Terminal Evaluation of the UNDP-GEF project:

Development of Sustainable Renewable Energy Power Generation (SREPGen)

Bangladesh

2015-2020

GEF Project ID: 4459
UNDP Project ID: 00086516
UNDP PIMS: 3948

Final

GEF focal area: Climate change mitigation
Terminal evaluation timeframe: 19/11-31/12 2020

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Acronyms and abbreviations

ADB	Asian Development Bank
BDT	Bangladesh Thaka
BGEF	Bright Green Energy Foundation
BSREA	Bangladesh Solar and Renewable Energy Association
CEO	Chief Executive Officer
CO	Country Office
CSO	Civil Society Organisation
CSR	Corporate Social Responsibility
EOP	End of Project
GDP	Gross Domestic Product
GEF	Global Environment Facility
GHG	Greenhouse Gas
GIZ	Deutsche Gesellschaft für Internationale Zuzammenarbait GmbH
GoB	Government of Bangladesh
IDCOL	Infrastructure Development Company Limited
KW	Kilowatt
LCG	Local Consultative Group
LCUD	Promoting Energy-Related Low Carbon Urban Development in Bangladesh
LED	Light-emitting Diode
M&E	Monitoring and Evaluation
MoPEMR	Ministry of Power, Energy and Mineral Resources
MT	Megatonne
MTR	Mid-term Review
MW	Megawatt
NACOM	Nature Conservation Management
NIM	National Implementation Modality
NGO	Non-Governmental Organisation
NPD	National Project Director
NPM	National Project Manager
PIF	Project Identification Form
PIR	Project Implementation Review
PMU	Project Management Unit
ProDoc	Project Document
PSC	Project Steering Committee
PSMP	Power System Master Plan 2010
PV	Photovoltaic
PVSL	Photovoltaic Solar LED Lantern
RE	Renewable Energy
REB	Rural Electrification Board
REP	Renewable Energy Policy
RET	Renewable Energy Technology
SDG	Sustainable Development Goal
SHS	Solar Home System
SIP	Solar Irrigation Pump
SMART	Specific, Measurable, Attributable, Relevant, Time-bound/Timely/Trackable/Targeted
SREDA	Sustainable and Renewable Energy Development Authority
SREPGen	Development of Sustainable Renewable Energy Power Generation
TE	Terminal Evaluation
ToR	Terms of Reference
UBOMUS	Upokulio Biddutayan O Mohila Unnayan Samity
UNDAF	United Nations Development Assistance Framework
UNDP	United Nations Development Programme
USD	United States Dollars
VoIP	Voice over Internet Protocol
WREL	Western Renewable Energy (Pvt.) Ltd.

1. Project information Table

Project Details		Project Milestones	
Project Title:	SREPGen	PIF Approval Date	01/11/2011
UNDP Project ID (PIMS #):	3948	CEO Endorsement Date (FSP) / Approval date (MSP):	15/08/2013
GEF Project ID:	4459	ProDoc Signature Date:	26/11/2013
UNDP Atlas Business Unit, Award ID, Project ID:	00073939 00091251	Date Project Manager hired:	01/12/2014
Country/Countries:	Bangladesh	Inception Workshop Date:	05/03/2015
Region:	Asia	Mid-Term Review Completion Date:	12/11/2017
Focal Area:	Climate change mitigation	Terminal Evaluation Completion date:	31/12/2020
GEF Operational Programme or Strategic Priorities/Objectives:	CCM-3: Promotion of Investment in RE Technologies	Planned Operational Closure Date:	31/12/2020
Trust Fund:	GEF TF		
Implementing Partner (GEF Executing Entity):	Sustainable and Renewable Energy Development Authority (SREDA), Power Division, Ministry of Power, Energy and Mineral Resources (MoPEMR)		
NGOs/CBOs involvement:	Beneficiaries, implementers of sub-projects and pilot projects		
Private sector involvement:	Beneficiaries, implementers of sub-projects and consultancies		
Geospatial coordinates of project sites:	• SREDA Office, Dhaka (*ENM roof-top system*) • South Sakuchia Union, Monpura Upazilla, Bhola District site: 22°9'15.6N 90°56'17.0E (*solar mini-grid*) • Monpura Union, Monpura Upazilla, Bhola District site: 22°14'53.1N 90°58'55.9E (*solar mini-grid*) • Char Montaz Union, Rangabali Upazilla, Patuakhali District (*4.3: solar ice plant*) 21.9394° N, 90.5541° E • Jashore, Chuadanga, Magura and Kushtia (*solar irrigation pumps*) • Naitong Para Village, Bandarban District (*pico-hydro-power*), 21.972546° N, 92.415005° E • Mymensing and Gazipur (*solar charging stations*) • KU, CUET, RUET, SUET, BAU, PUST, Begum Rokeya University, Kushtia Police Line (*PV resource assessment, solar irradiation stations*)		

Financial Information		
PDF/PPG	at approval (US$M)	at PDF/PPG completion (US$M)
GEF PDF/PPG grants for project preparation	0.15	0.15
Co-financing for project preparation	0.45 (in kind, GoB)	Information not available

Project	at CEO Endorsement (US$M)	at TE (28/12/20) (US$M)
[1] UNDP contribution:	5.00	Information not available
[2] Government:	21.15	2.76
[3] Other multi-/bi-laterals:	0.25	0.25
[4] Private Sector:	23.20	0.99
[5] NGOs:	-	14.84
[6] Total co-financing [1 + 2 + 3 + 4 + 5]:	49.60	18.84
[7] Total GEF funding:	4.07	4.00
[8] Total Project Funding [6 + 7]	53.67	22.84

2. Executive summary

1.1 Project Description

1. SREPGen's objective was to "*reduce the annual growth rate of GHG emissions from fossil fuel-fired power generation through the exploitation of Bangladesh's renewable energy resources for power generation*". It had four expected results:
    - *SREDA evolving into a facilitation center to support private sector RE investment development, enable regulators to determine fair flexible tariff structures, bring confidence to private RE investors, and increase the number of approved RE projects*
    - *Increasing capacities of relevant government agencies to generate, process, obtain and disseminate reliable RE resource information for use by GoB and potential project developers and investors*
    - *Increased affordability of photovoltaic solar (including LED lanterns (PVSLs)) and other Renewable Energy Power system for low income households*
    - *Renewable energy accounts for an increased share of Bangladesh's power generation mix*

2. SREPGen's outputs and activities fell under four components: 1) policy and regulatory support, 2) resource assessment support, 3) increasing affordability and access to solar power, and 4) upscaling renewable energy investments. Component 3 was delivered through sub-projects providing access to renewable energy (RE) to off-grid communities, and component 4 was implemented through sub-projects that demonstrated available RE solutions as well as pilot projects that tested innovative RE solutions.

1.2 Evaluation Rating Table

Monitoring and evaluation (M&E)	**Rating***
M&E design at entry	MS
M&E Plan Implementation	S
Overall Quality of M&E	**S**
Implementing Agency (IA) implementation and Executing Agency (EA) execution	**Rating***
Quality of UNDP implementation/oversight	MS
Quality of implementing partner execution	MS
Overall quality of Implementation/Oversight and Execution	**MS**
Assessment of outcomes	**Rating***
Relevance	S
Effectiveness	S
Efficiency	MS
Overall project outcome rating	**S**
Sustainability	**Rating***
Financial resources	L
Socio-political	ML
Institutional framework and governance	ML
Environmental	L
Overall likelihood of sustainability	ML
**See annex 7 for the rating scale applied*	

1.3 Summary of findings, conclusions and lessons learned

3. SREPGen was prior to 2018 affected by major delays, slow progress and low budget execution due to a lengthy GoB project document approval process, slow recruitment of the National Project Manager, and an overly prescriptive focus on solar lanterns (PVSLs), which was overtaken by rapid grid expansion, reduced costs of RE systems, and free distribution of solar home systems. Hence, there was only little demand for PVSLs. The project design was revised and project implementation picked up in 2018 but slowed down again in 2020 due to the COVID-19 pandemic. By the end of the project, 98 percent of the budget had been executed. One out of two objective targets and most outcome targets were reached or exceeded, but not always entirely as a result of SREPGen. However, some targets were highly overambitious and beyond what SREPGen could be expected to deliver.

4. Some significant contributions were made towards creating an enabling environment for increased renewable energy (RE) investments, in paqrticular the Net Metering Guidelines, which laid the economic foundation for grid integration of RE systems, which can be considered a catalytic contribution from SREPGen and the GEF with early evidence of increased investment in rooftop PV systems. Moreover, the National Solar Energy Road Map 2021-2041 contributed to the integration of RE in the Perspective Plan 2020-30 and the draft 8th Five Year Plan. SREPGen also contributed significantly to an enhanced capacity of SREDA, which now proactively engages in facilitating RE projects and the improved access to RE data.

5. The on-the-ground sub-projects providing access to RE under component 3 and demonstration pilot projects under component 4 provided energy to poor and remote off-grid communities and vulnerable people, including indigenous peoples in the Chittagong Hill Tracts, small-scale fishing communities on islands, female-headed households, and people living with disabilities. SRPEGen met its target number of households provided with electricity. The access to electricity led to a number of livelihoods improvements, such as new and improved income opportunities, increased agricultural productivity, and improved education.

6. The sub-projects and pilot projects were intended to demonstrate commercially viable RE solutions for the private sector. To this end, and to ensure sustainability, the project applied blended financing, combining the GEF grant with loans and/or equity. However, the private financial investment was much lower than expected and the participation of the private sector from a commercial perspective was limited to two sub-projects, while many sub-projects and pilot projects were implemented with not-for-profit partners, including small NGOs and CSOs, social enterprises, a government-owned financing institution, and a private company CSR investment. The reasons for this appear to include the remoteness and limited (or perceived limited) scope for commercial investments in some locations, and a perception that investment would be risky even with a 50 percent grant. Since many sub-projects and pilot projects were not implemented from a fully commercial perspective and loan financing was concessional, they did not fully demon-

strate the business potential and may thus not appear fully convincing for private companies. So far, there is little evidence of replication of the sub-projects and pilot projects, which could also in part be due to many sub-projects and pilot projects having been implemented recently and the COVID-19 pandemic.

7. The implementation of SREPGen was led by national stakeholdersm and SREDA was proactively engaged in the implementation and coordination with other initiatives supporting SREDA. However, grants and procurement were mostly handled by UNDP. IDCOL played a major role in the identification of implementing partners for the sub-projects. Implementing partners invested their own financial resources in the sub-projects and thus had a direct economic interest in them. Beneficiaries made an in-kind contribution, which in some cases was substantial.

