

Document of  
**The World Bank**  
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Report No: PAD2413

INTERNATIONAL DEVELOPMENT ASSOCIATION

PROJECT APPRAISAL DOCUMENT

ON A PROPOSED CREDIT

IN THE AMOUNT OF SDR XX MILLION  
(US\$ 136 MILLION EQUIVALENT)

A PROPOSED SERIES OF IDA GUARANTEE

IN THE AMOUNT OF SDR XX MILLION  
(US\$ 80 MILLION EQUIVALENT)

A PROPOSED STRATEGIC CLIMATE FUND CREDIT

IN THE AMOUNT OF US\$ 26.38 MILLION

AND A PROPOSED STRATEGIC CLIMATE FUND GRANT

IN THE AMOUNT OF US\$ 2.87 MILLION

TO THE

PEOPLE'S REPUBLIC OF BANGLADESH

FOR A

BANGLADESH SCALING-UP RENEWABLE ENERGY PROJECT  
{RVP/CD CLEARANCE DATE}

Energy & Extractives Global Practice  
South Asia Region

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## CURRENCY EQUIVALENTS

(Exchange Rate Effective {Apr 10, 2017})

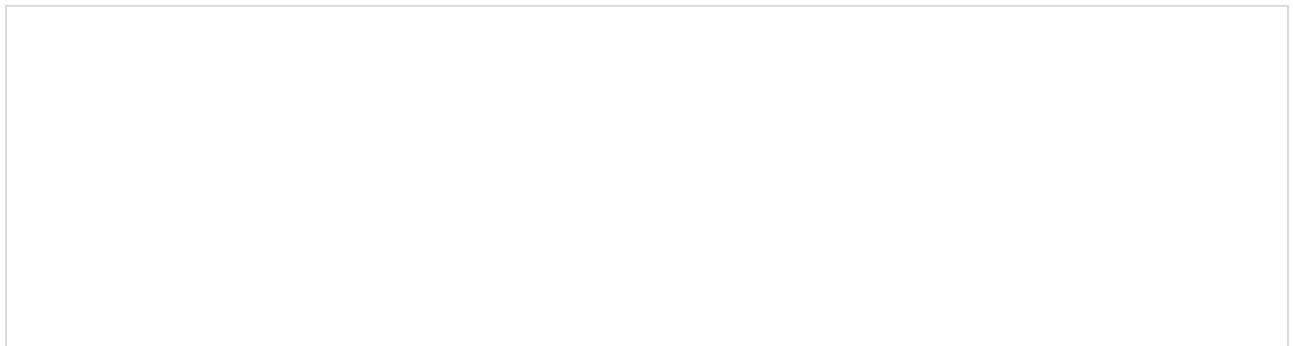
Currency Unit =

= US\$1

US\$ = SDR 1

## FISCAL YEAR

January 1 - December 31



## ABBREVIATIONS AND ACRONYMS

BEZA	Bangladesh Economic Zones Authority
BPDB	Bangladesh Power Development Board
DFI	Development Finance Institution
DSCR	Debt Service Coverage Ratio
EGCB	Electricity Generation Company of Bangladesh
EPC	Engineering, Procurement and Construction
ESMAP	Energy Sector Management Assistance Program
ESIA	Environment and Social Impact Assessment
ESPP	Environment and Social Policies and Procedure
GHG	Greenhouse Gas
GoB	Government of Bangladesh
HFO	Heavy Fuel Oil
HSD	High Speed Diesel
IDA	International Development Association
IDCOL	Infrastructure Development Company Limited
IPP	Independent Power Producer
LLCR	Loan Life Coverage Ratio
NREP	National Renewable Energy Policy 2008
O&M	Operation and Maintenance
PGCB	Power Grid Company of Bangladesh Limited
PPA	Power Purchase Agreement
PPP	Public Private Partnership
REFF	Renewable Energy Financing Facility
REREDII	Rural Electrification and Renewable Energy Development II
SE4ALL	Sustainable Energy for All
SHS	Solar Home System
SREDA	Sustainable and Renewable Energy Development Authority
SREP	Scaling-up Renewable Energy Program

**BASIC INFORMATION**

Is this a regionally tagged project?

No

Country(ies)

Financing Instrument

Investment Project Financing

☐ Situations of Urgent Need of Assistance or Capacity Constraints☒ Financial Intermediaries☐ Series of Projects

Approval Date

22-Mar-2018

Closing Date

Environmental Assessment Category

F - Financial Intermediary Assessment

Bank/IFC Collaboration

No

**Proposed Development Objective(s)**

The Project Development Objective is to increase installed generation capacity of renewable energy in Bangladesh.

**Components****Component Name****Cost (US\$, millions)**

Feni Utility-scale Solar PV

80.00

Renewable Energy Financing Facility (REFF)

162.38

Renewable Energy Resource Assessment and Technical Assistance

2.37

Waste-to-Energy Pilot

0.50

**Organizations**

Borrower :

People's Republic of Bangladesh



Implementing Agency : Infrastructure Development Company Limited (IDCOL)  
Sustainable and Renewable Energy Development Authority (SREDA)

#### PROJECT FINANCING DATA (IN USD MILLION)

<input type="checkbox"/> Counterpart Funding	<input type="checkbox"/> IBRD	<input checked="" type="checkbox"/> IDA Credit <input type="checkbox"/> Crisis Response Window <input type="checkbox"/> Regional Projects Window	<input type="checkbox"/> IDA Grant <input type="checkbox"/> Crisis Response Window <input type="checkbox"/> Regional Projects Window	<input checked="" type="checkbox"/> Trust Funds	<input checked="" type="checkbox"/> Parallel Financing
Total Project Cost: 351.25		Total Financing: 351.25 Of Which Bank Financing (IBRD/IDA): 136.00		Financing Gap: 0.00	

#### Financing (in US\$, millions)

Financing Source	Amount
Strategic Climate Fund Credit	26.38
Strategic Climate Fund Grant	2.87
International Development Association (IDA)	136.00
Foreign Private Commercial Sources (unidentified)	186.00
<b>Total</b>	<b>351.25</b>

#### Expected Disbursements (in US\$, millions)

Fiscal Year	2018	2019	2020	2021
Annual	20.00	30.00	30.00	20.00
Cumulative	20.00	50.00	80.00	100.00



## INSTITUTIONAL DATA

### Practice Area (Lead)

Energy & Extractives

### Contributing Practice Areas

Climate Change

### Climate Change and Disaster Screening

This operation has been screened for short and long-term climate change and disaster risks

### Gender Tag

Does the project plan to undertake any of the following?

a. Analysis to identify Project-relevant gaps between males and females, especially in light of country gaps identified through SCD and CPF

Yes

b. Specific action(s) to address the gender gaps identified in (a) and/or to improve women or men's empowerment

Yes

c. Include Indicators in results framework to monitor outcomes from actions identified in (b)

Yes

## SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)

Risk Category	Rating
1. Political and Governance	Moderate
2. Macroeconomic	Moderate
3. Sector Strategies and Policies	High
4. Technical Design of Project or Program	High
5. Institutional Capacity for Implementation and Sustainability	Substantial
6. Fiduciary	Moderate
7. Environment and Social	Moderate



8. Stakeholders	● Substantial
9. Other	
10. Overall	● Substantial

**COMPLIANCE****Policy**

Does the project depart from the CPF in content or in other significant respects?

☐ Yes ☒ No

Does the project require any waivers of Bank policies?

☐ Yes ☒ No

**Safeguard Policies Triggered by the Project****Yes****No**

Environmental Assessment OP/BP 4.01

✓

Natural Habitats OP/BP 4.04

✓

Forests OP/BP 4.36

✓

Pest Management OP 4.09

✓

Physical Cultural Resources OP/BP 4.11

✓

Indigenous Peoples OP/BP 4.10

✓

Involuntary Resettlement OP/BP 4.12

✓

Safety of Dams OP/BP 4.37

✓

Projects on International Waterways OP/BP 7.50

✓

Projects in Disputed Areas OP/BP 7.60

✓

**Legal Covenants****Conditions**

**PROJECT TEAM****Bank Staff**

Name	Role	Specialization	Unit
Zubair K.M. Sadeque	Team Leader(ADM Responsible)		GEE08
Joonkyung Seong	Team Leader		GEESO
Satheesh Kumar Sundararajan	Team Leader	Guarantee Team Leader	GEEFS
Ishtiak Siddique	Procurement Specialist(ADM Responsible)		GGO06
Mohammed Atikuzzaman	Financial Management Specialist		GGO24
Almudena Mateos Merino	Peer Reviewer		GEEES
Ashish Shrestha	Team Member		GEEDR
Blanca Ximena Talero	Counsel	Guarantee Lawyer	LEGSG
Iqbal Ahmed	Safeguards Specialist	Environment Safeguards	GEN06
Jorge Luis Alva-Luperdi	Counsel		LEGES
Md. Iqbal	Team Member		GEE06
Md. Tafazzal Hossain	Team Member		SACBD
Michael J. Goldberg	Peer Reviewer	OP10.0 Reviewer	GFMSO
Neeraj Gupta	Peer Reviewer		CASPS
Sabah Moyeen	Safeguards Specialist	Social Safeguards	GSU06
Satish Kumar Shivakumar	Team Member	Finance Officer	WFALA
Shaukat Javed	Team Member		GEE06
Silvia Martinez Romero	Team Member		GEEES
Teuta Kacaniku	Peer Reviewer		GEEFS

**Extended Team**

Name	Title	Organization	Location
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BANGLADESH  
BANGLADESH SCALING-UP RENEWABLE ENERGY PROJECT

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## I. STRATEGIC CONTEXT

### A. Country Context

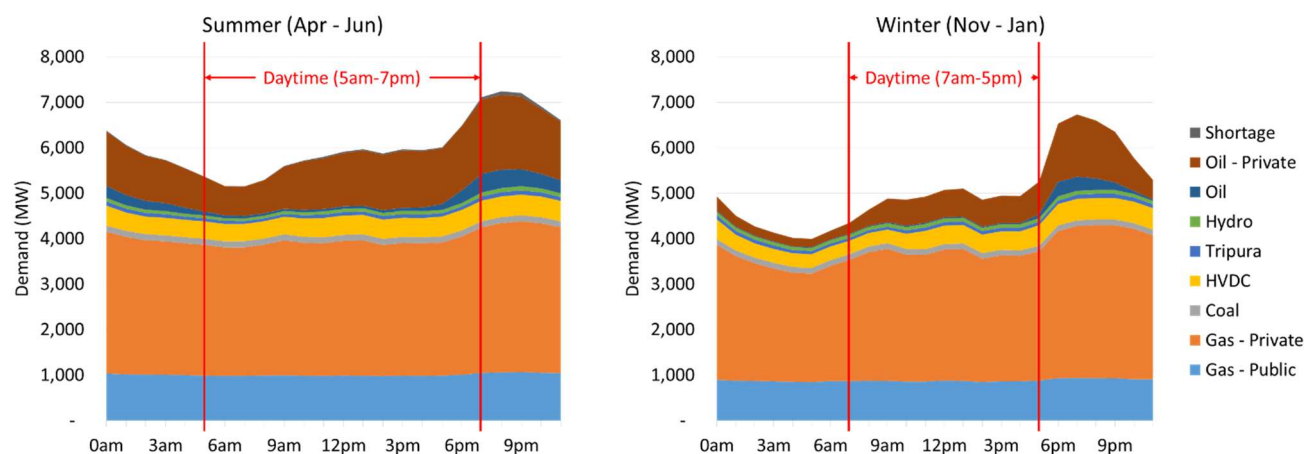
1. Bangladesh is a low-lying country located on the Ganges-Brahmaputra Delta – Asia’s largest and the world’s most densely populated delta. An estimated 160 million people live in a geographical area of 144,415 square kilometers, giving it *the* highest population density in the world among large countries, and twelfth highest overall. About 34.9 percent of the population is urban, with the remaining 65.1 percent living in rural areas. Seventy-five percent of the country is less than 10 meters above sea level and more than 700 rivers run through its borders, increasing the vulnerability to the risk of climate change and natural disasters.
2. With per capita income of US\$1,409 in 2016, it is well above the lower middle income country category threshold which it crossed in FY14. During recent years, economic conditions improved in the country with headline inflation declining to 5.9 percent in FY16 from 7.3 percent in FY14, while the fiscal deficit was contained at around 3.1 percent of Gross Domestic Product (GDP) in FY16. The FY17 budget targets 5 percent deficit with 28.7 percent growth in expenditures. The current account surplus rose to 1.7 percent of GDP in FY16. The GDP grew well above the average for developing countries in recent years, averaging 6.5 percent since 2010, with an officially reported growth of 7.1 percent in FY16, driven by manufacturing and services.
3. Progress on reducing extreme poverty and boosting shared prosperity through human development and employment generation has continued with the poverty incidence based on the international \$1.90 per capita per day poverty line (measured on the basis of the Purchasing Power Parity exchange rate) declining from 44.2 percent in 1991 to a 18.5 percent in 2010 (latest available poverty data) and a projected 14.9 percent in 2016. Bangladesh’s performance against the Millennium Development Goals (MDG) is impressive against the South Asia Region average for most of the indicators. Such progress notwithstanding, the country needs more effort in improving its growth rate to meet its goal of achieving the middle-income status by 2021. For accelerating private sector-led growth with improved investment climate, the key challenges are the need for increased infrastructure and power, with much improved quality in spending public resources, better regulations and enhanced skills of its vast and rapidly increasing labor force
4. The recent sustained growth has created higher demand for electricity, transport, and telecommunication services and has contributed to widening infrastructure deficits in Bangladesh as demand for infrastructure has risen faster than investments. Public investment in infrastructure is less than 2 percent of GDP in Bangladesh, compared to more than 7 percent of GDP in countries like China, Thailand, and Vietnam. Bangladesh is ranked 106th in the 2016-17 Global Competitiveness Index, out of 128 countries, and 110th on quality of electricity supply. In the Doing Business Indicator (2017), Bangladesh is ranked 176 out of 190 economies of the world and in the indicator of ‘Getting Electricity’, it is ranked the fourth lowest out of 190 economies. The infrastructure bottlenecks are becoming increasingly critical constraints for growth in Bangladesh.



## B. Sectoral and Institutional Context

5. The power sector in Bangladesh has grown rapidly over the last decade – maximum generation increased from a little over 3,000 MW in 2009 to more than 8,000 MW in 2016. However, supply still lags behind peak demand resulting in demand curtailment (load shedding) particularly in the rural areas during the peak summer months. While the peak demand occurs during the evening hours due to lighting load, there is a significant use (500-1,000MW) of expensive liquid fuel-run generation during daytime (Figure 1), which can be cost-effectively replaced by solar. Annual per capita energy consumption in Bangladesh is relatively low at 370 kWh, compared to 1,010 kWh for India, 2,600 kWh for China, and 13,246 kWh for the United States. With a little over 13 percent of transmission and distribution losses and accounts receivable of 2 months of sales equivalent, performance of Bangladesh’s power sector compares favorably with that of its larger South Asian neighbors.

Figure 1. Average Daily Load Curve for Summer and Winter 2016



6. Non-commercial energy sources, such as wood fuel, animal waste, and crop residues, are estimated to account for more than 40% of energy consumption in Bangladesh. About 67% of electricity generation is based on natural gas and the rest is from liquid fuel, coal and hydropower. The present share of renewable energy in grid supply is only 1.5% coming from the 230MW Kaptai Hydropower Project developed in the 1960s.

7. Bangladesh has been successful in increasing access to electricity. A decade ago, less than 50 percent of Bangladeshis had access to electricity; today, 78% have access, including about 14% from renewable energy, underlining the impressive progress made by the Government of Bangladesh (GoB) in providing power to all its citizens. Bangladesh has one of the most successful off-grid access programs in the world. Implemented by the Infrastructure Development Company Limited (IDCOL) in partnership with the non-government organizations, the solar home systems program has reached more than 4 million households and shops in remote rural areas of Bangladesh. Based on the implementation arrangements of the Solar Home System (SHS) program, IDCOL has now embarked on solar mini-grids for remote areas



including river islands and an ambitious program to replace diesel irrigation pumps with solar pumps. These off-grid programs have been supported by the World Bank and other development partners. It is expected that Bangladesh will achieve universal access to electricity much ahead of the Sustainable Energy for All (SE4ALL) target of universal access by 2030.

8. Considerable challenges, however, remain for ensuring that people connected to the grid get uninterrupted electricity supply. The primary challenge is that Bangladesh's reserves of natural gas, which accounts for about 67% of power generation, are estimated to deplete from 2020 if no new gas reserves are discovered or if technology does not allow a higher rate of extraction from existing gas fields. Declining indigenous resources and growing electricity demand have resulted in an increasing reliance on imported fuel oil for power generation. From 2009 to 2015, the share of oil-fired electricity increased from 5 to 20 percent. This increase in oil-fired electricity contributed to the fuel cost per kWh generated rising from BDT1.1/kWh to BDT3.42/kWh (US\$0.014/kWh to US\$0.04/kWh) over the same period. This leaves Bangladesh's energy sector vulnerable to political and economic instability in nations from which it imports fuel, as well as from rising prices generally.

9. Considering the depleting gas reserves, GoB is taking steps to incentivize international oil companies to undertake off-shore exploration of gas. Import of liquefied natural gas (LNG) is in process to ensure utilization of existing natural gas based power plants. Efforts are being made to increase the efficiency of the existing power plants with newer technologies (converting simple cycle operations to combined cycle) with one such project currently under implementation with Bank support. Import of electricity from India, a cheaper option than running liquid fuel-run plants, has started and more interconnections with India are being planned. GoB is also exploring the long-run option of tapping into the hydropower resources of Nepal and Bhutan that could provide much needed relief and a climate-friendly option for the energy shortage experienced throughout the region.

10. Bangladesh however lags behind in its efforts to tap into its own renewable energy potential for grid-tied electricity generation despite the tremendous success of its off-grid renewable energy program. Installed renewable energy generation capacity is currently 430MW, with the 230MW Kaptai Hydropower Project being the only grid-connected renewable energy resource. The remaining is mostly from off-grid solar homes in rural areas (175MW), some (15MW) from urban rooftop solar, and the rest from biogas and biomass based captive plants. Resource assessments indicate that Bangladesh could realize the installation of an additional 3,666 MW of renewable energy capacity (both grid-tied and off-grid) (Table 1). Taking into account the prevailing land scarcity in Bangladesh, this estimate excludes arable land needed for agriculture. The total potential for ground-mounted solar and wind and solar rooftop is about 2,600 MW.

Table 1. Renewable Energy (RE) Technical Potential of Bangladesh

Technology	Resource	Capacity (MW)	Annual Generation (GWh)
Solar Parks	Solar	1400 <sup>1</sup>	2,000
Solar Rooftop	Solar	635	860
Solar Home Systems	Solar	100	115
Solar Irrigation	Solar	545	735
Wind Farms	Wind	637 <sup>2</sup>	1250



Biomass	Rice husk	275	1800
Biogas	Animal waste	10	40
Waste to Energy	Municipal Waste	1 <sup>3</sup>	6
Small Hydropower Plants	Hydropower	60	200
Mini and Microgrids	Hybrid	3	4
<b>Total</b>		<b>3,666</b>	<b>7,010</b>

1 Excluding arable land

2 Excluding flood prone land

3 Technical potential unknown; 1MW is the capacity of proposed plant in Dhaka only

(Source: SREP Investment Plan of Bangladesh)

11. GoB has an ambitious plan for renewable energy development. As per the National Renewable Energy Policy 2008 (NREP), generation capacity of 2,000 MW is planned to be added by 2020 from renewable sources. GoB has also set renewable energy development targets for several technologies for each year from 2015 to 2021 (“RE Development Targets”). Furthering the ambitions of NREP, the RE Development Targets call for an additional 3,100 MW of renewable energy capacity to be installed by 2021. Most of the new capacity is planned from solar (1,676 MW, or 54 percent) and wind (1,370 MW, or 44 percent), and there are also targets for waste-to-energy (40 MW), biomass (7 MW), biogas (7 MW) and hydro (4 MW). Furthermore, the Power System Master Plan 2010 sets goals for fuel diversification with an emphasis on increasing the role of renewable energy in the power generation mix. To promote renewable energy and also energy efficiency, the Sustainable and Renewable Energy Development Agency (SREDA) was established in 2014.

12. Despite the government commitment, there has been no utility-scale solar PV projects delivered in Bangladesh. There are number of reasons for this, including:

- *Land constraint* is the major challenge for developing utility-scale solar in Bangladesh. Being the 12<sup>th</sup> most densely populated country in the world, land has alternative uses including for agriculture use and utility scale solar requires large amount of land (1 MW of solar will require 4-5 acres of land given the solar irradiance of Bangladesh). For ensuring food security, GOB has adopted a policy not to use agriculture land for other purposes, limiting the availability of land for utility-scale solar. The only land suitable for solar PV is government-owned land in river islands and low-lying areas with seasonal flooding that makes the land unsuitable for habitation or for other productive use.
- *Project Development Challenges* including insufficient data on resource availability, and lack of technical studies and inadequate preparation of bankable projects.
- *Financing Market Challenges* including lack of deep domestic financing market to provide long term financing to projects, lack of due diligence capacity and functioning syndication market. In addition, absence of effective credit enhancement and risk mitigation provides a significant challenge to lenders and investors entering into long term contracts.

13. A number of unsolicited proposals for grid-tied solar and wind were received by the Power Division over the past few years. Contracts were signed for about 300 MW of solar, and Letter of Intent issued for another about 530 MW of solar. In addition, more than 250 MW of wind projects have been submitted by private developers which are under review by the Power Division. Tariff offered ranged from



US\$ 13.9/kWh to US\$ 18.99/kWh for solar and US\$ 12/kWh for wind. However, none of these projects have progressed to financial closure or implementation due largely to non-availability of land. It is therefore important to find a way to make available the government-owned land to the private sector for installation, operation, and maintenance of solar PV plants.

14. Even if some of these projects managed to secure land from the market, financial closure will continue to be a challenge. The infrastructure financing market in Bangladesh is primarily supported by commercial banks, albeit mostly through balance sheet financing to corporates and/or trade financing. Project financing market is still nascent with tenors usually around 7 years. Key issues for commercial banks include lack of experience and knowledge of utility scale renewable energy projects, lack of technical capacity to conduct due diligence, implementation and monitoring, low risk appetite for long term lending, and very limited foreign currency capacity. Institutional investor base is very small and capital markets are not sufficiently developed to support infrastructure financing at this stage which leaves commercial banks to play an important role in financing renewable energy projects.

15. Bangladesh also has significant infrastructure needs in energy, transport, housing, water supply and urban infrastructure sectors. The PPP program of the Government envisages more than 40<sup>1</sup> projects in different sectors, most of which would need domestic financing<sup>2</sup> in the next few years. These projects, alongside other public investments financed through commercial banks, creates very high competition on availability of domestic financing. Lack of long-term domestic debt financing market and risk perceptions (of primarily foreign sponsors and investors) about the ability of the off-taker to meet payment obligations under power purchase agreements (PPAs) on a long term basis are identified as major barriers in mobilizing financing in grid-tied renewable energy projects. Appropriate risk mitigation instruments will be needed to de-risk projects such that long term commercial financing can be attracted to improve bankability and affordability of projects.

16. About 15 MW in solar rooftop PV systems have been installed in the main cities as a result of a government requirement for a certain percentage of lighting loads to come from solar for getting a new grid connection. However, most of these panels were installed to comply with the requirement to get a new grid connection and there were inadequate quality control and monitoring to ensure that quality panels were installed. As a result, most of this capacity produces little or no energy.

17. About 13,383 tons of solid waste are produced daily in Bangladesh, with more than 4,379 tons coming from Dhaka alone. Despite this vast municipal waste production, there is no waste-to-energy facility in operation in Dhaka, and the actual technical potential cannot be estimated without established procedures for delivering the waste to a power plant. A pilot is planned under the proposed Project that will establish the waste collection practices and demonstrate the viability of such plants.

18. To realize the renewable energy potential, GoB, in cooperation with the World Bank, the International Finance Corporation (IFC), and the Asian Development Bank (ADB), has developed an

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<sup>1</sup> <http://www.pppo.gov.bd/projects.php>

<sup>2</sup> In November 2016, 14 domestic financial institutions entered into an MoU with the PPP Authority to facilitate their participation in PPP projects.





Investment Plan to access concessional climate finance resources from the Scaling-up Renewable Energy Program (SREP) of the Climate Investment Funds (CIFs). The SREP Investment Plan for Bangladesh was approved by the SREP Sub-committee in November 2015 for a total of US\$75 million in funding. The Bank was assigned to implement US\$29.25 million of SREP funding (US\$2.87 million grant and US\$26.38 million non-grant) to support grid-connected renewable energy and waste-to-energy pilot<sup>3</sup>.

19. In addition to US\$29.25 million of SREP funding, US\$156 million of IDA funds is expected to be allocated for the Project, potentially providing US\$136 million of IDA credit and US\$80 million of IDA guarantee (leveraged using US\$20 million of the IDA country allocation) to de-risk projects and mobilize additional investments from the private sector.

20. The proposed Project aims at supporting a solar PV plant in the public sector on a government-owned land as a pilot to give the concerned utility the opportunity to develop capacity for operation and maintenance of utility scale renewable energy and also allow an opportunity for the grid operator to develop the capacity to integrate intermittent renewables into the grid. By supporting additional capacity through a private sector approach in parallel on the same government-owned land through a financing facility, the proposed Project is expected to help establish a mechanism that will address the land constraints issue by matching availability of public land with private sector expertise in installation, operation, and maintenance of utility scale renewable energy. The financing facility will be flexible to support other private sector projects on government-owned land or on private land subject to appropriate due diligence on the economy and efficiency of the projects, and competence and credit-worthiness checks of the project sponsors.

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

21. The proposed Project is consistent with the World Bank Group's Country Partnership Framework (CPF) for Bangladesh (FY2016–2020), which stresses the importance of boosting economic growth and competitiveness through, inter alia, increased power generation capacity and access to clean energy. The primary objective of the CPF is to increase engagement in the five *transformational priorities* identified by the Systematic Country Diagnostic, where concerted actions could have a profound impact on the pace of progress towards eliminating poverty and boosting shared prosperity. The activities in the CPF are structured around three focus areas consistent with the South Asia Regional Strategy – growth, social inclusion and climate and environmental management. Under the Growth and Competitiveness pillar (Focus Area 1), a transformational priority is given to narrowing the growing gap between demand and supply of power, through increased power generation capacity and access to clean energy. The Project is designed to directly contribute to this objective under the CPF.

