

RESTRUCTURING PAPER
ON A
PROPOSED PROJECT RESTRUCTURING
OF
BANGLADESH SCALING-UP RENEWABLE ENERGY PROJECT
APPROVED ON MARCH 1, 2019
TO
PEOPLE'S REPUBLIC OF BANGLADESH

ENERGY & EXTRACTIVES

SOUTH ASIA

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ABBREVIATIONS AND ACRONYMS

BDT	Bangladesh Taka
IDCOL	Infrastructure Development Corporation Limited
IDA	International Development Association
kWh	Kilowatt-hour
MW	Megawatt
MWh	Megawatt-hour
MWp	Megawatt-peak
PDO	Project Development Objective
PIU	Project Implementation Unit
PV	Photovoltaic
REFF	Renewable Energy Financing Facility
SCF	Strategic Climate Fund
SREDA	Sustainable and Renewable Energy Development Authority
US\$	United States Dollar



BASIC DATA

Product Information

Project ID P161869	Financing Instrument Investment Project Financing
Original EA Category Partial Assessment (B)	Current EA Category Partial Assessment (B)
Approval Date 01-Mar-2019	Current Closing Date 31-Jul-2025

Organizations

Borrower People's Republic of Bangladesh	Responsible Agency
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Project Development Objective (PDO)

Original PDO

The Project Development Objective is to increase installed generation capacity of, and mobilize financing for, renewable energy in Bangladesh.

Summary Status of Financing (US\$, Millions)

Ln/Cr/Tf	Approval	Signing	Effectiveness	Closing	Net Commitment	Disbursed	Undisbursed
IDA-63630	01-Mar-2019	29-Aug-2019	08-Dec-2019	31-Jul-2025	156.00	63.78	87.22
TF-A7640	01-Mar-2019	29-Aug-2019	08-Dec-2019	31-Jul-2025	26.38	3.92	22.46
TF-A9036	01-Mar-2019	29-Aug-2019	27-Jun-2020	31-Jul-2025	2.87	.97	1.90

Policy Waiver(s)

Does this restructuring trigger the need for any policy waiver(s)?

No



I. PROJECT STATUS AND RATIONALE FOR RESTRUCTURING

A. Background

1. **Bangladesh Scaling Up Renewable Energy Project (the Project) is an investment project financing operation whose project development objective (PDO) is to increase the installed generation capacity of, and mobilize financing for, renewable energy in Bangladesh.** The total funding of US\$185.25 million equivalent consists of a SDR 112.9 million (US\$156 million equivalent) credit from the International Development Association (IDA), and a US\$29.25 financing (US\$26.38 million loan and US\$2.87 million grant) from the Strategic Climate Fund (SCF). It was approved by the World Bank Board of Executive Directors on March 1, 2019. The original closing date of the Project was January 31, 2024.
2. **The Project has three components, implemented by three separate entities, as follows:**
 - i) **Component 1 - Feni Utility-Scale Solar Photovoltaic (PV) plant** (US\$89.17 million, of which US\$74.15 million equivalent IDA credit and US\$15.02 million of counterpart financing). This component supports the installation of a 50 MW solar PV plant and associated transmission infrastructure at Sonagazi, in the district of Feni. It is implemented by the Electricity Generation Company of Bangladesh.
 - ii) **Component 2 - Renewable Energy Financing Facility (REFF)** (US\$108 million equivalent, of which US\$81.85 million equivalent IDA credit and US\$26.28 million SCF loan). This component supports:
 - a) The establishment of a local currency facility to provide sub-loans to eligible project sponsors (private companies and public-private entities) to carry out rooftop and utility-scale solar PV investments; and
 - b) Capacity building and market development.It is implemented by Bangladesh's Infrastructure Development Company Limited (IDCOL).
 - iii) **Component 3 - Technical Assistance** (US\$3.64 million, of which US\$2.87 million of SCF grant and US\$0.77 million counterpart financing). This component supports technical assistance and capacity building activities to improve the enabling environment to scale-up renewable energy, and support the development of a project pipeline for private sector participation. It is implemented by the Sustainable and Renewable Energy Development Authority (SREDA).
3. **The Project was first restructured in 2022 to increase the installed capacity of the Feni solar PV plant from 50 MW to 75 MW and extend its closing date by 18 months from January 31, 2024, to July 31, 2025.** This restructuring was required to utilize realized cost savings and to provide additional time to complete the Project activities.

