimed at further scaling up the access to electricity component. The main components of the project, access to electricity and household energy, are implemented by IDCOL, which on-lends to selected partner organizations (POs) across the country.

3. Availability of electricity not only improves the quality of life 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 - 2014. 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, which is consistent with the first pillar of CAS 2010 - 2014. Thus, the proposed additional financing is consistent with the country's poverty reduction objectives.

III. Policy Framework for the Financial Intermediary Loan

4. Following a prolonged sluggish phase caused by political turmoil, the economic activities recovered in the second half of FY14; resilient exports and strong domestic consumption being the main driver of the recovery. Although the target will not be reached, recovery in export growth and increases in public expenditure are likely to help achieve 5.4 percent Gross Domestic Product (GDP) growth in FY14. This is slightly higher than the average for developing countries but lower than last year's 6 percent growth. Business and consumer confidence in general suffered through decline in rate of return on investment perceived by domestic and foreign investors, and by reduced remittances and demand for labor.

5. The financial sector, especially the public sector banking part of it, suffered from a decline in the governance situation, which affected financial transactions in the credit market. Stability as well as growth in the financial sector was shaken also by the prolonged disruption in production and trade in the face of the political turmoil. Defaults and non-performing loans (NPLs) in the banking sector went up, especially in the state-owned banks, which had already been negatively impacted by the financial scams in the preceding year. Excess liquidity is piling up in the banking sector due to low credit demand by the private sector. Stress testing assessment by the central bank for Jan-June Quarter 2013 affirmed that banks were more susceptible to credit and market risk and risks associated with excessive deposit withdrawals. However, banks were found to be quite resilient to various kinds of market risks and shocks such as change in interest rate or exchange rates. Also, the risk of a systemic failure is also low. IDCOL, being a non-bank financial institution and with its strong internal control and professional management is unhampered by the stresses in the banking system.

6. One important aspect of the review is the likelihood of Government intervention in the market through the Project, leading to distortion in the process of financial intermediation. As in the ongoing REREDII project, approach of implementation would remain the same for the proposed additional financing; 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 are selected based on their micro-credit experience, reach in the rural areas, financial soundness etc 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.³⁴ 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 proposed additional financing.

7. There are however some subsidies to make the services affordable to the poor. A small subsidy of US\$ 20 per system for smaller size SHS (>30Wp) on the selling price is provided to buy down the capital cost (at the SHS program inception in 2002, the subsidy was US\$90 per system for all systems, regardless of size; thus, the subsidy has already fallen significantly). The RAPSS component has the provision to have up to 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, and a commercial financing study is currently ongoing

³⁴ The differences in the terms at which IDCOL extends loans to the POs and the terms at which the POs extend the loans to the households contributes to improved liquidity at the POs. POs can recycle the loans collected from the households to extend credit for another SHS before the repayment to IDCOL becomes due. The credit risk is borne by the POs.

to provide for a plan towards commercialization with adequate safeguards that the program continues to reach the poorer segments of the population.

IV. Eligibility of the FI

1. Implementation Progress

8. Implementation progress of the renewable energy component implemented by IDCOL is rated satisfactory consistently. Against the target of reaching 550,000 households through SHS, the project has already reached over 414,000 households by March 2014. Currently about 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. The other options for increasing access to electricity (mini-grids, solar irrigation pumps etc) had initially taken time to take off the ground, and now there is a strong pipeline. 3 mini-grids have already been approved by IDCOL for financing while several others are in the pipeline. 40 irrigation pumps have already been installed and another 80 have been approved for financing.

2. Financial Performance of IDCOL

(i) Capitalization: IDCOL has a sound capital base. The paid-up capital was raised by BDT520 million to BDT 1.72 billion in FY13 and IDCOL has a target to increase its paid-up capital to its authorized limit of BDT5 billion gradually using its retained earnings of each year. In terms of Paid-up Capital, IDCOL is in compliance with the BASEL II requirement of BDT1 billion. The share capital and total equity is about 7.02% and 11.29% respectively of the loans and advances outstanding (these were 10.6% and 14.63%, respectively, during the last review in FY11). The drop in the capitalization to loans and advances ratio is due to significant increase in long term loans extended to renewable energy (which constitutes 61% of the total loan portfolio) followed by power sector (23%) and telecom (11%).

(ii) Recovery Performance: IDCOL's overall loan recovery rate is 96.7% as of June 30, 2013, down slightly from 98.69% during the last review. There were 12 classified loan accounts (0.81% of the total portfolio) and IDCOL filed lawsuit against two of the borrowers and the other classified loans are being closely monitored. The high loan recovery rate indicates the sustainability of IDCOL operations.

(iii) Loan Loss Provisioning: IDCOL complies with the provisioning guidelines of Bangladesh Bank - the central bank of the country. IDCOL 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 13, net profit of the company was 48.75% of its operating income (up from 44.85% during the last review in FY11).

(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

9. 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.

V. Key Risks and Challenges

10. While the overall loan recovery rate of IDCOL is high (over 96%), the recovery rate of the micro-credit extended by the POs to the SHS household is an important indicator about POs' ability to continue to service their debts to IDCOL. As part of implementation, IDCOL monitors this collection efficiency and there is a mechanism in place for suspending disbursement against new installations for any unit office of the POs that fail to maintain minimum collection ratio. This needs to be continued and any signs of stresses in the collection efficiency shall need to be handled appropriately.

11. IDCOL's investment portfolio has major concentration risk in terms of single sector/product exposure. At present about 61% of its portfolio holds lending/assets in renewable energy sector, which has decreased from 69% during the last review in FY11. The decrease signifies IDCOL's efforts to diversify its portfolio into different sectors/products. Going forward, the share of the power sector is expected to increase with the approval of several large loans for power generation projects that are currently in the pipeline. In line with the principle of diversification, IDCOL should continue to explore investments in sectors other than power.

VI. Recommendations

12. 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 requirements for financing to financial intermediaries. 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 the impact of the same on the FI, on 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) The collection efficiency of the POs for the credit extended to SHS households will need to be continued to be closely monitored for early signs of stresses and appropriate actions would need to be taken for ensuring program sustainability.
- (f) As far as the mini-grid component is concerned, market based private sector principles will be maintained.

Annex 6: Financial Management Assessment

1. **Brief Project Description:** The proposed additional financing amounting to US\$78.4 million would help finance the costs associated with further scaling up of the project’s renewable energy component supporting installations of Solar Home System (SHSs). The Additional Financing (AF) will be implemented by the Infrastructure Development Company Limited (IDCOL), a Financial Intermediary, fully owned by the Government. The program is implemented by IDCOL through eligible Partner Organizations (POs) under a micro-credit scheme. The sector technical assistance component in support of sector reform and capacity building is implementing by the Power Cell, a technical arm of the Ministry of Power, Energy and Mineral Resources (MPEMR).