22. The presence of IDA and CIF-SREP, through creation of a financing facility and provision of IDA guarantees, will provide the private investors and lenders the necessary confidence in the deliverability

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<sup>3</sup> IFC was assigned US\$15 million of SREP funding for supporting utility-scale solar and wind, and rooftop solar and ADB was assigned US\$29.95 million of SREP funding for supporting off-grid solar (mini-grids and solar irrigation).





of the Project. By building a track record, the Project will help unlock the private investment potential to support renewable energy development. Once initial phase is implemented under the proposed Project, Bangladesh can replicate the proposed structure with minimum modifications to scale-up renewable energy development.

## **II. PROJECT DEVELOPMENT OBJECTIVES**

### **A. PDO**

23. The Project Development Objective is to increase installed generation capacity of renewable energy in Bangladesh.

### **B. Project Beneficiaries**

24. The project's direct beneficiaries are (a) people in Bangladesh who will benefit in terms of better quality of supply due to the electricity generated from Solar PV (and potentially wind) as well as cleaner air; (b) people in selected municipalities who will benefit from improved waste collection and management as well as electricity generated from waste-to-energy pilots; (c) private sector developers of either utility-scale solar PV, rooftop solar PV, or wind, which will be supported through the Renewable Energy Financing Facility; and (d) industry in terms of reduced technological and integration risks.

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

25. The achievement of the Project Development Objective will be assessed using the following key outcome indicator:

- a. Generation capacity of energy constructed or rehabilitated (MW)

26. In addition, the following intermediate result indicators will be included. During project preparation, other intermediate result indicators related to citizen engagement, gender, etc. may be identified and added as necessary.

- a. Investments mobilized for renewable generation capacity (US\$)
- b. Net greenhouse gas emissions (tCO<sub>2</sub>/year)
- c. Renewable energy resource national atlas published
- d. Waste-to-energy pilot completed

## **III. PROJECT DESCRIPTION**

### **A. Project Components**



27. The proposed Project is aimed at supporting the development of grid-connected renewable energy, particularly solar PV and wind, and waste-to-energy through a combination of investment financing, risk mitigation, and technical assistance. It will specifically address the barriers to scaling up renewable energy by matching availability of public lands with the interest and expertise of the private sector in installation, operation and maintenance of utility scale renewable energy. It will also address the barriers by providing access to capital, de-risking investments, and conducting resource assessments. The proposed Project will support a public sector PV plant as a pilot to allow for development of public sector capacity in operation and maintenance of utility scale renewable energy and also allow an opportunity for the grid operator to develop the capacity to integrate intermittent renewables into the grid. The proposed Project will be comprised of four components as described below.

28. **Component 1: Feni Utility-Scale Solar PV (US\$80 million).** This component will support the first phase of the development of a renewable energy park with a capacity between 150-170 MW of solar PV and around 20MW of wind. This component will finance the common infrastructure (civil works, risk mitigating measures and fencing), for the entire site (1,000 acres) in Feni District, and the first phase of the solar PV generation plant, with a capacity of around 50 MW. This project would be the first-ever large scale grid-tied solar PV in Bangladesh, at a site owned by the state-owned generation utility, Electricity Generation Company of Bangladesh (EGCB). The generation facility will be developed as public investment through IDA credit. The EGCB will procure, through a competitive bidding procedure, an engineering, procurement and construction (EPC) and operation and maintenance (O&M) contract for the solar PV plant that covers O&M of the facility for the first five years after commissioning. Options are being considered for a performance based contract that will mimic the payment structure for the EPC and O&M contracts to that of a Build, Operate, and Transfer (BOT) model (for a shorter duration of the O&M contract period) to allow for a better risk sharing with the contractor. The construction of evacuation lines, between the Feni site and the national grid, will be done by the Power Grid Company of Bangladesh Limited (PGCB) as part of its transmission expansion, within the scope of Bank's upcoming lending operation on transmission expansion.

29. Once constructed, this will be a significant milestone in further scaling up solar PV in Bangladesh as it will demonstrate the viability of a solar PV plant on a difficult land (low-lying area with significant seasonal flooding risks)<sup>4</sup>. The pilot will test all other parameters for successional auctioning of further capacity in the private sector including the technical specifications, suitability of power purchase agreement and other legal agreements, effectiveness of tender procedure, how implementation realities are addressed, demonstrate its financial viability, verify legal and regulatory adequacy and demonstrate how other risks are handled.

30. Based on available irradiation data from the satellite, the site is one of the more promising available sites for solar resource potential in Bangladesh. Ground-based solar and wind resource assessment at the site will commence in June 2017, under a separate Bank-executed activity supported by the Asia Sustainable and Alternative Energy Program (ASTAE) and the Energy Sector Management

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<sup>4</sup> Given the high population density and the government policy of not to use agriculture land for any other purpose, only low-lying lands with seasonal flooding risks that are un-inhabitable otherwise can be considered for solar PV.



Assistance Program (ESMAP). The ground measurement campaign, that is expected to commence in June 2017, will help specify the technical specifications of the solar panels for optimal generation. The results of wind resource assessment will inform the viability of wind generation at the site.

31. A separate feasibility study has been launched by the client for the Feni site to inform technical, economic and financial feasibility and environmental and social safeguard issues of the solar PV plant. The feasibility study is expected to be completed by June 2017. As the site is prone to seasonal inundation during the monsoons, the flooding risks are being analyzed and mitigation measures being considered. The typical and highest water levels on wet season in the site are being confirmed. The closest meteorological data shows that the highest flooding ever recorded was above five meters above the site level (16.33m above the sea level). The project design will include protection against the risk. The preliminary draft of the feasibility analysis shows that a combination of a dike, elevation structures for the PV panels and water pumping for drainage inside the dike may be required to mitigate the risk of flooding. The dimensioning of these systems and the cost of the different alternatives are being refined by analyzing complete hydrologic data as part of the feasibility study.

32. **Component 2: Renewable Energy Financing Facility (REFF) (US\$162.38 million).** The Project will support the establishment of a dedicated Renewable Energy Financing Facility (REFF) hosted at a Financial Intermediary (IDCOL). The Facility will primarily have a Lending Window with IDA and SREP resources of US\$82.38 million, including US\$56 million of IDA credit and US\$26.38 million of SREP loan<sup>5</sup>. The Facility will offer necessary financing products, including long-term loan and other suitable products to support a series of sub-projects on renewable energy and associated technical assistance. While the primary focus of technology will be utility-scale solar PV and wind as well as rooftop solar PV, with a target of supporting 200 MW of installed capacity, other renewable energy technologies such as waste-to-energy will also be supported, if and when feasible. The Facility will have flexibility to support transactions on a first come first serve basis, between utility-scale solar PV/wind and rooftop solar PV. In addition, the Facility may also have a Guarantee Window. Considering the capacity limitations of IDCOL in offering credit enhancement products at this stage, it is proposed that the Bank provides a series of IDA guarantees to sub-projects, amount to a maximum of US\$80 million, to support an initial set of projects to build track record. Once IDCOL's capacity is sufficiently enhanced through learning from IDA guarantees to sub-projects, IDCOL can develop new REFF guarantee products to be offered through REFF Guarantee Window. Until such time, it is proposed that IDCOL will continue to build their capacity through learning from the proposed series of IDA guarantees for the sub-projects. While IDCOL will undertake full due diligence of sub-projects for the REFF Lending product<sup>6</sup>, they may undertake early stage screening or sub-projects and propose the need of guarantees to the task team. Depending on market feedback, the IDA funding allocation between Lending and Guarantee amounts will be finalized. The Facility will address the barrier of limited commercial financing by offering additional financing along with IDA guarantee products to mitigate key risks and attract domestic and international private developers and commercial financiers.

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<sup>5</sup> SREP funds earmarked for the facility can be deployed as either loan or risk guarantee.

<sup>6</sup> In conjunction with the provisions of Operations Manual, to be developed.



33. **Utility-scale solar PV and wind.** According to the SREP Investment Plan, Bangladesh has the potential for about 2,600 MW of ground mounted solar PV, wind and solar rooftop. Given the limited amount of public finance, even after taking into account all development financing options available for Bangladesh, developing renewable energy projects solely through public investment is insufficient to unlock such potential. Recent studies indicate that a number of countries have benefitted from the use independent power producer (IPP) or solar park models that brought long term competitive tariffs and private sector expertise to develop, finance and implement renewable energy projects. For instance, the solar park model, through which public sector provides land, shared infrastructure and evacuation; and private sector finances, builds and operates generation facility, would allow a more effective use of scarce public resource on scaling up grid-connected solar PV in Bangladesh. In this case, public sector part can be supported directly through the Government of Bangladesh using IDA credit. In parallel, alternative options to develop utility-scale solar PV, such as floating solar PV, use of canals or idle land at other facilities (e.g. airport, railways, etc.) will be further explored during project preparation. Wind sub-projects will be considered where resource potential turns out to be feasible, through wind resource assessment to be supported by the proposed Project (Component 3). The Facility will be flexible in supporting sub-projects developed on either public land or private land. The majority of potential pipeline however is expected to be on government-owned land given the significant land scarcity in Bangladesh and the challenges in procuring land due to fragmented ownership of private land. The team will work closely with GoB appointed Transaction Advisor for structuring the competitive auction for solar PV generation on the government-owned lands.

34. The Facility will provide limited amount of REFF financing and IDA risk mitigation guarantee support to grid-connected utility-scale solar PV and wind sub-projects for an initial target of 170 MW at different locations<sup>7</sup>, through site-wise competitive auction mechanism and potentially some unsolicited projects. To support unsolicited projects, the decision to provide REFF financing and/or IDA guarantees will be subject to detailed due diligence including confirmation of land availability, justification and/or potential renegotiation of price and review of contractual terms and conditions. The scope of GoB appointed Transaction Advisor may be extended to include review and renegotiation support on unsolicited projects.

35. Through the competitive auction process, the Facility will provide standard financing products and IDA risk mitigation products to potential bidders. It is expected that the projects will be financed through a combination of commercial banks, development finance institutions<sup>8</sup> (DFIs) and financing through the REFF. Under this arrangement, a standard set of financing options and WB approved Term Sheet for IDA risk mitigation guarantees<sup>9</sup> will be offered through the auction process by IDCOL to private participants, who will be selected through the auction process. On exceptional circumstances<sup>10</sup>, a selected bidder may approach for REFF financing and IDA guarantees ex-post the auction, duly providing the justification for

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<sup>7</sup> Pre-identified sites include [Feni, Rangunia, BEZA] with more than 300 MW technical capacity.

<sup>8</sup> IFC may participate in DFI financing both on its own and using IFC managed SREP funds to finance winning bidders.

<sup>9</sup> Considering inexperience and capacity limitations of IDCOL, IDA Guarantees to sub-projects may be offered directly by IDA through a guarantee series for initial set of projects.

<sup>10</sup> TBD – includes situations where project finance lending is limited or unavailable in the local financial markets



such products. The bidders can choose a combination of financing products (loans, IDA risk mitigation guarantees, etc.) for each sub-project as part of their bidding proposals.<sup>11</sup> To optimize the use of IDA and SREP resources and to create sustainable financing models, the auction process may include limitations for the use of REFF loans.

36. IDA Payment guarantees and IDA Loan guarantees are contemplated to be offered. The maximum amount of IDA guarantees is US\$ 80 million for a target capacity of 170 MW. The sub-projects can benefit from payment guarantees to mitigate default on ongoing payments and termination payments by the off-taker, and/or loan guarantees to mitigate default on debt service repayment from developers to commercial financiers. By leveraging private capital through enhanced use of IDA guarantee instrument, the Facility can maximize the use of limited concessionary resources and public capital that could potentially create a track record for financing of future projects without IDA and SREP resources. The Facility can later receive additional contribution from other development partners for supporting renewable energy development beyond those targeted under the Project.

37. **Rooftop solar PV.** Rooftop solar PV is critical to scale up renewable energy in a highly land-constrained country like Bangladesh. Development of grid-connected rooftop solar PV under the proposed Project will be focused initially on industrial rooftops, targeting 30 MW of installation capacity in aggregate. There are about 7,000 garment factories in Bangladesh (2015), many of which are larger buildings with extended rooftop and well-suited for rooftop solar. Industrial rooftops are economically more feasible due to relatively higher tariff than residential and commercial consumers. Government and institutional rooftops, such as public universities, will be also candidates as some of them are advanced in preparation. To incentivize the development of rooftop solar PV, the cost and tenor of financing will need to be set in a manner that will make the levelized cost of solar rooftop to slightly lower than the retail price of electricity, which is as high as BDT 9.24/kWh (US\$ 11.8/kWh) at peak for industrial consumers. The Facility will be flexible to support solar rooftop that supplies to the grid once the government adopts the appropriate policy for grid-connected solar rooftop. To minimize transactions costs, the option of aggregators will be explored who would lease rooftop areas from building owners and operate rooftop solar PV on aggregated sites. Depending on the need, IDA guarantees may be offered to mitigate any public sector obligations, such as regulatory risk associated with feed-in tariff or payment default on public sector offtake contracts. The need for IDA guarantees will be further explored during the preparation stage.

38. **Component 3: Renewable Energy Resource Assessment and Technical Assistance (US\$2.36 million).** This component will support resource assessment to facilitate further scale up of solar and wind power development in Bangladesh. In coordination with other agencies and funding sources, this component will cover data collection, validation, finalization, and publication of resource atlas at the national level which will inform policy makers and potential solar and wind developers. The component

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<sup>11</sup> Recently, Argentina and Zambia applied similar arrangements in the auction process, where financing products are offered at-cost to the bidders for selection as part of their bidding proposals.



will also include support for formulation of an enabling policy and regulatory framework for rooftop solar PV. US\$2.36 million of SREP grant is proposed to be allocated to this activity implemented by SREDA.

39. The resource assessment support under this component will include installation of dedicated solar measuring stations in different climate zones to collect sufficient data to generate a high-accuracy atlas at the national level complemented by the ground measurement at Feni site. The United States Agency for International Development (USAID) supported wind masts at nine locations throughout the country have been collecting wind data. This initiative will complete in late 2017. Depending on the needs, additional wind measurement can be supported to cover the national wind atlas. Bank-executed ASTAE-ESMAP support will be complementing the validation and finalization exercise for the national level solar and wind atlas. The outputs will be freely and widely accessible following open data principles.

40. Furthermore, technical assistance and capacity building will be provided to relevant government agencies by this component to maximize the benefit of the measuring equipment procured and the finalized resource assessment. Activities will include maintaining and further updating resource assessment data; and integrating geospatial information and tools into national planning of renewable energy development. This component is also expected to support an assessment of rooftop potential using satellite imagery technologies.

41. **Component 4: Waste-to-Energy Pilot (US\$0.5 million).** This component will support feasibility assessment and deployment of small scale pilots of municipal waste-to-energy sub-projects. US\$0.5 million of SREP grant will be used to finance the pilot in collaboration with city corporations that manage municipal waste collection. One of the potential candidate is the Rajshahi City Corporation for an installation of a biogas plant to utilize slaughterhouse waste. The City Corporation will provide the land required and GIZ will provide technical support for the small-scale pilot. The pilot is expected to inform technical and commercial feasibility of waste-to-energy sub-projects and to help establish waste collection practices and government schemes to support waste-to-energy in municipalities. This component is expected to be implemented by SREDA.

## B. Project Cost and Financing

42. The estimated Project costs to be covered by the proposed financing structure to achieve a target capacity of 250 MW (50 MW under component 1, 170 MW from ground-mounted solar and wind under component 2, 30 MW from solar rooftop under component 2), is shown below.

Project Components	Project cost	IDA Credit	IDA Guarantee	SREP Trust Fund	Counterpart Funding
1. Feni Utility-Scale Solar PV	80.00	80.00			
2. Renewable Energy Financing Facility (REFF)	348.38	56.00	80.00	26.38	186.00
3. RE Resource Assessment and	2.37			2.37	



Technical Assistance				
4. Waste-to-Energy Pilot	0.50			0.50
<b>Total Costs</b>				
Total Project Costs	431.25	136.00	80.00	29.25
Front End Fees				
<b>Total Financing Required</b>	<b>431.25</b>	<b>136.00</b>	<b>80.00</b>	<b>29.25</b>

43. Furthermore, the pipeline of potential private sector projects currently indicated by the Government exceeds 600 MW, including potential development on available public lands from BPDB (Rangunia) and BEZA, and a confirmed set of unsolicited projects with signed PPA status. For REFF/IDA to support such projects, the total financing needs could be approximately US\$165 million (in addition to the US\$80 million Feni EPC costs). In addition, the amount of IDA guarantees could also be much higher.

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

44. In the past feed-in-tariff mechanisms were the most popular power purchase mechanism for procuring renewable energy electricity. However, for technologies such as solar PV where costs are rapidly declining, the feed-in-tariff adjustment lagged price reduction and provided investors an opportunity to reap windfall profits. Furthermore, as the scale of projects became larger, transactions costs as a share of total project costs declined. In recent years, competitive auctions are resulting in lower cost of electricity especially from large scale solar and wind. A World Bank review of recent large scale grid-tied solar projects, found that auctions consistently resulted in lower cost of electricity.<sup>12</sup> The project will support the development of a government-owned land and invite private sector participation through a competitive auction.

45. Important lessons can be derived from auctions for utility-scale solar projects conducted in several countries, which will be incorporated in the auctioning process supported under the proposed Project. Among them are:

- a. Undertake credible feasibility studies to verify the optimum capacity of the solar PV project and what may be expected in terms of cost of power. Too frequently a superficial study is done on the expectation that the bidders will do their own due diligence. However, this can

<sup>12</sup> Zuzana Dobrotkova, Price of Solar PV Electricity in Developing Countries, Global Solutions Group: Clean Energy, The World Bank, November 7, 2016. More recent auctions have resulted in even lower cost electricity. For example: 750 MW Rewa Solar Park in the state of Madhya Pradesh, India at INR 3.30/kWh (US cents 5.1/kWh); Karapinar 1 GW solar PV project in Turkey at a price of US cents 6.99/kWh. (price is half of the existing FIT); and most recently (May 2017), the solar power auction at Bhadla Solar Park 3 in Rajasthan, India sets new record with electricity tariff of INR 2.44/unit (US cents 3.81), at the Solar Energy Corporation of India, 500 MW solar park at Bhadla..





- lead to false expectations. Projects must be well-designed with credible estimates of engineering costs and performance based on multi-year solar resource data. The assessment must also include a realistic assessment of risks, financing options, and influences of legal, financial and regulatory requirements. Raising expectations based on experiences in other countries may lead to disappointment, especially in the early procurements. A detailed and thorough feasibility study is being conducted for the Feni site.
- b. Inadequate transmission grid capacity may constrain the development of good projects. As necessary, provide confirmation through load flow and grid stability studies that power can be evacuated reliably. In cases where grid capacity must be improved, provide clear guidance on what will be done, who will be responsible, and when it will be completed. It may be preferable for the utility to be responsible for the power evacuation infrastructure. To extent possible and to reduce risks, the government could build the infrastructure for the project, including land acquisition and preparation, and building access roads. For the Feni site, transmission evacuation infrastructure will be supported under a separate Bank-financed project currently under preparation.
  - c. Not to be over ambitious in the early stages of large scale project development in a country. A phased approach is preferred, one that permits learning from earlier phases. Nevertheless, a minimum size of a project may be necessary to attract credible bidders and offset transactions costs. IFC Scaling Solar recommends 30-50 MW. Taking this into account, the plan for the EPC pilot of 50MW at Feni is proposed to be included in the Project.
  - d. Minimize transaction costs by using tested standardized/model documents for power purchase agreements, guarantees (if any), tender documents, etc. If access to concessional financing is to be made available, confirm its availability prior to call for tenders and provide clear guidance on the terms of such financing.
  - e. A balance needs to be struck between requirements for local content and obtaining the best technology at lowest cost. Requirements for excessive local content provisions may increase the project risks and raise costs. It may prevent benefitting from the best technologies, and significant economies of scale of key components such as inverters and solar modules.
  - f. Avoid the risk of speculative low-bids to capture a concession with an expectation of renegotiating later. Set high entry bars in terms of technical, financial and legal requirements and require substantial bid bonds.
  - g. Procurement process must be well designed and high standards must be observed in bidding process. Once PPA is signed, financial close is reached, continued supervision by the utility of government may be necessary during the construction phase up to and including commissioning.
46. Considering the project financing landscape of Bangladesh and lessons learned from IPFF operations<sup>13</sup>, a targeted financing facility through a financial intermediary would be more appropriate to

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<sup>13</sup> World Bank/IDA funded operations - Bangladesh Investment Promotion and Financing Facility Project I & II





address the financing challenges. The proposed REFF, to be hosted and managed by IDCOL, will be designed as a targeted financing facility only to finance renewable energy projects.

## **IV. IMPLEMENTATION**

### **A. Institutional and Implementation Arrangements**

47. SREDA is responsible for the coordination of Bangladesh's SREP Program. As the institution established by the GoB to promote renewable energy (and energy efficiency) in Bangladesh, SREDA has the functional authority needed to coordinate the activities and ensure compliance with monitoring and evaluation requirements of development partners. SREDA will be the implementing agency for the resource assessment and waste-to-energy components of the Project.

48. SREDA is a government agency with a mandate to promote renewable energy and energy efficiency. Established in 2014 under the Power Division of the Ministry of Power, Energy and Mineral Resources, it is best positioned to coordinate between ministries and departments and facilitate enabling environment for renewable energy, such as laws, policies and regulations. SREDA has recently strengthened its capacity with an increased number of staff. Institutional assessment including fiduciary and safeguards capacity assessment will be undertaken during project preparation to identify specific capacity gaps to implement solar and wind resource assessment and waste-to-energy pilot components. The Project will include technical assistance and capacity building support for meeting the capacity gaps.

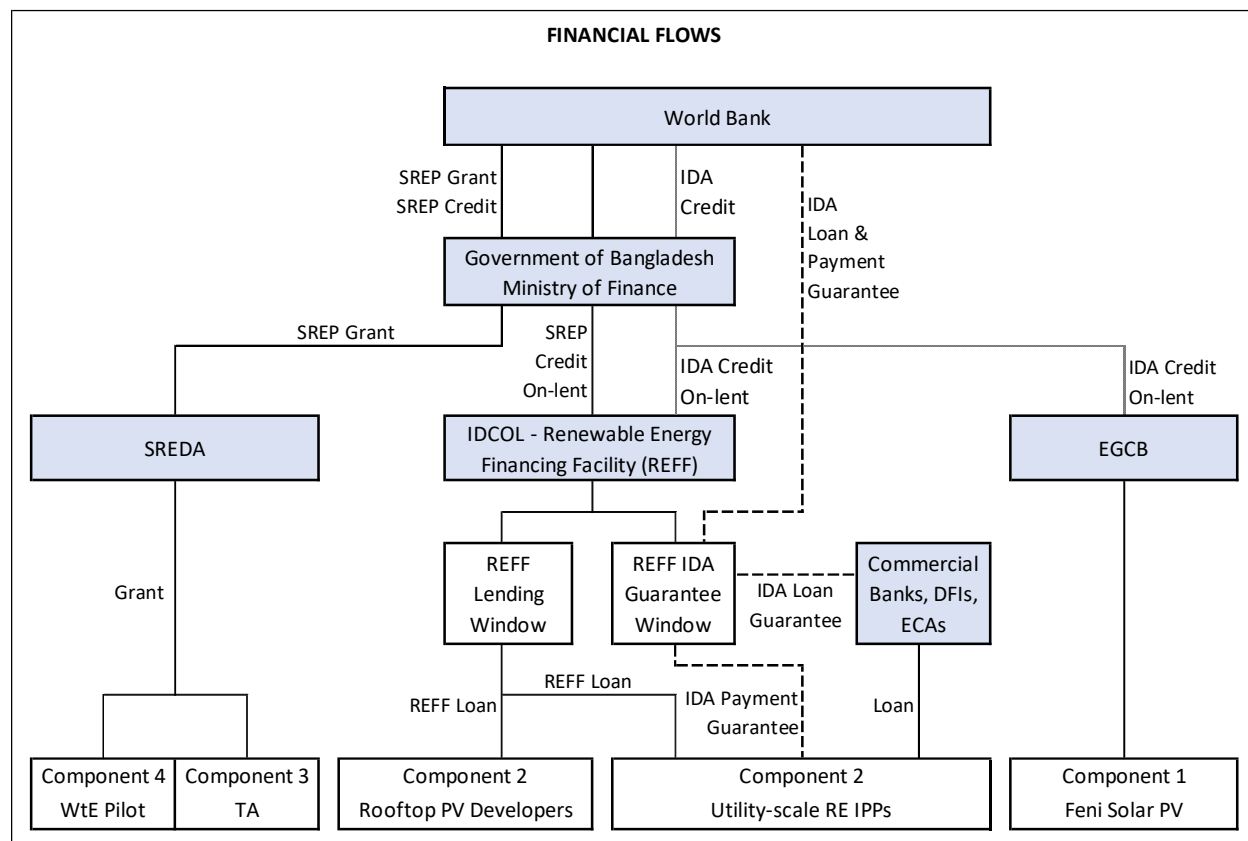
49. The EGCB will be the implementing agency of Component 1. To develop the Feni site for a renewable energy park, the EGCB will develop common infrastructure for the entire land, including civil works, risk mitigating measures and fencing, and implement the phase 1 of solar PV development, which will be 50 MW solar PV generation facility through the EPC and O&M contract. Developing common infrastructure upfront and demonstrating 50 MW scale at the site will help attract private sector developers to bid for the solar park by mitigating uncertainties and risks and reducing upfront cost burden. The Ministry of Finance will be the borrower of IDA credit that will be on-lent to the EGCB to finance the development as public investment.

50. The Renewable Energy Financing Facility (REFF) is proposed to be hosted and operated by IDCOL, a state-owned financial institution that has demonstrated a strong track record in managing a similar financing facility for the off-grid renewable energy program pooling resources from the World Bank and other development partners. IDCOL would act as the Financial Intermediary of IDA credits through Lending window following World Bank processes and procedures. For the initial set of projects, IDA guarantees would be directly offered to private sector. IDCOL will be responsible for day-to-day management of the Facility following Bank's safeguards policies and fiduciary guidelines and procedures. For the IDA guarantees, IDCOL will provide early screening of projects and propose the need for guarantees, which will be used as a basis for the WB task team to undertake further due diligence. It will also be responsible for monitoring of the Component 2 activities and results, and submission of quarterly/semi-annual reports to SREDA.



51. The overall structure of implementation arrangement and fund flow is illustrated as below.

Figure 2. Overall Structure of Implementation Arrangement and Fund Flow



52. The proposed on-lending, through financial intermediary, and guarantee structure illustrated in figure above is structured based on experience from recent IPFF operations in Bangladesh and Bank guarantee series structures used in Nigeria, Kenya and Maldives. Further details of the guarantee structures are explained in Annex 2.