8. SREDA has evolved significantly, but still needs further support for consolidation. There are still development partners working with SREDA, including UNDP-GEF through the upcoming LCUD project, so it seems likely that the capacity and policy results of SREPGen will be further consolidated and sustained. However, it is unclear whether there will be support for SREDA in the development of commercially viable RE solutions for remote rural areas. The sub-projects were planned to be commercially viable and designed to fully recover operation and maintenance costs from the electricity tariffs paid by the users/customers and the tariffs appear affordable for the beneficiaries.

9. No negative environmental or social impacts were identified by the terminal evaluation. The project had been duly screened at design and found to be of low environmental impact, but while the revision of the design led to a significant shift in the RE technologies promoted under the sub-projects and pilot projects, no follow-up screening was carried out. Nonetheless, the sub-projects that were co-financed by IDCOL were subject to environmental and social screening as per IDCOL procedures. While some sub-projects provided positive benefits for women and one sub-project was implemented by a woman enterprise, the project design did not include measures vis-à-vis gender inclusion and empowerment of women.

10. SREPGen has generated the following lessons, which are of relevance to other UNDP-GEF RE projects.
    - Lesson 1: RE project designs should not be overly prescriptive in terms of RE technology or systems.
    - Lesson 2: Stocktaking of contextual changes and the potential need for project revision should be carried out during the inception phase.
    - Lesson 3: When significant changes are made to the RE activities on the ground, an environmental and social screening should be carried out.
    - Lesson 4: RE project designs and implementation should include concrete gender strategies and gender disaggregated indicators and targets.
    - Lesson 5: Indicators and targets at the outcome/component level should be realistic and attributable to project interventions, and indicators at objective and outcome levels should not overlap

- Lesson 6: Socio-economic/livelihoods indicators should be included for sub-projects and pilot projects.
- Lesson 7: It is important to workout models that are viable for engaging the private sector in piloting to facilitate an interest in investing in replication.

1.4 Recommendations

Table 8.2.1: Recommendations			
Rec #	**TE recommendation**	**Entity responsible**	**Timeframe**
A	Category 1: Private sector involvement		
A.1	Analyse commercial and financial viability of the different sub-projects and pilot projects and identify potential areas of improvement vis-à-vis commercialisation of similar projects in the future.	SREDA, UNDP	2021-22
A.2	Engage in dialogue with the private sector to understand how a) the private sector can be atterrated to engage in future piloting, and b) how sub-projects and pilot projects can undertake demonstration that is relevant for the private sector.	SREDA, UNDP	2021-22
A.3	Assess how approaches from successful private sector development projects can be adapted to RE sector projects.	UNDP	2021-22
A.4	Engage with commercial financing institutions and RE companies to explore how the sub-projects and pilot projects can be replicated and tested under more commercial terms.	SREDA	2021-22
A.5	Explore possible ways to further reduce risk for the private sector – for example: a) risk insurance for losses, and b) increasing the grant share, for high risk and highly innovative sub-projects and pilot projects.	IDCOL, SREDA	2022-2023
B	Category 2: GoB institutional capacity to promote RE		
B.1	Carry out capacity needs assessments of key GoB institutions in the energy sector, vis-à-vis the technical capacity to engage more comprehensively in RE promotion and shifting priorities from hydro-carbons towards RE.	Power Division	2022
C	Category 3: Upscaling and replication		
C.1	Engage in dialogue with other development partners on how they can be mobilised to a) replicate the experiences and lessons from SREPGen sub-projects and pilot projects, and b) support SREDA and IDCOL vis-à-vis rural RE.	SREDA, IDCOL, UNDP	2021
D	Category 4: Analysing pilot project impacts		
D.1	Carry out impact studies on the livelihood benefits achieved by the sub-projects and pilot projects.	SREDA, UNDP	2021-2022

D.2	Carry out ex post environmental and social impact (positive and negative) assessments of the sub-projects and pilot projects.	UNDP	2021-2022
E	Category 5: Specific sub-projects		
E.1	Assess the reasons behind the size of the fixed line charge and compare it with the charges of other mini-grid systems in Bangladesh. Explore options for reducing the charge and rationalising the fixed costs.	WREL, IDCOL	2021
E.2	Explore the feasibility and financial viability of connecting wind-power to the solar ice-making factory to increase the production capacity of the existing facility.	UBOMUS, SREDA, IDCOL	2021
E.3	Explore options for mobilising financing to increase the capacity of the solar ice-making factory and making it more commercially viable.	UBOMUS, SREDA, IDCOL	2021
E.4	Consider installing capacity to produce larger ice blocks at the solar ice-making factory – and analyse the potential risk of large boat operators displacing small boat operators from purchasing ice, and develop mechanisms to ensure that small boat operators still have access to ice (e.g. maximum limit for daily/weekly purchases.	UBOMUS	2022

3. Introduction

3.1 Purpose and objective of the terminal evaluation

11. The purpose of the terminal evaluation was to assess the performance of the Development of Sustainable Renewable Energy Power Generation (SREPGen) project and the extent which it achieved its intended results (objectives, outcomes, outputs). Moreover, the terminal evaluation had the objective of capturing lessons learned and providing forward-looking and implementable recommendations vis-à-vis UNDP's future RE engagement in Bangladesh. Moreover, the terminal evaluation had a series of detailed objectives, see Box 3.1.1.

Box 3.1.1: Detailed evaluation objectives
• Assess to what extent SREPGen project has contributed to address the needs and problems identified during programme design • Assess how effectively SREPGen project has achieved its stated development objectives and purposes • Measure how efficiently the outcomes and outputs have progressed in attaining the development objective and purpose of the project • Assess both negative and positive factors that have facilitated or hampered progress in achieving the project outcomes, including external factors/environment, weakness in design, management and resource allocation • Assess the extent to which the application of the rights-based approach and gender mainstreaming are integrated within planning and implementation of the SREPGen project • Identify and document substantive lessons learned, good practices and also opportunities for scaling up the future SREPGen project in Bangladesh • Provide forward looking programmatic recommendations for the SREPGen project and the relevant portfolio of UNDP

3.2 Scope of the terminal evaluation

12. The terminal evaluation covers SREPGen from its formulation in 2011 and implementation start (2015) to its completion in 2020. It covers all components of SREPgen as well as management and coordination with other development partners. A sample of all stakeholder groups were consulted from the UNDP Country Office, key Government agencies, the private sector, civil society, technical experts/consultants, and end beneficiaries of selected sub-projects (see Annex 2 for the mission programme and sites visited, and Annex 3 for the full list of people interviewed).

3.3 Evaluation methodology

13. The terminal evaluation adhered to the 2020 UNDP-GEF guidelines for terminal evaluations. It was caried out as a mixed-method evaluation, using a combination of methods to gather information in order to triangulate information/data and thereby ensure their solidity, and to ensure that information gaps were filled. The methods used were a) review of available technical, financial and managerial documentation related to the project and its outputs, b) remote interviews with key stakeholders and implementing partners, and c) site visits to three SREPGen sub-projects[1]. The document review provided

[1] Solar mini-grids in Monpura Island, piloting of grid integration of solar irrigation pump, energy assisted ice-making plant in Char Montaz.

quantitative data on project implementation, financial information, and progress against project indicators. The stakeholder consultations focused on a) triangulating and validating information obtained from the document review, b) filling gaps, and c) obtaining views and perspectives from the different types of stakeholders. The site visits were used to a) verify sub-projects, their completion status, functionality and benefits, and b) engage directly with end beneficiaries in their own environment. A tight schedule with approximately one month to complete the evaluation from inception to submission of the evaluation report as well as movement and interaction restrictions imposed by the COVID-19 pandemic, limited the number of stakeholders that could be consulted and sub-project sites that could be visited. The data analysis was guided and structured by a series of evaluations questions and indicators presented in an evaluation criteria matrix (see Annex 5).

14. The terminal evaluation addressed and analysed gender equality by assessing the gender approaches implemented under SREPGen, the integration of gender and gender disaggregation of the indicators and targets, the inclusion of women in decision-making, and the specific benefits for women of the sub-projects and pilot projects. The guide the gender analysis, the evaluation matrix included seven gender-specific indicators under evaluation 67 on gender and empowerment (see Annex 5). This analysis was carried out on the basis of available gender information in the project documentation and reporting, and interviews with implementing partners and interviews with women beneficiaries.

3.4 Data collection and analysis

15. **Document review:** All available project documentation was reviewed, including: the project document (ProDoc), GEF Council Notification (revision), project implementation review (PIR) reports, work plans, project budget, financial statements, minutes of meetings, and the GEF focal area tracking tool. The assessment of results (outcomes) utilised the project's own indicators and monitoring data as much as possible. Moreover, key Government and UNDP policy and strategy documentation was consulted in relation to the assessment of relevance and alignment of SREPGen. See Annex 4 for a complete list of the documents reviewed.

16. Stakeholder consultation: Different methods of stakeholder consultations were carried out. Remote (VoIP) key informant interviews were carried out with staff at the UNDP Country Office, SREDA, the Power Division (Ministry of Power, Energy and Mineral Resources (MoPEMR)), the Infrastructure Development Company Limited (IDCOL), the Asian Development Bank (ADB), GIZ, private companies and civil society organisations involved in sub-project implementation, and technical experts/consultants that had been engaged in SREPGen. See Annex 3 for a list of interviewees. Implementing partners and sub-project beneficiaries were consulted by the national consultant during the site visits through interviews, focus group discussions and during inspection of sub-project infrastructure (see Annex 3 for the list of people interviewed). Interviews and focus groups discussions were carried out as semi-structured interviews/discussions. All the key stakeholders were consulted, albeit in terms of the private sector, civil society and end beneficiaries, only a sample was consulted due to their numbers. The beneficiaries

consulted were female and male farmers utilising the grid integrated solar irrigation pump, female and male consumers of electricity produced by solar mini-grids, female leadership and members and male staff operating a solar powered ice-making plant, and customers purchasing ice (see Annex 2 for information on people consulted during the field visits).

17. **Site inspection:** The national consultant inspected three SREPGen sub-project sites in site visits to SREPGen sub-projects: solar mini-grids (Monpura Island, Bhola), grid integration of solar pumps (Mirpur, Kushtia), and a solar powered ice-making plant (Char Mantaz, Rangabali, Patuakhali). Pictures for documentation were taken at each sub-project site. Annex 2 contains detailed field visit reports including pictures.