B. Project status

4. **Implementation progress and progress towards achievement of PDO are rated moderately satisfactory with varying performance across components.**
 - i) **The 75 MW Feni utility-scale solar PV plant (Component 1) is operational.** Supported investments include the solar field, a substation, separate control rooms for the grid and the power plant, and 13.3 kilometers of transmission line. The plant was commissioned in February 2024. This component is rated "satisfactory."
 - ii) **There is a slow uptake of the REFF financing (Component 2) despite a robust pipeline.** By January 22, 2024, IDCOL had approved 39 rooftop solar PV sub-projects. Actual disbursements are equivalent to US\$11.9 million for 20 rooftop solar PV sub-projects and 48.4 MWp cumulative installed capacity. IDCOL expects to disburse an additional US\$17.9 million by December 2024 for 27 sub-projects or 76.2 MWp additional rooftop solar PV capacity. The



pipeline of utility-scale solar PV sub-projects consists of two sub-projects with a total capacity of 128 MW (or 174 MWp) and an anticipated REFF financing contribution of US\$34 million. This component is rated “moderately satisfactory.”

iii) **The implementation of technical assistance activities supported by Component 3 is progressing at a moderate pace.** Staff turnover within the Project Implementation Unit (PIU) affected implemented progress. Except for one consultant, all the staff joined the PIU within the past 15 months. Ongoing consulting works comprise wind resource measurements, a bird and bat survey on specific locations for wind project development, and a detailed feasibility study of a slaughterhouse waste-based biogas plant. SREDA intends to prepare regulations for deploying solar PV systems, revise the 2018 net metering regulations, and carry out a network study for wind power development. SREDA has initiated the extension of the Government’s approval of the Technical Assistance Project Proposal (TAPP) from June 30, 2024, to July 31, 2025. This component is rated “moderately satisfactory.”

5. **The disbursement rate across all funding sources is 37.1 percent, with about 15 months remaining till the Project closing date.** This cumulative disbursement rate represents disbursement rates of 42 percent for the IDA credit, 14.9 percent for the SCF loan, and 33.7 percent for the SCF grant.

C. Rationale for the restructuring

6. **The proposed Level II restructuring aims to improve the utilization of REFF financing and is a response to request letters from the Government of Bangladesh (the Government) dated January 1, 2024, and March 24, 2024.** Only 12 percent of the funding allocated to the REFF, which represents 58 percent of the total financing cost (or US\$108 million out of US\$185.25 million), has been disbursed. It is critical to overcome the issues affecting the demand for REFF financing, which include the limited scope of the REFF-eligible sub-projects, the low concessionality (due to a low share of REFF financing) to sub-projects that may include battery energy storage systems, thus affecting their financial viability; and demand for US\$-denominated loans by utility-scale project sponsors to finance equipment imports.

7. **Demand for debt financing from the REFF is suppressed by limitations to the eligible sub-project categories.** IDCOL is considering financing for a 60 MW utility-scale wind sub-project and a 3MW solar PV mini-grid located on Monpura island off the coast of Bangladesh, in the northern part of the Bay of Bengal (the Monpura sub-project). IDCOL originally envisaged financing the Monpura sub-project out of the proceeds allocated under a separate World Bank operation: the Second Rural Electrification and Renewable Energy Development (RERED II, P131263), which closed on December 18, 2023. However, the REFF applies to solar PV rooftop and utility-scale solar PV facilities, which excludes these potential sub-projects. Expanding the scope of the REFF would enable IDCOL to support a larger share of renewable energy sub-projects, in line with the Government’s sustainable development targets.