53. The Ministry of Finance will be the borrower of IDA and SREP funding that will be on-lent to IDCOL. The on-lent proceeds along with resources from IDCOL and other sources will provide capital base for the Lending Window. A proportion of SREP non-grant funding may be allocated as SREP guarantees along with IDA guarantees, subject to further market assessment. Together, the REFF financing and IDA guarantees will be able to mobilize an additional capital of around US\$186 million.

Table 2. Indicative Financing Plan under the REFF

(Figures in US\$ millions)

	Utility-scale RE	Rooftop solar PV
<b>Target capacity (indicative)</b>	<b>170 MW</b>	<b>30 MW</b>
a. Estimated Project Cost	238	30



(\$1.4/W for utility-scale RE, including land development; \$1/W for rooftop)		
b. Estimated Private Equity (30%; 25%)	72	8
c. Estimated Debt	166	22
d. Of which commercial borrowing with IDA Guarantees	72	-
e. Of which Development Finance Institutions	34	-
f. Of which REFF financing (IDA and SREP)	60	22
g. Estimated Private Capital Raised (b+d) <sup>14</sup>	144	8
<b>h. Estimated Total Capital Raised (b+d+e)</b>	<b>178</b>	<b>8</b>

54. IDCOL has demonstrated a strong track record in managing a large volume of donor funding and implementing renewable energy programs. IDCOL has been managing the successful Rural Electrification and Renewable Energy Development II (REREDII) project of the World Bank, which includes the flagship solar home system (SHS) program introduced under the predecessor RERED project in 2003. IDCOL has been replicating the public-private partnership arrangement of the SHS program for renewable energy based mini-grids, solar irrigation pumps, improved cook stoves as well as biogas digesters for cooking. IDCOL has also gained experience in financing large scale IPPs and other infrastructure projects in the private sector through a Bank-financed Private Sector Infrastructure Development Project (PSIDP) in 1998 and more recently through a similar ADB-financed project. Hosting and operating the REFF, as a Financial Intermediary, may require additional capacity particularly for issuing offtake payment risk and/or loan guarantees. Necessary capacity building support will be provisioned for in the Project.

## B. Results Monitoring and Evaluation

55. EGCB, IDCOL and SREDA will provide the World Bank with quarterly progress reports and interim unaudited financial reports (IUFRs), annual information on progress of the key performance indicators for their respective project components, audited financial statements, and such other information as the World Bank may reasonably require. Monitoring and evaluation (M&E) will be linked to the project targets (key performance as well as intermediate indicators). EGCB, IDCOL and SREDA will carry out a midterm review and report its findings and conclusions to the World Bank three years after effectiveness and will review these with the World Bank. Section VII sets out the project's key performance as well as intermediate results indicators.

## C. Sustainability

56. The principal sustainability goals of this Project is to make grid-tied renewable energy a major contributor to power supply in Bangladesh and to do so by leveraging private sector capacities and resources. Specific sustainability goals are as follows:

<sup>14</sup> Taking into account the private equity and commercial borrowing only.



- a. Improve the policy and regulatory environment for grid-tied renewable energy to increase confidence of the private sector in investing in grid-tied renewable energy projects.
  - b. The Bangladesh renewable energy sector becomes a leading contributor to power generator in Bangladesh to eventually contribute about 2,600 MW of renewable energy capacity envisaged in the SREP Investment Plan.
  - c. Commercial banking sector will, with greater confidence and on competitive terms, lend to grid-tied renewable energy projects with their own resources and with decreasing reliance on credit risk guarantees.
57. That EGBC and PGCB improve their planning, integration and management of distributed and intermittent renewable energy to accept greater amounts of renewable energy generation.

## V. KEY RISKS

### A. Overall Risk Rating and Explanation of Key Risks

58. The various risks related to the proposed Project were preliminarily assessed through the Systematic Operations Risk-Rating Tool (SORT). The overall project risk is assessed to be **Substantial**. A number of risks were identified with 'high' rating, including: (i) Sector Strategy and Policies; and (ii) Technical design of project. Institutional Capacity for Implementation and Sustainability and Stakeholder risks were assessed as Substantial. Key risks and pertinent mitigation actions to achieving results are described below.

59. **Sector Strategy and Policies risk** is high. The enabling policy and regulatory framework needs to be further strengthened to implement the proposed Project. In particular, increasing generation from grid-connected rooftop solar PV would require specific policies and regulations, such as feed-in tariff, grid connectivity, financing scheme for developers, allowing distribution companies to purchase electricity from rooftop solar PV operators, and allowing aggregator business models, among others. These policies and regulations are not yet in place. Technical assistance will be provided for relevant stakeholders, benchmarking experience in other countries, to mitigate the risk and expedite the adoption of required policies and regulations.

60. **Technical design risk** is assessed as high because the concept of a utility-scale solar/wind and rooftop solar PV with participation of the private sector is new in Bangladesh. EGCB (for the first sub-project at Feni) prefers a pure public finance approach of Engineering, Procurement, and Construction (EPC) compared to immediately embarking on a solar park concept with private sector independent power producers (IPPs). It will give EGCB the opportunity to gain experience in operation and maintenance of utility-scale solar, PGCB to gain experience in managing the intermittent solar/wind generation, and for future investors to observe performance. Subsequently, the full potential at this site (estimated to be 150-170 MW of solar), can be constructed with private sector participation.

61. To properly structure the rooftop solar PV program with appropriate risk allocation for the private sector aggregators, SREDA may avail professional transaction advisory support can be made available



through the sector technical assistance component of the on-going Rural Electrification and Renewable Energy Development II (REREDII) project.

62. **Institutional Capacity for Implementation and Sustainability risk** is substantial. For the operation of the REFF, although IDCOL has been implementing various renewable energy programs and large-scale infrastructure projects, the proposed Project will involve new instrument like risk guarantees. Also, SREDA is just building up capacity with scope for further strengthening its capacity in the renewable energy space including rooftop solar. For some of the other stakeholders involved (for example, EGCB for the Feni sub-project), renewable energy is a new technology with very different risk and return characteristics particularly when seen in the context of partnering with the private sector. Operation Manuals will be prepared to guide IDCOL, SREDA and other stakeholders (EGCB), and necessary capacity building support will be provisioned for in the Project. In addition, for risk guarantees, IDCOL will also be supported through hands-on training for the first few projects.

63. **Stakeholder risk** is assessed as substantial given the number of stakeholders who would have to agree to collaborate effectively for allowing private sector participation in ground-mounted solar/wind and solar rooftop sub-projects. The stakeholders include, among others, Finance Division and Economic Relations Division of the Ministry of Finance, Power Division of Ministry of Power, Energy and Mineral Resources, SREDA, EGCB, the off-taker Bangladesh Power Development Board (BPDB), IDCOL, and private sector operators. The team will continue to reach out to different stakeholders during project preparation and ensure adequate buy-in and ownership of the government and other stakeholders.

64. **Climate and Disaster Risk Screening.** The Project concept was screened for short and long-term climate change and disaster risks. Renewable energy sub-projects, mainly solar PV and wind, to be supported under the Project, are expected to be highly exposed to extreme precipitation and flooding risk among others, as the country sits on the flood plains of several major rivers, making seasonal flooding a particular hazard. In particular, as the first sub-project site is located between the two rivers – Feni River and Chotto Feni River – and is adjacent to the Sandwip channel of Bay of Bengal, the sub-project would be carefully designed to mitigate the potential flooding risk. Going forward, the sub-projects may be further exposed to sea level rise and storm surge risks which are estimated to be adversely impacted by climate change. Potential climate and disaster risks at the Feni site are being assessed through the ongoing feasibility study report, which will provide guidance on proper structures and civil works to address them.

## VI. APPRAISAL SUMMARY

### A. Economic and Financial (if applicable) Analysis

65. The economic analysis was carried out for (i) Feni utility-scale solar PV under Component 1; (ii) solar PV IPP at the Feni site; and (iii) a model investment of rooftop solar PV with support of the REFF. The additional installed capacity from the proposed investments will displace the current marginal generation options, high speed diesel (HSD)-based generation, which is more expensive option. For all three investment cases, the economic internal rate of returns (EIRRs) exceed the discount rate of 10% for



Bangladesh, in accordance with the Bank guidance on discount rates in economic analysis.<sup>15</sup> The EIRR was estimated around 15.0%, 22.3% and 13.2%, respectively, demonstrating that targeted investments are economically sound. Reduction of greenhouse gas (GHG) and local pollutant emissions will additionally improve the economics of the investments by taking into account positive externalities. The inclusion of environmental externalities, including avoided costs of local pollution and global greenhouse gas emission (using the Bank guidance on social value of carbon), in the economic flows increases the EIRR to 20.0%, 29.5% and 20.4%. Annex 4 provides more details including assumptions and sensitivity analysis.

66. The financial analysis also demonstrates that these proposed individual investments are financially viable, factoring in different cost of financing and debt repayment terms for each investment. Feni EPC investment under Component 1 is projected to have the financial net present value (FNPV) of US\$12.7 million discounted at the WACC. The financial internal rate of return (FIRR) of Feni solar PV IPP to equity holder is estimated about 18.2%. The rooftop solar PV will also offer a return on equity of 21.6% to the industrial customers who install the rooftop system even without grid connection. Annex 4 provides more details including assumptions and sensitivity analysis.

67. **Financial sustainability of EGCB.** The implementing entity of Component 1, the EGCB, is projected to remain financially sustainable with this additional investment. Since the commissioning of the first power plant in 2012, the EGCB has maintained sound liquidity, adequate debt service coverage ratio, proper leverage and operation, and profitability. FY2016 was the only exception for profitability, due to repairing breakdown of a gas turbine for nearly 8 months and gas supply shortage to one of its two thermal power plants. EGCB is expected to return to profitability in FY2017 with the repair of the gas turbine being completed recently. The solar PV generation facility at the Feni site will provide additional NPV to the company, while maintaining the appropriate level of DSCR over the loan repayment period. Furthermore it will help diversify the revenue portfolio, which relies on only two power plants now, to enhance its resilience to the gas supply problem or any unforeseen issue, altogether improving the financial sustainability of the entity.

68. **Financial sustainability of BPDB.** BPDB, a fully state-owned utility, has been functioning as a single buyer in the power market of Bangladesh. It purchases power from both public and private generation companies and sells bulk electricity to its subsidiary distribution utilities (DPDC, DESCO, WZPDCL, BPDB distribution zones, and the rural cooperatives under BREB). BPDB's recent financial statements and audit reports indicate an operating loss of 5.37% (from 24.9% in 2015), very high long term debt to equity ratio and high budgetary support as subsidies. BPDB's retained earnings are negative, indicating previous continuous losses in its operation. Their operating losses are reduced in 2016 with significant cash in hand, although, Government budgetary support was essential to minimize their operational losses.

## B. Technical

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<sup>15</sup> Source: Discounting Costs and Benefits in Economic Analysis of World Bank Projects, OPSPQ, 2016



69. The technologies supported under the project, mainly solar PV but also wind and waste-to-energy, are well-tested and proven technologies across the world. However, in Bangladesh, these technologies have only very limited track records, in particular with connection to the grid at large scale. The project will factor in and conform to international experience and good practices in these renewable energy technologies: (a) technical standards and specifications; (b) grid integration; (c) regulatory framework; and (d) relevant business models. The project will support subprojects making use of technically proven and commercially viable solutions. The technical qualification criteria would be in line with international standards and account for local regulatory, technical, and climatic conditions.

70. **Grid integration of renewable energy.** Bank's Power System team has conducted an analysis on the ability of Bangladesh grid to absorb variable renewable energy. A combination of least-cost planning and transmission load flow analysis was conducted to assess the optimal penetration of variable renewable energy in Bangladesh generation system and the level of transmission system overloading and voltage violation that may need to be addressed. The current and planned grid system in a near term is capable of integrating the solar PV generation capacity, and potentially wind, at the Feni site to the grid. The analysis shows that the existing 132 kV network is sufficient to absorb in excess of 300 MW of renewable energy near Feni. The addition of the 230 kV substation near Feni and the proposed 400 kV lines between the South-East and Dhaka will facilitate the deployment of even more renewables energy near Feni. These system upgrades will provide relief to local grids near Feni and enable to deployment of large-scale renewables.

71. In a longer term, the grid integration of large-scale renewables in Bangladesh is potentially feasible provided capacity and network expansion plans. A least-cost optimization model was applied to assess the reserve requirements needed for meeting the challenge of integrating up to 4.2 GW of solar and 500 MW of wind, the maximum renewable energy penetration projected in the least-cost modeling by 2025. At 8% demand growth, overall generation capacity will need to increase from the current 13 GW to 21 GW by 2025. This could bring an increase in spinning reserve capacity from 500 MW to 880 MW by 2025, which the system could make available all times with limited additional costs.

### **C. Financial Management**

72. A financial management assessment for the Project indicates a 'substantial' risk in financial management (FM). The main drivers of the FM risks identified are: (i) the involvement of multiple implementing agencies and accounting centers; (ii) no experience of SREDA in managing the IDA finance and IDA financial management procedures and requirements; and (iii) no experience of EGCB in managing the Designated Account of IDA credit. The initial focus of the work to mitigate the initial substantial risk would be, (a) training of FM staff at executing agencies; (b) Development of comprehensive project specific financial manual; (c) Interim Financial Reporting; and (d) annual audit by an independent auditor etc. The assessment has concluded that with the implementation of the proposed risk mitigation measures, the proposed financial management arrangements will be considered satisfactory to the Bank's minimum requirements under OP/BP10.





73. Review of financial management and accountability arrangements of the three implementing agencies (EGCB, IDCOL, and SREDA) finds that EGCB and IDCOL have institutionalized certain fundamental principles, in commensurate with other public sector undertakings in Bangladesh in areas like budgeting, internal controls, accounting, reporting and auditing, which have laid the foundation for a basic financial accountability framework in these organizations. SREDA on the other hand is a relatively new entity with evolving systems and processes and therefore has a greater need to improve financial accountability arrangements commensurate with the future growth plan of the entity.

74. The financial management systems of EGCB are acceptable to IDA as it has gained adequate experience in Bank project implementation from their participation in the on-going Siddhirganj Power Project. IDCOL has acquired substantial experience in IDA financial management procedures and requirements through implementing the off-grid renewable energy program (RERED and REREDII including a number of additional financing credits). Both EGCB and IDCOL have unqualified audit opinions on the Financial Statement of the entities for FY 2015-16, which means the financial statements give true and fair view of the financial state of the projects and the entities.

75. For SREDA, as a relatively new organization with limited operational experience, there may be deficiencies in financial management capacity, inadequate capacity to address external audit issues, inadequate management information systems. However, SREDA is expected to manage only a small TA funds and adequate training will be provided to SREDA to build up its FM capacity.

76. **FM Arrangement.** IDA funds will be channeled through three separate Designated Accounts (DA) operated by each agency. Each agency will submit audited annual financial statements and interim unaudited financial reports for their specific project responsibilities to IDA. Initially disbursements for project will follow the “SOE” based principle whereby funds will be front-loaded to the Designated Account based on the cash forecast for the following two quarters.

77. The project’s financial statements for each of the implementing agency will be audited by the Independent Auditor and must be submitted to the Bank no later than 6 months (December 31) after the FY-end.

78. The structure and mechanism of the REFF, a financial intermediary lending, are being reviewed by the Finance and Market GP to ensure its compliance with Bank’s OP10 requirement. It was concluded that the IDCOL has sufficient capacity to implement this financial intermediary lending under Component 2. The proposed financing mechanism should not crowd out the existing financial market in financing grid-connected renewable energy projects, but rather contribute to the development of local financing market for investment in large scale renewable energy.

#### **D. Procurement**

79. All goods, works, non-consulting services and consulting services required for the Project and to be financed out of the proceeds of the Financing shall be procured in accordance with the requirements set forth or referred to in the World Bank’s “Procurement Regulations for Borrowers under Investment Project Financing”, dated July 1, 2016 (Procurement Regulations). Procurements under the Component-2





of the project will not follow the Procurement Regulations as the Procurement Regulations do not apply to the procurement of Goods, Works, Non-consulting Services, and Consulting Services financed by the Bank through loans made by eligible financial intermediaries to private borrowers. Procurement Regulations also do not apply in case of Bank Guarantees, provided by the Bank.

80. Procurement risks. Out of three implementing agencies, IDCOL and EGCB have prior experience in implementing Bank financed project. The fiduciary assessment carried out for the agencies indicates “substantial” risk in procurement operations and contract management. The main drivers to the risks are associated to capacity constraint in the agencies, in performing procurement and contract management related activities, and delay in procurement processing. Several measures to mitigate the risks would be put in place. A *Project Procurement Strategy for Development (PPSD)* is to be developed by the Implementing Agencies, in agreement with the Bank, taking into account the volume of items to be procured, prevailing market conditions, activity level risks etc. The PPCS will spell out the appropriate procurement strategy for this project. PPCS is a live document and it is to be updated at least annually. As an output of the PPCS exercise, initial Procurement Plans for the implementing agencies will be prepared. For each contract to be financed under the project, the different selection methods for procurement, market approach, the need for pre-qualification, contracting arrangement, estimated costs, prior review requirements and time frame will also be agreed between the implementing agencies and the Bank in the Procurement Plan.

81. Systematic Tracking of Procurement Exchanges system (STEP) will be introduced to prepare and manage procurement plan and procurement transactions under the project. The procurement plan will be updated semi-annually (or as required) using STEP system. Each of the implementing agencies shall nominate a procurement focal person for their part of the project. The appointed focal person will take necessary training in procurement including preparation of PPCS. The focal persons will help the respective agencies in day-to-day procurement follow-up and preparation of periodic procurement reports.

82. EGCB will recruit one international procurement expert and one international technical expert (solar power plant expert) to act as the member of Bid Evaluation Committee (BEC) for internationally advertised supply & installation/works contracts under the project.

83. Procurement Strategy for Component 1: The strategy is to construct the power plants in phases. In the 1st phase, a 50 MW Solar Power Plant will be built by EGCB through an Engineering, Procurement, and Construction (EPC) contract, the same contractor/operator will also be responsible for the Operations and Maintenance (O&M) of the plant at least for 5 years – the idea is that the EGCB’s Solar Power Plant will encourage the private sectors to bid for additional capacity at the site on Build-Own-Operate (BOO) or Build-Own-Operate-Transfer (BOOT) basis. EGCB’s EPC contract will follow the Request for Bids (RFB) method of procurement with Pre-qualification (PQ) process. Market approach for this procurement will be Open-International- Two Envelopes. It will be a performance based contract with a provision of staggered lump-sum payments throughout the O&M period.

84. Procurement for Component 2: The World Bank “Procurement Regulations for Investment Project Financing (IPF) Borrowers” govern the procurement of goods, works, non-consulting services, and



consulting services financed by the Bank (in whole or in part) through IPF operations. As per the Section I.1 of the Procurement Policy, procurement for sub-projects where IDA guarantees are used would be excluded from these Regulations.

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

85. Land alteration may be a significant issue when large utility scale solar or wind farms are developed and when these facilities are located in sensitive areas. The proposed Feni site under component 1 is low-lying and it goes under water for considerable time of the year. There is no settlement there, occasional cattle grazing by nearby villagers are the only economic activity on the ground. Part of the land was given to local people by the government as part of a “land for the poor and homeless” program a few years ago. The land was found to be un-habitable and the people who received land live in nearby villages and are no longer homeless. Sounds/vibration and visual impacts are the main public concerns of wind turbines.

86. For Component 1, a detailed Environment and Social Impact Assessment (ESIA) is currently being carried out by EGCB for the Feni site. An ESIA and a RAP will be prepared, which would include compensation measures for land along with other mitigation measures for all identified impacts. There are no indigenous people identified in the project area according to preliminary screening.

87. The location and degree of impact of potential sub-projects in the public sector (shared infrastructure within the solar park, transmission evacuation, resource assessment, and waste-to-energy) are not yet known. Therefore a framework approach is adopted for managing environment and social safeguard in accordance with the Bank Safeguards Policy 4.01. An Environment and Social Policies and Procedures (ESPP) is being developed jointly by SREDA and IDCOL in accordance with Bank Safeguards Policies. The ESPP will include a Tribal People’s Framework (as it is not clear at this stage whether or not the project will work in areas where tribal people live) and a Resettlement Policy Framework (RPF). The ESPP will also assess gender and inclusion aspects and provide guidance on actions to incorporate these aspects within the project design and service delivery.

88. For potential sub-projects under the REFF (Component 2) that are designed, owned, constructed, and/or operated by a Private Entity, World Bank Group’s Operational Policy OP 4.03 (Performance Standards for Private Sector Activities) will be applied. The ESPP mentioned above will be a guiding document for preparing necessary safeguard instruments for the sub-projects to be implemented by private entity. The instrument will provide the guideline to review of the Private Entity’s environmental and social management system (“ESMS”) and environmental and social impact assessment and any related documentation, when the subprojects will be identified during the implementation stage.

89. **Citizen Engagement.** Throughout preparation and implementation of the Project, proper and robust citizen engagement mechanisms (e.g. public hearing, consultations, focus group discussions, in-depth interviews, etc.) will be designed and carried out to ensure to incorporate feedback from beneficiaries, such as rooftop solar PV customers, residents in cities selected for waste-to-energy pilots,



and other stakeholders in the renewable energy sector. Relevant results indicators will be also designed during project preparation and included in the Results Framework (RF).

90. **Gender.** A gender responsive social assessment for the proposed Project was undertaken as part of project preparation. It examined the challenges and offered policy guideline to make the project design gender responsive. The assessment analyzed and determined the measures to be adopted for meeting the needs of the female beneficiaries of the project as well as the male and female members of the implementing agencies by undertaking reviews and stakeholder consultations. The analysis took into account gender variables based on the effect of access to entrepreneurship, use of renewable energy resources and challenges of development projects on the lives of women from rural households. The assessment generated gender sensitive operational recommendations for the project design, which will be further refined and agreed with the implementing agencies as part of project preparation. The main recommendations include addressing disruption of livelihoods of the women who are dependent on the Feni site; developing policies and awareness raising activities by IDCOL to attract women entrepreneurs to utilize IDCOL's credit facilities; developing a gender policy by EGCB to enable equitable working place for both men and women and; hiring more women employees to reduce the gap in male-female ratio of EGCB's workforce. To enhance civic engagement, the assessment further recommends forming citizens' committees in waste to energy projects at city/town levels.

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

91. **Environment Impacts and Mitigation Measures.** Renewable energy contributes to reduced environmental impacts compared to the energy generated from fossil fuels, however, there might still be environmental impacts associated with renewable energy generation. Also wind turbines might have some impacts on birds and bats. Sounds/vibration and visual impacts are the main public concerns of wind turbines. Also Land alteration may be an issue when large utility scale solar or wind farms are developed. Proper mitigation plan and monitoring plan is needed to ensure that no adverse impacts are occurring from the proposed roof top solar PV projects.

92. **Applicable Environmental Category and Safeguard Policies.** Given the financial intermediation proposed for majority of the investment, the environmental assessment (EA) category will be FI. The World Bank Safeguard policy Environment Assessment (OP/BP 4.01) and Natural Habitats (OP/BP 4.04) are triggered. Also Performance Standards for Private Sector Activities (OP 4.03) will be applied for sub-projects under the Renewable Energy Financing Facility (REFF) that are designed, owned, constructed, and/or operated by a Private Entity.

93. For component 1, a detailed Environment and Social Impact Assessment (ESIA) is being carried out by EGCB following the World Bank safeguard policies. For component 2, sub-project nature with locations are yet to be identified, and an Environmental and Social Management Procedure (ESMP) is being developed for environmental and social risk management (ESRM) for the project.

94. The ESMP is being prepared in accordance with the Bangladesh Environment Conservation Rules 1997, and the World Bank Safeguard Policies OP 4.01 – Environment Assessment along with the OP4.03 – Performance Standards for Private Sector Activities. Overall the ESMP will be the guiding document for



subproject-specific: (i) environmental screening and assessment; (ii) establishment of “baseline environment”; (iii) analysis of alternatives; (iv) identification of major sub-project activities and evaluation of the overall potential environmental impacts; (v) carrying out public consultations; (vi) identification of mitigation measures and preparation of EMP; (vii) monitoring of the implementation of EMP. The ESMP will also identify the institutional barriers and capacity building needs for the respective agency for proper environmental management.

95. Based on the ESMP, the agency will be responsible to carry out environmental screening/assessment along with analysis of alternatives and to prepare an Environmental Management Plan (EMP) with budget. The Environmental Management Plans (EMP) need to be incorporated in the bid document and the cost for the implementation of EMP will be a line item of the Bill of Quantities (BOQ). The agency will also be responsible for getting necessary environmental clearance from the Department of Environment (DoE).

96. **Borrower’s capacity on environmental safeguard.** IDCOL has been implementing Bank-financed projects for years and has adequate knowledge of Bank safeguards policies. IDCOL has two full-time environment and social specialist, both of which were trained adequately on Bank safeguards policies. IDCOL has demonstrated its capacity to ensure compliance of Bank safeguards policies in sub-projects through its implementation of Bank-financed projects in renewable energy. EGCB has also implemented Bank-financed project Siddhirganj Power Plant and experience in Bank safeguard policy. EGCB has an environment cell staffed by one Deputy General Manager (DGM), one Manager. Being relatively new agency, SREDA is yet to acquire full knowledge of Bank safeguards policies. The capacity gap will be assessed during project preparation and appropriate steps will be taken to address the capacity gap.

97. **Consultation and Disclosure.** The Specific ESIA for Feni and the ESMP will be prepared in consultation with the key stakeholders and the communities. National consultation workshop has been planned later this year to share the draft EIA and ESMP with all the stakeholders. Consultation with communities has been made mandatory for environmental screening/assessment of each subproject to be financed during implementation stage. The ESIA and ESMP along with Bangla summary version will be disclosed by EGCB, IDCOL and SREDA in their websites and hardcopies will also be available at respective headquarters and sub-project areas. Advertisement requesting public comments will be published in two daily Newspapers (English and Bangla). The ESMP will also be disclosed in World Bank operational site.

## **G. World Bank Grievance Redress**

98. Communities and individuals who believe that they are adversely affected by a World Bank (WB) supported project may submit complaints to existing project-level grievance redress mechanisms or the WB’s Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed in order to address project-related concerns. Project affected communities and individuals may submit their complaint to the WB’s independent Inspection Panel which determines whether harm occurred, or could occur, as a result of WB non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank’s attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints



to the World Bank's corporate Grievance Redress Service (GRS), please visit <http://www.worldbank.org/en/projects-operations/products-and-services/grievance-redress-service>. For information on how to submit complaints to the World Bank Inspection Panel, please visit [www.inspectionpanel.org](http://www.inspectionpanel.org).