2. **FM arrangement:** As the FM organization of IDCOL and Power cell has been considered adequate since the beginning of the project, the existing FM arrangement will continue under the proposed additional financing and the proposed reallocation (US\$17 million) for the RERED II. So far, IDCOL successfully managed the renewable energy component of RERED and has been successfully managing the access to electricity and household energy components of RERED II. Power Cell will be the implementing agency for the Sector Technical Assistance following the same implementation FM arrangement as in RERED II.

3. **Disbursements and Flow of Funds:** IDCOL and Power Cell will follow the transaction based disbursement. Each agency shall open and operate a separate designated account (CONTASA) to receive IDA funds. The allocation for Category 1 (sub-loans for access to electricity) will be made available to IDCOL through a Subsidiary Loan Agreement with the Finance Division of the Ministry of Finance (MOF). Funds will flow from IDCOL to Participating Organizations through sub-loans under Participation Agreements between IDCOL and the POs. Once the SHS are installed under a micro-credit arrangement between the POs and households, the POs would apply for refinancing for the credit part (upto 80% of the micro-credit part) and the capital buy-down grant (currently US\$20 per system for smaller systems). After inspection and verification IDCOL would release the credit and grant fund from the Project. The proposed additional financing credit will be utilized after the allocations under the original credit are exhausted.

4. The allocation for Category 2 (technical assistance for IDCOL) will be made available to IDCOL through a Subsidiary Grant Agreement (SGA) with the Finance Division. IDA will finance 100% inclusive of taxes in sub-loans and goods and services associated with management of sub-loans.

5. **Disbursement Category:** IDA financing under the credit will be allocated under the following disbursement categories.

Disbursement Table (Including Reallocated amount of USD 17 Million)

Category No	Category Name	US\$ Million AF	US\$ Million Reallocation	
1	Sub-Loans for Access to	73.7	12.00	100% (inclusive of Taxes)

	Electricity			
2	Technical Assistance for IDCOL	4.70		100% (inclusive of Taxes)
5	Sector Technical Assistance		5.00	100% (inclusive of Taxes)
	Total	78.4	17.00	

6. **Incremental Operating Costs:** The project will cover reasonable costs incurred on account of the implementation of the Project (which expenditures would not have been incurred absent the Project) including: consumable materials and supplies (including office supplies), office equipment, communications, translation services, mass media and printing services, office and vehicle rental, operation and maintenance, fuel costs, charges for the opening and operation of bank accounts required for the Project, postage and handling, honoraria and staff allowances, travel, lodging and per diems for the Project staff and officials on field visit; subscriptions to e-publishers, bandwidth cost including commodity internet, and salaries of contracted non-core project staff of IDCOL; but excluding salaries of officials of the government civil service. For the purpose of honoraria for members of tender/proposal evaluation committees, steering committees, task force, and working groups, the relevant rules and regulations of Public Procurement Rules 2008 or other similar rules and regulations of the government will govern the amount and eligibility. For the purpose of staff allowances, the relevant rules and regulations of the government will govern the amount and eligibility and will only cover amounts that are not provisioned from the government own funds.

7. **Accounting:** In ensuring accounting and financial control of transactions under the proposed AF, IDCOL and Power Cell will maintain adequate FM systems within the entity and in the PO. Separate books of accounts by IDCOL will be maintained for the proposed additional financing. The commitments of the PO have already been ensured through insertion of the following provisions in the Operating Guidelines of the project:

“POs shall:

- (i) maintain a financial management system including records and accounts, and prepare, all in accordance with accounting standards acceptable to the Association, consistently applied, adequate to reflect distinctly the operations, resources and expenditures related to sub-loans granted under the Project.
- (ii) have their records, accounts and financial statements (balance sheets, statements of income and expenses and related statements distinctly identifying) for each fiscal year audited, in accordance with auditing standards acceptable to the Association, consistently applied, by independent auditors listed under the List of Auditors Grade-A of Bangladesh Bank ;
- (iii) promptly furnish at the request of the Association, as soon as available, but in any case not later than six months after the end of each such year, (A) certified copies of the financial statements referred to in clause (i) of this Section, for such year as so audited, and (B) an opinion on such statements and report of such audit, by said auditors, of such scope and in such detail as the Association shall have reasonably requested including a management letter indicating auditor’s findings on state of governance ,internal controls and management practices involved in

- POs' operations and measures recommended by auditors to overcome weaknesses; and
- (iv) furnish to the Association such other information concerning such records, accounts and financial statements, and the audit thereof, and concerning said auditors, as the Association may from time to time reasonably request

8. **Financial Reporting:** The format, content and periodicity (within 45 days of the completion of quarters) of the Interim Unaudited Financial Monitoring Reports (IUFR) under the original Credit will continue for the AF as well. IDCOL shall continue to use its computerized accounting system so that IUFRs can be automatically generated from the entity accounting system itself without further add on process.

9. **Audit:** Separate audits will be conducted for the original credit and the proposed additional financing credit. The audit requirement under the AF that will be tracked through the Portfolio and Risk Management system (PRIMA) will follow the provisions of the original project as stated in the following table:

Implementing Agency	Audit	Auditors
IDCOL	Project Financial Statements	Private Auditor
IDCOL	Entity	Private Auditor
Power Cell	Project Financial Statements	Foreign Aided Project Audit Director (FAPAD)

10. **Supervision Plan:** The initial supervision will focus on compliance with all agreed actions, identifying any FM or disbursement issues in project implementation and agreeing on redress measures. The effectiveness of internal controls on FM functions of the implementing agencies will be closely reviewed by IDA's Financial Management unit both on-the-desk and at site as deemed appropriate for fulfillment of the fiduciary objectives.

Annex 7: Procurement Assessment

1. **Procurement Responsibility:** The overall responsibility of project implementation would be with IDCOL and Power Cell. The sub-loans under access to electricity component and sub-grants under the household energy component implemented by IDCOL would be under financial intermediary loan/grant and the procurement for these sub-loans/grants will be the responsibility of the concerned POs. The POs are expected to follow established commercial practices ensuring economy and efficiency.

2. **Procurement Capacity:** Both IDCOL and Power Cell have experience and capacity in managing Bank financed procurement. Under the ongoing RERED II project and completed RERED project, there was no major procurement related issue observed in these organizations. Moreover, only a few small value procurements will be done for the technical assistance components under the proposed additional financing. In view of the size of the procurement contracts envisaged under this Project, the risk of the project is rated as “*moderate*” from the standpoint of procurement operation and contract administration. Several measures to mitigate the risks are either in place or will be put in place as described below.