18. The evaluation criteria matrix (Annex 5) provides detailed information on the methodology and data sources used for each evaluation question. Several sources were used for each evaluation question to allow for triangulation and filling of information gaps.

19. **Analysis:** The data analysis was an iterative process throughout the evaluation, where initial findings and recommendations were discussed and tested with stakeholders as the terminal evaluation progressed to ensure their validity and appropriateness, as well as stakeholder participation and ownership. Both qualitative and quantitative analysis was used, depending on the nature of the data, evaluation question and indicators.

20. The terminal evaluation term of reference (ToR) provided a comprehensive set of evaluation questions, (see Annex 1). These were further crystallised and expanded with indicators (see Annex 5). The project's own indicators were utilised as much as possible for answering the evaluation questions. The evaluation questions were organised in accordance with the UNDP-GEF terminal evaluation guidelines. The assessments of results, outcomes, impact, drivers and assumptions were structured on the basis of the project's results framework. The evaluation used the standard scoring matrix for UNDP-GEF terminal evaluations as a tool for assessing project performance.

3.5 Ethics

21. Throughout the evaluation process and in the compilation of the evaluation report, efforts were made to represent the views of all stakeholders. Data were collected with respect to ethics and human rights issues. All information was gathered after prior informed consent from people, all discussions responses remained anonymous and all information was collected according to the UN Standards of Conduct.

3.6 Limitations to the evaluation

22. Table 4.4.1 presents the limitations the terminal evaluation encountered, and the measures taken to mitigate these.

Table 4.4.1: Limitations of the terminal evaluation	
Limitations	**Mitigation measures applied**

Travel restrictions due to the COVID-19 pandemic prevented the international consultant from visiting Bangladesh.	• Remote interviews (VoIP) with stakeholders and implementing partners • Field visits and interviews with end beneficiaries caried out by the national consultant, including photo documentation
Time constraints and remoteness made it impossible to visit all sub-project locations under components 3 and 4 and interview all private sector and civil society sub-project partners	• Interviews were carried out with a selection of private sector and civil society representatives – identified in consultation with the PMU • Three representative sub-projects were visited by the national consultant – identified in consultation with the PMU
Staff movement and limited knowledge and recollection of the early years of project planning and implementation	• Assessment of mid-term review findings • Interviews with current and former stakeholders involved in the early stages of the project
One interviewee was not fully able to respond in detail in English	• Translation between Bangla and English by the national consultant and PMU consultant

3.7 Structure of the terminal evaluation report

23. The evaluation report is structured in seven main sections plus annexes. The first section presents an overview of the basic project information. This is followed by the second section, which provides a brief executive summary of the findings, conclusions and recommendation of the terminal evaluation. The third section present the terminal evaluation purpose, scope and methodology, whereas the fourth section presents the SREPGen project objective, scope, strategy, management arrangements and stakeholders. The fifth section presents the detailed findings of the terminal evaluation, followed by the seventh section, which presents the main overall findings, conclusions, recommendations and lessons. The annexes presents supplementary information, including the terms of reference for the terminal evaluation, a list of people consulted, a list of documents reviewed, and the detailed evaluation matrix guidng the evaluation.

4. Project description

4.1 Project start, duration and milestones

24. SREPGen implementation formally started on 26 November 2013 (signature date), but implementation of programme activities started later; the National Project Manager assumed his position in December 2014, and the inception workshop was held on 5 March 2015. The original operational closing date was 31 December 2019. A mid-term review was carried out from 6 august to 12 November 2017. In response to the mid-term review recommendations the project design, in particular component 3, was revised and the project was extended with a new end date of 26 May 2020. To adjust to the COVID-19 pandemic, SREPGen was further extended to 31 December 2020.

4.2 Development context

25. To mitigate the impacts of the increasing intermittency of the power supply, the Government of Bangladesh (GoB) announced targets for capacity additions of 9,000 MW (nearly a tripling of current capacity) by 2015 based on the Power System Master Plan 2010 (PSMP) to improve and expand electricity supply to support an annual GDP growth of eight percent. The country's current power-generation capacity stands at 23,777 MW including captive and renewable energy (and 20,430MW without captive and renewable energy), while average production hovers between 8,024-12,892 MW in summer and 7,246-8,762MW in winter, according to the Power Cell report (25 Dec 2020). According to the Power System Master Plan 2016, Bangladesh has a target of generating 24,000MW of electricity by 2021, 40,000MW by 2030, and 60,000MW by 2041. Significant progress has been made in the renewable energy sector in the last few years. At present, 700.61 MW (SREDA website, 25 Dec 2020), three percent of the country's total energy consumption is generated from renewable energy sources. The PSMP outlines a time-bound reform process focusing on infrastructural development, tariff rationalisation, efficiency improvement, energy sources and fuel diversification with a target to supply power to all its citizens by 2021. 98 percent of Bangladesh's population already have access to electricity through grid extension and off-grid renewable (RE) solutions (Power Cell website, 25 Dec 2020).

26. In recognition of the potential contribution of renewable energy (RE) to sustainable economic growth, RE development is identified as a potential means for energy provision in Bangladesh's National Energy Policy 1996. In 2002, a Renewable Energy Policy (REP) was first drafted and a "Vision and Policy Statement on Power Sector Reforms" was issued with the objectives of: i) universal access with improved reliability and quality by 2020; ii) stabilising the financial status of the power sector and increasing its efficiency; iii) operating the sector on commercial principles and increasing private sector participation; and iv) establishing an independent institution to promote sustainable energy to promote sustainable energy. Finally, the Renewable Energy Policy was adopted in 2008 with a vision of generating ten percent of the total electricity production from RE sources by 2020. However, this vision was not viewed as a committed target, but rather an aspiration, should future conditions make this ambition feasible. In 2014, the Sustainable and Renewable Energy Development Authority (SREDA) was established as a nodal agency

for sustainable energy (renewable energy and energy efficiency) development and promotion.

4.3 Problems the project sought to address

27. SREPGen aimed to address the low growth in Bangladesh' power generation capacity. Specifically, SREPGen aimed to address the inability of GoB to catalyse private sector investment in RE (which contrasted GoB's ability to attract private sector investment in conventional energy), and to meet its long-term RE targets. The root cause identified, which SREPGen sought to address, was the lack of a functioning GoB agency for promoting and coordinating RE development; while SREDA had been recently established at the time of SREPGen formulation, it was still not functional. Since SREDA was not yet functional, there was an absence of a central repository for RE-related information and data, a lack of RE regulatory control and enforcement, a lack of a GoB entity and incentives dedicated to RE investment promotion, a lack of knowledge and risk assessment y commercial financing institutions, and a lack of RE investor confidence.

28. The project addressed the following barriers spelled out in the SREPGen ProDoc:
    - *An incomplete policy, regulatory and institutional framework to promote and approve RE power investments*
    - *Lack of accessible and complete RE resource data*
    - *General lack of experience amongst government power sector officers, private sector consultants and suppliers, and academia in the design, implementation, operation and maintenance of RE power projects*
    - *Poor perceptions of RE projects*

4.4 Project objectives

29. SREPGEN's objective was to "*reduce the annual growth rate of GHG emissions from fossil fuel-fired power generation through the exploitation of Bangladesh's renewable energy resources for power generation*".

30. This was in particular done through capacity development for the Sustainable and Renewable Energy Development Authority (SREDA) to promote RE and energy efficiency combined with RE pilot/demonstration projects and supported by a couple of assessment studies and an online information management system.

4.5 Expected results

31. The project had four components and outcomes, as shown in the table below, and an additional project management and operations component. The mid-term review (MTR) led to a revision of outcome 3, due to little progress in project component 3, which accounted for 55 percent of the entire project budget, since the energy demands in Bangladesh had evolved with a diminishing demand for photovoltaic solar LED lanterns (PVSLs) and solar home systems. Table 5.5.1 depicts the project components and outcomes. Component 3 was delivered through sub-projects providing access to renewable energy (RE) to off-grid communities, and component 4 was implemented through sub-projects that demonstrated available RE solutions as well as pilot projects that tested innovative RE solutions.

Table 5.5.1: Components and intended outcomes			
#	Components	Outcomes	
		At design *(source: ProDoc)*	**After MTR** *(source: 2018-2020 PIRs)*
1	RE policy and regulatory support programme	SREDA evolving into a facilitation center to support private sector RE investment development, enable regulators to determine fair flexible tariff structures, bring confidence to private RE investors, and increase the number of approved RE projects	
2	Resource assessment support programme	Increasing capacities of relevant government agencies to generate, process, obtain and disseminate reliable RE resource information for use by GoB and potential project developers and investors	
3	Increased affordability and access to solar power	Increased affordability of photovoltaic solar LED lanterns (PVSLs) for low income households	Increased affordability of photovoltaic solar **(including LED lanterns (PVSLs)) and other Renewable Energy Power system** for low income households
4	Renewable energy investment scale-up	Renewable energy accounts for an increased share of Bangladesh's power generation mix	

4.6 Total resources

32. SREPGen was supported by the GEF Trust Fund with an allocation of USD 4,077,272 (cash) and intended co-financing of USD 5,000,00 from UNDP, USD 21,150,000 from GoB (in-kind), USD 250,000 (cash) from GIZ, and USD 23,200,000 (in-kind, buyer's credit, household equity/down-payments) from private sector investors (ProDoc). However, the co-financing from UNDP was exclusively in-kind and the value was not estimated. GIZ provided the expected USD 250,000. GoB provided USD 1,000,000 in cash, USD 1,661,481 in loans (IDCOL), and an in-kind contribution with an estimated value of USD 100,000. The private sector only provided USD 998,586 in cash. A significant unexpected amount of co-financing came from civil society organisations, which provided USD 14,839,112. Total co-financing realised was USD 18,849,180, corresponding to 38 percent of the expected co-financing.

4.7 Main stakeholders

33. SREPGen was executed according to UNDP's National Implementation Modality (NIM), where GoB was responsible for the implementation with oversight and support from the UNDP Bangladesh Country Office. The UNDP CO was also responsible for reporting to the GEF Secretariat (GEF implementing agency).

34. The responsible GoB entity for SREPGen implementation (GEF executing agency) was the Sustainable and Renewable Energy Development Authority (SREDA) under the Power Division of the Ministry of Power, Energy and Mineral Resources (MoPEMR).