## VII. RESULTS FRAMEWORK AND MONITORING

### Results Framework

COUNTRY : Bangladesh

Bangladesh Scaling-up Renewable Energy Project

#### Project Development Objectives

The Project Development Objective is to increase installed generation capacity of renewable energy in Bangladesh.

#### Project Development Objective Indicators

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
Name: Generation capacity of energy constructed or rehabilitated	✓	Megawatt	0.00	250.00			
Renewable energy generation capacity (other than hydropower) constructed under the project	✓	Megawatt	0.00	250.00			
Description:							

**Intermediate Results Indicators**

Indicator Name	Core	Unit of Measure	Baseline	End Target	Frequency	Data Source/Methodology	Responsibility for Data Collection
<b>Name:</b> Investment mobilized for renewable generation capacity (US\$)		Amount(US D)	0.00	186000000.00			
Description:							
<b>Name:</b> Net greenhouse gas emissions	✓	Tones/year	0.00	-285000.00			
Description:							
<b>Name:</b> Renewable energy resource national atlas published		Yes/No	N	Y			
Description:							
<b>Name:</b> Waste-to-energy pilot construction completed		Yes/No	N	Y			
Description:							

**Target Values****Project Development Objective Indicators**

Indicator Name	End Target
Generation capacity of energy constructed or rehabilitated	250.00
Renewable energy generation capacity (other than hydropower) constructed under the project	250.00

**Intermediate Results Indicators**

Indicator Name	Baseline	End Target
Investment mobilized for renewable generation capacity (US\$)	0.00	186000000.00
Net greenhouse gas emissions	0.00	-285000.00
Renewable energy resource national atlas published	N	Y
Waste-to-energy pilot construction completed	N	Y





## ANNEX 1: DETAILED PROJECT DESCRIPTION

### COUNTRY : Bangladesh Bangladesh Scaling-up Renewable Energy Project

#### Background

1. The power sector in Bangladesh has grown rapidly over the last decade – maximum generation increased from a little over 3,000 MW in 2009 to more than 8,000 MW in 2016. However, supply still lags behind peak demand resulting in demand curtailment (load shedding) particularly in the rural areas during the peak summer months. Bangladesh however lags behind in its efforts to tap into its own renewable energy potential for grid-tied electricity generation despite the tremendous success of its off-grid renewable energy program.
2. GoB has taken a systematic approach towards renewable energy development through the formulation of relevant policies and targets. As per the National Renewable Energy Policy 2008 (NREP), generation capacity of 2,000 MW is planned to be added by 2020 from renewable sources. GoB has also set renewable energy development targets for several technologies for each year from 2015 to 2021 (“RE Development Targets”). Furthering the ambitions of NREP, the RE Development Targets call for an additional 3,100 MW of renewable energy capacity to be installed by 2021. Most of the new capacity is planned from solar (1,676 MW, or 54 percent) and wind (1,370 MW, or 44 percent), and there are also targets for waste-to-energy (40 MW), biomass (7 MW), biogas (7 MW) and hydro (4 MW). Furthermore, the Power System Master Plan 2010 sets goals for fuel diversification with an emphasis on increasing the role of renewable energy in the power generation mix. To promote renewable energy and also energy efficiency, the Sustainable and Renewable Energy Development Agency (SREDA) was established in 2014.
3. Despite the government commitment, there has been no utility-scale solar PV projects delivered in Bangladesh. There are number of reasons attributable to this, including:
  - a. *Land constraint* is the major challenge for developing utility-scale solar in Bangladesh. Being the 12<sup>th</sup> most densely populated country in the world, land has alternative uses including for agriculture use and utility scale solar requires large amount of land (1 MW of solar will require about 4-5 acres of land given the solar irradiance of Bangladesh). For ensuring food security, GOB has adopted a policy not to use agriculture land for other purposes, limiting the availability of land for utility-scale solar. The only land suitable for solar PV is government-owned land in river islands and low-lying areas with seasonal flooding that makes the land unsuitable for habitation or for other productive use.
  - b. *Project Development Challenges* including insufficient data on resource availability, inadequate availability of suitable land, feasibility assessment of potential capacities on available land and lack of technical studies and preparation of bankable projects.
  - c. *Financing Market Challenges* including lack of deep domestic financing market to provide long term financing to projects, lack of due diligence capacity and functioning syndication



market. In addition, absence of effective credit enhancement and risk mitigation provides a significant challenge to lenders and investors entering into long term contracts.

4. The private infrastructure financing market is primarily supported by commercial banks, albeit mostly through balance sheet financing to corporates and/or trade financing. In Bangladesh, project financing market is still nascent with tenors usually around 7 years. Key issues for commercial banks include lack of experience and knowledge of utility scale renewable energy projects, lack of technical capacity to conduct due diligence, implementation and monitoring, low risk appetite for long term lending and very limited foreign currency capacity. Institutional investor base is very small in Bangladesh and capital markets are not sufficiently developed to support infrastructure financing at this stage which leaves commercial banks to play an important role in financing renewable energy projects.

5. Bangladesh also has significant infrastructure needs in energy, transport, housing, water supply and urban infrastructure sectors. The PPP program of the Government envisages more than 40<sup>16</sup> projects in different sectors, most of which would need domestic financing<sup>17</sup> in the next few years. These projects, alongside other public investments financed through commercial banks, creates very high competition on availability of domestic financing. Lack of long-term domestic debt financing market and risk perceptions (of primarily foreign sponsors and investors) about the ability of the off-taker to meet payment obligations under power purchase agreements (PPAs) on a long-term basis have been major barriers in mobilizing financing in grid-tied renewable energy projects. Appropriate risk mitigation instruments will be needed to de-risk projects such that long term commercial financing can be attracted to improve bankability and affordability of projects.

6. The World Bank/IDA has been supporting SREDA and other government agencies in project development through technical assistance including creating an enabling environment, conducting feasibility studies and preparing bankable project structure. The proposed Project<sup>18</sup> also aims to address the financing challenges through establishment of a new Renewable Energy Financing Facility (REFF) through an experienced Financial Intermediary, IDCOL. The REFF will be initially supported through IDA and SREP contribution of up to US\$82.38 million which primarily will be used to provide limited long term financing support to renewable energy projects. Thus the proposed WB intervention addresses the challenges of both demand (project development) and supply (financing) side. The use of IDA and SREP resources, through REFF, provides additional liquidity and establish a demonstration effect to initial set of projects that allows crowding-in of other commercial banks.

7. To address the financing challenges in developing renewable energy projects in Bangladesh, two important aspects should be considered – help build capacity of domestic commercial banks in due diligence, credit assessment, implementation and monitoring; and provide initial, but limited, liquidity to allow crowding-in commercial banks. Considering the project financing landscape of Bangladesh and

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<sup>16</sup> <http://www.pppo.gov.bd/projects.php>

<sup>17</sup> In November 2016, 14 domestic financial institutions entered into an MoU with the PPP Authority to facilitate their participation in PPP projects.

<sup>18</sup> In conjunction with other IPFF projects in Bangladesh



lessons learned from IPFF operations<sup>19</sup>, a targeted financing facility through a financial intermediary would be more appropriate to address the financing challenges. The proposed REFF, operated and managed by IDCOL, will be designed as a targeted financing facility to finance renewable energy projects. The main objective of REFF is to crowd-in commercial financing by providing limited amount of liquidity and by building capacity of domestic commercial banks. In this context, IDCOL will act as an enabler and market-maker for financing, following the principles of additionality, financial viability and commerciality in supporting renewable energy projects.

## Project Components

8. The proposed Project is aimed at supporting the development of grid-connected renewable energy, particularly solar PV and wind, rooftop solar PV and waste-to-energy through a combination of investment financing, risk mitigation guarantees and technical assistance. It will specifically address the barriers to scaling up renewable energy, by providing access to capital, de-risking investments, and conducting resource assessments. The proposed Project comprises of four components as described below.

9. **Component 1: Feni Utility-Scale Solar PV (US\$80 million).** This component will support the first phase of the development of a renewable energy park with a capacity between 150-170 MWp of solar PV and around 20 MWp of wind. This component will finance the common infrastructure (civil works, risk mitigating measures and fencing) and the first phase of the solar PV generation plant, with a capacity of 50 MW. This project would be the first-ever large-scale grid-tied solar PV in Bangladesh, at an identified site in Feni District, owned by the state-owned generation utility, Electricity Generation Company of Bangladesh (EGCB).

10. The land allocated to the project is close Sonagazi Upazilla, District of Feni, Chittagong Division, Bangladesh. The available land area is about 1,000 acres. The location of the project is shown in Figure 3. The land is being transferred to EGCB for the development of renewable energy projects, with the condition of allowing partial use of the land for productive uses such as agriculture or fisheries.

11. Ground-based solar and wind resource assessment at the site will commence in June 2017, under a separate Bank-executed activity supported by the Asia Sustainable and Alternative Energy Program (ASTAE) and the Energy Sector Management Assistance Program (ESMAP). The ground measurement will help specify the technical specifications of the solar panels for optimal generation. The results of wind resource assessment will inform the viability of wind generation at the site.

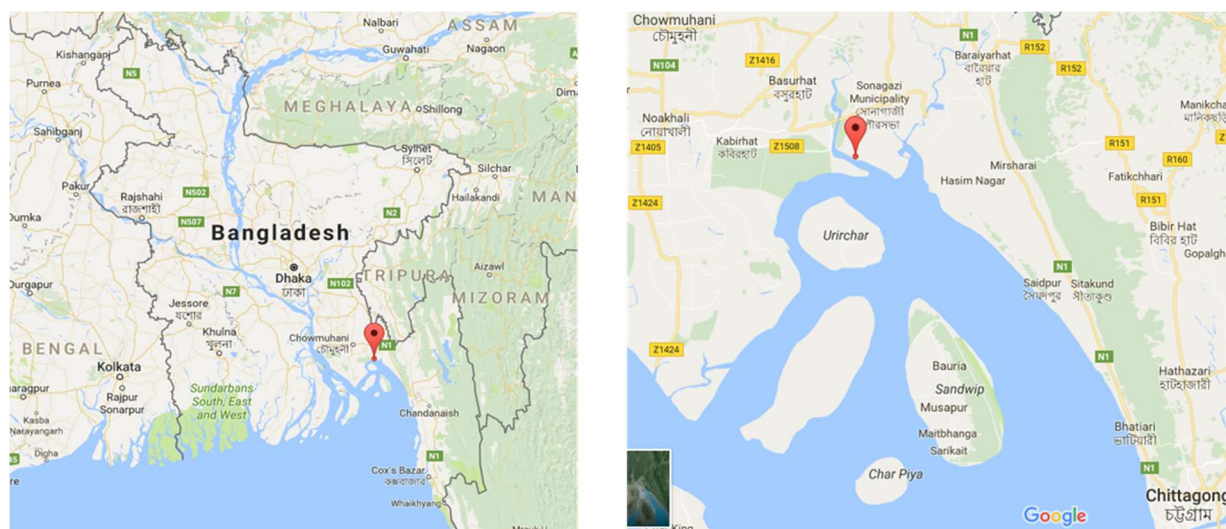
12. Bank's Power System team has conducted an analysis on the ability of Bangladesh grid to absorb variable renewable energy. A combination of least-cost planning and transmission load flow analysis was conducted to assess the optimal penetration of variable renewable energy in Bangladesh generation system and the level of transmission system overloading and voltage violation that may need to be addressed, for the proposed investment at the Feni site and the scaling up of renewable energy by 2025.

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<sup>19</sup> World Bank/IDA funded operations - Bangladesh Investment Promotion and Financing Facility Project I & II



Figure 3. Project Site in District of Feni



13. Feni town is connected to the grid via a 132 kV substation along the route of Hathazari-Comilla-Meghnaghat 230 kV power line. That power line does not yet have a substation and so near-term projects may need to feed into the 132 kV line. The Bank is in preparation of another lending operation for transmission expansion. This operation plans to develop an additional 230 kV line to ensure adequate and reliable power supply for the upcoming economic zone at Mirsharai in Chittagong. This line would have a 230 kV substation in Mirsharai, which is about 20 km East of Feni. It is expected to be available by 2020.

14. The current and planned grid system in a near term can integrate the solar PV and wind generation capacity at the Feni site. The analysis shows that the existing 132 kV network is sufficient to absorb more than 300 MW of renewable energy near Feni. The addition of the 230 kV substation near Feni and the proposed 400 kV lines between the South-East and Dhaka will facilitate the deployment of even more renewables energy near Feni. These system upgrades will provide relief to local grids near Feni and enable to deployment of large-scale renewables.

15. A feasibility study has been launched by the client for the Feni site to inform the technical, economic and financial feasibility and environmental and social safeguard issues of the solar PV and wind power plants. The feasibility study is expected to be completed by June 2017.

16. Several options are being evaluated in the feasibility study to use the available land combining solar PV and wind in different shares: (i) Option 1: 100 MWp solar PV and 24 MWp wind; (ii) Option 2: 100 MW solar PV and 24 MW wind plus an additional 54MWac solar PV under shadow free area of WTGs. (iv) Option 3: 260 MW solar PV; (v) Option 4: 170 MW solar PV and 10 MW wind power project. With this option, around 25 percent of entire land could be used for other productive uses like fishery and agriculture around WTGs area.

17. Power would be evacuated to the PGCB grid. There are three substations close to the site to connect these facilities to the grid: Feni 132 kV Sub-Station of PGCB, Baraiyaarhaat 132 kV Sub-Station, and Mir Sharai 230 KV Sub-Station (construction planned, which is expected to be completed by 2020).



The Feni substation does not have adequate capacity. Baraiyaarhaat Sub-Station has adequate spare capacity to absorb 50 MW of power.

18. The draft feasibility study as of April 2017, proposes a combination of solar and wind generation. The solar project would be undertaken in two phases with 50 MW in Phase I financed under this proposed project along with the transport, civil and power evacuation infrastructure. This phase would be undertaken by EGCB. Phase II would comprise of 122 MW of solar PV and 10 MW of wind. Phase II projects would be developed by the private sector under an IPP arrangement. Electricity would be sold to BPD under power purchase agreements. The Phase I solar power would be evacuated to the Bairiyarhat grid substation. Phase 2 power would be evacuated to the Mirasarai grid substation. The characteristics of the project are summarized in Table 3.

Table 3. Feni Solar and Wind Project Characterization as of April 2017

Parameter	Unit	Phase-1	Phase-2	
		Solar PV	Balance Solar PV	Wind
Capacity	MWdc	68	166	-
	MWac	50	122	10
Technology		Fixed-tilt solar PV system based on central inverter and polycrystalline module technology		2 MW wind turbines
Net Energy Yield	GWhr/yr	97.8	238.6	12.8
Total Area	Ha	67	164	450 (with most of land available for alternative agricultural use.)
Evacuation items		33 kV one circuit txm line of 20 KMs; four pole structure with outdoor type gang operated isolator with earth switch, drop out fuse, LA;	four 50/60 MVA, 230 kV / 33 kV, ONAN/ONAF Power Transformers; 8 bays; 230 kV two circuit txm line of 20 KMs; two additional bays at 230 kV grid SS; 10 numbers of VCBs	
Required Grid SS capacity to inject generated power		33 kV will directly be injected to the Bairiyarhat grid SS, no need of additional bays	two additional bays at 230 kV Mirasarai grid SS	
Total evacuation cost	million USD	0.5	15	

19. The proposed physical layout of the solar park and wind turbines is given in Figure 4.



**PROJECT SUMMARY: (IN WIND TURBINE AREA)**

PROPOSED CAPACITY	136.08 MWp
TOTAL NO. OF PV MODULES	402000
PV MODULE CAPACITY (MULTI-CRYSTALLINE)	315 Wp (Canadian)
PV MODULE DIMENSION	1954x962x40 MM
PV TABLE CAPACITY	18.94 Wp
PV MODULE MOUNTING ORIENTATION	PORTRAIT
PV MODULE TILT ANGLE	15°
PV MODULE AZIMUTH	TRUE SOUTH
TOTAL NO. OF INVERTER, 1 MW	72

**PROJECT SUMMARY:**

PROPOSED CAPACITY	136.08 MWp
TOTAL NO. OF PV MODULES	402000
PV MODULE CAPACITY (MULTI-CRYSTALLINE)	315 Wp (Canadian)
PV MODULE DIMENSION	1954x962x40 MM
PV TABLE CAPACITY	18.94 Wp
PV MODULE MOUNTING ORIENTATION	PORTRAIT
PV MODULE TILT ANGLE	15°
PV MODULE AZIMUTH	TRUE SOUTH
TOTAL NO. OF INVERTER, 1 MW	300

**PROJECT SUMMARY:**

PROPOSED CAPACITY	97.97 MWp
TOTAL NO. OF PV MODULES	311040
PV MODULE CAPACITY (MULTI-CRYSTALLINE)	315 Wp (Canadian)
PV MODULE DIMENSION	1954x962x40 MM
PV TABLE CAPACITY	18.94 Wp
PV MODULE MOUNTING ORIENTATION	PORTRAIT
PV MODULE TILT ANGLE	15°
PV MODULE AZIMUTH	TRUE SOUTH
TOTAL NO. OF INVERTER, 1 MW	72



20. As the site is prone to seasonal inundation during the monsoons and has some record of high flooding that resulted in around 5-7 meters of water level, the project include protection against the risk. The draft analysis shows that a combination of a dike, elevation structures for the PV panels and water pumping for drainage inside the dike may be required to mitigate the risk of flooding. The dimensioning of these systems and the cost of the different alternatives are being refined based on analysis of the hydrological data and geotechnical studies.

21. The consultants are evaluating one additional option of inundating the land within the dike and installing floating solar plants with the pond used for prawn aquaculture. The consultants were also required to evaluate the logistics for transporting the equipment and materials to site as the existing road infrastructure (the section from Feni town to the site), is inadequate, especially to transport the wind turbine components. The costs of improving the road infrastructure would be included in the project costs. The feasibility study consultants are preparing the environmental and social safeguards impact assessments. They will prepare the bid documents using standard World Bank procurement procedures.

22. The construction of evacuation lines, between the Feni site and the national grid, will be done by the Power Grid Company of Bangladesh Limited (PGCB) as part of its transmission expansion financed by another Bank project as noted previously.

23. The phase I solar generation facility will be developed as public investment by EGCB through IDA credit. The EGCB will procure, through a competitive bidding procedure, an engineering, procurement and construction (EPC) and operation and maintenance (O&M) contract for the solar PV plant that covers O&M of the facility for the first five years after commissioning. This development will be a significant milestone in further scaling up solar PV in Bangladesh as it demonstrates that a large scale solar PV can be integrated to the current grid system and also ensures that utilities have relevant experience and capacity in technology, operation and maintenance of solar PV.

24. As this is EGCB's first renewable energy project, the ECGB will recruit an Owner's Engineer to advise them during the bidding and contract negotiation process, to oversee the EPC contractor's technical and commercial performance, and to represent ECGB during the plant testing and commercial operation.

25. Phase II projects will be offered to the private sector for development through competitive auctions. The infrastructure built will support the second phase development and reduce costs for Phase II thereby permitting lower cost electricity to be offered. The performance of the 50 MW solar PV project will inform the private sector developers as to PV production at this site and how well it integrates into the PGCB grid. This will reduce perceived risks and permit more competitive electricity prices to be obtained. Technical assistance offered under Component 3 will assist in conducting auctions for the Phase II projects.

26. Successfully completing this project would open the market for even more renewable energy capacity, including those financed under Component 2. In a longer term, the grid integration of large-scale renewables in Bangladesh is potentially feasible, if the planned grid expansions will be realized. The Bank Power Systems least-cost optimization model was applied to assess the reserve requirements needed for meeting the challenge of integrating up to 4.2 GW of solar and 500 MW of wind, the maximum



renewable energy penetration projected in the least-cost modeling by 2025. At 8% demand growth, overall generation capacity will need to increase from the current 13 GW to 21 GW by 2025. This could bring an increase in spinning reserve capacity from 500 MW to 880 MW by 2025, which the system could make available all times with limited additional costs

27. The current system relies heavily on 230 kV lines for transmission over longer distances and around Dhaka. However, due to the geographic balance in supply these lines operate at well below capacity. A 400kV network has been proposed to connect Dhaka to the four corners of Bangladesh. These lines will add significant transmission capacity in the couple of coming years. All proposed 400 kV lines will be double-circuit with projected capacities of roughly 3 GW. The existing plans for the transmission network will create a grid that can indeed accommodate the 4.2 GW of solar and 500 MW of wind.

28. **Component 2: Renewable Energy Financing Facility (REFF) (US\$162.38 million).** The Project will support the establishment of a dedicated Renewable Energy Financing Facility (REFF) hosted at IDCOL, a financial intermediary. The Facility will primarily have a Lending Window with IDA and SREP resources of US\$82.38 million, including US\$56 million of IDA credit and US\$26.38 million of SREP credit<sup>20</sup>. The Facility will offer necessary financing products, including long-term loan and other suitable products to support a series of sub-projects on renewable energy. It will also provide associated technical assistance. While the primary focus of technology will be utility-scale solar PV and wind as well as rooftop solar PV, with a target of supporting 200 MW of installed capacity, other renewable energy technologies such as waste-to-energy will also be supported, if and when feasible. The Facility will have flexibility to support transactions on a first come first serve basis, between utility-scale solar PV/wind and rooftop solar PV. In addition, the Facility may also have a Guarantee Window. Considering the capacity limitations of IDCOL in offering credit enhancement products at this stage, it is proposed that WB provides a series of IDA guarantees to sub-projects, amount to a maximum of US\$80 million, to support an initial set of projects to build track record. Once IDCOL's capacity is sufficiently enhanced through learning from IDA guarantees to sub-projects, IDCOL can develop new REFF guarantee products to be offered through REFF Guarantee Window. Until such time, it is proposed that IDCOL will continue to build their capacity through learning from the proposed series of IDA guarantees for the sub-projects. While IDCOL will undertake full due diligence of sub-projects for the REFF Lending product<sup>21</sup>, they may undertake early stage screening or sub-projects and propose the need of guarantees to the task team. Depending on market feedback, the IDA and SREP funding allocation between Lending and Guarantee amounts will be finalized. The Facility will address the barrier of limited commercial financing by offering additional financing along with IDA guarantee products to mitigate key risks and attract domestic and international private developers and commercial financiers.

29. **Utility-scale solar PV and wind.** According to the SREP Investment Plan, Bangladesh has the potential for 2,600 MW of grid-connected solar and wind, and solar rooftop. Given the limited amount of public finance, even after taking into account all development financing options available for Bangladesh, developing renewable energy projects solely through public investment is insufficient to unlock such

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<sup>20</sup> SREP non-grant portion can be deployed as either loan or risk guarantee.

<sup>21</sup> In conjunction with the provisions of Operations Manual, to be developed.





potential. Recent studies indicate that a number of countries have benefitted from the use independent power producer (IPP) or solar park models that brought long term competitive tariffs and private sector expertise to develop, finance and implement renewable energy projects. For instance, the solar park model, through which public sector provides land, shared infrastructure and evacuation; and private sector finances, builds and operates generation facility, would allow a more effective use of scarce public resource on scaling up grid-connected solar PV in Bangladesh. In this case, public sector part can be supported directly through the Government of Bangladesh using IDA credit. In parallel, alternative options to develop utility-scale solar PV, such as floating solar PV, use of canals or idle land at other facilities (e.g. airport, railways, etc.) will be further explored during project preparation. Wind sub-projects will be considered where resource potential turns out to be feasible, through wind resource assessment to be supported by the proposed Project (Component 3). The Facility will be flexible in supporting sub-projects developed on either public land or private land. The majority of potential pipeline however is expected to be on government-owned land given the significant land scarcity in Bangladesh and the challenges in procuring land due to fragmented ownership of private land. The team will work closely with GoB appointed Transaction Advisor for structuring the competitive auction for solar PV generation at the park.

30. The Facility will provide limited amount of REFF financing and IDA risk mitigation guarantee support to grid-connected utility-scale solar PV and wind sub-projects for an initial target of 170 MW at different locations<sup>22</sup>, through site-wise competitive auction mechanism and potentially some unsolicited projects. To support unsolicited projects, the decision to provide REFF financing and/or IDA guarantees will be subject to detailed due diligence including confirmation of land availability, justification and/or potential renegotiation of price and review of contractual terms and conditions. The scope of GoB appointed Transaction Advisor may be extended to include review and renegotiation support on unsolicited projects.

31. Through the competitive auction process, the Facility will provide standard financing products and IDA risk mitigation products to potential bidders. It is expected that the projects will be financed through a combination of commercial banks, development finance institutions<sup>23</sup> (DFIs) and financing through the REFF. Under this arrangement, a standard set of financing options and WB approved Term Sheet for IDA risk mitigation guarantees<sup>24</sup> will be offered through the auction process by IDCOL to private participants, who will be selected through the auction process. On exceptional circumstances<sup>25</sup>, a selected bidder may approach for REFF financing and IDA guarantees ex-post the auction, duly providing the justification for such products. The bidders can choose a combination of financing products (loans, IDA risk mitigation guarantees, etc.) for each sub-project as part of their bidding proposals.<sup>26</sup> To optimize the use of IDA and

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<sup>22</sup> Pre-identified sites include [Feni, Rangunia, BEZA] with more than 300 MW technical capacity.

<sup>23</sup> IFC may participate in DFI financing both on its own and using IFC managed SREP funds to finance winning bidders.

<sup>24</sup> Considering inexperience and capacity limitations of IDCOL, IDA Guarantees to sub-projects may be offered directly by IDA through a guarantee series for initial set of projects.

<sup>25</sup> TBD – includes situations where project finance lending is limited or unavailable in the local financial markets

<sup>26</sup> Recently, Argentina and Zambia applied similar arrangements in the auction process, where financing products are offered at-cost to the bidders for selection as part of their bidding proposals.



SREP resources and to create sustainable financing models, the auction process may include limitations for the use of REFF loans.

32. A key criterion for the use of REFF financing would be ‘additionality’, where the private sector has to demonstrate the financing gap that needs to be secured through REFF financing. The mechanism to demonstrate the use of REFF financing will follow broadly the ‘cascade principle’<sup>27</sup> of the World Bank. To incentivize participation of competitive market-based financing and to prevent crowding out commercial financiers, REFF financing products will be priced at-market as well as be a capped<sup>28</sup> amount per sub-project. Such mechanisms allow better use of IDA and SREP concessional sources to address financing market failure (e.g. lack of sufficient liquidity) while also maximizing the support to many sub-projects to enable scaling-up of renewable energy.

33. The sub-projects can also receive IDA risk mitigation guarantees such as payment guarantees to mitigate default on ongoing payments and termination payments by the off-taker, and/or loan guarantees to mitigate default on debt service repayment from developers to commercial financiers. By leveraging private capital through enhanced use of IDA guarantee instrument, the Facility can maximize the use of limited concessionary resources and public capital that could potentially create a track record for financing of future projects without IDA and SREP resources. The Facility can later receive additional contribution from other development partners for supporting renewable energy development beyond those targeted under the Project.