3. **Managing Procurement Risks:** 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 will be implemented during implementation of the Project.

a. General

- (i) *Bid/Proposal Evaluation Committee:* Both the implementing agencies shall ensure that the bid/proposal evaluation committees are formed in a manner acceptable to the Bank, and Bank’s no objection shall be required on the formation of the bid/proposal evaluation committees.
- (ii) *Introducing electronic procurement plan and monitoring system:* Electronic procurement plan and monitoring system (SEPA) will be used to prepare, update, and obtain no objection of the procurement plans of this Project.
- (iii) *Identify procurement focal points (PFP) in IDCOL and Power Cell:* Each of the two implementing agencies shall nominate a procurement focal person for their part of the Project. The appointed focal persons will take necessary training, both on Public Procurement Rules (PPR) 2008 and Bank Procurement Guidelines, if required. The focal persons will help the respective agencies in day-to-day procurement follow-up and preparation of periodic procurement reporting.
- (iv) *Due-diligence Measures:* the following steps will be followed as part of procurement and implementation arrangements: (a) all bid evaluation reports will include verification of recommended bidders’ post-qualification information; (b) make bidders generally aware about fraud and corruption issues; (c) preserve records and all documents regarding procurement (including correspondences with the potential bidders as well as complaints/clarification requests etc.), in accordance with the Bank Guidelines and PPA/PPR, to facilitate smooth procurement audit or post-review; and (e) publish contract award information on Central Procurement Technical Unit

(CPTU) and the respective agencies website within two weeks of contract award (and in UNDB online for ICBs or international consultancies).

b. Special measures for National Competitive Bidding (NCB) Contracts:

- (i) *Bid Evaluation Committee (BEC)* for NCB contracts will be formed in accordance with Public Procurement Rules 2008. Formation of such BEC shall be subject to Bank's acceptance.
- (ii) *Electronic Government Procurement (e-GP)*: This has been rolled out in June 2011 under the Second Public procurement Reform Project (PPRP-II). It is a web based system which encompasses the total procurement lifecycle and records all procurement activities. Project will process the NCB packages under this project using this system of the country in a progressive manner.

c. Other measures:

- (i) *Adopt contract implementation monitoring tool, individually by IDCOL and Power Cell*: This tool will project quarter-wise milestones for each contract under the Project and related disbursement, and will track its accomplishments. The agencies will report to the Bank on a quarterly basis on the accomplishment of milestones and related disbursement against the target set in this tool. Specific reporting requirements/milestones and related disbursement figures will be finalized during project implementation in agreement with the Bank.

4. **World Bank's Procurement Guidelines.** Procurement financed under the Project will be carried out in accordance with the World Bank's "Guidelines: Procurement of Goods, Works and Non-Consulting Services under IBRD Loans and IDA Credits and Grants by World Bank Borrowers" dated January 2011 and "Guidelines: Selection and Employment of Consulting Services under IBRD Loans and IDA Credits and Grants by World Bank Borrowers" dated January 2011, and the provisions stipulated in the Financing Agreement

5. **Procurement Plan:** For each contract to be financed by the Project, the different procurement methods or consultant selection methods, the need for pre-qualification, estimated costs, prior review requirements and time frame are agreed between the Borrower and the Bank in the Procurement Plan. The Procurement Plan dated May 11, 2014 has been prepared by IDCOL in agreement with the Bank. It will also be available in the Project's database and in IDA's external website for this project. Besides, all expected major procurements will be announced in the General Procurement Notice (GPN), published in the Bank external website and United Nations Development Business (UNDB). The procurement plan will be updated semi-annually or as required and will be the basis of Bank's procurement supervision plan. Bank's electronic procurement plan and monitoring system (SEPA) will be used to prepare and regular updating and getting no objection of the procurement plans of this project.

6. **Particular Methods of Procurement of Goods, Works and Non-consultancy services.** 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), Framework Agreement, 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/model bidding documents satisfactory to the Bank. Shopping will be carried out based on a model document satisfactory to The Bank. For the purpose of NCB the following shall apply:

- Post bidding negotiations shall not be allowed with the lowest evaluated or any other bidder;
- Bids should be submitted and opened in public in one location immediately after the deadline for submission;
- Lottery in award of contracts shall not be allowed;
- Bidders' qualification/experience requirement shall be mandatory;
- 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
- Single-stage two-envelope procurement system shall not be allowed.

7. **Methods of Procurement of Consultants' Services.** Selection of Consultants will follow the Bank's Consultant Guidelines and the Bank's Standard Request for Proposals (SRFPs) is applicable for all types of selection processes. 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), and Single Source Selection (SSS). Shortlist of consultants for services estimated to cost less than US\$500,000 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, along with the Bank's review and implementation support requirements.

8. **Use of Standard Procurement Documents.** For procurement through International Competitive Bidding and for selection of consultants, the Bank's Standard Bidding Documents (SBDs) and Standard Request for Proposals (SRFPs) will be used, including the form of contract attached with SBDs and SRFPs. For all NCB packages, the implementing agencies will use tender documents based on model tender documents (MTD) agreed with the Bank.

9. **Incremental Operating Costs:** These costs will include the reasonable costs incurred on account of the implementation of the Project including: consumable materials and supplies (including office supplies), office equipment, communications, translation services, mass media and printing services, vehicle rental, operation and maintenance, fuel costs, charges for the opening and operation of bank accounts required for the Project, postage and handling, travel, lodging and per diems for the Project staff and officials on field visits and on inspection and testing visits; subscriptions to e-publishers, bandwidth cost including commodity internet; but excluding salaries of officials of the Recipient's civil service.

10. **Prior review Thresholds.** The Procurement Plan shall set forth those contracts which shall be subject to the Bank’s prior review. All other contracts shall be subject to Post Review by the Bank. Initial Procurement plan agreed with IDCOL and Power Cell indicates the following prior review thresholds which will be updated annually based on the review of the capacity and performance of the procuring entity and will be reflected in the updated procurement plan as appropriate:

Table: Prior Review Thresholds

Expenditure Category	Contract Value	Procurement Method	Contracts Subject to Prior Review
	(Threshold)		
<u>Goods</u>	>=US\$ 2,000,000	ICB	All contracts
	<US\$ 2,000,000	NCB	All contracts valued US\$ 1,000,000 or more
	<US\$ 2,000,000	Framework Agreement	First contract by the project regardless of value and thereafter, all contracts valued US\$ 1,000,000 or more
	<=US\$ 6,000	DC	All contracts
RFQ/ National Shopping		Post review	
<u>Works</u>	>= US\$10,000,000	ICB	All contracts.
	<US\$10,000,000	NCB	All contracts valued US\$10,000,000 or more
	<=US\$ 12,500	RFQ/ National Shopping	Post review
		DC	All contracts
<u>Services</u>	>=US\$500,000	QCBS /QBS	All contracts valued US\$500,000 or more
	<US\$500,000	FBS	All contracts valued US\$500,000 or more
	<US\$ US\$300,000	LCS	Post review
	<US\$ US\$300,000	CQ	Post review
		IC	All contracts valued US\$200,000 or more
		SSS	All Contracts

Note: In case of contract package awarded in the form of lots or sub-packages, the combined estimated cost of all lots/sub-packages in a particular procurement package will determine whether it will be prior- or post-reviewed, in accordance with the thresholds given above.

11. **Post Review.** For compliance with the Bank’s procurement procedures, the Bank will carry out sample post review of contracts that are below the prior review threshold. Such review (ex-post and procurement audit) of contracts below the threshold will constitute a sample of about **10 percent (fifteen percent)** of the post-review contracts in the project. Procurement post-reviews will be done on annual basis depending on the number of post-review contracts.