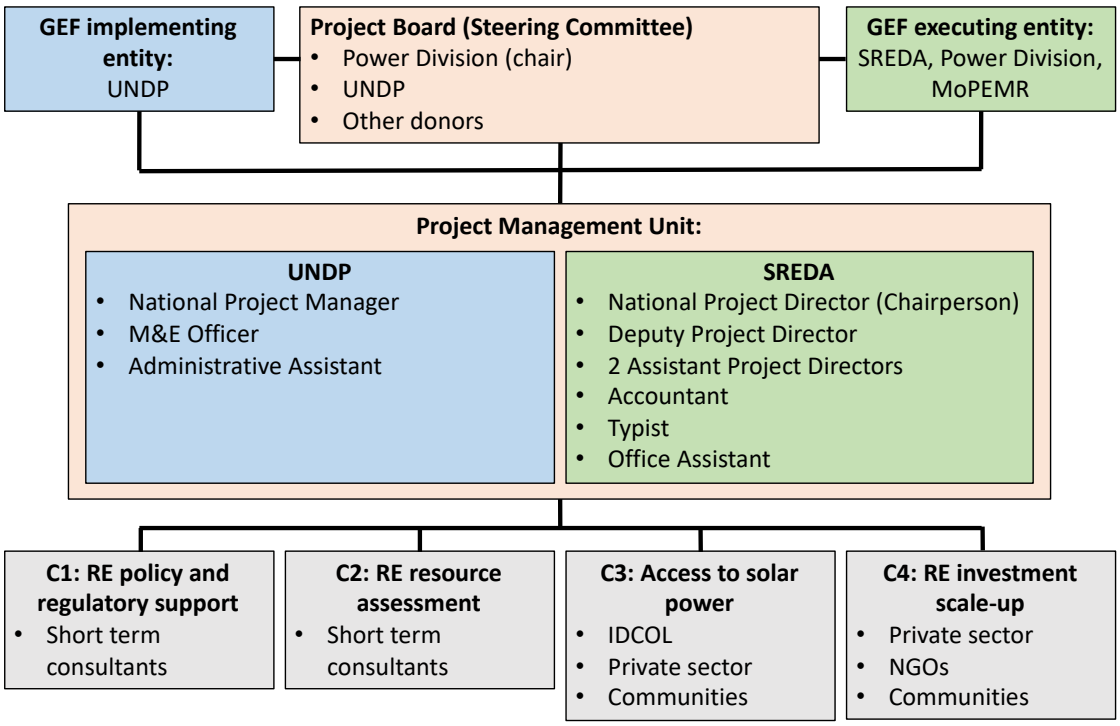
35. SREDA was directly responsible for the implementation of components 1 and 2 and most of component 4, whereas the implementation of component 3 was outsourced as grants to GoB's Infrastructure Development Company Limited (IDCOL), following IDCOL's business model for provision of loans and grants. SREDA oversaw the implementation of component 3 and the outsourced parts of component 4.

36. A project steering committee (PSC), chaired by the Secretary, Power Division, Ministry of Power, Energy and Mineral Resources (MoPEMR), provided oversight, strategic guidance and direction and approved work plans and budgets. It comprised members from a) the Power Division, b) SREDA, c) the Economic Relations Division of the Finance Ministry, d) the Implementation, Monitoring Evaluation Division (IMED) of the Planning Commission, e) UNDP, and f) donors active in supporting RE power generation.

37. A project management unit (PMU) housed at SREDA was responsible for day-to-day management of project activities under the guidance of the NPD. The PMU comprised staff recruited by UNDP and staff appointed by SREDA. A National Project Director (NPD), the SREDA Chairperson, was responsible for overall guidance and oversight of project management and implementation and coordination with other government entities. Moreover, the NPD was supported by a Deputy NPD and two Assistant NPDs appointed by SREDA. A National Project Manager (NPM) responsible for day-to-day project management, a Monitoring and Evaluation (M&E) Officer, and an Administrative Assistant were recruited by UNDP. An Accountant, a Typist and an Office Assistant were appointed by SREDA.

38. Figure 5.7.1 depicts the management setup for SREPGen.

Figure 5.7.1: Project management arrangements



39. IDCOL was engaged in SREPGen through the provision of concessional loan financing for off-grid RE sub-projects under component 3. Other project stakeholders included independent power producers, private sector investors, NGOs, policy makers, academia, and

universities.

40. Poor people in remote off-grid areas, including school children, youth group, women, and ethnic minorities, were direct beneficiaries of RE sub-projects, which provided access to electricity.

4.8 Theory of change

41. The project was formulated and approved before it became standard UNDP procedure to include a theory of change in the project design. Nonetheless, there project had a comprehensive results framework, with an immediate objective, outcomes, outputs and assumptions at the objective and outcomes levels. The results framework was revised with changes made to outcome 3 and some indicators and further expanded with assumptions added at the output level following the mid-term review (see Section 5.2.1). However, the results framework did not include a goal/development objective. Figure 5.8.1 depicts SREPGen's implicit theory of change based on the revised results framework, with the addition of a higher level impact/goal towards the which the project would contribute. The output level assumptions are presented in table 5.8.1.

42. As described in section 5.5, the project had four components, each with distinct expected outcome. A series of 3-5 outputs were planned under each component:

    - Outcome 1 focused on capacitating SREDA to implements its mandate to function as a RE facilitation centre, supporting regulators and investors and creating an enabling environment for RE investment. Its five outputs focused on a) the development of a conducive policy, planning and regulatory framework, and b) enhancing SREDA and private sector capacities vis-à-vis RE development. The underlying assumptions were that: a) *Political will for net metering and utility scale RE projects is realized*, and b) *Capacity of government does not substantially delay approval of RE policies/regulations and guidelines*.
    - Outcome 2 focused on ensuring that government agencies have access to RE resource information and the capacity to use the information to inform government policy making and planning and private sector investors. Its three outputs focused on a) generating and making available RE data, and b) enhance the capacity to manage and utilise the data. The underlying assumptions were that: a) *Domestic stakeholders have capacity and willingness to be trained through learning-by-doing wind resource assessment activities,* and b) *relevant organizations have willingness to allocate these individuals' time to participate*.
    - Outcome 3 focused on enhancing the affordability and access to solar power for poor people, and thereby providing energy to enable livelihoods improvements. Its three outputs focused on providing electricity to remote off-grid communities. The underlying assumptions were that: a) *Consumers in off-grid villages have demand for access to power or increased access to power and capability to pay for this on an as needed or pay-as-you-go basis*, and b) *Nano-grid (pay as you use) and small SHS/ pico-PV pay-as-you-go options release pent up demand for electricity that was inhibited by high up-front costs of SHSs*.

- Outcome 4 focused on increased the share of RE in Bangladesh's power mix. Its five outputs focused on providing grants, which in combination with equity would facilitate investment in grid-connected RE projects which were commercially viable and with potential for replication, including piloting innovative solutions. The underlying assumptions were that: a) *Capacity of government does not substantially delay approval of RE policies/regulations and guidelines and of RE projects*, and b) *Financial institutions find risk of power projects in Bangladesh acceptable and are willing to provide debt and equity to utility scale RE power projects*.

43. The combination of the **four outcomes** (policy and regulatory framework, access to data and information, increased affordability and access to RE, and increased share of RE in the power mix) were expected to contribute to the **objective** of enhancing the harnessing of RE resources and thereby reducing the growth in greenhouse gas (GHG) emissions caused by the increased production and consumption of fossil fuel based energy required for economic development and poverty alleviation in Bangladesh. This **intermediate state** would in turn contribute to the **global impact/goal** of reducing the magnitude of climate change in the future climate.