34. **Rooftop solar PV.** Rooftop solar PV is critical to scale up renewable energy in a highly land-constrained country like Bangladesh. Development of grid-connected rooftop solar PV under the proposed Project will be focused initially on industrial rooftops with a target of 30 MW installed capacity in aggregate. Industrial rooftops are economically more feasible due to relatively higher tariff than residential and commercial consumers. Government and institutional rooftops, such as public universities, will be also candidates as some of them are advanced in preparation. To incentivize the development of rooftop solar PV, financing terms for solar rooftop will be such that the solar rooftop costs are below the retail price of electricity, which is as high as BDT 9.24/kWh (US\$ 11.8/kWh) at peak for industrial consumers. The Facility will be flexible to support grid-tied solar rooftop installations once the appropriate policies are adopted by GOB. To minimize transactions costs, the option of aggregators will be explored who would lease rooftop areas from building owners and operate rooftop solar PV on aggregated sites. Depending on the need, IDA guarantees may be offered to mitigate any public sector obligations, such as regulatory risk associated with feed-in tariff or payment default on public sector offtake contracts. The need for IDA guarantees will be further explored during the preparation stage.

35. **Component 3: Renewable Energy Resource Assessment and Technical Assistance (US\$2.36 million).** This component will support resource assessment to facilitate further scale up of solar and wind power development in Bangladesh. In coordination with other agencies and funding sources, this component will cover data collection, validation, finalization, and publication of resource atlas at the

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<sup>27</sup> <https://spark.worldbank.org/docs/DOC-162225>. What is the Cascade?

<sup>28</sup> Expected to be around [15-25]% of the capital cost of the project.



national level which will inform policy makers and potential solar and wind developers. The component will also include support for formulation of an enabling policy and regulatory framework for rooftop solar PV. US\$2.36 million of SREP grant is proposed to be allocated to this activity implemented by SREDA.

36. The resource assessment support under this component will include installation of dedicated solar measuring stations in different climate zones to collect sufficient data to generate a high-accuracy atlas at the national level complemented by the ground measurement at Feni site. The United States Agency for International Development (USAID) supported wind masts at nine locations throughout the country have been collecting wind data. This initiative will complete in late 2017. Depending on the needs, additional wind measurement can be supported to cover the national wind atlas. Bank-executed ASTAE-ESMAP support will be complementing the validation and finalization exercise for the national level solar and wind atlas. The outputs will be freely and widely accessible following open data principles.

37. Furthermore, technical assistance and capacity building will be provided to relevant government agencies by this component to maximize the benefit of the measuring equipment procured and the finalized resource assessment. Activities will include maintaining and further updating resource assessment data; and integrating geospatial information and tools into national planning of renewable energy development. The component will also support resource assessment for solar rooftop using satellite imagery technologies.

38. **Component 4: Waste-to-Energy Pilot (US\$0.5 million).** This component will support feasibility assessment and deployment of small scale pilots of municipal waste-to-energy sub-projects. US\$0.5 million of SREP grant will be used to finance one or more pilots in collaboration with city corporations that manage municipal waste collection. One of the potential candidate is the Rajshahi City Corporation for an installation of a biogas plant to utilize slaughterhouse waste. The City Corporation will provide the land required and GIZ will provide technical support for the small-scale pilot. The pilot is expected to inform technical and commercial feasibility of waste-to-energy sub-projects and to help establish waste collection practices and government schemes to support waste-to-energy in municipalities. This component is expected to be implemented by SREDA.

39. **Grid integration of renewable energy.** Bank's Power System team has conducted an analysis on the ability of Bangladesh grid to absorb variable renewable energy. A combination of least-cost planning and transmission load flow analysis was conducted to assess the optimal penetration of variable renewable energy in Bangladesh generation system and the level of transmission system overloading and voltage violation that may need to be addressed, for the proposed investment at the Feni site and the scaling up of renewable energy by 2025.

40. Feni is currently connected to the grid via a 132 kV substation along the route of Hathazari-Comilla-Meghnaghat 230 kV power line. That power line does not yet have a substation and so near-term projects may need to feed into the 132 kV line. The Bank is in preparation of another lending operation for transmission expansion with the GoB. This operation plans to develop an additional 230 kV line to ensure adequate and reliable power supply for the upcoming economic zone at Mirsharai in Chittagong. This line would have a 230 kV substation in Mirsharai, which is about 20 km East of Feni, expected by 2020.



41. The current and planned grid system in a near term is capable of integrating the solar PV generation capacity, and potentially wind, at the Feni site to the grid. The analysis shows that the existing 132 kV network is sufficient to absorb in excess of 300 MW of renewable energy near Feni. The addition of the 230 kV substation near Feni and the proposed 400 kV lines between the South-East and Dhaka will facilitate the deployment of even more renewables energy near Feni. These system upgrades will provide relief to local grids near Feni and enable to deployment of large-scale renewables.

42. In a longer term, the grid integration of large-scale renewables in Bangladesh is potentially feasible, assuming that the planned grid expansions will be realized. A least-cost optimization model was applied to assess the reserve requirements needed for meeting the challenge of integrating up to 4.2 GW of solar and 500 MW of wind, the maximum renewable energy penetration projected in the least-cost modeling by 2025. At 8% demand growth, overall generation capacity will need to increase from the current 13 GW to 21 GW by 2025. This could bring an increase in spinning reserve capacity from 500 MW to 880 MW by 2025, which the system could make available all times with limited additional costs

43. The current system relies heavily on 230 kV lines for transmission over longer distances and around Dhaka. However, due to the geographic balance in supply these lines operate at well below capacity. A 400kV network has been proposed to connect Dhaka to the four corners of Bangladesh. These lines will add significant transmission capacity in the couple of coming years. All proposed 400 kV lines will be double-circuit with projected capacities of roughly 3 GW. The existing plans for the transmission network will create a grid that can indeed accommodate the 4.2 GW of solar and 500 MW of wind.



## ANNEX 2: IMPLEMENTATION ARRANGEMENTS

### COUNTRY : Bangladesh Bangladesh Scaling-up Renewable Energy Project

#### Project Institutional and Implementation Arrangements

1. **Institutional Arrangements.** SREDA is responsible for the coordination of Bangladesh's SREP Program. As the institution established by the GoB to promote renewable energy (and energy efficiency) in Bangladesh, SREDA has the functional authority needed to coordinate the activities and ensure compliance with monitoring and evaluation requirements of development partners. SREDA will be the implementing agency for the resource assessment and waste-to-energy components of the Project.
2. SREDA is a government agency with a mandate to promote renewable energy and energy efficiency. Established in 2014 under the Power Division of the Ministry of Power, Energy and Mineral Resources, it is best positioned to coordinate between ministries and departments and facilitate enabling environment for renewable energy, such as laws, policies and regulations. SREDA has recently strengthened its capacity with an increased number of staff. Institutional assessment including fiduciary and safeguards capacity assessment will be undertaken during project preparation to identify specific capacity gaps to implement solar and wind resource assessment and waste-to-energy pilot components. The Project will include technical assistance and capacity building support for meeting the capacity gaps.
3. The EGCB will be the implementing agency of Component 1. To develop the Feni site for a renewable energy park, the EGCB will develop common infrastructure for the entire land, including civil works, risk mitigating measures and fencing, and implement the phase 1 of solar PV development, which will be 50 MW solar PV generation facility through the EPC and O&M contract. Developing common infrastructure upfront and demonstrating 50 MW scale at the site will help attract private sector developers to bid for the solar park by mitigating uncertainties and risks and reducing upfront cost burden. The Ministry of Finance will be the borrower of IDA credit that will be on-lent to the EGCB to finance the development as public investment.
4. Within the financial institutions of Bangladesh, IDCOL has the richest experience in renewable energy and infrastructure project financing. IDCOL is already mandated to finance renewable energy and infrastructure projects listed in Government's priority list and implemented by the private sector. Accordingly, the organization was equipped with appropriate policies, procedures, and manpower to develop capacity to identify investment opportunities and assess small, medium and large infrastructure as well as renewable energy projects. In case of renewable energy projects, IDCOL apart from extending financial support also closely monitors the market for compliance of renewable energy technologies and maintains required technical standards to ensure the quality and sustainability of its programs and projects. At present, IDCOL is financing a diverse portfolio of renewable energy initiatives among which Solar Home System, Solar Irrigation, Solar Mini-Grid, Biogas Plant and Improved Cook-stove have



transformed the lives of rural households with reliable and affordable source of energy. REFF will benefit from the experience of IDCOL together with assistance of the World Bank.

5. The REFF financing terms and IDA guarantees are proposed to be included as part of the request for proposal (RFP) documentation of the auction process, although as an option to the bidders. Thus the selection of appropriate financing products of REFF will be designed by IDCOL as a result of preliminary due diligence and safeguards for each project to be auctioned. This will allow IDCOL to lead the selection and appraisal, including undertaking risk assessment, due diligence and credit analysis of projects. A key requirement for IDA supported projects is to ensure procurement, environment and social safeguards are compliant with WB policies and procedures. IDCOL, through the existing Solar Home System project, is experienced in implementing WB policies and procedures and therefore can prepare renewable energy projects. IDCOL also is experienced in implementing and monitoring renewable energy projects. IDCOL's experience in both appraisal and monitoring would add significant value to other commercial banks to learn and build their own capacities.

6. The expected amount of financial support from IDA and SREP is approximately US\$162.38 million to initiate the REFF. This will provide adequate capital for REFF to support initial set of projects while further projects are being developed. The proposed pipeline includes both new projects identified by some of the public agencies as well as some of the directly negotiated private sector projects with GoB. The financing plan based on the project sites, proposed generation capacity and investment level identified as part of this project are outlined below. Notwithstanding this, REFF will provide support to projects on a first-come first-served basis.

Table 4. Expected REFF Contribution to support Indicative Generation Capacity and Investment Levels

Project Sites	Generation Capacity (MW)	Indicative Investment (USD million)	Expected Start Year	Expected REFF Support to sub-projects	
				20% of CAPEX	30% of CAPEX
Feni/EGCB	50-100	75-150	2018	15-30	23-45
Rangunia/BPDB	60	90	2018	18	27
BEZA	200	300	2019-20	60	90
Various Sites under Direct Negotiation with Private Sector*	200	300	2017-18	60	90
<b>Total</b>	<b>510-560</b>	<b>765-840</b>	<b>2017-20</b>	<b>153-168</b>	<b>230-252</b>

\* The total generation capacity of directly negotiated projects may exceed 200 MW. Depending on the readiness, contractual terms and conditions, pricing and financing needs of these projects, REFF may be able to support few projects.

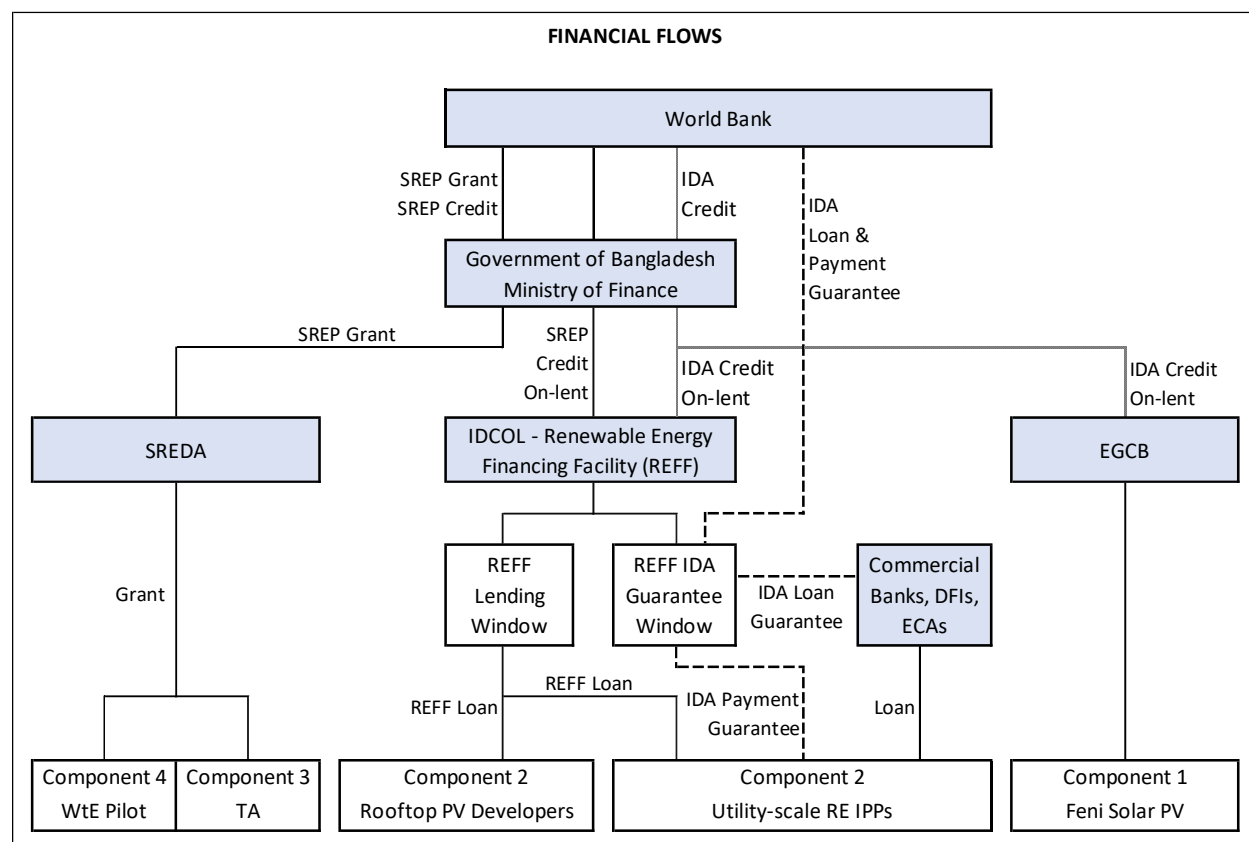
7. REFF Products: Considering the growing needs for infrastructure financing in Bangladesh, REFF retains the flexibility to provide the most appropriate financing product needed for the projects. It is expected that REFF may participate in senior debt, mezzanine and/or subordinated debt tranches. However, it is important to ensure that REFF is reflective of the market and does not distort the market terms by crowding out commercial financiers. The terms of REFF products have to meet as a minimum, the cost of the funds to REFF plus an on-lending margin reflecting: (i) IDCOL's operations management costs, and (ii) a credit risk margin. The tenors, other terms and conditions may be more flexible than the



market terms such that the benefits of REFF are reflected in underlying tariff reductions. The exact choice of financing product will be assessed by IDCOL based on specific project needs.

8. The overall structure of implementation arrangement and fund flow is illustrated as below.

Figure 5. Structure of Implementation Arrangement and Fund Flow



9. The proposed on-lending, through financial intermediary, and guarantee structure illustrated in Figure 5 above is structured based on experience from recent IPFF operations in Bangladesh and WB guarantee structures used in Nigeria, Kenya and Maldives.

10. In addition to the above structure, the IDA will enter into specific contractual agreements for the IDA guarantees for the sub-projects with relevant contractual beneficiaries. The guarantee will be offered as a series of guarantees, however, the terms of such guarantees will be specifically designed for each sub-project. To provide maximum flexibility at this stage of the Project, both IDA Payment guarantees and IDA Loan guarantees are contemplated to be offered. The maximum amount of IDA guarantees is US\$ 80 million for a target capacity of 200 MW. The sub-projects can benefit from payment guarantees to mitigate default on ongoing payments and termination payments by the off-taker (BPDB), and/or loan guarantees to mitigate default on debt service repayment from developers to commercial financiers.

11. Currently, IPPs receive payment security on a rolling 12 months Letter of Credit cover from BPDB, through a GoB state owned bank. BPDB is the single offtaker of grid-tied electricity in Bangladesh. Annex





3 provides an assessment of offtaker BDPB and presents a rationale for the use of IDA guarantees for better risk mitigation and cost efficiency. Further to this assessment, the proposed design is to offer IDA payment guarantees to cover a maximum of [3-6] months of PPA and/or other SoE/Government payment or performance obligations through a stand by letter of credit structure. The IDA loan guarantee structure is expected to provide primarily extension of tensors for domestic banks but also may provide other structures (rolling interest and/or principal, fixed first loss principal cover, etc) to regional and international banks providing commercial loans to IPPs. The proposed financing structure include a proportion of financing expected from DFI/ECA tranches, including from IFC or MIGA insured tranches. The following figures provide an illustrative example of IDA payment and loan guarantee structures.

Figure 6. Indicative IDA Payment Guarantee Contractual Structure

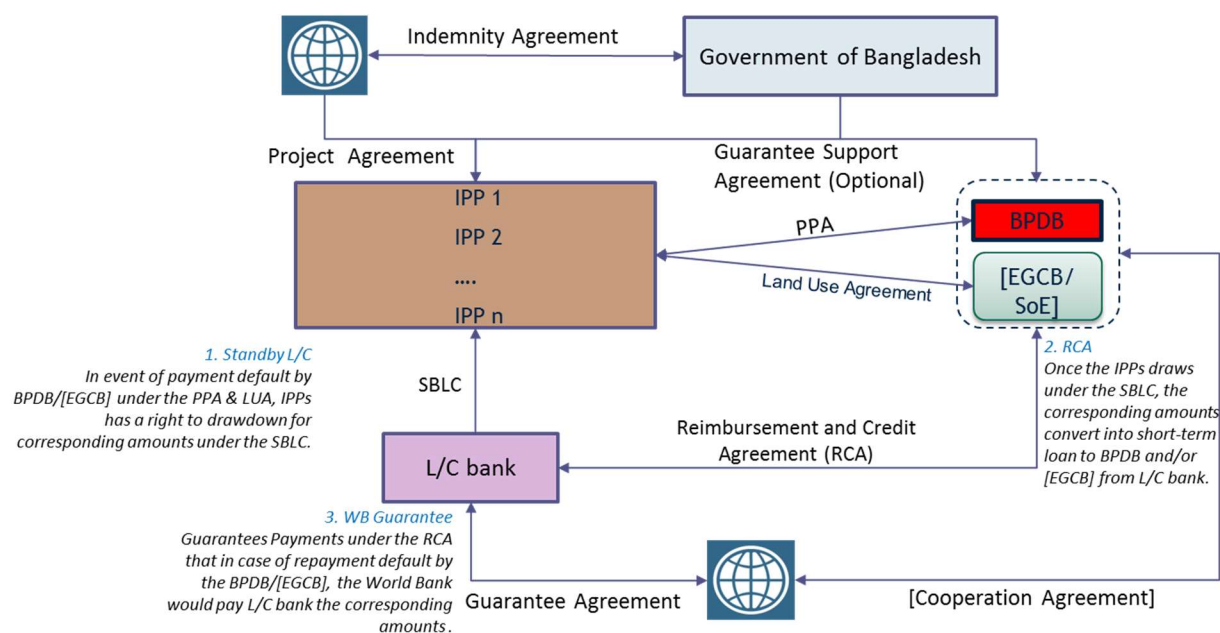
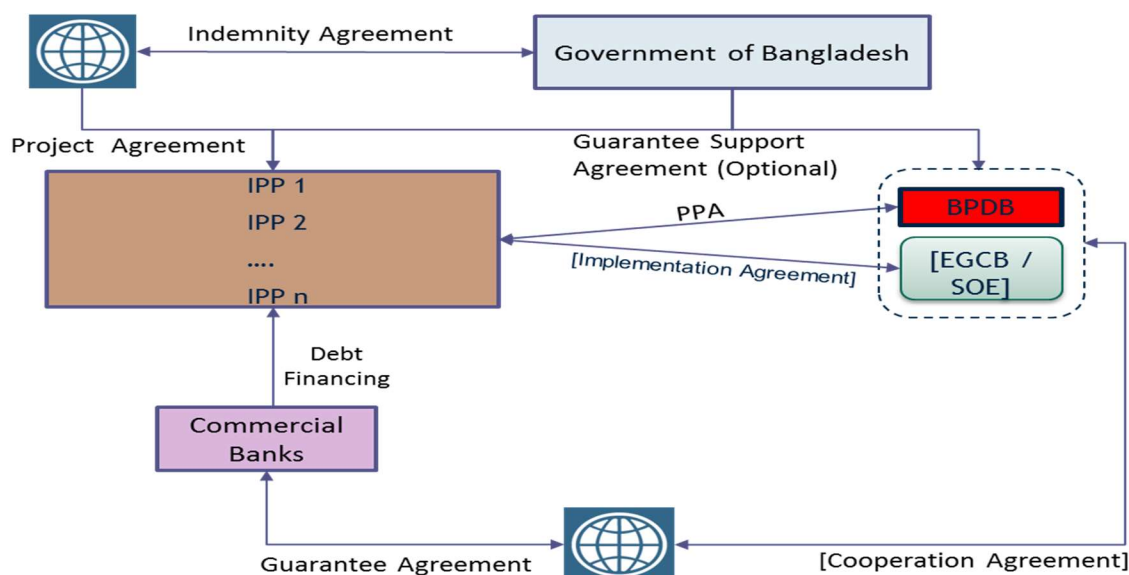






Figure 7. Indicative IDA Loan Guarantee Contractual Structure



12. The Ministry of Finance will be the borrower of IDA and SREP funding that will be on-lent to IDCOL. The on-lent proceeds along with resources from IDCOL and other sources will provide capital base for the Lending Window. A proportion of SREP non-grant funding may be allocated as SREP guarantees along with IDA guarantees in the Guarantee Window subject to further market assessment. Together, the REFF guarantees will be able to mobilize an additional capital of around US\$272 million.

Table 5. Indicative Financing Plan under the REFF

(Figures in US\$ millions)

	Utility-scale RE	Rooftop solar PV
<b>Target capacity (indicative)</b>	<b>170 MW</b>	<b>30 MW</b>
a. Estimated Project Cost (\$1.4/W for utility-scale RE, including land development; \$1/W for rooftop)	238	30
b. Estimated Private Equity (30%; 25%)	72	8
c. Estimated Debt	166	22
d. Of which commercial borrowing with IDA Guarantees	72	-
e. Of which Development Finance Institutions	34	-
f. Of which REFF financing (IDA and SREP)	60	22
g. Estimated Private Capital Raised (b+d) <sup>29</sup>	144	8
<b>h. Estimated Total Capital Raised (b+d+e)</b>	<b>178</b>	<b>8</b>

13. The figure below illustrates an indicative REFF financing features and guarantee claims processes. This structure will be further refined as detailed market assessments are conducted on the need for

<sup>29</sup> Taking into account the private equity and commercial borrowing only.



suitable risk mitigation and credit enhancement products for potential lenders and investors to invest in sub-projects.

Figure 8: Features of REFF Financing & IDA Guarantee

- IDCOL-REFF Lending Window will provide IDA and SREP on-lent amounts to sub-projects. IDA [and potentially, SREP] Guarantees are provided directly to sub-projects.
- REFF financing will be provided on a limited basis (10-20% of capital cost) to sub-projects through IPP auction mechanism for each sub-project.
- IDA guarantees will be offered directly through IPP auction process for each sub-project, up to a maximum of IDA (and SREP) guarantee amounts, to improve bankability and mitigate public sector risks.
- IDA Loan Guarantees are offered to commercial banks to mitigate debt service default risks; and IDA Payment Guarantees, through a Stand-by Letter of Credit structure (SBLC), to Project Entities (IPPs) to mitigate PPA payment default risks.
- For IDA Payment Guarantees, IDA will enter into Guarantee Agreement with SBCL Lender, Project Agreement with IPPs, Cooperation Agreement with BPDB/[EGCB] and an Indemnity Agreement with Government of Bangladesh.
- For IDA Loan Guarantees, IDA will enter into Guarantee Agreement with Commercial Lenders, Project Agreement with IPPs, Cooperation Agreement with BPDB/[EGCB] and an Indemnity Agreement with Government of Bangladesh.

## Financial Management

14. A financial management assessment for the Project indicates a ‘substantial’ risk in financial management (FM). The main drivers of the FM risks identified are: (i) the involvement of multiple IAs and accounting centers; (ii) no experience of SREDA in managing the IDA finance and IDA financial management procedures and requirements; and (iii) no experience of EGCB in managing the Designated Account of IDA credit. The initial focus of the work to mitigate the initial substantial risk would be, (a) training of FM staff at executing agencies; (b) Development of comprehensive project specific financial manual; (c) Interim Financial Reporting; and (d) annual audit by an independent auditor etc.

15. The assessment has concluded that with the implementation of the proposed risk mitigation measures the proposed financial management arrangements will be considered satisfactory to the Bank’s minimum requirements under OP/BP10.

16. The implementing agencies, EGCB, IDCOL and SREDA, are State Owned Enterprises/ autonomous body/ Government entity of Bangladesh. Review of financial management and accountability arrangements of these three entities shows that EGCB and IDCOL have institutionalized certain fundamental principles, in commensurate with other public sector undertakings in Bangladesh in areas like budgeting, internal controls, accounting, reporting and auditing, which have laid the foundation for a basic financial accountability framework in these organizations. While IDCOL and EGCB are well



established companies with institutionalized standard processes which have been operational for the past few years, SREDA on the other hand is a very new entity with evolving systems and processes and therefore has a greater need to improve financial accountability arrangements commensurate with the future growth plan of the entity.

17. EGCB, the implementing agency for the Component 1, has been implementing the 300 MW gas turbine power station under the Siddhirganj Peaking Power Project (SPPP) using IDA credit since 2008. The financial management systems of EGCB are acceptable to IDA as it has gained adequate experience in Bank project implementation from their participation in the SPPP project. The Statutory Audit Reports of EGCB shows unqualified audit opinions on the Financial Statement (FS) of the entity for FY 2015-16, which means the financial statements, in all material aspects, give true and fair view of the financial state of the entity.

18. IDCOL has acquired substantial experience in IDA financial management procedures and requirements. IDCOL, the implementing agency for the component of Renewable Energy Financing Facility (REFF) through using the facility of two windows-a Lending window and a Guarantee window, currently implementing the RERED II project using IDA credit. IDCOL's FM organization and system are found to be adequate to manage its operation and to undertake project financial management activities. IDCOL is in the process of full-computerization of its accounting system that will allow for automatic generation of interim project reports without any scope for manipulation and errors. The project audit reports of RERED II and statutory audit reports of IDCOL shows unqualified audit opinions on financial statements for FY 2015-16 and 2014-15 respectively, which means the financial statements give true and fair view of the financial state of the project and the entity.