8. **The Government of Bangladesh aims to fully electrify Monpura island with renewable energy to serve as a demonstration case that can be replicated in other remote localities, isolated from the national grid.** The sub-project consists of installing ground-mounted solar PV panels with a capacity of 11 MWp and an energy storage system of 22 MWh to generate about 12,340 MWh of annual electricity output (or about 68 percent of the island's annual electricity demand). It would interconnect with the islands' existing three solar mini-grid facilities.¹ to form a unified island grid. People living on Monpura island rely on fishing as the main source of livelihood. Increased access to affordable and reliable clean electricity supply would potentially help create new economic opportunities (through productive uses of electricity and ecotourism, for example) and improve climate resilience. When completed, the sub-project would serve approximately 15,100 households, 2600 small businesses, and 40 offices, educational and religious facilities. The

¹ The island is currently powered by three solar mini-grids with a cumulative installed capacity of 0.675 MWp and a diesel generator plant of 1,650 kVA operated by the West Zone Power Distribution Company Limited, a state-owned utility and electricity distribution company.



Monpura sub-project development company signed a power purchase agreement with the West Zone Power Distribution Company Limited and an implementation agreement with the Government in July 2022.

9. **Despite renewable energy solutions gaining traction as a clean source of electricity, additional concessionality is needed to scale them up in distributed and remote systems.** The REFF provides debt financing of up to 25 percent and 50 percent of the total cost of utility scale and rooftop solar PV sub-projects, respectively. Unlike utility-scale solar PV systems, energy storage systems such as batteries² can be part of rooftop solar PV sub-projects to support continuity of supply during power outages, mitigate the use of diesel generation backup and the associated running cost³. Despite falling prices, there is a cost premium associated energy storage, and they are yet to reach full commercial maturity. A higher share of REFF financing share would lower the financing cost of rooftop solar PV and mini-grid⁴ sub-projects to stimulate market demand.

10. **Bangladesh's economy faces a shortage of foreign currency, which affects the ability of the sponsors of utility-scale projects to secure letters of credit from commercial banks to backstop payment commitments for equipment imports.** As a result, these sponsors seek US\$-denominated loans to finance the portion of the capital expenditures incurred in dollars and, thus, overcome currency convertibility challenges. This is the case with the two utility-scale projects in IDCOL's pipeline. However, IDCOL can only provide REFF sub-loans in Bangladesh Taka (BDT), in line with the provisions of its subsidiary agreement with the Government, and as reflected in the legal agreements between the World Bank and the Government for the Project. Enabling IDCOL to finance sub-projects in US\$ will require amendments in the IDA Financing and the SCF Loan agreements. These amendments will form part of an additional restructuring once the Government finalizes the additional on-lending modalities.

11. **This restructuring aligns the results framework with the new World Bank Group Corporate Scorecard for FY24-30.** The revision introduced three indicators and modified an existing one (see paragraph 17).

12. **The restructuring activities do not involve additional environmental and social risks and impacts.** The Project follows World Bank safeguard policies. IDCOL developed the following safeguard instruments during the initial stage of the Project: an Environmental and Social Management Framework, a Resettlement Policy Framework, and an Environmental and Social Management System. These instruments ensure that the REFF-financed sub-projects are prepared and implemented in accordance with the Bank safeguards policies and the environmental legislation of Bangladesh. In addition, IDCOL has successfully managed and implemented similar sub-projects under the World Bank-financed RERED II. The Project's environmental and social classification remains Category B.

DESCRIPTION OF PROPOSED CHANGES

13. **The proposed restructuring involves the following changes:**

- (i) Extension of the scope of eligible sub-projects;
- (ii) Increase of the share of the total project cost financed by the REFF for specific sub-project categories; and

² Lithium-ion batteries have grown in popularity and are displacing lead acid batteries, thanks to reduced prices, longer lifespan, and minimal maintenance requirements.

³ The cost of operating a diesel generator in Bangladesh is current about US\$0.38 per kWh at current diesel prices, compared to a levelized cost of solar and battery electricity supply of about US\$0.12 per kWh.