Figure 5.8.1: Theory of change

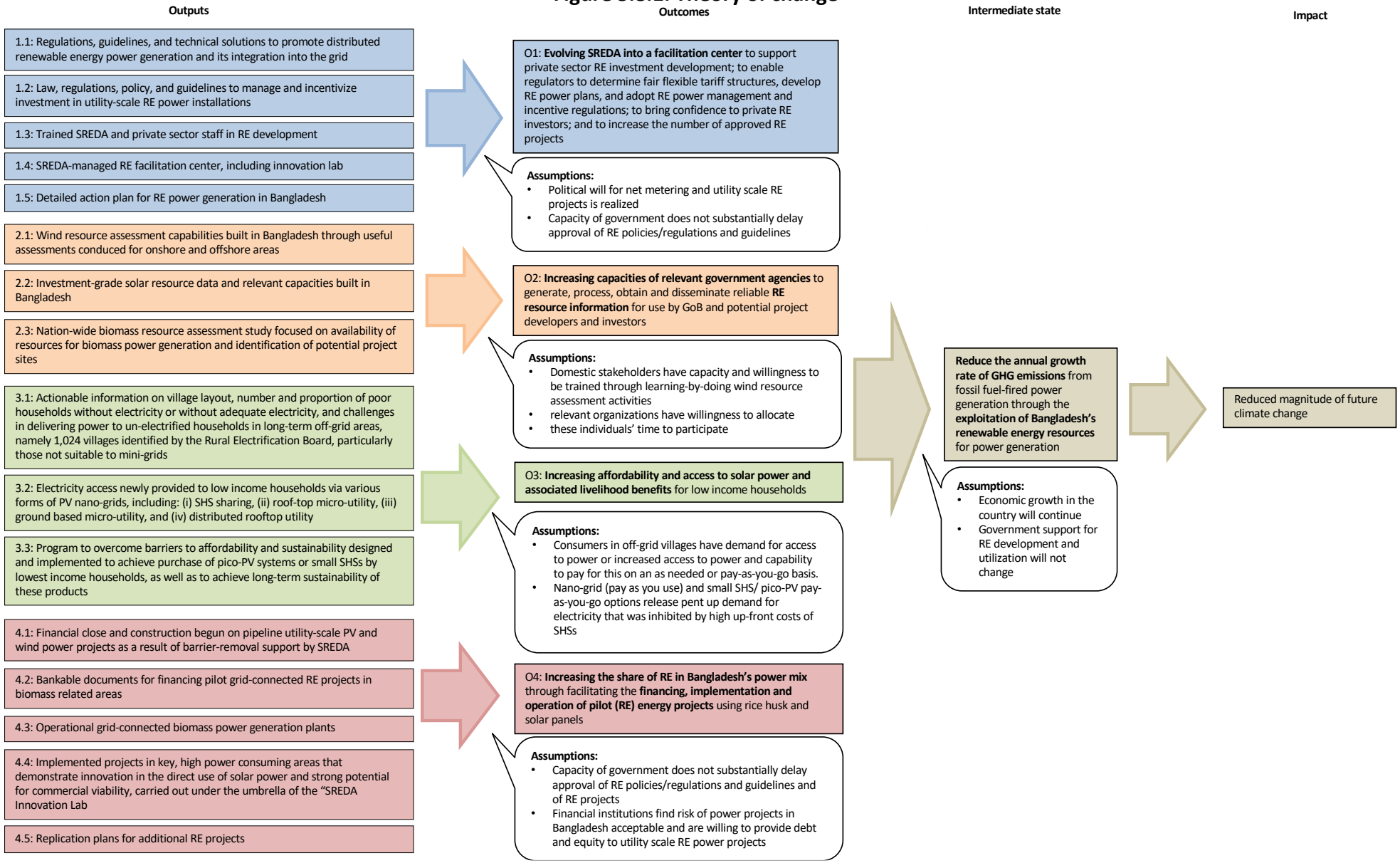


Table 5.8.1: Output assumptions
Component 1: • 1.1a: Political will for net metering is realized • 1.1b: Capacity of government does not substantially delay entry of RE policies/regulations and guidelines into the approval pipeline • 1.2a: Political will for utility-scale RE continues for PV and is realized for wind and biomass • 1.2b: Capacity of government does not substantially delay approval of RE policies/regulations and guidelines • 1.3a: Trainees have basic capacity and motivation needed to study and master RE power generation materials presented • 1.4a: Capacity and interest exists among civil society to development contest entries for innovation in renewable energy power generation • 1.5a: Political will for RE continues • 1.5b: Capacity of government does not substantially delay approval of RE Power Generation Action Plan
Component 2: • N/A
Component 3: • 3.2a: Consumers in off-grid villages have demand for access to power or increased access to power and capability to pay for this on an as needed or basis • 3.2b: Nano-grid (pay as you use) options release pent up demand for electricity that was inhibited by high up-front costs of SHSs • 3.3a: Consumers in off-grid villages have demand for access to power and capability to pay for this on a pay-as-you-go basis. • 3.3b: Small SHS or pico PV pay-as-you-go options release pent up demand for electricity that was inhibited by high up-front costs of SHSs delay approval of RE policies/regulations and guidelines and of RE projects
Component 4: • 4.1b: Financial institutions find risk of utility scale PV and wind projects in Bangladesh acceptable and are willing to provide debt and equity to such projects • 4.2a: Capacity of government does not substantially delay approval of RE policies/regulations and guidelines and of RE projects • 4.2b: Financial institutions find risk of biomass power generation projects in Bangladesh acceptable and are willing to provide debt and equity to such projects • 4.3a: Capacity of government does not substantially delay approval of RE policies/regulations and guidelines and of RE projects • 4.3b: Financial institutions find risk of biomass power generation projects in Bangladesh acceptable and are willing to provide debt and equity to utility scale RE power projects • 4.4a: Partners, such as filling stations or schools, willing to host solar PV charging stations and arsenic removing pumps, respectively • 4.4b: Market receptive to benefits of solar freezers, household pumps, and PV boats • 4.5a: Financial institutions/ investors find risk of RE power projects in Bangladesh acceptable and are willing to provide debt and equity to utility scale RE power projects

5. Findings

5.1 Project design/formulation

5.1.1 Project strategy

44. The overall strategy for facilitating an increased use of RE was rational, as it addressed key challenges faced in the RE sector and promoted the establishment of a conducive and enabling environment for RE investments, through addressing: a) GoB's facilitation capacity and the conduciveness of the regulatory framework, b) ensuing access to data and the capacity to process and use data, c) enhancing the affordability of, and access to, RE for poor off-grid households, and d) replicating RE options. However, component 3 and outcome 3 were overly specific and narrowly defined vis-à-vis the RE technology to promoted, with an exclusive focus on PVSLs with no room to engage in other RE solutions (this was rectified after the mid-term review). Outcome 4 was phrased with a level of ambition that would be impossible for the project to directly deliver and would thus have been better placed at the objective level: "*Renewable energy accounts for an increased share of Bangladesh's power generation mix*". Considering the amount of financial resources available to SREPGen, the ambition of delivering a direct, significant and measurable contribution to increasing the RE in Bangladesh's power mix was overly ambitious, although the approach of providing catalytic inputs to facilitate an improved RE investment climate with improved access to funding at reduced risk and demonstrating RE options was appropriate. Moreover, component 4 (but not outcome 4) was prescriptive in terms of RE technology, with a focus on upscaling and rice husks, nano-grids and solar irrigation pumps, with little room for engaging in other technologies or piloting RE systems and grid integration, which in practice was the focus of the activities and outputs implemented under the component. The mid-term review had proposed a revision of outcome 4, but the revision was not adopted.

45. The indicators at the objective and outcome level were generally appropriate for measuring the intended change and measurable with clear baselines and end-of-project targets.

5.1.2 Assumptions and risks

46. The assumptions (see section 5.8) at the objective and outcome levels were relevant and appropriate. The risk analysis in the ProDoc identified four relevant risks.

- *Terms and conditions for replication phase are not sufficiently attractive for private investors*
- *Delays due to lack of government capacity*
- *Insufficient capital made available for RE investment scale-up*
- *Returns on investment not realized due to renewable energy technologies (RETs) or RE projects not generating sufficient renewable energy*

47. In addition to these four risks, specific risks were assessed for four specific technologies: rice husk power plants, solar nano-grids, and solar irrigation pumps.

48. However, two key risks of particular importance to component 3 and also to component 4 had not been identified, namely a) GoB's substantial investments in expanding the national electricity grid, and b) the rapid improvement of technology and reduced prices of RE systems available on the market – and how these would influence the demand for specific technologies. On the contrary, in relation to the distribution of PVSLs, the risk analysis in the ProDoc found that "*No potential major risks to the functionality of these appliances has been identified other than decreased availability of solar inputs to the PVSLs*". Hence, the project did not have any measures in place for mitigating these risks.

5.1.3 Lessons from other projects

49. The ProDoc contained an analysis of lesson and results from several earlier interventions and experiences in the RE sector, including earlier GEF project and IDCOL experiences with provision of solar home systems (SHS) in rural off-grid areas and its successes in terms of uptake and limitations vis-à-vis the affordability for poor households, as well as GIZ's experience with PVLs dissemination. The financing model for SREPGen sub-projects under component 3 was IDCOL's existing model.

5.1.4 Stakeholder participation in project design

50. During the development of SREPGen, a range of stakeholders were consulted meetings and workshops, such as a Local Project Appraisal Committee (LPAC) meeting in May 2013, with participants from UNDP, GoB, development partners and the private sector. However, the mid-term review found indications of the stakeholder consultations perhaps not having been fully sufficient:
    - The ProDoc indicated that a nation-wide biomass study had already been completed and was thus not necessary for SREPGen to undertake – whereas the last quality assessment had been done in 1980 and a new assessment was a high priority
    - The ProDoc had a strong emphasis on rice husk power generation – whereas this was not a priority for SREDA since there was already a GIZ-IDCOL pipeline project on tice husk power generation
    - The project design included investment plans for wind energy – whereas USAID seemingly already had the intention to prepare such plans

5.1.5 Linkages with other RE interventions

51. SREPGen did not have joint activities or outputs with other projects. However, SREPGen was in dialogue and coordination with other development partners supporting SREDA, in particular through SREDA's monthly coordination meetings, which helped avoiding duplication of efforts. SREPGen abandoned some activities and outputs that had already been taken up by other donors, such as a grid integration study and the development of operational rules for SREDA. Moreover, SREPGen built on, and continued, interventions of other projects. For example, following World Bank support for the development of a net metering policy, SREPGen supported the finalisation of the policy and the development of net metering guidelines. In turn, the net metering guidelines facilitated the decision of the Asian Development Bank (ADB) to include grid integration of 2,000 solar irrigation pumps already under installation.

5.2 Project implementation

5.2.1 Adaptive management

52. During to lengthy period from the project was formulated to the start of project implementation, there had been significant change in the context, such as a) grid expansion, b) reduced costs of RE systems, and c) some policy/regulation activities having been assumed by other projects. These changes, in combination of the overly prescriptive design vis-à-vis technology choice, contributed to hampering progress of SREPGen, in particular component 3. The demand for PVSLs, pico-photovoltaic (PV) and solar home systems had dropped significantly and was limited, so little progress had been made on component 3, for which 55 percent of the total project budget was allocated. Moreover, whereas component 4 was formulated to promoted replication and upscaling, the 2017 mid-term review found it had in practice interpreted and implemented as an innovation and piloting component, and some of the activities, e.g. the solar powered boats, were not aligned with the outcome 4's replication and upscaling focus.

53. The mid-term review found that the PSC had been unaware of the focus of the project as per its objective and outcomes and board members had recommended activities outside the scope of SREPGen. Moreover, the PSC had engaged in overly detailed management, to the level of approving individual activities on a one-by-one basis, despite the ProDoc had already been agreed upon by GoB, rather than focusing on overall strategic guidance and approval of changes in the project and leaving the detailed activity management to the PMU. Reportedly, the PSC has provided appropriate and adequate guidance after the mid-term review.

54. Due to limited progress, the mid-term review was specifically requested to re-design the project. The mid-term review proposed a comprehensive series of revisions to the project design to make the results framework less prescriptive and more flexible in terms of technology choices and introduce space for piloting under component 4. Revisions were also proposed for outcomes 1, 3 and 4 as well as a number of outputs and activities. Moreover, the indicators were proposed revised. Assumptions and indicators were also proposed for the output level. The mid-term review did not assess or propose any changes to the risk analysis.

55. Outcome 3 was revised, which allowed for more flexibility in terms of technologies promoted (see table 5.2.1). However, the changes to outcomes 1 and 4 proposed by the mid-term review were not adopted, and the shortcomings related to outcome 4 vis-à-vis making it more realistic and allowing for piloting were not rectified. Some of the suggested new indicators were incorporated, and the measuring of the energy capacity installed in addition to the number of projects was added to other indicators. However, the unrealistic (unattributable) outcome 4 indicator related to changes in the national energy mix remained.