19. Sustainable and Renewable Energy Development Authority (SREDA) has been formed under the Sustainable and Renewable Energy Development Authority Act, 2012 (Act No. 48 of 2012), of the Bangladesh Parliament, as a nodal agency to promote, facilitate and disseminate sustainable energy (SE), i.e. covering both the areas of Renewable Energy (RE) and Energy Efficiency (EE) to ensure the energy security of the country. SREDA, the implementing agency for the component "Renewable Energy Resource Assessment and Technical Assistance" and Component "waste-to-Energy Pilot". SREDA has no prior experience in IDA financial management procedures and requirement, however, currently there are four projects being implemented by this entity e.g. "Development of Sustainable Renewable Energy Power Generation (SREPGen)" funded by Global Environment Facility (GEF) and "Renewable Energy and Energy Efficiency Program".

20. As a new organization with limited operational experience, there may be deficiencies in financial management capacity, inadequate capacity to address external audit issues, inadequate management information systems (MIS). However, SREDA 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 purposes. As there is no experience in managing the IDA finance and IDA financial management procedures and requirements, the SREDA may need further training to enhance their FM monitoring skills.

## Disbursements



21. IDA funds will be channeled through three separate Designated Accounts (DA) operated by each agency. Each agency will submit audited annual financial statements and interim unaudited financial reports for their specific project responsibilities to IDA. Initially disbursements for project will follow the “SOE” based principle whereby funds will be front-loaded to the Designated Account based on the cash forecast for the following two quarters.

22. The project’s financial statements for each of the implementing agency will be audited by the Independent Auditor and must be submitted to the Bank no later than 6 months (December 31) after the FY-end.

## Procurement

23. All goods, works, non-consulting services and consulting services required for the Project and to be financed out of the proceeds of the Financing shall be procured in accordance with the requirements set forth or referred to in the World Bank’s “Procurement Regulations for Borrowers under Investment Project Financing”, dated July 1, 2016 (Procurement Regulations). Procurements under the Coponent-2 of the project will not follow the Procurement Regulations as the Procurement Regulations do not apply to the procurement of Goods, Works, Non-consulting Services, and Consulting Services financed by the Bank through loans made by eligible financial intermediaries to private borrowers. Procurement Regulations also do not apply in case of Bank Guarantees, provided by the Bank.

24. Procurement Responsibility: Each of the three PIUs will centrally process all procurements for their respective implementing agencies – EGCB, IDCOL, and SREDA.

25. Procurement risks. Out of three implementing agencies, IDCOL and EGCB have prior experience in implementing Bank financed project. The fiduciary assessment carried out for the agencies indicates “substantial” risk in procurement operations and contract management. The main drivers to the risks are associated to capacity constraint in the agencies, in performing procurement and contract management related activities, and delay in procurement processing. Several measures to mitigate the risks would be put in place as described below.

26. *Managing Procurement Risks:* In order to minimize the procurement associated risks, the following measures have been agreed upon with the implementing agencies:

### (a) General

- i. *Project Procurement Strategy for Development (PPSD) and Procurement Plan:* A PPSD is to be developed by the Implementing Agencies, in agreement with the Bank, taking into account the volume of items to be procured, prevailing market conditions, activity level risks etc. The PPSD will spell out the appropriate procurement strategy for this project. PPSD is a live document and it is to be updated at least annually. As an output of the PPSD exercise, initial Procurement Plans for the implementing agencies will be prepared. For each contract to be financed under the project, the different selection methods for procurement, market approach, the need for pre-



qualification, contracting arrangement, estimated costs, prior review requirements and time frame will also be agreed between the implementing agencies and the Bank in the Procurement Plan;

- ii. *Introducing STEP system:* Systematic Tracking of Procurement Exchanges system (STEP) will be introduced to prepare and manage procurement plan and procurement transactions under the project. The procurement plan will be updated semi-annually (or as required) using STEP system;
- iii. *Bid/Proposal Evaluation Committee:* All 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, as well as alteration in the composition or membership, of the bid/proposal evaluation committees.
- iv. *Electronic Government Procurement (e-GP):* Request for Bids (Open-National) contracts under use the e-GP system of the country;
- v. *Identify Procurement Focal Persons (PFP) in all three agencies:* Each of the implementing agencies shall nominate a procurement focal person for their part of the project. The appointed focal person will take necessary training in procurement including preparation of PPSD. The focal persons will help the respective agencies in day-to-day procurement follow-up and preparation of periodic procurement reports.
- vi. *Due-diligence Measures:* the following measures will be adopted 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's Procurement Regulations and Public Procurement Rules, to facilitate smooth procurement audit or post-review; and (e) publish contract award information on the Central Procurement Technical Unit (CPTU) and the respective agencies website within two weeks of contract award (and in UNDB online for international contracts).

**(b) Special Measures for Internationally Advertised Contracts**

- i. *Service of international technical and procurement experts for EGCB:* EGCB will recruit one international procurement expert and one international technical expert (solar power plant expert) to act as the member of Bid Evaluation Committee (BEC) for internationally advertised supply & installation/works contracts under the project.
- ii. *Bid/Proposal Evaluation Committee (BEC).* EGCB will form a Bid Evaluation Committee for internationally advertised contracts for supply & installation/works. The committee will consist of five members including international procurement expert, international technical expert and three other members of the respective



implementing agency. Formation of such BEC/PEC shall be subject to Bank's acceptance.

- iii. *Extra due diligence for the local agents and sub-contractors:* All implementing agencies will undertake extra due diligence on the local agents and major sub-contractors.

27. **Selection Methods for Procurement of Goods, Works and Non-consultancy services:** Except as otherwise agreed in the Procurement Plan, goods, works and non-consulting services may be procured on the basis of Request for Bids (Open-International) procurement method. As allowed under the World Bank's "Procurement Regulations July 1, 2016", other selection methods, market approach, and contract arrangement as agreed in the Procurement Plan on a case to case basis can also be used.

28. **Selection Methods of Procurement of Consultants' Services:** The Procurement Plan will specify the selection method, market approach (International/National, Open/Limited/Direct) and contract modality for each of the selection of consultant following the World Bank's "Procurement Regulations July 1, 2016".

29. **Use of Standard Procurement Documents:** For all procurements under the project, the Bank's Standard Procurement Documents shall be used. In case of unavailability of a particular procurement document, the implementing agencies shall use model tender documents (MTD) agreed with the Bank.

30. **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.

31. **Procurement Strategy for Component 1:** The strategy is to construct the power plants in phases. In the 1st phase, a 50 MW Solar Power Plant will be built by EGCB through an Engineering, Procurement, and Construction (EPC) contract, the same contractor/operator will also be responsible for the Operations and Maintenance (O&M) of the plant at least for 5 years – the idea is that the EGCB's Solar Power Plant will encourage the private sectors to bid for solar power plants in the 2nd phase on Build-Own-Operate (BOO) or Build-Own-Operate-Transfer (BOOT) basis. EGCB's EPC contract will follow the Request for Bids (RFB) method of procurement with Pre-qualification (PQ) process. Market approach for this procurement will be Open-International- Two Envelopes. It will be a performance based contract with a provision of staggered lump-sum payments throughout the O&M period.

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

32. **Applicable Environmental Category and Safeguard Policies.** Given the financial intermediation proposed for majority of the investment, the environmental assessment (EA) category will be FI. The World Bank Safeguard policy Environment Assessment (OP/BP 4.01) and Natural Habitats (OP/BP 4.04) are triggered. Also Performance Standards for Private Sector Activities (OP 4.03) will be applied for sub-projects under the Renewable Energy Financing Facility (REFF) that are designed, owned, constructed, and/or operated by a Private Entity.

33. **Approach to Address Environmental Safeguard Issues.** The Project intends to ensure that the proposed infrastructure takes environmental concerns into account. One subproject 'Utility-Scale Solar





PV in Feni District' is already identified and will be implemented by the state-owned generation utility, Electricity Generation Company of Bangladesh (EGCB). A detailed Environment and Social Impact Assessment (ESIA) is being carried out by EGCB following the World Bank safeguard policy.

34. The Project also supports the establishment of the Renewable Energy Financing Facility (REFF) hosted in Infrastructure Development Company Limited (IDCOL). The Facility will offer necessary financing instruments, including loan and risk mitigation guarantee, to support a series of sub-projects on renewable energy by domestic and international private developers and commercial financiers. While the primary focus of technology will be utility-scale solar PV and wind as well as rooftop solar PV, with a target of supporting 200 MW of installed capacity, other renewable energy technologies such as waste-to-energy will also be supported, if and when feasible. The location and degree of impact of potential sub-projects in the public sector (shared infrastructure within the solar park, transmission evacuation, resource assessment, and waste-to-energy) are not yet known. Therefore a framework approach is adopted for managing environment and social safeguard in accordance with the Bank Safeguards Policy 4.01. An Environment and Social Policies and Procedures (ESPP) is being developed jointly by SREDA and IDCOL in accordance with Bank Safeguards Policies. The ESPP is being prepared in accordance with the Bangladesh Environment Conservation Rules 1997, and the World Bank Safeguard Policies OP 4.01 – Environment Assessment along with the OP4.03 – Performance Standards for Private Sector Activities. The ESPP is being prepared based on the sample site visits at proposed intervention areas and several discussions with the relevant stakeholders. The ESPP lays out the guideline for developing the specific environment assessment document for the subprojects to be implemented by public agency. The ESPP is also a guiding document for preparing necessary safeguard instruments for the sub-projects under the Renewable Energy Financing Facility (REFF) that are designed, owned, constructed, and/or operated by a Private Entity. Overall the ESPP will be the guiding document for subproject-specific(i) environmental screening and assessment; (ii) establishment of “baseline environment”; (iii) analysis of alternatives; (iv) identification of major sub-project activities and evaluation of the overall potential environmental impacts; (v) carrying out public consultations; (vi) identification of mitigation measures and preparation of ESMP; (vii) monitoring of the implementation of ESMP. The ESPP will also identify the institutional barriers and capacity building needs for the respective agency for proper environmental management.

35. Based on the ESMP, the agency will be responsible to carry out environmental screening/assessment along with analysis of alternatives and to prepare an Environmental and Social Management Plan (ESMP) with budget. The Environmental and Social Management Plans (EsMP) needs to be incorporated in the bid document and the cost for the implementation of ESMP will be a line item of the Bill of Quantities (BOQ). The agency will also be responsible for getting necessary environmental clearance from the Department of Environment (DoE).

36. **Environment Impacts and Mitigation Measures.** It is anticipated that renewable energy contributes to reduced environmental impacts significantly when compared to the energy generated from fossil fuels, however, there might still be environmental impacts associated with renewable energy generation. Also wind turbines might have some impacts on birds and bats. Sounds/vibration and visual impacts are the main public concerns of wind turbines. Also Land alteration may be an issue when large utility scale solar or wind farms are developed and then these facilities are located on the areas. Proper



mitigation plan and monitoring plan is needed to ensure that no adverse impacts are occurring from the proposed roof top solar PV projects.

37. **Borrower's capacity on environmental safeguard.** Infrastructure Development Company Limited (IDCOL) where the Renewable Energy Financing Facility (REFF) is expected to be hosted has been implementing Bank-financed projects for years and has adequate knowledge of Bank safeguards policies. IDCOL has two full-time environment and social specialist, both of which were trained adequately on Bank safeguards policies. IDCOL has demonstrated its capacity to ensure compliance of Bank safeguards policies in sub-projects through its implementation of Bank-financed projects in renewable energy. EGCB has also implemented Bank-financed project Siddhirganj Power Plant and experience in Bank safeguard policy. They have an environment cell staffed by one Deputy General Manager (DGM), one Manager. Additional capacity building measures would be necessary for preparation of appropriate documents and maintaining compliance with OP4.03 which is new for the client. Such capacity building needs and consequent plans will be identified and implemented during preparation. Sustainable and Renewable Energy Development Agency (SREDA) will be responsible for implementing the resource assessment component and waste-to-energy pilot. Being relatively new agency, SREDA is yet to acquire full knowledge of Bank safeguards policies. The capacity gap will be assessed during project preparation and appropriate steps will be taken to address the capacity gap.

38. **Grievance Redress System.** The grievances emanate from the programmer may be varied. The proposed grievance mechanism as stated in the ESPP must be reviewed during ESIA or ESMP preparation and, if required, adjusted to suit the specific needs of the stakeholders, particularly building users and neighbors.

39. **Consultation and Disclosure.** The Specific EIA for Feni and the ESPP will be prepared in consultation with the key stakeholders and the communities. National consultation workshop has been planned later this year to share the draft EIA and ESPP with all the stakeholders. Consultation with communities has been made mandatory for environmental screening/assessment of each subproject to be financed during implementation stage. The EIA and ESPP along with Bangla summary version will be disclosed by EGCB, IDCOL and SREDA in their websites and hardcopies have been also available at respective headquarters and sub-project areas. Advertisement requesting public comments will be published in two daily Newspapers (English and Bangla). The ESPP will also be disclosed in World Bank operational site.

## **Monitoring and Evaluation**

40. EGCB, IDCOL and SREDA will provide the World Bank with quarterly physical progress and interim unaudited financial reports (IUFRs), annual information on progress of the key performance indicators for their respective project components, audited financial statements, and such other information as the World Bank may reasonably require. Monitoring and evaluation (M&E) will be linked to the project targets (key performance as well as intermediate indicators). EGCB, IDCOL and SREDA will carry out a midterm review and report its findings and conclusions to the World Bank three years after effectiveness and will review these with the World Bank. Section VII sets out the project's key performance as well as





intermediate results indicators. The World Bank will conduct field implementation support missions twice per year.



## ANNEX 3: ECONOMIC AND FINANCIAL ANALYSIS

### COUNTRY : Bangladesh Bangladesh Scaling-up Renewable Energy Project

#### Economic Analysis

##### *Feni Utility-scale Solar PV*

1. An economic analysis was carried out for the investment under Component 1: 50 MW utility-scale solar PV through the EPC contract. A list of assumptions used is presented below. The counterfactual is a high speed diesel (HSD)-fired power plant that generated the same amount of electricity, as it is the marginal generation of the power system at the moment.

Table 6. List of assumptions and results of the economic analysis

Item	Value
<b>Assumptions</b>	
PV system CAPEX	US\$1/W
Development of land and shared infrastructure CAPEX	40% of PV CAPEX
Solar park OPEX	1% CAPEX + 2% Revenue 3% increase p.a.
Capacity factor	22.5%
Degradation of PV output	1% p.a.
Lifetime	20 years
Avoided CAPEX of diesel-fired plant	US\$1/W for 14MW <sup>30</sup>
Avoided fuel cost of diesel	US\$0.45/litre, no increase
Emission factor of diesel	0.65 kg/kWh
Economic/social discount rate	10%
<b>Results</b>	
EIRR (without environmental externalities)	15.0%
EIRR (including environmental externalities)	20.0%
ENPV @ 10% (w/o environmental externalities)	US\$17.2 million
ENPV @ 10% (including environmental externalities)	US\$36.7 million
Lifetime GHG emission reduction	1.2 million tCO <sub>2</sub> eq

2. The economic internal rate of return (EIRR) is estimated about 15.0%, exceeding the hurdle rate of 10% for Bangladesh in accordance with the Bank guidance.<sup>31</sup> The economic net present value (ENPV) is about US\$17.2 million. Moreover, this solar PV generation facility has substantial local and global

<sup>30</sup> 14MW is calculated for a HSD plant which generates the same amount of electricity with 50MW solar PV, assuming 80% capacity factor for the HSD plant

<sup>31</sup> Source: Discounting Costs and Benefits in Economic Analysis of World Bank Projects, OPSPQ, 2016



environmental benefits and consideration of these benefits increases the EIRR of the solar park significantly. The inclusion of environmental externalities, including avoided costs of local pollution and global greenhouse gas emission (using the Bank guidance on social value of carbon), in the economic flows increases the EIRR to 20.0% (NPV US\$36.7 million).

3. The analysis indicates that the solar park will reduce GHG emissions by 1.2 million tons over the life of project compared to the current marginal generation using HSD. The marginal abatement cost of GHG emission for the investment is US\$69/ton. The solar PV facility will help avoid local and environmental damage costs equal to US\$20 million compared with the thermal counterfactual.

4. The sensitivity analysis was conducted to calculate the switching values for the important variables. The switching values that reduce the EIRR with environmental externalities down to the hurdle rate of 10% are 58% of cost overrun, 14% of capacity factor, and US\$ 0.2/liter of diesel price.

#### ***Utility-scale solar PV under REFF***

5. To assess potential IPPs for utility-scale solar PV to be supported by the REFF, an investment of 122 MW solar PV at the Feni site, which was suggested by the feasibility study for the phase 2 following the phase 1 of 50 MW EPC development, was evaluated. Many of the assumptions used are consistent with those for the previous economic analysis on the Feni site. Some assumptions are applied in a different way, including i) CAPEX of developing land and share infrastructure is excluded; and ii) instead the IPP pays annual fee of US\$1,140,000 for the use of land and common infrastructure within the site. In case that IPPs are invited to a site owned by public sector, the public entity can develop the land and common infrastructure first and charge fees to IPPs for the use of these facilities.

6. The EIRR is estimated about 22.3%, higher than the hurdle rate of 10% for Bangladesh. After taking into consideration local and global environmental externalities, consistent with the relevant Bank guidance, the EIRR becomes 29.5% and the NPV US\$112.7 million. The lifetime GHG emission reduction projected from this model IPP is 2.8 million tons of CO<sub>2</sub> equivalent. As the EIRR is higher than the Feni EPC due to avoiding the upfront development cost of land and shared infrastructure, the sensitivity analysis proves more room to accommodate adverse changes in the assumed variables.

#### ***Rooftop solar PV under REFF***

7. An economic analysis was carried out to a model investment of 500 kW rooftop solar PV at an industrial building without grid connection. Key assumptions can be found below. Considering the avoided cost of electricity from the grid during daytime, when the price for industrial consumers is BDT 7.57/kWh (equivalent to US\$ 9.6/kWh)<sup>32</sup>, the EIRR is estimated at 13.2%, higher than the hurdle rate for Bangladesh. Taking into account environmental externalities locally and globally increases the EIRR to 20.4%. The lifetime GHG emission reduction is projected around 9,850 tons.

Table 7. List of assumptions and results of the economic analysis

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<sup>32</sup> From the flat tariff (5am-5pm) for industrial customers of Dhaka Electric Supply Company Limited (DESCO)



Item	Value
<b>Assumptions</b>	
Rooftop PV system CAPEX	US\$1/W
Rooftop PV system OPEX	1% CAPEX 3% increase p.a.
Capacity factor	19%
Degradation of PV output	1% p.a.
Lifetime	20 years
Avoided payment for grid electricity	BDT 7.57/kWh
Emission factor of HSD (marginal generation of grid)	0.65 kg/kWh
Economic/social discount rate	10%
<b>Results</b>	
EIRR (without environmental externalities)	13.2%
EIRR (including environmental externalities)	20.4%
ENPV @ 10% (w/o environmental externalities)	US\$48,000
ENPV @ 10% (including environmental externalities)	US\$214,700
Lifetime GHG emission reduction	9,850 tCO <sub>2</sub> eq

8. The sensitivity analysis informed that even with 58% of cost overrun the EIRR including externalities is at 10%, remaining economically feasible. At 12% of the capacity factor the EIRR of the investment exceeds the hurdle rate of Bangladesh.

## Financial Analysis

### *Feni Utility-scale Solar PV*

9. Additional assumptions used for the financial analysis is in Table 8. The investment will be fully financed by IDA credit, which will be on-lent from the Government to the EGCB. The terms of on-lending will be further determined by the GoB, but for the purpose of the analysis the terms of previous on-lending project were assumed. The feasibility study reported that the project site would be able to host 172 MW of solar PV and 10 MW of wind. This investment includes not only 50 MW of solar PV generation but also the development of the entire Feni site and shared infrastructure, including access road, evacuation and other required facilities within the site, to invite private sector bidders in the rest of the project site. Therefore, additional revenue would accrue when IPPs start using land and shared infrastructure, which is assumed from year 3.

Table 8. List of assumptions and results of the financial analysis of Feni Solar PV

Item	Value
<b>Assumptions</b>	
Proportion of CAPEX for debt financing	83%
Proportion of CAPEX for equity financing	17% (US\$12m of land cost)
Interest rate of debt financing	4%
Tenor of debt financing	20 years, 5 years of grace period



Required return on equity	15%
Corporate income tax rate	35%
WACC	4.71%
Depreciation	Straight line over the lifetime
Additional revenue from potential IPPs (for the use of land and shared infrastructure)	US\$1,140,000 p.a. (from Year 3)
PPA tariff	US\$ 0.08/kWh
<b>Results</b>	
Levelized cost of electricity	US\$ 0.066/kWh
Project IRR	7.0%
FNPV	US\$12.7 million

10. The EGCB will be paid by the offtaker, the BPDB, based on a PPA which will be negotiated at a later stage of project development. For two other power plants that the EGCB is currently operating, the level of PPA tariff reflects the actual cost of generation. The same principle is expected to apply for this investment to cover the entire cost of generation through the PPA. For the purpose of financial analysis the PPA tariff is assumed at US\$ 8/kWh (approximately BDT 6.3/kWh).

11. The project IRR would be around 7.0%, which is higher than the weighted average cost of capital (WACC) of 4.71%. The financial NPV is estimated about US\$12.7 million, discounted at the WACC. The levelized cost of electricity is projected around US\$ 6.6/kWh.

12. A sensitivity analysis was carried out for key assumptions. The switching values of key variables, which makes the project IRR down to the cost of financing, 4%, are 18.2% of capacity factor and 23% of cost overrun.

### ***Financial Sustainability of EGCB***

13. Electricity Generation Company of Bangladesh Limited (EGCB) is one of the power generation companies in Bangladesh that sell generated electricity to the single off-taker, the Bangladesh Power Development Board (BPDB). Founded in 1996 and converted from Private Limited Company to Public Limited Company in 2009, it is currently operating two power plants, namely Siddhirganj 2X120 MW Peaking Power Plant and Haripur 412 MW Combined Cycle Power Plant, financed by the Asian Development Bank (ADB) and the Japan International Cooperation Agency (JICA) respectively. Another power plant, Siddhirganj 335 MW Combined Cycle Power Plant, is under development with IDA credit. All of its long-term debt is provided by either the GoB or DFIs.

14. Since the commissioning of the first plant in May 2012, the EGCB has increased its net profit until FY2015. In FY2016, it recorded net loss of BDT 183 million, due to mainly two reasons. First, the Haripur CCPP was shut down for eight months, from June 2015 to January 2016, due to the breakdown of gas turbine, which significantly reduced the revenue. Also there was gas supply shortage at the Siddhirganj PPP which as a result could not operate in full load. The Haripur CCPP is now back to normal operation but the issue of gas supply is still unclear, though its impact on the revenue is relatively small. The profitability is expected to turn around in FY2017.



Table 9. Key financial metrics of EGCB

(Unit: BDT mil)	FY2012	FY2013	FY2014	FY2015	FY2016
Revenue	2,144	2,019	2,765	5,199	4,018
Operating profit	224	897	812	1,170	(116)
Net profit	146	306	355	601	(183)
Net margin (%)	6.8	15.2	12.9	11.6	(4.6)
ROE (%)	4.0	7.1	5.2	5.7	(1.8)
Current ratio (x)	2.4	1.7	2.0	1.0	1.2
LT Debt to equity (x)	6.0	8.3	6.9	4.1	5.0
DSCR (x)	n/a	1.52	1.86	1.70	1.21
DRO (days)	304	376	543	198	222
DPO (days)	36	42	130	94	101

15. Liquidity, leverage and capacity to pay debt service are stable. The current ratio is at 1.2 in FY2016, increased from the lowest in FY2015. Long-term debt is 5 times of equity, and debt service coverage ratio has been over 1.2 ever since. Account receivable is collected within a year, except FY2014, and account payable is paid in about 3 months.

16. The proposed investment under Component 1 is expected to improve the overall financial sustainability of the EGCB over the long run. The financial analysis of the investment demonstrates that the project IRR is 7.0%, exceeding the cost of capital, at the tariff of US\$ 0.08/kWh. The average net profit margin will be 16.4% over 20 years, with the DSCR over 1.2 throughout the loan repayment period. Although the financial analysis is dependent on the level of PPA tariff, in any case, the tariff for this solar PV investment will be sufficient to cover the actual cost. For EGCB's two existing thermal plants, the EGCB is being paid by the offtaker, BPDB, based on PPAs. The level of tariff on PPAs reflect the actual cost of generation. The principle of having a cost-recovery tariff will be maintained for the solar PV development at Feni, and therefore the entity will recover its cost associated with electricity generation. Furthermore it will help diversify the revenue portfolio, which relies on only two power plants at the moment, to enhance its resilience to the gas supply problem or any unforeseen issue, altogether improving the financial sustainability of the entity.

#### **Utility-scale solar PV under REFF**

17. Assumptions used in the financial analysis are presented below. With these assumptions, the return on equity (ROE) is projected to be 18.2% with the PPA tariff of US\$ 0.08/kWh, which is competitive to the current marginal generation with HSD. The average DSCR is 1.26, exceeding debt financiers' general requirement of 1.25. The loan life coverage ratio (LLCR) is also higher than the generally accepted threshold for financial viability, 1.25. The NPV is a less comparable metric in this case as the uniform WACC cannot reflect various financing terms of different instruments and changing mix of debt and equity. IDA guarantee offered at competitive auctions may further improve the financing terms of commercial loans.

Table 10. List of assumptions and results of the financial analysis of utility-scale solar PV

Item	Value
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<b>Assumptions</b>	
Debt financing of CAPEX	70%
by loan tranche 1: REFF loan	25%
by loan tranche 2: other DFI/commercial loans	45%
Equity financing of CAPEX	30%
Required return on equity	15%
Loan tranche 1 - interest rate	7%
Loan tranche 1 - tenor	15 years, 5 years of grace period
Loan tranche 2 - interest rate	10%
Loan tranche 2 - tenor	10 years, 1 year of grace period
Corporate income tax rate	40%
Weighted average cost of capital (WACC)	8.25%
Depreciation	Straight line over the lifetime
PPA tariff	US\$ 0.08/kWh
<b>Results</b>	
Levelized cost of electricity	US\$ 0.073/kWh
Project IRR	9.1%
IRR to equity holder	18.2%
Average debt service coverage ratio (DSCR)	1.26
Loan life coverage ratio (LLCR)	1.93

18. If the PPA tariff goes down to US\$ 0.074/kWh, the return on equity would decrease to 15%, which is likely the minimum return required in Bangladesh. In this case, the minimum DSCR would be 0.95, undermining the creditworthiness of the project from debt financier's perspective. If the CAPEX turns out to be higher by 23%, the return on equity would be again around 15%. The switching value of the capacity factor would be 18.5%, reduced by 4%p, to make the IRR to equity holder 15%.