⁴ ESMAP defines a mini-grid as an electric generation and distribution system that operates independently of the main grid. It can serve just a few customers in a remote settlement or hundreds of thousands of customers in a town or city, but with the ability to isolate itself from the main grid (also known as "islanding"). [Energy Sector Management Assistance Program (ESMAP). 2019. Mini Grids for Half a Billion People: Market Outlook and Handbook for Decision Makers. ESMAP Technical Report;014/19. World Bank, Washington, DC. <http://hdl.handle.net/10986/31926>]



(iii) Change in the result indicators.

A. Extension of the scope of eligible sub-projects to utility-scale wind projects and renewable energy (solar and wind) mini-grids.

14. **The proposed restructuring would extend the scope of the renewable energy financing facility (REFF) beyond utility-scale and rooftop solar PV systems.** To this effect, the REFF would support wind power and solar- and wind-powered mini-grid sub-projects, in line with the Government's efforts to electrify remote areas of the country and deliver the associated social benefits, while fostering low-carbon development pathways.

B. Increase of the share of the total project cost financed by the REFF for specific sub-project categories.

15. **The proposed revision would increase the share of REFF financing for rooftop solar PV, solar and wind mini-grid sub-projects to up to 80 percent of the total project cost.** This change is required to mitigate the impact of the additional capital investment of battery storage systems.⁵ In grid-connected rooftop solar PV power projects, energy storage systems reduce the use of diesel generators during power outages. In renewable energy mini-grid sub-projects, energy storage is required to manage the intermittency of solar and wind power supply and limit the use of diesel-based backup generators, thus enabling a higher consumption of renewable energy. Annexes 1 and 2 summarize the proposed modifications to the REFF design, the eligible expenditure categories, and the use of financing proceeds.

16. **Economic and financial considerations drive the recommendation of a higher share of REFF financial support for sub-projects that include energy storage systems.** A cost-benefit analysis was conducted on a hypothetical 20 MWp solar mini-grid, using diesel generation as the counterfactual scenario. The analysis shows that a higher concessionality is needed to lower the financing cost of renewable energy mini-grid subprojects and mitigate the need for a substantially higher tariff. The main economic costs are the life-cycle expenditures for building, operating, and maintaining the renewable energy facility. The economic benefits are the avoided capital and operating cost of the diesel generation plant and the avoided greenhouse gas emissions, compared to the status quo. The economic internal rate of return (EIRR) is 21.1 and 25.1 percent, respectively, with and without environmental benefits. The Economic Net Present Value (ENPV) approximates US\$40.7 million over 20 years, considering a social discount rate of 10 percent for Bangladesh. From the financial standpoint, the analysis considered a case where the REFF supports 25 percent of the total cost, with the balance funded by equity sponsors and commercial lenders. The alternative scenario envisaged 80 percent debt financing from the REFF. The investment leads to a negative financial internal rate of return (FIRR) of 9.3 percent and a negative financial net present value (FNPV) of US\$ 4.1 million. In contrast, the higher concessional level enabled by the larger share of REFF financing improves the FIRR to 18.1 percent, which corresponds to an NPV of US\$1.1 million. Annex 3 presents the economic and financial assumptions and results.

C. Changes to the results framework.

17. **The changes to the results framework involves four indicators.** The new PDO indicator "GW of renewable energy capacity enabled (Gigawatt)" supplements a similar existing one, which measures the renewable energy generation capacity (other than hydropower) constructed under the project in megawatts. The revision changes the "private capital mobilized (US\$)" indicator to "\$ billions in total private capital mobilized," in line with the new World Bank Group Corporate Scorecard FY24-30. Two additional intermediate-level indicators respectively measure the number of people provided with access to electricity and the number of new or better jobs.