Table 5.2.1: Revision of outcomes		
At design	**MTR proposal**	**After MTR**

O1: SREDA evolving into a facilitation center to support private sector RE investment development, enable regulators to determine fair flexible tariff structures, bring confidence to private RE investors, and increase the number of approved RE projects	O1: Evolving SREDA into a facilitation center to support private sector RE investment development; to enable regulators to determine fair flexible tariff structures, **develop RE power plans, and adopt RE power management and incentive regulations**; to bring confidence to private RE investors; and to increase the number of approved RE projects	*Unchanged, original phrasing kept*
O2: Increasing capacities of relevant government agencies to generate, process, obtain and disseminate reliable RE resource information for use by GoB and potential project developers and investors		
O3: Increased affordability of photovoltaic solar LED lanterns (PVSLs) for low income households	O3: Increasing affordability **and access to solar power and associated livelihood benefits** for low income households	O3: Increased affordability of photovoltaic solar **(including LED lanterns (PVSLs)) and other Renewable Energy Power system** for low income households
O4: Renewable energy accounts for an increased share of Bangladesh's power generation mix	O4: Increasing the share of RE in Bangladesh's power mix **through facilitating the financing, implementation and operation of pilot (RE) energy projects using rice husk and solar panels**	*Unchanged, original phrasing kept*

5.2.2 Stakeholder participation and partnerships

56. SREPGen was implemented under UNDP's national implementation modality (NIM), whereby day-to-day implementation fell under the responsibility of GoB. As per UNDP's standard model, the National Project Director (NPD) overseeing project implementation was a senior Government staff member, the Chairperson of SREDA. Day-to-day project implementation was managed by a PMU housed at SREDA, but with staff contracted by UNDP. This model allowed for daily interaction and cooperation between the PMU and SREDA. However, no technical level SREDA staff were designated to work with the PMU on the day-to-day management of the project. Moreover, grants and procurement were handled by the UNDP Country Office. As such, while SREDA staff were involved in project activities and trainings were provided to SREDA staff, an opportunity for a new agency to gain direct project management experience was not fully utilised.

57. A number of SREPGen technical workshops, training workshops and seminars had a broad participation of RE sector stakeholders from the public and private sectors, academia, civil society, and development partners. Thereby, the project contributed to enabling SREDA to implement its RE sector facilitation mandate.

58. The technical work under components 1 and 2 was carried out by external, mainly Bangladeshi, consultants with knowledge of Bangladesh's power system.

59. The sub-projects under components 3 were co-financed with grant funding from SREPGen/GEF (typically 50 percent), concessional loans from the Government-owned company IDCOL (typically 30 percent), and equity funding from the private companies and NGOs implementing the sub-projects (typically 20 percent) and one pilot project. IDCOL's standard financing modality and procedures were generally used. While the choice of technology type for the sub-projects were done by SREDA and SREPGen, IDCOL played a pivotal role in the identification of the implementing companies and NGOs, called "sponsors" in IDCOL terminology, based on IDCOL's previous experience. SREPGen also mobilised technical assistance for sub-projects. The sub-projects under component 4 were financed with grant funding from SREPGen and equity from the implementing partner.

60. The main reason for using a mix of grants, loans and equities was to ensure that the sub-projects would be owned and operated by organisations with the necessary expertise and capacity. This approach was also applied to ensure that the RE solutions promoted would have the potential for becoming commercially viable and replicable on market terms and thus could demonstrate their viability to the private sector in Bangladesh. However, in practice, the majority of the sub-project and pilot project implementers were not commercial enterprises or engaged with a CSR rather than commercial objective. For example, the solar ice-making plant was implemented by *Upokulio Biddutayan O Mohila Unnayan Samity* (UBOMUS), which is a social enterprise, where all projects are reinvested in new social projects. Bangladesh Solar and Renewable Energy Association connected the solar irrigation pump to the grid. The pico-hydropower plant was installed by Oporajeo, which is a for-profit private entity with a social enterprise background, but it was implemented as a not-for-profit social intervention under its corporate social responsibility (CSR) programme. The two solar mini-grids in Monpura Island were implemented by the for-profit private company Western Renewable Energy (Pvt.) Ltd. (WREL) and the installation of the two solar mini-grids was carried out by the international company Symbior Solar. The loan financing came from the Government-owned IDCOL rather than private loan institutions. Moreover, the loans were provided on concessional rather than commercial terms. Loan financing was only mobilised for sub-projects under component 3, whereas sub-projects under component 4 were fully funded by SREPGen grants and equity.

61. The reasons for the difficulties with mobilising commercial entities appear to have been a) the remoteness of a number of the locations served (such as off-grid villages in the Chittagong Hill Tracts only accessible by foot-paths and coastal islands in the Ganges-Brahmaputra-Meghna Delta only reachable by boat), and b) uncertainty about the commercial viability even with grant funding, and thus uncertainty regarding the business potential in replication.

62. Stakeholders from local government entities and communities were consulted for the installation of RE systems. NGOs were in some projects (e.g. the solar ice-making plant) responsible for community mobilisation. The community made a significant labour contribution to the pico-hydropower plant.

63. NGOs and academia were also mobilised to contribute to studies and for the organisation of public awareness raising activities.

5.2.3 Financing and co-financing

64. SREPGen was supported by the GEF Trust Fund with an allocation of USD 4,077,272 (cash). Prior to the mid-term review, spending had been slow due to the design shortcomings faced (see table 5.2.2). After the mid-term review and project re-design, spending picked up significantly. By 28 December 2020, USD 3,998,696 had been spent, corresponding to 98 percent of the GEF grant.

Table 5.2.2: Spending, GEF grant (US$)

	C1	C2	C3	C4	Management	Total	%
2014	-	-	-	-	3,256	**3,256**	0%
2015	62,361	80	6,010	5,887	42,543	**116,881**	3%
2016	27,145	-	108,065	229,980	41,762	**406,952**	13%
2017	91,169	35,383	571,902	71,052	9,072	**778,578**	32%
2018	155,551	216,989	711,783	109,272	51,672	**1,245,267**	63%
2019	31,143	158,508	138,513	87,384	11,275	**426,823**	73%
2020	26,637	94,563	445,615	452,090	2,034	**1,020,939**	98%
Total	**394,006**	**505,523**	**1,981,888**	**955,665**	**161,614**	**3,998,696**	**98%**
%	10%	12%	49%	23%	4%	**98%**	

Source: UNDP Atlas 28 Dec 2020

65. The expected co-financing for the SREPGen was USD 5,000,00 from UNDP, USD 21,150,000 from GoB (in-kind), USD 250,000 (cash) from GIZ, and USD 23,200,000 from private sector investors (see table 5.2.3). However, the co-financing from UNDP was exclusively in-kind and not quantified, the co-financing from other development partners did not materialise, GoB provided USD 1,000,000 in cash, 1,661,481 in loans (from IDCOL) and an unquantified and estimated in-kind contribution from SREDA of USD 100,000 (see table 5.2.4). The private sector only provided USD 998,586 in cash (equity). End beneficiaries also provided an unquantified in-kind contribution (labour). A significant unexpected amount of co-financing came from civil society organisations, which provided USD 14,839,112 in cash (equity). Total co-financing realised was USD 18,849,180, corresponding to 38 percent of the expected co-financing.

Table 5.2.3: Co-financing table

Co-financing (type/source)	UNDP financing (US$m)		Government (US$m)		Partner agency (US$m)		Total (US$m)	
	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual
Grants	5.00	-	-	1.00	0.25	0.25	5.25	1.25
Loans/concessions	-	-	-	1.66	-	-	-	1.66
In-kind support	-	?	21.15	0.1*	-	-	21.15	?*
Other	-	-	-	-	23.20	15.83	23.20	15.83
Totals	**5.00**	**-**	**21.15**	**2.76**	**23.45**	**16.08**	**49.60**	**18.84**

*The in-kind support provided by UNDP and end beneficiaries has not been quantified

Table 5.2.4: Confirmed Sources of Co-Financing at TE Stage				
Sources of co-financing	**Name of co-financier**	**Type of co-financing**	**Investment mobilised**	**Amount (US$)**
GEF agency	UNDP	Grant	Investment mobilized	-
		In-kind	Investment mobilized	?
Donor agency	GIZ	Grant	Investment mobilized	250,000
Recipient country government	SREDA	Public Investment	Recurrent expenditure	1,000,000
		In-kind	Recurrent expenditure	100,000
	IDCOL	Loan	Investment mobilized	1,661,481
Private sector	Companies	Equity	Investment mobilized	998,586
CSOs	NGOs	Equity	Investment mobilized	14,839,112
Beneficiaries	Communities	In-kind	Investment mobilized	?
Total co-financing				**18,849,180**

5.2.4 Monitoring and evaluation

66. The ProDoc contained an outline monitoring and evaluation (M&E) framework, which specified the main types of M&E activities, responsible parties and estimated costs. The M&E activities identified were:
    - Meetings: inception workshop and report, PSC meetings
    - Indicator monitoring: "*measurement of means of verification of project results*", "*measurement of means of verification of output and implementation*"
    - Progress reporting: PIRs, progress reports, terminal report
    - External evaluation: mid-term evaluation, final evaluation
    - Financial control: audit
    - Field verification: sub-project site visits

67. However, while the M&E costs were estimated, there was no separate budget line specifically for M&E in the project budget other than a statement that M&E was included in the overall project management budget allocation.

68. The ProDoc did not contain a detailed M&E plan and budget but specified that this would be developed during the inception workshop: "*Providing a detailed overview and reach consensus on reporting, monitoring and evaluation (M&E) requirements, the M&E work plan and budget*". However, the inception workshop report indicated that this had not taken place. Rather, the following recommendation came out of the inception workshop: "*Strong evaluation and progress monitoring activities should strictly be maintained for this program. And no compromise attitude should be practiced regarding quality issue".*

69. The indicators at the objective and outcome level were for the larger part appropriate for measuring the intended change and measurable with clear baseline values and end-of-project targets, although a few were in practice output indicators (e.g. number of PVSLs disseminated). The indicators were "SMART" (specific, measurable, attributable, relevant, time-bound/timely/trackable/targeted). All indicators were quantitative in nature, none were qualitative. For outcome 1, the indicators focused on the number of RE

projects facilitated by SREDA but did not measure the regulations and guidelines introduced and their appropriateness and utility as perceived by sector stakeholders. For outcome 4, some indicators, in particular "*% increase of RE in Bangladesh's power generation mix by EOP (end of project)*", "*MW capacity of RE generation projects (on-grid and off-grid) in planning and design stages by EOP*", were very difficult to attribute to the project and would have been more appropriately placed at objective level. This was linked to the similarly overly ambitious definition of outcome 4, but while the mid-term review had identified and addressed these shortcomings, the proposed changes were not adopted. One of the indicators for outcome 4 was in essence a duplication of the second objective indicator. The attribution challenge also applies to one indicator for component 3, "*Number of households with direct and improved quality of access to electricity and productivity using renewable energy technology* ***outside of the project*** *by EOP*".