### ***Rooftop solar PV under REFF***

19. The same model investment of 500 kW rooftop solar PV used for the economic analysis was assessed for the financial analysis. Additional assumptions on financing are below. With the assumptions, the levelized cost of generation is estimated around US\$ 0.090/kWh, which is lower than the retail tariff for industrial users, BDT 7.57/kWh (equivalent to US\$ 0.096/kWh). Therefore the investment is financially viable. The return on equity would be around 21.6% taking into account the avoided cost of electricity to be paid to the grid.

Table 11. List of assumptions and results of the financial analysis of rooftop solar PV

Item	Value
<b>Assumptions</b>	
Debt financing of CAPEX from REFF	75%
Equity financing of CAPEX	25%
Required return on equity	15%
REFF loan - interest rate	6%
REFF loan - tenor	10 years, 1 year of grace period



Results	
Levelized cost of electricity	US\$ 0.09/kWh
Project IRR	11.3%
IRR to equity holder	21.6%

20. If the interest rate increases up to 8%, the LCOE of the rooftop system would be about US\$ 0.094/kWh, still making the business case of the rooftop system. However the return on equity would be reduced to 17.4%, which could be lower than the expected return, and the minimum DSCR would be 1.03, barely paying debt obligations.

### ***Financial Assessment of BPDB, the offtaker***

21. Bangladesh Power Development Board, BPDB, is a statutory body created in 1972 by Presidential Order after bifurcation of Bangladesh Water and Power Development Authority. It is now under the Power Division of the Ministry of Power, Energy and Mineral Resources and the core business includes generation, transmission and distribution of electricity.

22. As of 2016, Bangladesh has the installed capacity of 12,365MW and plans to add additional 17,984MW of new generations by 2021 in order to mitigate the growing demand to reach the generation capacity of 24,000MW. The following Table x.1 shows an overview of the current generation mix by type of plant and fuel.

Table 12. Installed capacity by plant and fuel type

By type of plant		By type of fuel	
Hydro	230MW (1.86%)	Gas	7,628MW (61.69%)
Steam Turbine	2,578MW (20.85%)	Furnace Oil	2,629MW (21.26%)
Gas Turbine	1,193MW (9.65%)	Diesel	1,028MW (8.31%)
Combined Cycle	3,293MW (29.63%)	Power Import	600MW (4.85%)
Power Import*	600MW (4.85%)	Hydro	230MW (1.86%)
Reciprocating Engine	4,471MW (36.16%)	Coal	250MW (2.02%)
Total	12,365MW (100%)	Total	12,365MW (100%)

\* Power imported from India

23. BPDB has been functioning as a single buyer in the power market of Bangladesh. It purchases power from both public and private generation companies and sells bulk electricity to its subsidiary distribution utilities (DPDC, DESCO, WZPDCL, REB) including six distribution zones.

24. In year 2015-16, BPDB including its subsidiaries recorded net energy generation of 52,193GWh. Public sectors produced 22,586GWh while private sectors (IPP, SIPP and Rental) produced 23,786GWh, imported 3,822GWh and REB (Rural Electrification Board) generated remaining 1,999GWh. Compared to FY 2014-15, power purchased from IPP have increased by about 23% replacing power from Rental and lowering average cost of generation from 6.27 Taka/kWh to 5.55 Taka/kWh. Therefore, it is expected that reducing the Rental power and replacing with other source of power can lower the total average cost of





generation, thus impacting overall net profit of the entity. Details of generation cost from BPDB's own plan and other sources are shown below.

Table 13. Generation cost of BPDB's own plant and electricity purchase from other sources

Particulars	FY 2015-16		FY 2014-15		Increase/ (Decrease)
	Amount (BDT million)	Cost (BDT/kWh)	Amount (BDT million)	Cost (BDT/kWh)	
1. BPDB's Generation	56,260.9	4.40	54,276.8	4.73	3.66%
2. Purchase from IPP	75,651.8	5.11	61,313.3	6.32	23.39%
3. Purchase from Rental	64,520.1	6.91	87,747.8	8.90	(26.47%)
4. Purchase from Public Plant	39,938.3	4.22	33,655.9	3.62	18.67%
5. Purchase from India	19,668.7	5.15	19,003.7	5.62	3.50%
6. Interest on budgetary support	9,946.5	0.20	7,806.6	0.18	27.41%
7. Provision for Maintenance and Development fund	12,705.0	0.25	10,343.5	0.24	22.83%
TOTAL	278,691.2	5.55	271,417.6	6.27	1.66%

25. Taking a closer look at the electricity purchase from rental and quick rental plants in Table 14, it is observed that rental and quick rental plants using HFO and HSD fuel has much higher generation cost compared to gas. Again, replacing those plants with cheaper generation sources such as IPP will significantly lower average cost of generation.

Table 14. Comparison of electricity purchase from rental and quick rental plants

Nature of Fuel	FY 2015-16		FY 2014-15	
	Total kWh	Average cost (BDT/kWh)	Total kWh	Average cost (BDT/kWh)
Gas	5,260,080,071	3.38	5,621,458,144	3.92
HFO	3,699,892,174	10.00	3,799,561,735	14.41
HSD	365,914,328	26.57	424,653,293	25.80
Total	9,325,886,573	6.92	9,845,673,923	8.91

26. In terms of transmission and distribution system operations, total system loss for the FY 2015-16 was 13.31% which is in acceptable range. It is assumed that the system is properly operated and maintained. In BPDB's commercial activities in Distribution Zones, Collection/Bill Ratio was 95.9% which is considerably high. Net loss for the FY 2015-16 was by 38,738 million Takas. This is due to high operating cost to purchase power from Rental and IPPs. However, compared to previous year, the net profit/loss has improved due to reduction of power purchased from Rental as mentioned above.

27. In addition, recent BPDB's PPAs were reviewed to assess the payment security provisions. The typical payment security provisions that BPDB provides include a 'Stand By Letter of Credit', in an amount



of around [3]<sup>33</sup> months of full tariff payment after commercial operations date. These letter of credits each has a term of 1 year and renewed annually until the end of the PPA term. In addition, the payment in local currency also follows USD exchange rate, where applicable, through a true-up exercise. Thus volatility of currency appears to be a full pass through<sup>34</sup>. Further optimization of payment security and currency volatility risk management is needed to engage with more IPPs on a long term basis.

28. Following Table 15 shows some of the key indicators of BPDB based on the available data.

Table 15. Income statement and balance sheet ratios

Ratios	June 30, 2016		June 30, 2015	
	Calculation	Result	Calculation	Result
Operating margin	(13,606,013,789) / 253,223,305,276	(5.37%)	(52,747,807,698) / 211,876,335,448	(24.90%)
Return on asset	(13,606,013,789) / 468,096,193,005	(2.91%)	(52,747,807,697) / 419,203,706,432	(12.58%)
Operating expense ratio	266,829,319,065 / 253,223,305,276	105.37%	264,624,143,146 / 211,876,335,448	124.90%
Current ratio	248,917,015,853 / 203,028,938,754	1.23	230,959,496,521 / 191,803,999,576	1.20
Quick ratio	236,253,900,360 / 203,028,938,754	1.16	217,557,986,130 / 191,803,999,576	1.13
Long-term debt to equity ratio	475,308,651,506 / (111,737,898,501)	(4.25)	421,518,075,683 / (99,799,620,738)	(4.22)

29. The results of off-taker BPDB's recent financial statements and audit reports, as presented in table above, indicate an operating loss of 5.37% (from 24.9% in 2015), very high long term debt to equity ratio (-4.75% to 1) and high budgetary support as subsidies. BPDB's retained earnings are negative, indicating previous losses continues in its operation. Their operating losses are reduced in 2016 with significant cash in hand, although, Government budgetary support was essential to minimize their annual operational losses. Based on the above analysis and considering the overall information available, the following are the key inferences.

- The operating margin has improved significantly in 2016, owing to increased revenue by BPDB. However, the operating margin is still negative indicating higher expenditures.
- The return on asset has increased in 2016 because of rise in the asset and improvement in the net profit/loss, however, still negative indicating limited revenues on a large asset base.

<sup>33</sup> TBD.

<sup>34</sup> TBC.



- c. Both current ratio and quick ratio has slightly improved which will have positive impact to the company.
- d. Overall, it is assumed that BPDB's financial status is gradually improving, with significant areas for further improvements including efficiently re-structuring current purchase from expensive Rental power and procuring cheaper electricity through upcoming competitive IPP renewable energy projects.

***Financial Sustainability of BPDB, the offtaker***

30. An indicative sub-project with the use of REFF financing and IDA guarantee structures are used assess that the sub-projects are financially viable and sustainable with competitive tariffs and minimize potential call on FDN guarantees. The criteria and process for selection of sub-projects will be included in the Operations Manual to be developed by IDCOL. To assess financial viability conditions of sub-projects, a financial model was developed using technical information provided in the feasibility study produced by the external consultant.

31. As evidenced from the Annual Report 2015-16 of BPDB and supported by the feasibility Study consultant's report, the cost of diesel generation is around 25.75 USD cents/kWh. Prices for both solar PV & wind technologies, as shown above, are significantly cheaper than power generation by diesel generators. In addition, properly designed and run auction process, with the support of REFF financing and IDA guarantees can reduce the expected tariffs further. Thus replacing high cost fuel sources with renewable energy could save significant amount of costs along with environmental benefits. Based on this, both solar PV and wind sub-projects are considered financially feasible.



## **ANNEX 4: FINANCIAL INTERMEDIARY ASSESSMENT**

### **COUNTRY : Bangladesh Bangladesh Scaling-up Renewable Energy Project**

#### **Introduction**

1. This is a review of the Scaling-up Renewable Energy Project (SREP), 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.

#### **Project Summary**

2. The Project is aimed at supporting the development of grid-connected renewable energy, particularly solar PV and wind, and waste-to-energy through a combination of investment financing, risk mitigation, and technical assistance. It will specifically address the barriers to scaling up renewable energy, by providing access to capital, de-risking investments, and conducting resource assessments. In particular, the Project will be comprised of four components, including i) public investment in a utility-scale solar PV to demonstrate that a large scale solar PV can be integrated to the current grid system and to ensure that utilities have relevant experience and capacity in technology, operation and maintenance of solar PV; ii) establishment of the Renewable Energy Financing Facility (REFF) which will provide long-term credit line and risk guarantee to utility-scale solar PV sub-projects and rooftop solar PV sub-projects; iii) renewable energy resource assessment and technical assistance; and iv) waste-to-energy pilot.

3. The REFF is proposed to be hosted and operated by IDCOL, a state-owned financial institution that has demonstrated a strong track record in managing a similar financing facility for the off-grid renewable energy program pooling resources from the World Bank and other development partners. IDCOL would act as the financial intermediary of IDA credits and guarantees through Lending and Guarantee Windows respectively following World Bank processes and procedures. The Ministry of Finance will be the borrower of IDA and SREP funding that will be on-lent to IDCOL. The on-lent proceeds along with resources from IDCOL and other sources will provide capital base for the Lending Window. IDA guarantee will be offered through the Guarantee Window to improve bankability of sub-projects and attract competitive financing.

4. In operating the REFF, the Ministry of Finance will extend to the IDCOL IDA credit and SREP loan in USD or in BDT, or in a combination of both USD and BDT, depending on business need of sub-projects. Therefore foreign exchange risk of the BDT-denominated portion will be assumed by the Government of Bangladesh. The IDCOL will undertake credit and investment risks of the sub-projects and be responsible for the detailed assessments of the sub-projects' soundness, financial and economic feasibility, and E&S risks and management. Considering the capacity limitations of IDCOL in offering guarantees, it is not proposed that IDA guarantee backstops any new guarantees offered by IDCOL under this Project. Thus, the role of IDCOL under the Guarantee window is contemplated only as the intermediary to manage IDA



guarantee processes, which would help improve their capacity to offer guarantees independently. The Bank will conduct due diligence and detailed assessment of the sub-projects that would ask for guarantee under the REFF.

## **Macroeconomic Environment and Financial Sector**

5. Bangladesh has achieved over six percent growth in gross domestic product (GDP) since 2010 and the GDP growth in FY16 is provisionally estimated to be 7.05 percent. Propelled by rapid economic growth, Bangladesh crossed the threshold from low income to low middle income country status in FY14 as per capita Gross National Income (GNI) of US\$1,080 exceeded the threshold of US\$1,046; and per capita GNI was US\$1,190 in 2015. Average CPI inflation for 2016 was 5.5%, the lowest in 7 years and within the government target of 5.8%, due to both food and non-food CPI inflation reflecting favorable domestic agricultural production and modest rise in global commodity prices. The inflation has been gradually declining from 7.5% in 2013 to 5.5% in 2016. Bangladesh Bank has been maintaining a moderately restrained monetary approach to safeguard macroeconomic stability and keep inflation in check.

6. The financial sector is dominated by commercial banks that engage predominantly in trade finance and some project finance usually limited to five to six years of maturity. Outstanding domestic bank credit has grown by 11.6% in 2016, reaching BDT 8,834 billion (equivalent to USD 112 billion). Despite progressive improvement of the sector and a demonstrated resilience in the face of the global financial turmoil, the financial system remains weak in its capacity to allocate resources to the most productive uses, as well as to perform its term transformation function—supplying a fast-growing economy with long-term credit. Ability for longer-term lending is further plagued by impaired assets on the balance sheets of state-owned banks (SOBs) and a rising share of non-performing loans (NPLs) in the banking system. NPL ratio reached 10.1% for the entire banking sector in June 2016, due to the higher ratio of SOBs over 25%. A lack of adequate levels of credit underwriting capacity coupled with deficient regulatory and institutional capability continues to exacerbate the NPL problem, particularly for SOBs. As a result, sectors in need of long-term credit underinvest, constraining growth

## **Eligibility of the Financial Intermediary**

7. IDCOL was incorporated in Bangladesh in May 1997 as a government owned public limited company under the Companies Act 1994. The Company was licensed by Bangladesh Bank as a non-bank financial institution (NBFI) in January 1998. 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.

### ***Financial Performance***

8. IDCOL has a sound capital base. The capital adequacy ratio has been maintained over 10 percent, the Minimum Capital Requirement (MCR) of the Risk Weighted Assets (RWA) under Basel-III posed by the Bangladesh Bank. Both paid-up capital and shareholders' equity keep growing rapidly over the last three



years, benefitting from the strong profitability and the conversion of retained earnings to paid-up capital. As of December 2016 the paid-up capital reached BDT 6 billion.

Table 16. Key Financial Ratios of the IDCOL

Key financial ratios	FY2013-14 (Jul 2013-Jun 2014)	FY2014-15 (Jul 2014-Jun 2015)	FY2016 <sup>1</sup> (Jan-Dec 2016)
Capital Adequacy Ratio (%)	12.4	13.4	12.4
Paid-up Capital (BDT million)	2,600	3,850	5,000
Shareholders' equity (BDT million)	4,106	5,240	5,971
Current Ratio (times)	11.9	9.5	6.5
Return on Equity (%)	35.4	24.7	6.7
Profit Margin (%)	37.5	31.6	8.8
NPL Ratio (%)	0.8	1.6	9.5

<sup>1</sup> A change in counting FY was introduced in 2015, resulting in inconsistency in accounting period in FY2016.

9. Sufficient short-term liquidity is available at the IDCOL. The current ratio is still over 6x, despite the recent drop, indicating that current asset is sufficient to cover current liability. Asset-liability maturity mismatch has occurred as loan portfolio is concentrated to the SHS program with a short loan tenor but the majority of liability is long-term debt from the Government of Bangladesh. This Project will help address asset-liability management by strengthening longer-term lending to large scale renewable energy developers.

10. IDCOL shows sound profitability from its business until FY15. The return on equity and profit margin have dropped from the high level in FY16, due to a large loan loss provision. If the provisioning loss is excluded, the ratios would remain at the same level. Complied with the relevant regulation from the Bangladesh Bank, loan loss provisioning has been done based on classification levels and days overdue and already reflected in the financial results. The increase in loan loss provision is mainly because of two issues: i) the sudden slow-down of new sales of solar home systems (SHS) under the SHS Program; and ii) the recent classification of two large loan accounts. Due to rapid grid expansion as well as free distribution of SHS under government social safety net programs, the sales of new SHS has decreased, resulting in many of the unit offices of the Partner Organizations of the SHS Program to close down as the collection efforts of existing installments from past sales were no longer cost effective in the absence of new sales. IDCOL has been taking various measures to address the problem, including having a collection efficiency improvement program where joint collection efforts are undertaken to minimize the costs, reaching agreement with the government to involve IDCOL partner organizations in distributing the SHS under social safety net programs, and filing legal actions against delinquent partner organizations.

11. The NPL ratio has increased sharply between 2015 and 2016, due to the same reason explained above, though it is still far lower than the average NPL ratio of state-owned banks (SOBs). IDCOL expects partial recovery and write-off in the coming years, stabilizing the NPL ratio and profitability.

12. Accounting documents and financial statements of the IDCOL have been audited by renowned audit firms over the last three years. Adequate numbers of disclosures (mandatory and voluntary) have been made in IDCOL's annual reports and those were approved by the auditors. IDCOL has been awarded



for best presented annual reports in the category of public sector entities by the Institute of Chartered Accountants of Bangladesh (ICAB).

### ***Implementation Capacity***

13. IDCOL has been supporting a number of large-scale infrastructure and IPP projects, mainly on gas-to-power, since 2001. Power sector accounts for 27% of its loan portfolio. Its staff has sufficient experience and expertise to take due diligence and underwriting on project finance investment at scale backed by a long-term power purchase agreement (PPA).

14. Renewable energy has been the single largest sector that IDCOL has financed, taking 70% of the total loan portfolio. Starting from the well-known SHS program in 2003, IDCOL has extended its financing to solar home systems, domestic biogas plants, improved cook stoves, solar PV based irrigation pumps and mini-grids. It proves IDCOL's ample capacity to assess solar PV technology, which will be the main technology to be supported under the REFF.

15. Despite its long history of engagement in financing IPPs and renewable energy projects, IDCOL has limited experience in financing utility-scale renewable energy projects or large-scale rooftop solar PV projects, because the entire country has very few of such projects on the ground so far. Therefore technical assistance will be offered through the Project to strengthen its capacity to conduct a detailed assessment of sub-projects and evaluate credit and investment risks. Given its abundant experience in thermal IPPs and off-grid solar PV, the gap is considered not large, to be filled easily with first few transactions.

16. The policy affairs of IDCOL are set and overseen by an independent Board, represented by eight 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. The Board has formed three special committees, namely Audit Committee, Credit Committee and Organization Committee, to guide and manage its business activities and to assure the independence of internal control functions and audit activities.

17. IDCOL maintains the adequate level of information technology and management information systems to manage transactions across the country and streamline the management information with the strategic directions of the Company

### ***Potential Market Distortion***

18. The primary objective of IDCOL is to promote significant participation of the private sector in investment and operation, ownership and maintenance of new infrastructure facilities by bridging financing gaps for infrastructure and renewable energy projects in Bangladesh. Given the nascent financing market for large-scale infrastructure, IDCOL stands as the market leader in private sector energy and infrastructure financing, encouraging participation of other local financial institutions and development of their capacity, for example through loan syndication.

19. As the country has very limited experience in utility-scale solar PV and wind as well as large-scale rooftop solar PV, there is in fact no such a market to finance these types of investments. Most of local financial institutions do not have any exposure to any of these, constraining their capacity for due





diligence and risk taking. Furthermore, the limited availability of long-term credit further undermines investment opportunities in these projects, which requires long-term debt financing for financial viability.

20. The REFF is designed to address these barriers to developing large-scale renewable energy projects building on the famous success of Bangladesh in small-scale renewable energy solutions in the off-grid. Long-term capital from IDA and SREP will be channeled through the Government to IDCOL to provide capital base for debt financing. Appropriate mechanisms will be carefully designed and introduced to ensure crowding-in of commercial financing, for instance by limiting the percentage of total project cost that the REFF can finance. IDA guarantee offered through the Guarantee Window will further encourage commercial financing to be attracted. It will provide other commercial lenders with exposures to these projects, strengthening their capacity and encouraging a market-driven and sustainable approach to the development of large-scale renewable energy solutions.

21. The cost of funds from the Ministry of Finance to IDCOL will include, at a minimum, the cost of IDA and SREP funds to the Government of Bangladesh plus on-lending margins agreed between IDA and the Government, reflecting the foreign exchange risk that the Government takes. In the past, the Government extended on-lending at around 3-5% in BDT and at a lower rate in USD.

22. The cost of financing by IDCOL to private sector sponsors will include, at a minimum, the cost of the funds to IDCOL plus an on-lending margin reflecting: (i) IDCOL's operating costs, and (ii) a credit risk margin. In other previous projects, IDCOL's margin was around 3-5%, depending on a number of factors to be taken into account.

23. IFC and KfW currently offer debt financing to the private sector at a range of about 6-8% in Bangladesh. The terms of financing under the REFF are expected to be at a similar level, taking into account on-lending margins on both the Government and IDCOL.

## Recommendations

24. Considering the assessment taken in the previous sections and based on other available information, it appears that IDCOL, the financial intermediary for the Project, is compliant with the Bank's requirements for the IPF with financial intermediary. However, it is recommended that adequate care and due diligence be carried out as regards the following aspects:

- a. Technical assistance and training, as appropriate, would be offered to improve IDCOL's capacity in assessing utility-scale solar PV and rooftop solar PV sub-projects, at least for the first few ones
- 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 IDCOL, on domestic capital, and on sub-projects and their sponsors
- c. During the mid-term review of the Project, financing terms and conditions offered by the REFF and other commercial banks will be reviewed to make sure that the REFF would not crowd out commercial financing in the business lines of the REFF.





## ANNEX 5: SCALING UP RENEWABLE ENERGY PROGRAM (SREP)

### COUNTRY : Bangladesh Bangladesh Scaling-up Renewable Energy Project

#### Results Framework

Indicator	SREP/IDA Project	Transformational Scaled-up Phase by 2021 (Government RE Target)
Additional RE Installed capacity [MW]	250	1,676 (Solar PV)
Annual electricity output from RE as a result of SREP interventions [GWh/year]	483	3,246
Financing leveraged through SREP funding [US\$ million]	US\$ 402.5m in total, Including: - US\$ 136m IDA credit - US\$ 80m IDA guarantee - US\$ 0.5m ESMAP - US\$ 186m private sector/DFI	US\$ 2,126m in total, Including public and private investment
SREP leverage ratio [1:X]	1 : 14	1 : 73
Tons of GHG emissions reduced or avoided		
-Tons per year [tCO <sub>2</sub> eq/yr]	285,000	1,900,000
-Tons over lifetime of the project [tCO <sub>2</sub> eq]	5,718,000	38,000,000
Co-benefits	<ul style="list-style-type: none"> <li>Improved energy security, reducing imported fuel dependency and the average generation cost</li> <li>Economic benefit from increased reliability of electricity service</li> <li>Employment opportunities from individual sub-projects and a potential ESCO market for rooftop solar PV</li> <li>Environmental impacts, both on local pollutants and global GHG emissions</li> </ul>	

#### Country and Sector Context

- The power sector in Bangladesh has grown rapidly – maximum generation increased to more than 8,000 MW in 2016. However, supply still lags behind peak demand resulting in demand curtailment (load shedding) particularly in the rural areas during the peak summer months. While the peak demand occurs



during the evening hours due to lighting load, there is a significant use (500-1,000MW) of expensive liquid fuel-run generation during daytime, which can be cost-effectively replaced by solar. Bangladesh has been successful in increasing access to electricity. A decade ago, less than 50 percent of Bangladeshis had access to electricity; today, 78% have access, including about 14% from renewable energy. Bangladesh has one of the most successful off-grid access programs in the world. Implemented by the Infrastructure Development Company Limited (IDCOL) in partnership with the non-government organizations, the Solar Home System (SHS) program has reached more than 4 million households and shops in remote rural areas of Bangladesh. It is expected that Bangladesh will achieve universal access to electricity much ahead of the Sustainable Energy for All (SE4ALL) target of universal access by 2030.

2. Considerable challenges remain for ensuring that people connected to the grid get uninterrupted electricity supply. The primary challenge is that Bangladesh's reserves of natural gas, which accounts for about 67% of power generation, are estimated to deplete from 2020 if no new gas reserves are discovered or if technology does not allow a higher rate of extraction from existing gas fields. Declining indigenous resources and growing electricity demand have resulted in an increasing reliance on imported fuel oil for power generation. From 2009 to 2015, the share of oil-fired electricity increased from 5 to 20 percent. This increase in oil-fired electricity contributed to the fuel cost per kWh generated rising from BDT1.1/kWh to BDT3.42/kWh (US\$0.014/kWh to US\$0.04/kWh) over the same period. This leaves Bangladesh's energy sector vulnerable to political and economic instability in nations from which it imports fuel, as well as from rising prices generally.

3. GoB has an ambitious plan for renewable energy development. As per the National Renewable Energy Policy 2008 (NREP), generation capacity of 2,000 MW is planned to be added by 2020 from renewable sources. GoB has also set renewable energy development targets for several technologies for each year from 2015 to 2021 ("RE Development Targets"). Furthering the ambitions of NREP, the RE Development Targets call for an additional 3,100 MW of renewable energy capacity to be installed by 2021. Most of the new capacity is planned from solar (1,676 MW) and wind (1,370 MW). To promote renewable energy and also energy efficiency, the Sustainable and Renewable Energy Development Agency (SREDA) was established in 2014.

4. Bangladesh however lags behind in its efforts to tap into its own renewable energy potential for grid-tied electricity generation despite the tremendous success of its off-grid renewable energy program. A number of unsolicited proposals for grid-tied solar and wind were received by the Power Division over the past few years. Contracts were signed for about 300 MW of solar, and Letter of Intent issued for another about 530 MW of solar. In addition, more than 250 MW of wind projects have been submitted by private developers which are under review by the Power Division. Despite the government commitment, there has been no utility-scale solar PV projects delivered in Bangladesh. There are number of reasons for this, including:

- *Land constraint* is the major challenge for developing utility-scale solar in Bangladesh. Being the 12<sup>th</sup> most densely populated country in the world, Bangladesh has adopted a policy not to use agriculture land for other purposes, limiting the availability of land for utility-scale solar. The only land suitable for solar PV is government-owned land in river islands and low-lying areas with seasonal flooding that makes the land unsuitable for habitation or for other productive use.



- *Project Development Challenges* including insufficient data on resource availability, and lack of technical studies and inadequate preparation of bankable projects.
- *Financing Market Challenges* including lack of deep domestic financing market to provide long term financing to projects, lack of due diligence capacity and functioning syndication market. Lack of long-term domestic debt financing market and risk perceptions (of primarily foreign sponsors and investors) about the ability of the off-taker to meet payment obligations under power purchase agreements (PPAs) on a long term basis are identified as major barriers in mobilizing financing in grid-tied renewable energy projects.