⁵ Battery storage systems can represent up to 50 percent of the total investment cost, depending on the sub-project design. Forecasts suggest that lithium-ion batteries will extend their lead as the lowest-cost battery technology for mini grids dropping from 2022 levelized cost of service of \$0.37 per kWh to \$0.34 in 2026 and \$0.32 by 2030, compared to lead-acid batteries cost reduction from \$0.55 to \$0.54 per kWh over the same period.



II. SUMMARY OF CHANGES

	Changed	Not Changed
Results Framework	✓	
Disbursements Arrangements	✓	
Disbursement Estimates	✓	
Overall Risk Rating	✓	
Economic and Financial Analysis	✓	
Implementing Agency		✓
DDO Status		✓
Project's Development Objectives		✓
PBCs		✓
Components and Cost		✓
Loan Closing Date(s)		✓
Cancellations Proposed		✓
Reallocation between Disbursement Categories		✓
Safeguard Policies Triggered		✓
EA category		✓
Legal Covenants		✓
Institutional Arrangements		✓
Financial Management		✓
Procurement		✓
Implementation Schedule		✓
Other Change(s)		✓
Technical Analysis		✓
Social Analysis		✓
Environmental Analysis		✓

IV. DETAILED CHANGE(S)



DISBURSEMENT ESTIMATES

Change in Disbursement Estimates

Yes

Year	Current	Proposed
2019	0.00	0.00
2020	105,785.99	105,785.99
2021	783,378.74	783,378.74
2022	9,763,583.32	9,763,583.32
2023	55,000,000.00	51,184,353.53
2024	50,000,000.00	25,047,265.00
2025	50,000,000.00	28,400,000.00
2026	19,597,252.27	69,965,633.80

SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)

Risk Category	Rating at Approval	Current Rating
Political and Governance	● Substantial	● Moderate
Macroeconomic	● Moderate	● Moderate
Sector Strategies and Policies	● Moderate	● Low
Technical Design of Project or Program	● Substantial	● Moderate
Institutional Capacity for Implementation and Sustainability	● Substantial	● Moderate
Fiduciary	● Substantial	● Substantial
Environment and Social	● Substantial	● Moderate
Stakeholders	● Moderate	● Low
Other		
Overall	● Substantial	● Moderate



Results framework

COUNTRY: Bangladesh

Bangladesh Scaling-up Renewable Energy Project

Project Development Objectives(s)

The Project Development Objective is to increase installed generation capacity of, and mobilize financing for, renewable energy in Bangladesh.

Project Development Objective Indicators by Objectives/ Outcomes

Indicator Name	PBC	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
Increased installed capacity of renewable energy								
GW of renewable energy capacity enabled (Gigawatt)		0.00	0.01	0.02	0.03	0.05	0.12	0.31
Action: This indicator is New	Rationale: New indicator added to align the project's results framework with the World Bank corporate scorecard.							
Generation capacity of energy constructed or rehabilitated (CRI, Megawatt)		0.00	10.00	18.00	30.00	48.00	123.00	310.00
Action: This indicator has been Revised								
Renewable energy generation capacity (other than hydropower)		0.00	10.00	18.00	30.00	48.00	123.00	310.00



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Indicator Name	PBC	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
constructed under the project (CRI, Megawatt)								
Action: This indicator has been Revised								
Financing mobilized for renewable energy								
\$ billions in total private capital mobilized (Amount(USD))		0.00	0.00	0.01	0.01	0.04	0.06	0.12

Intermediate Results Indicators by Components

Indicator Name	PBC	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
Feni Utility-Scale Solar PV								
Net greenhouse gas emissions (CRI, Tons/year)		0.00	0.00	0.00	0.00	58,000.00	58,000.00	58,000.00
Number of women employed in the Project by EGCB and its EPC contractor (Number)		0.00	5.00	10.00	30.00	35.00	40.00	40.00
Renewable Energy Financing Facility								
Millions of people provided with access to electricity (Number)		0.00						0.07