Annex 8: Environment and Social Safeguards

A. BACKGROUND

1. Based on a full-fledged Environmental and Social Assessment, RERED II was classified as a Category 'B' which is appropriate and consistent with the provisions of OP/BP 4.01. The project design and expected impacts remain unchanged for the proposed additional financing, for which safeguard category B remains unchanged for the proposed additional financing. As the project does not include any land acquisition, OP/BP 4.12 is not likely to be triggered in this project. As tribal people may live in many off-grid areas where different components of the project will be implemented, the Indigenous Peoples Policy (OP/BP 4.10) has now been triggered.

B. METHODOLOGY OF ENVIRONMENTAL AND SOCIAL SAFEGURADS COMPLIANCE FOLLOWED IN RERED II PROJECT

2. To ensure the compliance of required environmental and social safeguards in a satisfactory manner, a comprehensive environmental and social management framework (ESMF) was adopted in June 2012. The ESMF, along with the Bangla version, was disclosed in websites of the implementing agencies (<http://www.idcol.org>. and <http://www.reb.gov.bd>) in July 2012 and in the World Bank's InfoShop on the same date. Hard copies of the document were made available in IDCOL, BREB, Power Cell and at the offices of the partner organizations of IDCOL. The Frameworks separately assessed the environment and social impacts of project components and served as a set of guidelines to be used for projects where the precise nature and scale of sub-projects are not known in advance. These guidelines served as a tool to select the optimal project intervention from social and environmental perspectives, to prepare preliminary designs, and to ensure complete integration of social and environmental concerns and mitigation measures in the design for the activities to be undertaken by project implementing agencies.

3. In general, the ESMF provided a set of policies, acts, rules, procedures, programs, and institutions that collectively worked towards protecting and enhancing the attributes of the environment and persons that may be impacted by the activities undertaken in the Project. Various mitigation measures are outlined to minimize environmental impacts and fair compensation mechanisms should residual impact be unavoidable. Moreover, the ESMF provided for screening, monitoring, and post-evaluation mechanisms so that any present or future impact can be identified and resolved quickly.

C. SUMMARY OF ENVIRONMENTAL ASSESSMENT OF REREDII

4. The potential environmental impacts of the project components under RERED II project and their corresponding mitigation measures as have been adopted by IDCOL are mentioned as follows:

Table: Environmental impacts and corresponding mitigation measures adopted by IDCOL

Component	Impact	Mitigation measure
SHS	Operation Phase: Improper management of expired batteries may	▪ IDOCL has prepared "Policy Guidelines on Disposal of Warranty Expired Battery". The

Component	Impact	Mitigation measure
	<p>lead to environmental pollution and health safety concern.</p> <p>Construction Phase: During manufacturing of lead-acid battery, there is significant risk of environmental and health safety hazards.</p>	<p>customers, POs, and manufactures should comply with this Policy fully.</p> <ul style="list-style-type: none"> ▪ IDCOL has introduced the tracking mechanism for proper disposal expired battery. ▪ IDCOL has deployed 12 solar inspectors spreading over in 12 regional offices with coverage of the entire country to exclusively monitor the management of expired battery. ▪ There is a financial incentive for POs and recyclers for recycling the expired battery properly. ▪ IDOCL has required all battery suppliers and battery recyclers under the SHS program to be ISO 14001:2004 and OHSAS 18001:2007 compliant in addition of the requirements of the Department of Environment. At present there are 17 battery suppliers and 3 battery recyclers, who have complied with these requirements. ▪ IDCOL arranges quarterly environment and health safety compliance meeting to raise awareness and assess the implementation of the required health and safety standards. ▪ Installation of effluent treatment plant (ETP) and air treatment plant (ATP) have been made mandatory for en-listed battery suppliers and battery recyclers.
Solar irrigation	<p>Construction Phase: Adverse Impact on ecosystem will not occur in general circumstances. However, moderate change in land use including tree clearing may be required depending on project site.</p> <p>Operation Phase: Excessive water use may cause impact on hydrology.</p>	<ul style="list-style-type: none"> ▪ To mitigate the scope of environmental impacts due to solar irrigation, IDCOL has introduced a special screening template, which covers most of the relevant aspects. ▪ IDCOL has emphasized the project proponent to prepare a proper water pump-up and use plan reference from experience in the surrounding areas and results of hydrological surveys. ▪ In addition, IDCOL has conducted a survey by an Expert about the water availability in various potential areas.
Mini-grid	<p>Construction Phase: As mini-grid requires a considerable piece of land, there is scope of disturbance to site specific ecosystem in the Project area.</p> <p>Operation Phase: Due to operation of back-up generator, there could be temporal noise concern.</p>	<ul style="list-style-type: none"> ▪ To address the possible adverse impacts, IDCOL has made mandatory to project sponsor to prepare a detailed environmental impact assessment (EIA). In this regard, IDCOL has introduced a well-structured ToR for EIA.

Component	Impact	Mitigation measure
	Operation Phase: Due to operation of diesel fueled back-up generator, there could be temporal concern due to SOx emission.	
Gasification of Biomass	<p>Operation Phase: Smoke from biomass gasification plant may cause air pollution. The smoke and dust may include hazardous substances and cause health disturbance to the workers.</p> <p>Construction Phase: Impact on ecosystem will not occur in ordinary circumstances. However, tree clearing may be required depending on project site.</p>	<ul style="list-style-type: none"> ▪ IDCOL has required a detail environmental impact assessment and the proper implementation of EMP.
Biogas Power Generation	Operation Phase: Because waste water will be digested in the system, the environmental load will be reduced. However, improper slurry management may cause water pollution.	<ul style="list-style-type: none"> ▪ IDCOL has required the project proponent to install sufficient facilities and ensure proper maintenance.

D. SUMMARY OF SOCIAL ASSESSMENT OF REREDII

Social Management Plan

5. Among the project components, there is no specific land requirement for SHS because they can be installed at roof or any high place in the premise of the customer. In addition, the requirement of land for ICS manufacturing plant will be localized which will be met by direct purchase of land from willing sellers. Similarly, land required for mini-grid, solar irrigation, biogas and biomass based project will be bought from the market. Thus, OP 4.12 will not be triggered in the additional financing phase. However, as the project will cover whole Bangladesh, tribal population may come in contact with the project. Therefore, Indigenous Peoples' Policy (OP4.10) has now been triggered. A tribal people's development framework was adopted as part of the updated Environment and Social Management Framework (ESMF). The transactions with the tribal people will be commercial in nature on a willing-buyer willing-seller basis. Consultations with the tribal people are done in their local languages to be able to persuade them to buy the products/services that the Project is supporting. IDCOL has adopted the following basic principles in regard of social safeguards as is provided in Box-01.

Box 01: Basic principles of social safeguards

- A project requiring any type of land acquisition will not be financed
- No public lands will be used for the project
- Land whether made available via direct purchase or leasing will be screened to ensure that no physical displacement of communities/persons will take place

6. As a part of Social Management Plan, IDCOL has introduced a social compliance screening checklist as is provided in following Box-02.