5. Under the severe land constraints, rooftop solar PV can be an alternative to scale up solar PV in Bangladesh. About 15 MW in solar rooftop PV systems have been installed in the main cities as a result of a government requirement for a certain percentage of lighting loads to come from solar for getting a new grid connection. However, most of these panels were installed to comply with the requirement to get a new grid connection and there were inadequate quality control and monitoring to ensure that quality panels were installed. As a result, most of this capacity produces little or no energy.

### **SREP Investment Plan**

6. To realize the renewable energy potential, GoB, in cooperation with the World Bank, the International Finance Corporation (IFC), and the Asian Development Bank (ADB), has developed an Investment Plan to access concessional climate finance resources from the Scaling-up Renewable Energy Program (SREP) of the Climate Investment Funds (CIFs). The SREP Investment Plan for Bangladesh was approved by the SREP Sub-committee in November 2015 for a total of US\$75 million in funding. The Bank was assigned to implement US\$29.25 million of SREP funding (US\$2.87 million grant and US\$26.38 million non-grant) to support grid-connected renewable energy and waste-to-energy pilot. The indicative financing plan of the SREP IP is presented in Table 17.

7. In addition to US\$29.25 million of SREP funding allocated to the World Bank, US\$136 million of IDA credit and US\$80 million of IDA guarantee is mobilized to de-risk subprojects and mobilize additional investments from the private sector. The Project is expected to leverage additional US\$186 million from private sector and other sources of financing. Both the World Bank financing and the leveraged financing exceed the indicative financing plan. GoB still provides duty exemptions and tax incentives, which was expected during IP development and estimated for co-financing in the SREP IP, but the result indicator doesn't include it anymore as it is indirect financial benefit rather than direct co-financing to investments.



Table 17. Indicative Financing Plan of the SREP IP

SREP Project	MDB	Indicative Financing Plan				
		SREP	MDB	GoB	Private Sector	Total
<b>Grid-Connected Renewables</b>						
Investment in utility-scale solar and wind, and rooftop solar	WB	28.00	200.00	49.20	100.00	<b>377.20</b>
Investment in utility-scale solar and wind, and rooftop solar	IFC	15.00	30.00	20.25	90.00	<b>155.25</b>
Resource assessment	WB	0.95	-	-	-	<b>0.95</b>
Technical assistance or transaction advisory	IFC	0.50	-	-	-	<b>0.50</b>
<b>Subtotal: Grid-connected renewables</b>		<b>44.45</b>	<b>230.00</b>	<b>69.45</b>	<b>190.00</b>	<b>533.90</b>
<b>Off-grid solar PV</b>						
Investment in mini-grids	ADB	5.00	120.00	18.75	-	<b>143.75</b>
Investment in solar irrigation		24.00	20.00	6.60	-	<b>50.60</b>
Project preparation		0.95	-	-	-	<b>0.95</b>
<b>Subtotal: Off-grid solar PV</b>		<b>29.95</b>	<b>140.00</b>	<b>25.35</b>	<b>0.00</b>	<b>195.30</b>
<b>Development support for Waste-to-Energy</b>						
Assessment of technical and commercial feasibility for Waste-to-Energy plant	WB	0.30	-	-	-	0.30
<b>Subtotal: Development support for Waste-to-Energy</b>		<b>0.30</b>	-	-	-	<b>0.30</b>
<b>Investment Plan Preparation Grant</b>		<b>0.30</b>				
<b>Grand Total</b>		<b>75.00</b>	<b>370.00</b>	<b>94.80</b>	<b>190.00</b>	<b>729.80</b>

## Project Description

8. The Project Development Objective is to increase installed generation capacity of renewable energy in Bangladesh.

9. The proposed Project is aimed at supporting the development of grid-connected renewable energy, particularly solar PV and wind, and waste-to-energy through a combination of investment financing, risk mitigation, and technical assistance. It will specifically address the barriers to scaling up renewable energy by matching availability of public lands with the interest and expertise of the private sector in installation, operation and maintenance of utility scale renewable energy. It will also address the barriers by providing access to capital, de-risking investments, and conducting resource assessments. The proposed Project will support a public sector PV plant as a pilot to allow for development of public sector capacity in operation and maintenance of utility scale renewable energy and also allow an opportunity for the grid operator to develop the capacity to integrate intermittent renewables into the grid. The proposed Project will be comprised of four components as described below. Please refer to Annex 1 for more details.

10. **Component 1: Feni Utility-Scale Solar PV (US\$80 million).** This component will support the first phase of the development of a renewable energy park with a capacity between 150-170 MW of solar PV



and around 20MW of wind. This component will finance the common infrastructure (civil works, risk mitigating measures and fencing), for the entire site (1,000 acres) in Feni District, and the first phase of the solar PV generation plant, with a capacity of 50 MW. This project would be the first-ever large scale grid-tied solar PV in Bangladesh, at a site owned by the state-owned generation utility, Electricity Generation Company of Bangladesh (EGCB).

11. The generation facility will be developed as public investment through IDA credit. The EGCB will procure, through a competitive bidding procedure, an engineering, procurement and construction (EPC) and operation and maintenance (O&M) contract for the solar PV plant that covers O&M of the facility for the first five years after commissioning. Options are being considered for a performance based contract that will mimic the payment structure for the EPC and O&M contracts to that of a Build, Operate, and Transfer (BOT) model (for a shorter duration of the O&M contract period) to allow for a better risk sharing with the contractor. The construction of evacuation lines, between the Feni site and the national grid, will be done by the Power Grid Company of Bangladesh Limited (PGCB) as part of its transmission expansion, within the scope of Bank's upcoming lending operation on transmission expansion.

12. Once constructed, this will be a significant milestone in further scaling up solar PV in Bangladesh as it will demonstrate the viability of a solar PV plant on a difficult land (low-lying area with significant seasonal flooding risks)<sup>35</sup>. The pilot will test all other parameters for successional auctioning of further capacity in the private sector including the technical specifications, suitability of power purchase agreement and other legal agreements, effectiveness of tender procedure, how implementation realities are addressed, demonstrate its financial viability, verify legal and regulatory adequacy and demonstrate how other risks are handled.

13. **Component 2: Renewable Energy Financing Facility (REFF) (US\$162.38 million).** The Project will support the establishment of a dedicated Renewable Energy Financing Facility (REFF) hosted at a Financial Intermediary (IDCOL). The Facility will primarily have a Lending Window with IDA and SREP resources of US\$82.38 million, including US\$56 million of IDA credit and US\$26.38 million of SREP loan<sup>36</sup>. The Facility will offer necessary financing products, including long-term loan and other suitable products to support a series of sub-projects on renewable energy and associated technical assistance. While the primary focus of technology will be utility-scale solar PV and wind as well as rooftop solar PV, with a target of supporting 200 MW of installed capacity, other renewable energy technologies such as waste-to-energy will also be supported, if and when feasible. The Facility will have flexibility to support transactions on a first come first serve basis, between utility-scale solar PV/wind and rooftop solar PV. In addition, the Facility may also have a Guarantee Window. Considering the capacity limitations of IDCOL in offering credit enhancement products at this stage, it is proposed that the Bank provides a series of IDA guarantees to sub-projects, amount to a maximum of US\$80 million, to support an initial set of projects to build track record. Once IDCOL's capacity is sufficiently enhanced through learning from IDA guarantees to sub-projects, IDCOL can develop new REFF guarantee products to be offered through REFF Guarantee

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<sup>35</sup> Given the high population density and the government policy of not to use agriculture land for any other purpose, only low-lying lands with seasonal flooding risks that are un-inhabitable otherwise can be considered for solar PV.

<sup>36</sup> SREP funds earmarked for the facility can be deployed as either loan or risk guarantee.



Window. Until such time, it is proposed that IDCOL will continue to build their capacity through learning from the proposed series of IDA guarantees for the sub-projects. Depending on market feedback, the IDA funding allocation between Lending and Guarantee amounts will be finalized. The Facility will address the barrier of limited commercial financing by offering additional financing along with IDA guarantee products to mitigate key risks and attract domestic and international private developers and commercial financiers.

14. **Utility-scale solar PV and wind.** The Facility will support independent power producer (IPP) or solar park models that brought long term competitive tariffs and private sector expertise to develop, finance and implement renewable energy projects. The Facility will be flexible in supporting sub-projects developed on either public land or private land. The majority of potential pipeline however is expected to be on government-owned land given the significant land scarcity in Bangladesh and the challenges in procuring land due to fragmented ownership of private land. The Facility will provide limited amount of REFF financing and IDA risk mitigation guarantee support to grid-connected utility-scale solar PV and wind sub-projects for an initial target of 170 MW at different locations<sup>37</sup>, through site-wise competitive auction mechanism and potentially some unsolicited projects. To support unsolicited projects, the decision to provide REFF financing and/or IDA guarantees will be subject to detailed due diligence including confirmation of land availability, justification and/or renegotiation of price and review of contractual terms and conditions.

15. Through the competitive auction process, the Facility will provide standard financing products and IDA risk mitigation products, including IDA Payment guarantees and IDA Loan guarantees, to potential bidders. It is expected that the projects will be financed through a combination of commercial banks, development finance institutions<sup>38</sup> (DFIs) and financing through the REFF. Under this arrangement, a standard set of financing options and WB approved Term Sheet for IDA risk mitigation guarantees<sup>39</sup> will be offered through the auction process by IDCOL to private participants, who will be selected through the auction process. On exceptional circumstances<sup>40</sup>, a selected bidder may approach for REFF financing and IDA guarantees ex-post the auction, duly providing the justification for such products. The bidders can choose a combination of financing products (loans, IDA risk mitigation guarantees, etc.) for each sub-project as part of their bidding proposals.<sup>41</sup> To optimize the use of IDA and SREP resources and to create sustainable financing models, the auction process may include limitations for the use of REFF loans.

16. **Rooftop solar PV.** Development of grid-connected rooftop solar PV under the proposed Project will be focused initially on industrial rooftops, targeting 30 MW of installation capacity in aggregate. There are about 7,000 garment factories in Bangladesh (2015), many of which are larger buildings with extended rooftop and well-suited for rooftop solar. Industrial rooftops are economically more feasible due to relatively higher tariff than residential and commercial consumers. Government and institutional

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<sup>37</sup> Pre-identified sites include [Feni, Rangunia, BEZA] with more than 300 MW technical capacity.

<sup>38</sup> IFC may participate in DFI financing both on its own and using IFC managed SREP funds to finance winning bidders.

<sup>39</sup> Considering inexperience and capacity limitations of IDCOL, IDA Guarantees to sub-projects may be offered directly by IDA through a guarantee series for initial set of projects.

<sup>40</sup> TBD – includes situations where project finance lending is limited or unavailable in the local financial markets

<sup>41</sup> Recently, Argentina and Zambia applied similar arrangements in the auction process, where financing products are offered at-cost to the bidders for selection as part of their bidding proposals.



rooftops, such as public universities, will be also candidates as some of them are advanced in preparation. To incentivize the development of rooftop solar PV, the cost and tenor of financing will need to be set in a manner that will make the levelized cost of solar rooftop to slightly lower than the retail price of electricity, which is as high as BDT 9.24/kWh (US\$ 11.8/kWh) at peak for industrial consumers. To minimize transactions costs, the option of aggregators will be explored who would lease rooftop areas from building owners and operate rooftop solar PV on aggregated sites. Depending on the need, IDA guarantees may be offered to mitigate any public sector obligations, such as regulatory risk associated with feed-in tariff or payment default on public sector offtake contracts. The need for IDA guarantees will be further explored during the preparation stage.

**17. Component 3: Renewable Energy Resource Assessment and Technical Assistance (US\$2.36 million).** This component will support resource assessment to facilitate further scale up of solar and wind power development in Bangladesh. In coordination with other agencies and funding sources, this component will cover data collection, validation, finalization, and publication of resource atlas at the national level which will inform policy makers and potential solar and wind developers. Furthermore, technical assistance and capacity building will be provided to relevant government agencies by this component to maximize the benefit of the measuring equipment procured and the finalized resource assessment. Activities will include maintaining and further updating resource assessment data; and integrating geospatial information and tools into national planning of renewable energy development. This component will also include support for an assessment of rooftop potential using satellite imagery technologies and for formulation of an enabling policy and regulatory framework for rooftop solar PV. US\$2.36 million of SREP grant is proposed to be allocated to this activity implemented by SREDA.

**18. Component 4: Waste-to-Energy Pilot (US\$0.5 million).** This component will support feasibility assessment and deployment of small scale pilots of municipal waste-to-energy sub-projects. US\$0.5 million of SREP grant will be used to finance the pilot in collaboration with city corporations that manage municipal waste collection. One of the potential candidate is the Rajshahi City Corporation for an installation of a biogas plant to utilize slaughterhouse waste. The City Corporation will provide the land required and GIZ will provide technical support for the small-scale pilot. The pilot is expected to inform technical and commercial feasibility of waste-to-energy sub-projects and to help establish waste collection practices and government schemes to support waste-to-energy in municipalities. This component is expected to be implemented by SREDA.

**19. SREP Additionality.** The SREP resource will be used to finance Component 2, 3 and 4. Under the Component 2, the Lending Window of the REFF, capitalized by the SREP loan and IDA credit, will offer various financing products, including long-term loan and other suitable products such as bridge loan, subordinated loan, etc., that are not available from the local commercial financing market. The risk appetite of local commercial banks is very limited to support renewable energy projects, in terms of scope and sizing. In addition, the competing needs of infrastructure financing from other sectors (transport, housing, large scale energy projects, etc.) is also acting as a hurdle to attract long term competitive financing for renewable energy projects. To improve affordability of renewable energy projects, long term financing will be important. To provide financing products with longer tenors or higher risk appetite than what is available in the market, the concessionality of SREP resource is critical.





20. In support of rooftop solar PV sub-projects, the role of the REFF is even more critical. There has been very limited commercial financing appetite to finance rooftop solar PV in Bangladesh. Given the relatively small scale of sub-projects (generally less than 1MW), they will be supported mostly by local banks and financiers through corporate financing. However such financing will not be able to provide for a long tenor to make the sub-projects financially viable given the level of industrial electricity tariff. The REFF lending has the potential to offer required terms and conditions, which is projected about 6% interest rate and 10 years of tenor based on an indicative financial analysis, to achieve financial viability of the investment in rooftop solar PV. IDCOL, through the REFF, is expected to lead the development of financing products suitable for rooftop sub-projects at the beginning, and local financiers will follow as the number of rooftop PV projects in Bangladesh increases over time to give the market sufficient demonstration and experience and the cost of rooftop system decreases due to the development of the market and supply chain.

21. US\$2.87 million of the SREP grant available for the project will support Component 3 and 4 to allow various technical assistance and capacity building to enable scaling up of renewable energy in Bangladesh, including the establishment of a national resource atlas using ground measured resource data, the assessment of rooftop potential countrywide, the support for formulation of an enabling policy and regulatory framework, and the feasibility assessment and pilot of waste-to-energy in a small scale. Without the SREP grant funding, these activities would not be carried out by the government due to unavailability of resources.

## **Assessment of Proposed Project with SREP Investment Criteria**

### ***Increased installed capacity from renewable energy sources***

22. The proposed Project will support the investments in a total of 250 MW of renewable energy generation capacity, of which 220 MW is expected for utility-scale solar PV (and potentially wind) and 30 MW for rooftop solar PV. The REFF is designed to flexibly support among utility-scale renewables, rooftop solar PV, or other renewable energy technologies, whichever comes earlier, therefore depending on pipeline development of each type of sub-project, the installed capacity may be divided differently into utility-scale renewables and rooftop solar PV at the end of the project.

### ***Increased access to energy through renewable energy sources***

23. All consumers connected to the grid will benefit from the increased access to renewable energy from grid-tied utility-scale renewable energy sub-projects. There are currently about 25 million customers (approximately 100 million people) connected to the grid system. Once the installed capacity target is achieved, it is expected to provide 483 GWh of electricity generated from renewable energy sources to the grid or consumers every year. Taking into account the average electricity consumption per capita of 370 kWh, the increased electricity generation from renewable energy sources will be sufficient to meet the annual electricity demand of about 1.3 million people.





### ***Low Emission Development***

24. Both ground-mounted solar PV/wind and rooftop solar PV will replace the marginal generation of the grid, which is high speed diesel (HSD) based. The supply of electricity from renewable energy sources instead of diesel, of which the emission factor is assumed at 0.65 kg/kWh<sup>42</sup>, is expected to reduce the greenhouse gas (GHG) emission by 5,718,000 tCO<sub>2</sub>eq over the lifetime of the investments, hereby assumed for 20 years. The average annual GHG reduction will be about 285,000 tCO<sub>2</sub>eq.

### ***Affordability and competitiveness of renewable sources***

25. Renewable energy development is still at an early stage in Bangladesh, and there has been no investment in solar PV at scale. Therefore the cost of PV panels, balance of system and other renewable energy technologies is yet relatively higher than in India or other countries with a more established renewable energy market. Supporting a total of 250 MW of generation capacity and promoting commercial financing toward renewable energy will help develop the market, including the supply chain of equipment, and make the technologies more affordable. At the current level of cost of technology, solar PV is already a more affordable option than diesel-fired plants, the marginal generation of the grid, depending on the cost of financing. The proposed Project will contribute to further improvement of affordability and competitiveness of renewable energy technologies, unlocking their potential in the country and increasing the penetration of renewable energy in the grid.

### ***Productive use of energy***

26. Increased supply of electricity from utility-scale renewables and rooftop PV sub-projects is expected to reduce the disruption in the provision of electricity service. In particular, by operating rooftop solar PV, industrial buildings will benefit from the direct consumption of electricity from the rooftop during daytime regardless of grid reliability or any load shedding. Improved reliability of electricity service will contribute to the increase in productive activities in the industrial sector and others.

### ***Economic, social and environmental development impact***

27. *Improved energy security.* Declining gas reserves and the growing share of oil-fired electricity generation pose a significant challenge to Bangladesh's energy security. The energy sector becomes vulnerable to political and economic instability in nations from which it imports fuel, as well as from rising prices of fuel and electricity generation. Renewable energy, like solar or wind, is not affected by price fluctuations and delivery of fuel. Increasing generation capacity from renewable energy sources is expected to replace the oil-fired generation, reducing the dependence on imported fuel and lowering the average generation cost that will improve the financial performance of the offtaker and the fiscal burden of the GoB.

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<sup>42</sup> From World Bank Guidance Manual: GHG Accounting for Energy Investment Operations (2015)



28. *Economic benefit from improved reliability of electricity service.* The investments supported by the Project, particularly rooftop solar PV, will help improve the reliability of electricity service, which is a significant challenge in Bangladesh. Increased supply of electricity will stabilize the grid service in general and reduce the incidence of disruptions or load shedding. Rooftop solar PV systems will supply electricity to the consumers, mainly industrial companies, regardless of the reliability of the grid during daytime. It will lead to the increase in economic activities and competitiveness of the industrial users.

29. *Employment opportunities.* The development of 250 MW renewable energy generation capacity in aggregate will generate employment opportunities to local population. Utility-scale renewable energy sub-projects will need employees throughout the development process from construction and logistics to operation and maintenance. Support to scaling up rooftop solar PV may promote the creation of the ESCO market, which will offer a third-party investment on rooftops to rooftop owners or aggregate a number of rooftops for developing solar PV systems. If the new market is evolved, it will create more sustainable opportunities for local employment.

30. *Environmental impact.* The proposed Project will bring in positive environmental impact, not only by avoiding greenhouse gas emissions through production of clean energy but also by reducing local air pollution emissions which would have otherwise occurred from diesel-based thermal power generation. At the local pollution level, a solar PV plant will contribute to reducing emissions of sulfur dioxide (SO<sub>2</sub>), nitrogen oxide (NO<sub>x</sub>), and total suspended particulates (TSP).

### ***Economic and financial viability***

31. The economic analysis was carried out for (i) Feni utility-scale solar PV under Component 1; (ii) solar PV IPP at the Feni site; and (iii) a model investment of rooftop solar PV with support of the REFF. The additional installed capacity from the proposed investments will displace the current marginal generation options, high speed diesel (HSD)-based generation, which is more expensive option. For all three investment cases, the economic internal rate of returns (EIRRs) exceed the discount rate of 10% for Bangladesh, in accordance with the Bank guidance on discount rates in economic analysis.<sup>43</sup> The EIRR was estimated around 15.0%, 22.3% and 13.2%, respectively, demonstrating that targeted investments are economically sound. Reduction of greenhouse gas (GHG) and local pollutant emissions will additionally improve the economics of the investments by taking into account positive externalities. The inclusion of environmental externalities, including avoided costs of local pollution and global greenhouse gas emission (using the Bank guidance on social value of carbon), in the economic flows increases the EIRR to 20.0%, 29.5% and 20.4%. Annex 4 provides more details including assumptions and sensitivity analysis.

32. The financial analysis also demonstrates that these proposed individual investments are financially viable, factoring in different cost of financing and debt repayment terms for each investment. Feni EPC investment under Component 1 is projected to have the financial net present value (FNPV) of US\$12.7 million discounted at the WACC. The financial internal rate of return (FIRR) of Feni solar PV IPP to equity holder is estimated about 18.2%. The rooftop solar PV will also offer a return on equity of 21.6%

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<sup>43</sup> Source: Discounting Costs and Benefits in Economic Analysis of World Bank Projects, OPSPQ, 2016



to the industrial customers who install the rooftop system even without grid connection. Annex 4 provides more details including assumptions and sensitivity analysis.

### ***Leveraging of additional resources***

33. The SREP resource of US\$29.25 million allocated to this Project will be co-financed by US\$136 million of IDA credit, US\$80 million of IDA guarantee and US\$0.5 million of the ESMAP Trust Fund. Altogether, IDA, ESMAP and SREP resources are expected to mobilize additional US\$186 million of investment from commercial financing, DFIs or other financiers for utility-scale renewables or rooftop solar PV. Therefore a leverage of 1 to 14 is projected through the proposed Project. In the scaled-up phase, this SREP resource will contribute to the achievement of GoB's renewable energy target. To invest in 1,676 MW of solar PV, the leverage ratio would be 1 to 73, and even higher taking into account other renewable energy technologies to be materialized during the phase.

### ***Gender***

34. A gender responsive social assessment for the proposed Project was undertaken as part of project preparation. It examined the challenges and offered policy guideline to make the project design gender responsive. The assessment analyzed and determined the measures to be adopted for meeting the needs of the female beneficiaries of the project as well as the male and female members of the implementing agencies by undertaking reviews and stakeholder consultations. The analysis took into account gender variables based on the effect of access to entrepreneurship, use of renewable energy resources and challenges of development projects on the lives of women from rural households. The assessment generated gender sensitive operational recommendations for the project design, which will be further refined and agreed with the implementing agencies as part of project preparation. The main recommendations include addressing disruption of livelihoods of the women who are dependent on the Feni site; developing policies and awareness raising activities by IDCOL to attract women entrepreneurs to utilize IDCOL's credit facilities; developing a gender policy by EGCB to enable equitable working place for both men and women and; hiring more women employees to reduce the gap in male-female ratio of EGCB's workforce. To enhance civic engagement, the assessment further recommends forming citizens' committees in waste to energy projects at city/town levels.

### ***Co-benefits of renewable energy scale up***

35. There are significant economic benefits expected to be brought by scaling-up renewable energy in Bangladesh. It will address the challenge of energy security and increasing dependence on imported fuel, and thus it will reduce the vulnerability of the economy to external factors such as international oil price, potential trade conflict, etc. Renewable energy will also help reduce the average generation cost by replacing the expensive oil-fired generation. Eventually the offtaker, BPDB's financial performance will be gradually improved, and the fiscal burden on the GoB will be mitigated by reducing financial support required to sustain the BPDB. Furthermore, increased supply of electricity and captive use of rooftop solar



PV systems are expected to enhance the reliability of electricity service, reducing the disruption in the grid and boosting economic activities with more reliable power.

36. Social and environmental co-benefits will be also accompanied with the increasing deployment of renewable energy. Employment opportunities are expected, not only from individual sub-projects for construction, operation and other tasks, but also from the development of domestic renewable energy market, including various opportunities throughout the entire value chain of technologies. From rooftop solar PV, ESCOs may be formed for aggregation of rooftop spaces or provision of a third-party service for rooftop development, leading to more employment opportunities. In addition, scaling up renewable energy will contribute to the reduction of GHG emission as well as local pollutants such as sulfur dioxide (SO<sub>2</sub>), nitrogen oxide (NO<sub>x</sub>), and total suspended particulates (TSP), by replacing fossil fuel-based thermal power generation plants.

## **Monitoring and Evaluation**

37. EGCB, IDCOL and SREDA will provide the World Bank with quarterly progress reports and interim unaudited financial reports (IUFRs), annual information on progress of the key performance indicators for their respective project components, audited financial statements, and such other information as the World Bank may reasonably require. Monitoring and evaluation (M&E) will be linked to the project targets (key performance as well as intermediate indicators). EGCB, IDCOL and SREDA will carry out a midterm review and report its findings and conclusions to the World Bank three years after effectiveness and will review these with the World Bank. Section VII sets out the project's key performance as well as intermediate results indicators.

## **Implementation Readiness**

38. A feasibility study has been launched by the client for the Feni site to inform the technical, economic and financial feasibility and environmental and social safeguard issues of the solar PV and wind power plants. The feasibility study is expected to be completed by June 2017. The EGCB will procure, through a two-stage competitive bidding procedure, an engineering, procurement and construction (EPC) and operation and maintenance (O&M) contract for the solar PV plant. To start a pre-qualification stage, the first step of the competitive bidding procedure, the draft pre-qualification documents are prepared and being reviewed by the EGCB. Upon confirmation of the documents and evaluation criteria, the Request for Qualification (RFQ) can begin immediately even before the feasibility study ends. The second stage, a Request for Proposal (RFP), is anticipated to be launched before the Board approval.

39. For utility-scale renewables under the REFF, the pipeline of potential private sector projects currently indicated by the Government exceeds 600 MW, including potential development on available public lands from the BPDB and BEZA, and a confirmed set of unsolicited projects with signed PPA status. There have been preliminary discussions with the public entities owning land and the private sector sponsors with signed PPAs. During project preparation, the pipeline will be further refined and shortlisted as potential candidates of REFF support.



40. IDCOL has already received several rooftop PV proposals from industrial companies, and is now conducting preliminary due diligence on their financial viability. They will be the initial pipeline of the REFF support for rooftop solar PV, and further pipeline will be developed through technical assistance activities such as the assessment of rooftop potential and the marketing of the REFF to industrial consumers.