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Indicator Name	PBC	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
Action: This indicator is New			<p>Rationale: <i>This intermediate indicator is added to align the project's results framework with the World Bank corporate scorecard. It measures the number of people have new or improved access to electricity through the mini-grid investments supported by the facility.</i> <i>The target value is equivalent to 64,980 (or 0.07 million) people.</i></p>					
New or better jobs, of which (%) for women and youth (Number)		0.00						1,970.00
Action: This indicator is New			<p>Rationale: <i>This intermediate indicator is added to align the project's results framework with the World Bank corporate scorecard.</i></p>					
Net greenhouse gas emissions (CRI, Tons/year)		0.00	12,000.00	32,000.00	58,000.00	118,000,000.00	179,000,000.00	319,000.00
Investment mobilized for renewable energy generation capacity (US\$) (Amount(USD))		0.00	1,000,000.00	5,000,000.00	7,000,000.00	10,000,000.00	15,000,000.00	212,000,000.00
Action: This indicator has been Revised								
REFF portfolio at risk (Percentage)		0.00	4.00	4.00	4.00	4.00	4.00	4.00
Share of end-users expressing satisfaction with rooftop PV systems due to the improvement in electricity service (Percentage)		0.00	0.00	0.00	75.00	75.00	75.00	75.00



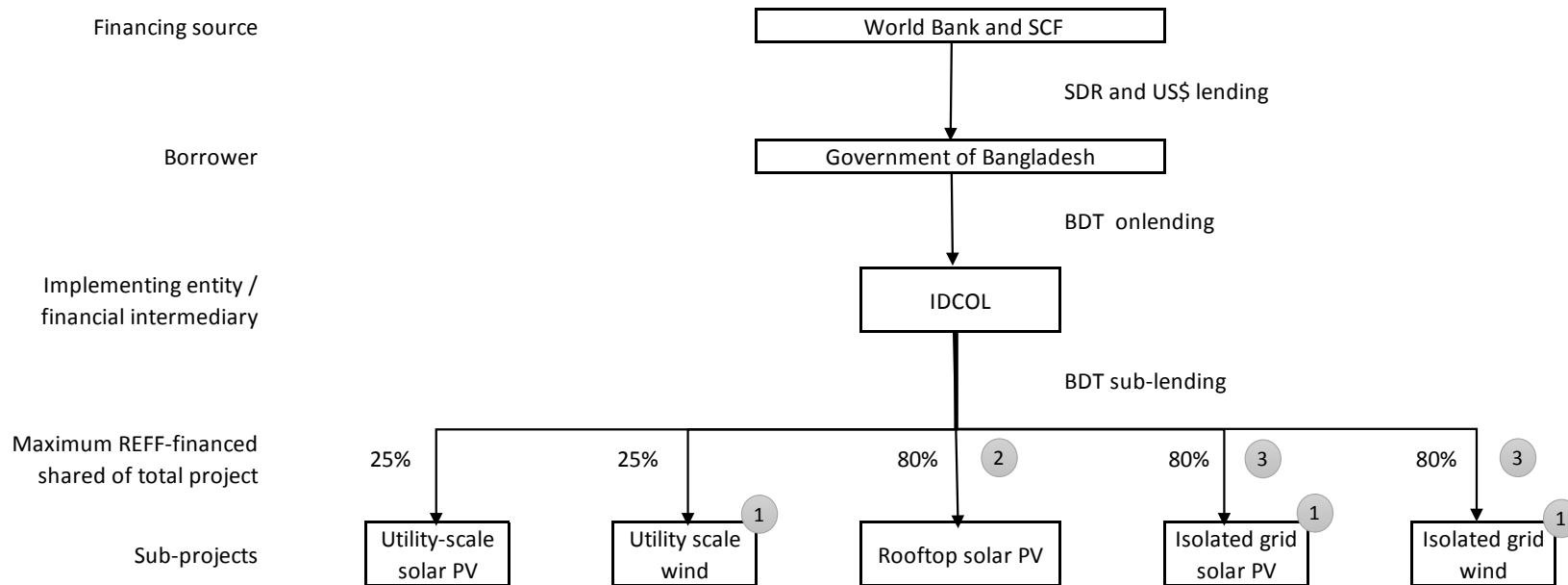
The World Bank

Bangladesh Scaling-up Renewable Energy Project (P161869)