Box 02: Social safeguards compliance screening checklist

A. Involuntary Resettlement (IR) Aspect

- Does the project require any land acquisition?
- Type of land (public, private or lease)
- Is there any settlement present in the site?
- Is there any recorded litigation issue associate with the site?
- Is there any close relationship between the general livelihood pattern and the site in the project area
- Does the project require physical displacement of any person/household/community?

B. Tribal People Aspect

- Is the project site located in tribal people prone area?
- Is there any impact of the project on religious and cultural practice and belief of tribal people?
- Is there any impact of the project on livelihood pattern of tribal people?
- Is there any tribal people settlement recorded (present and near past) in the site?
- Is there any necessity of displacing (physically or economically) any tribal person/household/community?
- What local language is used by the tribal population?
- Is there any close relationship between the general livelihood pattern and the site in the project area
- Are the PO staffs conversant in these languages and is the information material relevant to the terms and conditions of purchasing the services and operation and maintenance of equipment available in local language?

7. IDCOL is in an advance stage of financing six mini-grid projects. It has approved about 100 solar irrigation projects, which are at various stages of implementation. Among the pipeline sub-projects, the location of one mini-grid project is at Kutubdia Island, Cox's Bazar, which may have the likelihood of being a tribal area. IDCOL has required the project proponent to conduct comprehensive consultation with the tribal communities as are available in the Project area. Based on the Environmental Impact Assessment (EIA) report, respective official of IDCOL will go to verify the actual scenario in light of the submitted document and ensure that the tribal people are not being affected adversely.

Resettlement Action Plan

8. As any type of land acquisition is not supported under the Project, there is no requirement of resettlement action plan.

Consultation and Participation

9. For SHS, the representatives of POs consult with potential customers and based on their response, they install SHS. The clients usually pay in installments by availing a micro credit from the POs. The same approach of consultation is applicable for ICS and biogas plants. Mini-

grid, solar irrigation, biogas and biomass based power project require significant consultation as these projects will serve a wider community instead of individual households. Before financing these components, IDCOL assesses the local demand or customer's response on the components through exhaustive public consultation.

E. ASSESSMENT OF INSTITUTIONAL ARRANGEMENT FOR SUCCESSFUL IMPLEMENTATION OF EMP AND SMP

10. More than 400,000 SHS have been installed under the Project so far. Financing for eight mini-grid projects is under consideration. To comply with the required environmental and social safeguards, for each sub-project (mini-grid, micro-grid or other potential applications under RAPSS), IDCOL has adopted a three-phased process. These phases are-

Appraisal phase

11. During appraisal phase of mini-grid and commercial biogas based projects, in addition of appraising technical and commercial viabilities of project components, IDCOL also considers the potential environmental and social issues. For mini-grid project, it has already introduced a well-structured ToR for environmental impact assessment, which is distributed to the project sponsor as a guideline. For solar irrigation project, it has adopted a customized screening template, which is to be filled up by the project proponent and duly verified by the respective IDCOL official. For other components, excluding SHS, IDCOL has agreed to comply with the requirement of the Department of Environment, Bangladesh.

12. Out of seven mini-grid projects, Environmental consultant has already been appointed for three projects and the EIA reports with detail information of baseline scenario are expected to be available by April 2014.

a) Construction phase

13. IDCOL is committed to ensure sustainable development and thus monitors construction of mini-grids during construction phase in light of the EMP of EIA.

b) Operation phase

14. Operation phase is an ongoing process. To ensure environmental and social compliances, IDCOL is in the process of introducing a well-structured monitoring and reporting schedule.

15. For ensuring satisfactory compliance of environmental and social safeguards, IDCOL has already adopted a number of institutional measures. Among them, the following measures are worth mentioning:

i) Revision of organogram and inclusion of Environmental Specialists

16. IDCOL has deployed a full-time Environmental Specialist. In addition, in its revised organogram, a position of a second Environmental Specialist has been included. This person has already been recruited and is expected to commence work from May 2014.

ii) Development of expired battery monitoring team

17. IDCOL has developed a separate template in addition to the regular inspection form, for monitoring the warranty expired batteries. In this regard, IDCOL has formed a separate Inspection Team comprising 12 Inspectors who are responsible for monitoring throughout the country. Their responsibility is to monitor the status of operation or arrangement of disposal of batteries that are older than five years. These inspectors submit monthly Inspection Report.

18. The regular data on monitoring expired battery is expected to be available in IDCOL database by June 2014. However, from November 2012 to December 2013, IDCOL Inspectors have inspected 24,815 systems with five year above operation period. Of these batteries, 898 have been replaced.

iii) Conducting Environmental Audit

19. A professional team for conducting environmental audit is currently under process.

iv) Consultation and disclosure of ESMF

20. IDCOL has consulted with relevant stakeholders including battery suppliers, recyclers and POs about the required course of action for complying with the ESMF of RERED II. Thereafter it was disclosed in IDCOL website at www.idcol.org. In addition, for ensuring effective compliance, it was translated in Bengali and was also made available in IDCOL website. As part of the proposed additional financing, the ESMF was updated and a tribal people's development framework was developed. The updated ESMF including the tribal people's development framework was disclosed in-country on April 20, 2014 and at the World Bank Infoshop on April 21, 2014.

v) Capacity building of stakeholders

21. For raising awareness, IDCOL arranges quarterly compliance session, where the respective official provides information about environment health and safety. It also facilitates satisfactory implementation of ESMF. In addition, to enhance skill on technical aspects, IDCOL arranges Training of Trainers (ToTs) on a regular basis. Thirteen rounds of training have been completed by September, 2013. After having this training, the trained PO staffs are expected to disseminate technical learning to field level officials through 2-day long staff training. Thereafter, they are expected to orient the technology to customer through 1-day training.

F. LEARNING FROM THE ASSESSMENT & RECOMMENDATION FOR ADDITIONAL FINANCING FOR FURTHER IMPROVEMENT

22. Based on the aforesaid discussion, it can be concluded that the ESMF of REREDP II has adequately covered most of the environmental and social issues and IDCOL has shown competency to implement required measures. However, as enhancement is a continuous process, IDCOL plans to take the following measures.