70. A detailed M&E system was included in the original agreement with IDCOL for the PVSL and solar home systems (component 3) that were abandoned after the project redesign.

71. As per the ProDoc, a full-time M&E Officer was engaged in the PMU. The PIRs and annual progress reports reported systematically on all objective and outcome indicators, both in terms of annual progress and cumulated progress. However, objective indicator 1 on carbon emission reductions was not reported on by end of project, but instead calculated on the basis of the projected situation after 10 and 20 years and was thus not directly comparable to the target. The PIRs often, but not always, reported when progress on an indicator was due to, or mainly due to, other factors than SREPGen.

Table 5.2.5: Rating of M&E	
Monitoring and evaluation (M&E)	**Rating***
M&E design at entry	Moderately Satisfactory (MS)
M&E Plan Implementation	Satisfactory (S)
Overall Quality of M&E	**Satisfactory (S)**
**See annex 7 for the rating scale applied*	

5.2.5 Implementation/oversight and execution

72. SREPGen was affected by major delays from design to approval further to implementation start. The reasons for the long period from design to GEF approval are unclear to the terminal evaluation. The 13-month delay from GEF endorsement to implementation start was mainly due to GoB's cumbersome and bureaucratic approval process and the long time it thus took to approve its internal project document (called TPP). After GoB approval, it took further 3-4 months for UNDP to recruit the Project Manager. Furthermore, prior to the mid-term review in 2017, implementation progress was slow for all components (but in particular for component 3), significantly behind targets and with low budget execution. Major reasons for the slow progress included a) capacity constraints within SREDA, which was new institution (established in 2014), b) slow procurement and responsiveness from UNDP, and c) the design shortcomings of component 3 described above. Relatively slow procurement as well as micro-management by the PSC appear to have been other contributing factors. The project was extended to mid 2020

after the mid-term review to allow for full implementation and budget execution. After the redesign, implementation picked up. However, beyond the project's control, implementation significantly slowed down again in early 2020 due to the national and international restrictions imposed in response to the COVID-19 pandemic. In response, the project was further extended till end 2020.

73. The implementation challenges and slow delivery were duly reported in the PIRs and the scoring of project progress, which was reported as "*moderately satisfactory*" or "*moderately unsatisfactory*" prior to 2018. Implementation progress was rated as "*highly satisfactory*" in the 2019 and 2020 PIRs.

74. Being concerned with the lack of progress, the 2017 mid-term review was requested by UNDP to focus on re-designing the project rather than carrying out as standard mid-term review. UNDP provided strong technical support to the redesign, and the UNDP Regional Bureau in Bangkok also engaged to ensure the project did not deviate significantly from the objective and intended outcomes. Despite being implemented under UNDP's national implementation modality (NIM), the grants for sub-projects and most procurement were handled by the UNP Country Office. The reasons given for this was, a) that GoB procurement takes much longer than UNDP procurement, and b) the strong fiduciary procedures applied by UNDP. The mid-term review found UNDP procurement had been slow and could take up to four months and recommended faster procurement turnaround of maximum 6 weeks. This issue appears to have been rectified by the UNDP Country Office, with grant recipients and contractors reporting UNDP procurement being timely and smooth.

75. SREDA provided office space for the PMU, and the working relationship between SREDA's staff and the PMU was very good. Despite being understaffed, SREDA staff engaged readily and constructively in SREPGen implementation and project stakeholders often perceived project activities as being implemented by SREDA rather than by a project. Nonetheless, SREDA's engagement was at times affected by staff turnover, for example, SREDA had four different Chairpersons, and there by SREPGen had four different National Project Directors, since 2014. This had a disruptive effect, for example leading to a three-month gap between the departure of the previous National Project Director to the engagement of his successor towards the end of the project. The SREDA Chairperson facilitated the interaction with SREDA staff, as did the National Project Manager's previous experience from GoB positions.

76. A major limitation prior to the mid-term evaluation was a lack of understanding in SREDA about the project focus and scope, and the GEF approach of demonstration and additionality in general, as evidenced by an interest in having SREPGen spending substantial (USD 600,00) financing PV mini-grids, despite several such grids having already been demonstrated by other development partners and more were already in the pipeline. The mini-grid initially proposed (prior to the mid-term review) for SREPGen financing did not have any distinct differences from these mini-grids. Moreover, SREDA was hesitant towards contracting sub-projects to other entities than IDCOL, as it was the only financial institution in Bangladesh with experience in financing and supporting solar

PV mini-grid projects. It was thus perceived easier to have the contracting handled by IDCOL. This seems to have contributed to the lack of engagement of private financing institutions in SREPGen sub-projects, whereby an opportunity to demonstrate the feasibility of commercially financed RE projects may have been missed.

77. The local consultative group (LCG) for the energy sector in Bangladesh was not fully functional. In the absence of an effective LCG, SREDA took a proactive role in ensuring that development partner interventions that involved SREDA were well-coordinated and did not overlap. Prior to the mid-term evaluation, this sometimes led to activities and outputs that SREPGen was expected to deliver had been handed over to other projects (partly caused by to the delayed start-up of SREPGen), such as a grid integration study and the development of operational rules for SREDA, which was supported by GIZ. Overall, the coordination by SREDA worked well and prevented duplication and overlap of major deliverables, such as policy and guideline development, and sub-projects and pilot projects. The two main partners engaged in developing the capacity of SREDA were SREPGen and GIZ. the SREPGen PMU and GIZ coordinated their efforts, participated in each other's events and provided comments to the policies and guidelines produced with support from the other, e.g. GIZ provided inputs to the draft Solar Energy Road Map 2021-2041 and national biomass study supported by SREPGen. However, smaller activities, such as studies and assessments, appear to not always to have been fully coordinated. For example, SREPGen and GIZ each carried out a capacity needs assessment of SREDA in 2017-2018.

Table 5.2.6: Rating of implementation and execution	
UNDP implementation/oversight and implementing partner execution	**And Rating***
Quality of UNDP implementation/oversight	Moderately Satisfactory (MS)
Quality of implementing partner execution	Moderately Satisfactory (MS)
Overall quality of implementation/oversight and execution	**Moderately Satisfactory (MS)**
**See annex 7 for the rating scale applied*	

5.2.6 Risk management

78. The status of the four risks identified in the ProDoc were not systematically reported on in the PIRs and the risk matrix was not updated. Nonetheless, the impacts of risks that were encountered during implementation, such as the changes in the demand for RE solutions, the rapid expansion of the national grid and COVID-19 restrictions and how the project responded to these were duly reported on in the PIRs. See table 5.2.7 for an overview of the risks identified in the risk matrix, additional major risk encountered, their implications, the mitigation measures implemented, and the terminal evaluations assessment of the adequacy of the response.

Table 5.2.7: Risk management			
Risks	**Status and implications**	**Mitigating measures implemented**	**Assessment of adequacy of response**
Risks identified in ProDoc			

Terms and conditions for replication phase are not sufficiently attractive for private investors	Difficulty experienced in attracting commercial entities to engage in sub-projects, especially in remote sub-projects locations.	Cooperation with government-owned companies, social enterprises and NGOs.	Appropriate for demonstration purposes and for reaching poor and underserved areas. Not fully sufficient for attracting private sector and demonstrating commercial viability.
Delays due to lack of government capacity	Major delays experienced vis-à-vis GoB approval and pre-MTR implementation.	Requesting MTR to redesign project (2017). Capacity building for SREDA. Extension of completion date.	Appropriate for preventing further delays and ensuring project completing and budget execution. Mitigation measures should have been implemented much earlier to avoid late start up and slow initial delivery.
Insufficient capital made available for RE investment scale-up	Limited evidence of replication of sub-projects and pilot projects.	Partnership with IDCOL for making concessional loans available. No measures implemented to address availability of financial capital for scale-up or replication of sub-projects and pilot projects.	Partly adequate response. Project could have engaged with commercial financing institutions to test and promote RE financing models.
Returns on investment not realized due to RETs or RE projects not generating sufficient renewable energy	Too early to assess return on investment. Sub-projects and pilot projects generated expected amounts of energy and are expected to generate sufficient revenue.	N/A	N/A
Additional risks faced by the project			
Expansion of national electricity grid	Potential off-grid project areas connected to the grid. Reduced demand for off-grid solutions.	Promoting grid integration through net metering policy and guidelines. Piloting grid integration of RE systems. Sub-projects remote areas, which have not been, and in some cases will not be, connected to the grid.	Appropriate response for adapting to the context.

RE technologies available and reduced prices	Limited demand for PVSLs and solar home systems – demand for higher energy solutions.	Redesign of component 3 by MTR, investment in pico-hydropower and mini-grid solutions.	Appropriate response for adapting to the context. Mitigation measures should have been implemented much earlier to avoid slow initial delivery.
COVID-19 restrictions	Implementation stalled.	Six-month extension of project. Working from home. Communication and meetings via phone and VoIP.	Appropriate response and only measures feasible.

79. As per UNDP rules at the time of project approval, the UNDP environmental and social screening template was filled and attached to the ProDoc. SREPGen was assessed as a "category 1", i.e. with no significant environmental risk, and no further action was thus required. No further environmental or social screening was carried out during implementation or when the project was re-designed, even though the revision implied a significant change in the RE technologies promoted under component 3. Moreover, no gender or social assessment were carried out during the implementation of the project. No environmental or social impacts or risks and no environmental or social grievances were identified and reported in the PIRs.

80. The component 3 sub-projects receiving loans from IDCOL were subjected to environmental and social screening and management plans prepared by the project proponents as per IDCOL procedures. IDCOL also ensured that agreements were in place with battery recycling facilities, but this was not yet feasible for solar panels. However, it is expected that SREDA will have regulations for PV waste in place in a few years, well before the whereas the panels installed are expected to require replacement, with estimated lifespan of 20 years. The pico-hydropower systems installed were run-of-river systems without damming the streams, and were thus not subject to environmental screening, and Oparajeo reports that it was ensured that the hydropower plants were not located in locations were significant fish population and that the power lines did not affect wildlife migration routes. The cancelled waste-to-energy pilot project would have required an environmental impact assessment before getting Government approval.

5.3 Project results and impacts

5.3.1 Progress towards objective and expected outcomes

81. Table 5.3.1 provides an overview of SREPGen's achievements vis-à-vis the targets for the project objective and outcomes.