Indicator Name	PBC	Baseline	Intermediate Targets					End Target
			1	2	3	4	5	
Share of women benefiting from outreach initiatives by IDCOL (Percentage)		0.00	10.00	12.00	14.00	16.00	18.00	20.00
Technical Assistance								
Waste-to-energy pilot construction completed (Yes/No)		No	No	No	No	No	Yes	Yes
Share of women benefiting from capacity building by SREDA (Percentage)		0.00	25.00	25.00	25.00	25.00	30.00	30.00



Annex I: Summary of the proposed changes to the Renewable Energy Energy Financing Facility



- ① : New eligible subproject categories
- ② : Increase of the maximum REFF financing share from 50% to 80%
- ③ : Maximum REFF financing share of new eligible subproject category

Acronyms: BDT = Bangladesh Taka, IDCOL = Infrastructure Development Company Limited, PV = photovoltaic, REFF = Renewable Energy Financing Facility, SCF = Strategic Climate Fund, US\$ = United States Dollar



Annex II: Summary of proposed changes to eligible expenditure categories and use of financing proceeds

Category	Amount of IDA credit allocated (SDR)	Percentage of expenditures to be financed	Amount of SCF loan allocated (US\$ million)	Percentage of expenditures to be financed	SCF grant (US\$ million)	Percentage of expenditures to be financed	Comment
(1) Goods, works, non-consulting services, Training and Incremental Operating Costs for Component 1	53.65	100% (exclusive of taxes)					No change
(2) Sub-loans under Component 2.a	59.25	Up to 19% of total capital expenditure for utility-scale solar PV and wind sub-projects Up to 61% of total capital expenditure for rooftop PV and solar and wind mini-grid sub-project	24.88	Up to 6% of total capital expenditure for utility scale solar PV and wind sub-projects Up to 19% of total capital expenditure for rooftop PV sub-projects and solar and wind mini-grid sub-projects			Scope extended to utility-scale wind sub-projects and renewable energy (solar and wind) mini-grid sub-projects. The total financing share of rooftop solar PV projects increased from up to 50 % to up to 80%.
(3) Non-consulting services and consulting services, Training and Incremental Operating Costs under Component 2.b	-	-	1.5	100%			No change
(4) Goods, works, non-consulting services, and consulting services, Training and Incremental Operating Costs under part 3 of the Project (Component 3)					2.87	100%	No change
Total		112.9		26.38		2.87	No change

**Annex III: Economic and financial analysis****A. Economic analysis**

A cost-benefit analysis was conducted for an isolated mini-grid system, using a representative 20 MWp solar PV plant associated with a lithium-ion battery with 8 hours of storage. The counterfactual was the cost of generating the same energy using a diesel generator. The analysis assumed 100 percent capacity credit for the solar plant, and a load factor of 22 percent. As a result, it was assumed that the solar energy produced would displace an equivalent amount of energy from the diesel generator plant. In other words, the 20MWp solar plant is equivalent to a 5.5 MW diesel-powered plant with a load factor of 80 percent.

The main economic cost are the capital expenditures (CAPEX) associated with the construction of the mini-grid, which includes the associated development and financing expenses. These costs are estimated at US\$1.9/W of which the cost of the battery energy storage system is estimated at US\$1 per watt.⁶ The economic benefits consist of the avoided cost of acquiring and running a diesel generator, as an alternative to the solar mini-grid, and the environmental benefit from the avoided greenhouse gas (GHG) emissions and particulate matters (PM). The calculation of the economic value of GHG emissions used updated values social cost of carbon published by the World Bank in 2022. The analysis considered a social discount rate of 10 percent.

As shown in Table A3.1, the analysis shows that the isolated mini-grid system is economically viable. The economic internal rate of return of 21 percent increases to 25 percent when considering the global environment benefits. Additional potential economic benefits were identified but not monetized. These benefits include improved population health due to lower air pollution, job creation due to productive uses of energy, and improved climate resilience.