Table: Recommended measures for RERED II AF

Issue	Potential responsive measure	Proposed action in the ESMF of REREDP 2 AF
Pollution during PV panel manufacturing	<ul style="list-style-type: none"> ▪ Ensuring proper EMS and OHS measures during manufacturing process 	<ul style="list-style-type: none"> ▪ ISO 14001:2004 and OHSAS 18001:2007 have been required for all PV panel suppliers.
Pollution with expired PV panel	<ul style="list-style-type: none"> ▪ An Action Plan is required for proper disposal of PV panel 	<ul style="list-style-type: none"> ▪ An Action Plan to be formulated.
Proper management of expired battery	<ul style="list-style-type: none"> ▪ Enforcing independent recycling facility for all battery suppliers 	<ul style="list-style-type: none"> ▪ It is planned to suggest a time line of installing recycling plant by all battery suppliers.
Satisfactory compliance of basic environmental, social and health safety aspects in regard of all project components	<ul style="list-style-type: none"> ▪ All commercial biogas projects need to conduct detail environmental impact assessment (EIA). ▪ The respective official of IDCOL will regularly monitor the safeguards compliance of operational project ▪ The respective official of IDCOL will conduct site suitability assessment during the appraisal process new project. 	<ul style="list-style-type: none"> ▪ Commercial biogas and biomass based projects will conduct EIA. ▪ Environmental Specialist of IDCOL will initially assess and later on monitor the safeguards compliance status according to the schedule as has been provided as Annex-01.
Gender mainstreaming	<ul style="list-style-type: none"> ▪ Adoption of Gender Action Framework 	<ul style="list-style-type: none"> ▪ Emphasis on Gender Development has been mainstreamed in the project.

Annex 9: Gender Responsive Social Assessment

1. A Gender Responsive Social Assessment for the RERED II Project was carried out during appraisal of the project in mid-2012. The detailed assessment design was based on the experience of the predecessor RERED project taking into account the learning and feedback from the project beneficiaries. Using a gender lens of analysis, the assessment report explored the impacts, problems and opportunities in the Solar Home Systems (SHS), improved cook stoves (ICS) and biogas plants for cooking in the lives of women living in remote rural areas. This annex reviews the progress in implementation of the main recommendations of the gender responsive social assessment of 2012.

Solar Home Systems (SHS)

2. During the 2012 assessment, it was found that the Solar Home System (SHS) has vastly increased mobility and entrepreneurial ambitions among women. Women and children were found to create demand for SHS at the household level. However, women were not targeted specifically in POs' marketing strategies. Second, though women were the key to securing the micro-loans to buy the SHS, their opinion was rarely sought regarding its usage. Thirdly, training for operation and maintenance of SHS were provided at locations which are inconvenient for women to travel to. Based on these findings, the assessment had recommended that women should be consulted about their preferred usage at the time of installation of the SHS so that women can benefit from the locations of the light for specific activities like sewing, knitting, or cooking. The assessment also recommended that the training sessions on SHS should be women-friendly; the place, time, and content of the training should be designed in a way that considers the special needs of a woman in households.

3. Based on these findings and recommendations, IDCOL has incorporated a requirement in its installation manual to consult with the women in the household before putting in the solar light connections. Also, POs were instructed to report on their monthly SHS installation data in a gender segregated way and the POs have been doing so since the end of 2012. POs have been asked to ensure inclusion of women participants in customer trainings. During inspection, IDCOL inspectors now prioritize talking to women members of households to ensure that they are aware of maintenance requirements of SHS. IDCOL is exploring options to introduce technician training courses in the national curricula targeting both men and women for developing a national level technician pool to meet the growing demand of the program.

Biogas Plants for Cooking

4. 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. However, the 2012 social assessment identified that the POs did 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. The assessment had recommended for employing women field workers who would have the access to the women.

5. In response to the above finding and recommendation, IDCOL has trained more than 100 female motivators to market door to door about biogas plants in their respective localities. The POs have been instructed to register biogas plants under the ownership of women in the user households.

Improved Cook stoves (ICS)

6. Before the ICS was introduced in the RERED II project, there have been ICS programs in Bangladesh supported by different development partners. The 2012 assessment found that many of the ICS already introduced through other programs were not working properly due to technical problems and in some cases were not proving to be fuel-efficient. The space between the two stoves was not sufficient and as a result, one cannot place two cooking pots at the same time or use large cooking pots. Second, the height of the stoves was such that women could not cook either seating or standing, rather had to bent down to cook affecting women's health. The cook stove could not be used in rainy season. In addition to these design flaws, the service providers had almost no female employees, as a result, the consumers, most of whom are women, faced uneasiness in dealing with the service provider officials.

7. Taking these into account, IDCOL has taken initiatives to mitigate the technical issues mentioned above and ensure convenience of women using the cook stoves. IDCOL has formed a five member technical committee chaired by an eminent academic with expertise in the sector. IDCOL has also hired a consultant to work on different technical aspects. To assess the performance of the stoves, IDCOL is following ISO International Workshop Agreement (IWA). According to ISO IWA, different criteria have been set to categorize stoves in terms of four different tiers. To ensure the performance of the stoves, IDCOL has developed a tier improvement plan for next five years in terms of Fuel Efficiency, Indoor Air Pollution (IAP) and Emissions.

8. In addition, to review the status of existing stoves being implemented in Bangladesh, IDCOL arranged a stove certification program and received application from 35 organizations with stoves being sold by them in Bangladesh. After thorough review of technical committee, IDCOL selected 11 types of stoves for testing, both in the laboratory and in the field to assess their performance. Based on the test results, IDCOL has selected six different models having performance standards at par with the tier improvement targets. Based on the findings from the field tests, modifications have been made to these stoves to address issues such as keeping adequate spacing between two mouths in double mouth stoves to make users able to place two pots at the same time and to use larger pots. IDCOL has prepared a graduation plan to include higher tier stoves in accordance with the tier improvement plans and is going to sign a contract with Bangladesh University of Engineering and Technology to foster the R&D activities regarding stove development, testing, fuel improvement etc.

9. To address the issue of women inconvenience from the height of the stove, IDCOL has developed three different models for ICS installation. A fixed ICS can be installed in three different ways based on users' choices; half underground, on the floor and on a raised platform. During installation, the technician will ask the users about their current cooking practices and

preferences and will install the stoves accordingly. Previously, most of the ICSs in Bangladesh were made of mud and it was difficult to use them during rainy seasons. None of the ICS selected under IDCOL ICS Program are made of mud and there would be no direct implication of rainy season on the performances of these stoves.

10. IDCOL has also taken initiative to encourage the participation of women in the ICS program. Of the 30 organizations included under the IDCOL ICS program as partner organizations; four organizations are led by women. It is well understood that, effectively reaching women is key to the success of the program and IDCOL is encouraging POs to use female for marketing and installation of ICS.

11. Continued follow-up of the gender-responsive activities will be ensured during implementation of the proposed additional financing.

Annex 10: Micro-grid and Pay-as-you-go Options

1. There is wave of excitement about micro-grids and their potential role in meeting rural electrification challenges. But micro-grids' context within the highly successful Bangladesh RERED programme needs to be more carefully understood, to ensure that micro-grids lives up their promise, and do not promise what can be best be delivered via SHS. This annex compares SHS and micro-grids. The micro-grid model currently being piloted in Bangladesh is a pay-as-you-go model, so this annex addresses the differences between that and the prevailing SHS financing model, as well. IDCOL financing will be open to all micro-grid models.