Table A3.1: Economic analysis summary results

Costs		
PV EPC including Development and Financing Cost	[\$US thousands]	38,000
Total O&M cost	[\$US thousands]	6,004
Total Costs	[\$US thousands]	44,004
Benefits		
Capital cost of counterfactual plant	[\$US thousands]	1,124
Avoided fuel cost	[\$US thousands]	71,628
Total Economic Benefits	[\$US thousands]	72,752
Total Economic Flows	[\$US thousands]	28,748
ERR		21.10%
Avoided cost of SO ₂	[\$US thousands]	-
Avoided cost of Nox	[\$US thousands]	32
Avoided cost of PM	[\$US thousands]	97
Avoided GHG Emissions	[\$US thousands]	11,963
Total Economic Flows (including GHG Emission Reduction Benefits)	[\$US thousands]	40,711
ERR (GHG Emission and Reduction Benefits)		25.10%

⁶ Estimated capital cost assumed to include development costs, solar panel inverter and mounting structure, battery energy storage, power control system, substation equipment, transformer, switchgear, monitoring system, pyranometer, and other equipment.



B. Financial analysis

The financial analysis considers two scenarios as follows: (i) The first scenario envisages a limited level of concessionality, with 25 percent of the cost of the mini-grid financed by the renewable energy financing facility (REFF) and the remaining debt portion financed by commercial lenders; (ii) The second scenario increases the share of the concessional financing to 80 percent.

As expected, financing a higher share of the project cost with concessional resources reduces the weighted average cost of capital of the mini-grid and by extension, the total debt burden. Moreover, the project does not meet the hurdle rate expected from the equity investors under the limited concessionality scenario, unlike the higher concessionality case. It is, therefore, critical to reduce the financing cost to attract private sector interest in such projects.

About half of the mini grid’s capital cost is due to the associated lithium-ion battery, which mitigate the use of diesel backup generation by storing excess generation which can be utilized when the sun is not shining. Providing a higher level of concessional resources to distributed systems and mini-grids, more likely to have batteries than utility-scale plants, is consistent with the goal of increasing renewable energy use. The need for such a higher amount of concessional resources is expected to reduce as battery prices decrease. Table A3.2 summarizes the results of the financing analysis.

Table A3.2: Financing scenarios and summary results

		Concessionality level	
		Limited	High
Assumptions			
Equity		30%	20%
Debt			
Loan A: REFF loan in BDT		25%	80%
6% interest rate, 15 year tenor, 1 year grace period			
Loan B: Commercial loan in BDT		20%	
12% interest rate, 10 year tenor, 1 year grace period			
Loan C: Commercial loan in USD		25%	
8% interest rate, 10 year grace period, 1 year grace period			
Project Return			
Operating Cash Flow	[US\$ thousands]	40,517	40,517
Cash Outflow	[US\$ thousands]	(40,517)	(40,517)
Net Cash Flow	[US\$ thousands]	(0.00)	(0.00)
Internal Rate of Return (IRR)		7.87%	
Weighted average cost of capital		10.40%	7.80%
Equity Return			
Operating Cash Flow	[US\$ thousands]	25,986	25,986
Interest Expense (Loan A)	[US\$ thousands]	(2,242)	(7,176)
Interest Expense (Loan B)	[US\$ thousands]	(3,510)	0
Interest Expense (Loan C)	[US\$ thousands]	(2,408)	0
Principal Payment (Loan A)	[US\$ thousands]	(3,150)	(10,081)
Principal Payment (Loan B)	[US\$ thousands]	(3,014)	0
Principal Payment (Loan C)	[US\$ thousands]	(4,407)	0
Equity Investment	[US\$ thousands]	(11,400)	(7,600)
Net Equity Cash Flow	[US\$ thousands]	(4,146)	1,129
Equity Internal Rate of Return (IRR)		9.3%	18.1%
Expected Equity return		15.00%	