2. RERED IDCOL SHS programme is without doubt the most successful rural RE programme in world for a combination of reasons. There is a strong partner in IDCOL, providing overall packaging and financing, supervision etc. SHS are technically, economically and financially sound options for customers and for IDCOL's PO's doing the actual sales and implementation. Offerings range from 20Wp up to 130Wp, with 50Wp being current average, and include: 1 year maintenance, 5 year battery warrantee, down-payment of 10-15%, repayment over 3 years in total. A grant is available for smaller systems. The overall packaging overcomes the typical barriers encountered to SHS market expansion:

- **Affordability:** by reducing high upfront cost of SHS by allowing for a small down-payment and the balance spread over 3 years to make monthly saving comparable with previous kerosene expenditure,
- **Access:** expanded to rural areas via extensive network of PO's, providing optional maintenance contracts, component spares.
- **Quality Standards:** QA and long life equipment warrantees extending beyond repayment period.
- **Awareness:** marketing nationally of the cost and benefits widely disseminated and understood.
- **Financing:** overall programme, in the main stream using financial tools to buy down interest rates to IDCOL, PO's and to user using
- **Economies of Scale:** to reduce equipment costs significantly, reduce supply chain mark-ups, and reduce transaction costs and interest rates.
- **Strong framework for dissemination and delivery for other rural energy services.** Success breeds success in this model.

Ownership model for IDCOL SHS Program

3. Ownership of SHS provides a sound financial energy choice for customers that will be off-grid for 15+ years, assuming that SHS will continue to be utilised. However, consumers' needs change over 20 years, and even over 5 years: loads grow and more light-hours are needed; colour TV is now an expectation, not black and white TV; cell-phone charging is practically mandatory; cooling fans and even refrigeration become part of the household energy development. Technologies change too: CFL lights are displaced by more efficient and longer life LED. Efficient LED TV's displace old very inefficient Cathode Ray Tube (CRT) technology. Other changes will also filter through.

4. Under RERED various upgrade paths are available for existing SHS customers:
- For customers with large “old generation CFL based” systems (50Wp and greater), introducing further energy efficiency measures can free up energy for alternative uses. Switching to LED lamps and LED TV will enable longer TV hours and more light hours, or enable consumers to introduce efficient fans.
 - Procure 12V LED lamps from PO. Procure 12V DC LED TV and optionally source 12V DC fans from local suppliers. Typically these transactions would be cash, although PO/IDCOL may be able to refinance some components.
 - Procure the “3G Solaric” package or similar not yet on the market. Solaric technology upgrade uses 12V-110V DC-DC converter with inbuilt prepayment meter, 220V AC LED lamps, AC LED TV, and option of modified AC fans. The new prepayment energy meter provides some financing comfort in the first 6 months in that system shuts down if the customer does not make regular payments for the upgrades. These upgrades can be refinanced by PO/IDCOL.
 - For customers with smaller SHS systems (CFL or LED), or those with the new LED based systems less than 50Wp; or those seeking substantial load growth, some form of additional solar panel and battery capacity upgrades would generally be necessary.
 - Under the current framework this means purchasing additional SHS system or capacity. Customers would need to reinvest for another 3 years and keep the systems operational for 15 years. The risk is on the consumer. All of these upgrades require additional investment, and finance/loans, of which PO/IDCOL could access.
5. Another interesting expansion option is outlined below, as an alternative to the ownership model.

Pay-as-you-go or pay-to-use arrangement

6. As the name suggests, this non-ownership model offers more flexibility to consumers seeking a shorter term and less onerous financial commitment, for their expanding load demand. The desire for shorter term commitment may stem from: the fact that owning an additional SHS ownership still only provides for a fixed daily energy output, and further growth may be desired on an ad-hoc basis; or the perception of imminent arrival of cheaper subsidised grid or grid-compatible PDC supply. Or it may be affordability based - these are not exhaustive.

7. Pay-to-use options offer the user a similar type of service to the grid-connected urban population. In the rural context this may be either energy consumption based (metered) packages, or a tier-based (fixed monthly sum for a particular package). Consumers nominate a tier or maximum power demand, and pay for this on a monthly basis, or energy consumption basis. If they wish to increase power or energy consumption, they can upgrade the package or draw more energy. If they need to scale back, they do so at short notice without obligation or commitment. Technology packages may differ, but flexibility and low consumer obligation is the key. Further, there is no consumer ownership and maintenance responsibility, and this is passed onto the service provider who owns the supply assets.

8. Compared to the urban network connected population the energy cost is high without doubt. But the rural pay-as-you-use solution offers enhanced flexibility of service at similar cost to a long term SHS ownership. Certainly the pay-as-you-use cost is lower cost and lower risk to customer than short term SHS ownership. In fact, in this model the risk is mainly on the operator, and the consumer pays a slight premium in monthly cost to avoid the risk.

Implementation perspective and niche for pay-as-you-go packages

9. From an implementation perspective, pay-to-use packages sit between the existing service offerings of remote SHS and centralised mini-grid installations. A summary of the important characteristics are in the table below.

	SHS ownership	Pay-as-you-go usage (micro-grid and SHS)	Mini-grid
Energy costs	High energy tariff equivalent	Higher energy tariff (in general)	Moderate energy tariff
Load growth	Little prospect for significant load growth without considerable reinvestment	Flexibility from consumer perspective. Operator package manages this	Flexibility from consumer perspective. Operator package manages this
Risk burden	Risk 90% on consumer for 15 years	Risk 90% on operator for 6-7 years	Risk 90% on operator for 15 years
Risks	System failure and unaffordable to repair, inability to afford regular maintenance. Inability to expand. Shorter term horizons than 15 years escalate equivalent tariff significantly.	Grid encroachment in 5 years. Other risks can be operator managed within clear business model. But business model often is itself a risk.	Planning difficulties. Grid encroachment within 10 years will ruin business unless compensated. Low consumer uptake. Other risks operator managed.
Financing	Loan to user. 3 year micro –finance as per PO/IDCOL	Loan to operator: 3-5 year debt required. Risk profile challenges.	Loan to operator; long term debt required
Planning challenges	None - implemented on a per customer basis. Simple approvals process.	Identification of clusters of 20-50 households/shops required for uptake. Identification of local operator. Limited regulation desired, simple approvals process envisaged.	Identification of large clusters of 400-600 consumers required, including large anchor consumer ideally. Site identification challenging with respect to 15 year grid planning. EIA and approvals required.
Investment scale	Less than \$1,000 for 150Wp	\$10,000 - \$50,000 typically for 50-100 customers	\$500,000 for 500 customers

10. The risk niche for pay-as-you systems is interesting as they are similar to mini-grids in terms of customer flexibility, but are not huge investments and thus do not suffer the same investment risks as mini-grids which need 12-15 year terms without grid encroachment to be financially bankable plans. Typically the pay-as-you-go packages are structured to provide operator payback over 3-5 years, and can be moved and relocated should the situation on the ground change.

Some examples of pay-as-you-go technologies

11. Several companies offer both hard and soft technology solutions, and some examples are listed below.

- **Simpa Networks** - India based company offers pre-payment and customer and revenue management systems for SHS and smaller (50Wp to lanterns), using a mobile phone based payment system, and cloud. The end solution is outright ownership. - <http://simpanetworks.com/>
- **Azuri Technologies** – UK-based company offers “pay-as-you-grow” solar systems with soft and business support, using a scratch card and mobile phone based cloud. The lease agreement can optionally end in system ownership, but there is also an upgrade path inherent in the technology design. The ability to upgrade provides flexible growth opportunity, and users may progressively increase the quantity of electrical equipment in their household over time, adding important items such as a radio and TV. This “pay-as-you-grow” business model assists users to slowly build their way out of energy poverty, and transforms the proposition from a simple rent-to-own product purchase scheme, into a long term growth scheme. Yet users can opt to buy out the system at any time and are not committed to a long-term debt or continual upgrading beyond their means. <http://www.azuri-technologies.com>
- **Off-grid: Electric / M-Power** – USA innovation company with Tanzanian base in Arusha, offering complete improved lighting and efficient appliance leasing package using SHS pay-as-you-go systems, supported by sophisticated management and tracking software. The packages are tier-based rather than energy metered, and range from 5-50Wp, with modern Li-ion batteries. Users can migrate between different package tiers relatively easily. The model within Tanzania is region based, with national call center, with village based agents which has enabled high roll-out rates of 10,000 customers in 4 months, with a target of 70,000 in one year. <http://www.offgridelectric.com>
- **Devery micro-grid** – Dutch innovation company with Tanzania footprint. The offering comprises of a complete tiered-energy packages with efficient appliance packaging. The system comprises of a DC micro-grid system reaching about 200 customers, with DC prepayment energy metering. Electricity generation and storage (Li-ion batteries) is decentralized at about 10 or more strategic locations on the network, with total capacity of about 3kWp, while distribution is at 24V DC. Operators generate prepayment meter codes on site, and collect revenue. Wireless communication links the prepayment meters and decentralized generation controllers to optimize energy flows, and all are accessible for remote monitoring.
- **Solaric Nano-grid** – Bangladesh-based technology company pioneering a DC prepayment energy metering system on a DC micro-grid reaching about 50 customers. Electricity generation is centralized with capacity of about 3kWp and standard 100Ah tubular deep cycle batteries as used in in SHS program; while distribution is uniquely stepped-up to 220V DC. Distribution cost per connection is relatively low due to non-assumable standards being adopted, yielding a distribution model which is well optimized. Operators generate prepayment meter codes on site, and collect revenue on site. The intention is for existing SHS PO’s to deploy the nano-grids and develop clusters of a reproducible technology format, in a franchise model. Customers are responsible for their own efficient appliance procurement. - <http://www.solar-ic.com>

12. Micro-grids are a subset of the pay-as-you go rural technology options. Both pay-as-you-go options using stand-alone SHS and micro-grid are worthy of financing and consideration, if the solution is sufficiently flexible to the customer.

Micro-grid / Nano-grid definition

13. This definition is to distinguish “micro-grids” from SHS-based pay-as-you-go and from Mini-grids, when used in the development context. It is tempting, but there are no accepted size definitions with regards to size micro-grids. General size guidelines may apply, but there are other more important defining characteristics.

14. Micro-grids should comply with the following:

- Generation assets are shared between more than one consumer (i.e. output of generating plant supplies more than one consumer)
- Renewable energy or hybrid by design (less than 20% of annual average energy produced from fossil fuels)
- Typically less than 250 customers per micro-grid (but could be higher and could be expandable)
- Distribution network not necessarily built to the AC-grid network standard, and therefore network not necessarily assumable by utility on grid arrival. (However must still comply with safety standards)
- Distribution may be by AC or DC, and innovation encouraged (however must still comply with safety standards)
- Energy metering is not essential - sales of energy may be in tier-based packages with time-base access, or per metered kWh. (These must be less costly than current traditional fuels)
- Innovative, flexible and expandable packaging to cater for load growth and generation growth. Often modular in nature
- Payback periods must be shorter at 6-7 years (far less than traditional mini-grid)
- Regional and replicable approach presented which is scalable, to allow large numbers of customers to be reached by multiple micro-grids roll-out.

Challenges with micro-grid (and pay-as-you –go models)

15. While micro-grids may be new to Bangladesh, and relatively new globally there is a growing pool of experience documented, and challenges already identified may need to be mitigated. Some of the key threads are:

- Small developers unable to put own project equity into project to enable scale-up
- Financial institutions unable to process projects due to conservative nature, difficulty in reaching financial closure
- Extremely risky and untested business models. Few proven business models.
- Models will be different from large mini-grids because they require similar planning efforts but yield lower returns due to scale
- Technical risk in some designs – prefer proven technology
- Remote locations and difficulty in estimating actual costs

- Little regulatory or policy frame-work to encourage development of micro-grids
- Risk models and vicious and virtuous cycles must be identified which shut down/support schemes. Many lessons to learn. Don't be naïve.
- Roles clearly identified to ensure understanding of benefits, and management of risks
- Specifically, the consensus “best practice” with respect to design is that developers should not design the system based on “pure technological considerations, but instead adapt to the specific social and economic characteristics of the rural community” (Alliance for Rural Electrification, 2011, p. 51).

Micro-grid appraisal

16. Micro-grid approval process should be similar to the approval of financing for pay-as-you go SHS based technologies. The micro-grid is intended to be a light and flexible and scalable solution that does not require the rigorous appraisal process of the mini-grids on a site by site basis. No regulation of tariffs required, no regulatory approvals desired. Light-handed regulation approach to be followed. The following steps is a suggested checklist to follow in applying due diligence to approving projects; however, IDCOL will have flexibility to apply this list as appropriate.

1. Approval of PO as suitable organization to implement the micro-grids in a scalable manner
2. Approval of technical standards of the specific technology offering:
 - Sufficient pilot sites installed to show proof of technical concept, customer satisfaction, etc (a \$10,000 pilot project does not need finance to move ahead, so initial investment and onus on proposer/sponsor)
 - System meets basic technical standards – or if new technology, meet agreed standards including safety standards
3. Approval of the operation and scale-up plan, and financial viability
 - Business plan sound and credible
 - Functional business model described (i.e. franchise model with technology developer, project developer's, and operators; or other models)
 - Key role-players requirements identified, and potential role-players identified
 - Operational plan credible, as viability linked and strongly depend on operational costs
 - Risk model clearly mapped
 - Well priced tariffs / underpriced tariffs
 - High cost-recovery/theft of energy
 - Sufficient O&M / poor O&M
 - Customer proper use / over-use
 - Growth satisfied / unmet customer growth
 - Good contractor performance /poor performance
 - Effective local training / ineffective local training
 - Training and capacity building plan for expansion of roll-out
 - Clear financial analysis, costing, and tariff structure presented to show
 - Financial viability for each role-player in the business model, including equity contributions:

- Technology developer
- PO/project developer who might be financed from IDCOL (20%+ IRR)
- Operator viability and sufficient incentives for operator
 - Short pay back – for example 20%+ at 4 years before 5 year battery replacement.
 - Charges and tariffs financially and economically viable for customer
- Meets criteria for large scale roll-out via scalability and replicability, as documented in business plan and evidenced from initial pilots implemented.