82. Outcome 1: The targets for outcome 1 were all achieved or exceeded as SREDA was able to facilitate the development and approval of RE projects. SREPGen contributed through capacity development for SREDA staff as well as support for the formulation of policy and guidelines (e.g. for net metering, solar irrigation pump grid integration, draft National Solar Energy Road Map 2021-2041) that contributed to an enabling environment for RE investments (see box 5.3.1). SREPGen was not the only entity support SREDA, in

particular, GIZ contributed to strengthening SREDA since SREDA's inception. Other development partners, such as JICA, also supported SREDA.

Box 5.3.1: Policy and capacity contribution

Guidelines and regulations:

- Net Energy Metering Guideline + Net Metering Handbook (English and Bengali)
- Renewable Energy (RE) power generation action plan 2019-2041
- Regulations for standards of PV system parts + guidelines for preferred PV system parts
- Regulations + institutional plans for disposal of PV system waste (e.g. panels, batteries)
- Guideline for grid integration of solar PV-diesel hybrid mini-grid
- Guideline for grid Integration of solar irrigation pumps (Bangla)
- Template agreements for grid integration of rooftop solar systems

Technical assessments and studies:

- Technical assessment of distribution line of mini-grid for grid integration
- Assessment of base-level standard tariff for utility-scale solar independent power producer projects considering the local climatic, geographic and grid condition and power evacuation facilities
- Net metering appraisal study to addresses issues relating to scale it up
- Grid integration of solar PV water pumps study through a pilot at Kushtia
- Impact study of solar ice-making project in Char Montaz, Patuakhali

Capacity development:

- Installation of a complete energy net metering demonstration system at SREDA for hands-on training
- Capacity building needs assessment
- Capacity assessment and exit strategy for SREDA
- Energy net metering training programme – 500 officials trained

83. Outcome 2: The targets for outcome 2 were all achieved or exceeded in terms of providing access to information to assist the development of RE projects. SREPGen played a key role in providing access to information through the PV/solar irradiation and biomass assessments and a waste-to-energy study in six municipalities. The installation of a web-based database/spatial information management system also improves access to, and analysis of, data and information. However, SREPGen did not make a significant contribution vis-à-vis access to wind information, due to financial constraints.

Box 5.3.2: Resource information access contribution

- National photovoltaic (PV) resource assessment study
- Comprehensive biomass resource assessment
- Feasibility study for waste-to-energy generation in six municipalities
- Web-based database management system/web-based spatial information management system for renewable energy data collection, monitoring and data management

84. Outcome 3: The targets for outcome 3 were achieved or exceeded, except the target on PVSL supply chains, which was not measured, nor an area SREPGen engaged in due to the demand-shift away from PVSLs. SREPGen sub-projects provided electricity to the expected number of poor households, but the project's contribution to reaching the intended indirect beneficiaries is unclear, although the capacity, policy and regulatory support under component 1 is likely to have made an indirect contribution. SREPGen did

not make a significant contribution to the two targets with a PVSL focus, due to the re-design of the project, and the overall low demand for PVSLs. See Box 5.3.3 for an overview of the sub-projects implemented to provide energy for off-grid low-income households.

Box 5.3.3: Sub-projects for provision of energy to low-income households

- **Solar mini-grids in Monpura Island with capacities of 279.5 kW and 218.5 kW**
  Implementing partner/investor: Western Renewable Energy (Pvt.) Ltd. (WREL) – **private company, commercial investment**
  Financing: SREPGen grant: USD 666,378.35 (BDT 56,497,399), IDCOL loan: USD 1,110,630.57 (BDT 94,162,331), equity: 30:20:50
- **Distribution of 6170 solar lanterns to low-income households**
  Implementing partner/investor: IDCOL – **government entity**
  Financing: SREPGen grant: USD 153,197.60 (USD 30 per unit) (BDT 12,988,516), IDCOL loans for purchasers: USD 260,849.97 (63%)
- **Solar irrigation pump (SIP) projects:**
  Implementing partner/investor**:** MCL SIP 2, UDDIPAN SIP 2, Dishari SIP 1 – **private companies, commercial investments**
  Financing: SREPGen grant (partially financed under component 4): USD 420,000 (BDT 116,490,000), IDCOL loan: USD 290,000 (BDT 24,990,000), equity: USD 130,000 (BDT 34,751,000)

85. Outcome 4: Two targets were exceeded but three targets were not achieved for component 4. Targets related to numbers of projects were reached, but the targets vis-a-vies installed MW capacity and increased the RE share of Bangladesh's power mix were not fully achieved. Moreover, SREPGen's contribution to all of the targets was modest, although the sub-projects and pilot projects did make a direct contribution in terms of MW and indirect contribution through demonstration and capacity and policy support under component 1. However, the modest contribution from SREPGen was not due to poor project performance but to overambitious targets in terms of what a project the size of SREPGen could be expected to deliver. See Box 5.3.4 for an overview of the sub-projects and pilot projects implemented to test and demonstrate commercially viable RE solutions.

Box 5.3.4: Sub-projects and pilot projects for testing and demonstrating RE options

Sub-projects

- **Energy assisted ice-making plant in Char Montaz, Rangabali, Patuakhali**
  Implementing partner/investor: UBOMUS – **social enterprise**
  Financing: SREPGen grant: USD 101,130.50, equity: USD 169,700.29
- **Piloting of pico-hydropower plant in NaitongPara Village, Ruma, Bandarban**
  Implementing partner/investor: Bandarban Disabled Peoples' Organization to Development (Bandarban DPOD) in partnership with Oporajeo Pvt Ltd – **NGO + private company, CSR investment**
  Financing: SREPGen grant: USD 8,389.75 (BDT 710,296), equity: USD 8,389.75 (BDT 710,296)
- **Solar irrigation pump (SIP) projects**
  Implementing partner/investor: Same as sub-project 3.3 (see box 5.3.3)
  Financing: Same as sub-project 3.3 (see box 5.3.3)

Pilot Projects

- **Piloting of grid integration of solar irrigation pump**
  Implementing partner/investor: BGEF – **NGO**
  Financing: SREPGen grant: USD 23,671.08 (BDT 2,006,900), equity: USD 59,301.09 (BDT 5,020,568)
- **Piloting of five solar boats; a business model for commercial upscaling**

Implementing partner: Solar E. Technology Australia, SREDA – **government entity**
Financing: SREPGen grant: USD 94,660.00

- **Charging stations for tri-wheelers in Gazipur and Mymensingh**
  Implementing partner: Gazipur palli bidyut samity-1, Mymenshing palli bidyut samity-2 – **government entities**
  Financing: SREPGen grant: USD 56,313.60, equity: USD 56,313.60
- **8 kW off-grid rooftop solar system at Adaptation Learning Center at Char Kukri-Mukri**
- Implementing partner: Ministry of Environment, Forest and Climate Change – **government entity**
  Financing: SREPGen grant: USD 10,000.00

86. Objective: The first objective targets was exceeded. The expected CO_2 emission reduction of 1.64 MT over ten years was surpassed with a calculated ten year reduction of 2.35 MT. Nonetheless, over a 20-year period, the calculated emission reduction will be 2 MT. The second objective target of increasing the share of Bangladesh's power mix to 6 percent by the end of the project was not achieved, but the target was also highly ambitious and well beyond what SREPGen could be expected to deliver. By end of 2020, the share was 3.15 percent, partly due to a major increase in Bangladesh's fossil fuel electricity generation for the grid expansion. However, the target of 1,000 MW was not reached; by the end of 2020, the total RE capacity in Bangladesh was 700.61 MW – up from 200 MW at baseline. SREPGen made a catalytic contribution to developing an enabling environment for RE, in particular for grid integration of RE systems, and a small direct contribution through sub-projects and pilot projects.

Table 5.3.1: Achievement of objective and outcomes					
Objective/outcome	**Indicator**	**Baseline**	**Target**	**Result**	**Assessment**
Objective: Reduction in the annual growth rate of GHG emissions from fossil fuel-fired power generation through the exploitation of Bangladesh's renewable energy resources for power generation	Cumulative direct post-project CO_2 emission reductions resulting from the RE technical assistance and investments by end-of-project (EOP), MT CO_2	0 MT	1.64 MT over 10 years	2.35 MT over 10 years	**Target exceeded**, through direct emission reductions from SREPGen sub-projects and pilot projects reported by PMU)
	% share of RE in the power generation mix of Bangladesh (MW of RE power generation in Bangladesh, including on and off grid)	1% (200 MW)	6% (1,000 MW)	3.15 % (700.61 MW out of 20,430.00 MW)	*Inappropriate target, beyond the control of SREPGen* **Target not achieved**, partly due to significant increase in fossil fuel production. Increase cannot be attributed to SREPGen. A small contribution made through sub-projects and pilot projects, and an indirect contribution through improved SREDA capacity and regulatory framework
Outome 1: SREDA evolves into a facilitation center to support private sector RE investment development, enable regulators to determine fair flexible tariff structures, bring confidence to private RE investors, and increase the number of approved RE projects	Number of on-grid RE projects approved based on studies of improved RE policy and tariffs and RE grid integration and SREDA operational rules (in KW)	0 projects	3 projects (40,000 KW)	17 projects signed (1,217,000 KW)	**Target exceeded**, SREPGen contributed through capacity development and policy/guideline preparation support
	Number of utility scale RE projects approved/pipeline (MW)	0 projects	4 projects (2000 MW)	22 LOIs issued (2,023.77 MW)	**Target achieved**, SREPGen contributed through capacity development and policy/guideline preparation support
	Number of RE development project proponents that were assisted by SREDA staff in the technical design and approval of their projects	0 projects	6 projects	6 projects	**Target achieved**, SREPGen contributed through capacity development and policy/guideline preparation support

Outcome 2: Increased capacities of relevant government agencies to generate, process, obtain and disseminate reliable RE resource information for use by GoB and potential project developers and investors	Number of implemented wind energy projects that were designed based on the wind maps	0 projects	1 project	2 projects	**Target achieved**, but SREPGen did not contribute to wind maps. Plans to finance 1 wind turbine were dropped due to financial constraints
	RE assessments coverage area of the country for identification of potential utility scale RE projects including private sector	0% (biomass) 0% (solar PV) 0% (wind)	100% (biomass) 100% (solar PV) 10% (wind)	100% (biomass) 100% (solar PV) 100% (wind)	**Target exceeded**, SREPGen contributed with biomass and solar PV assessments but not for wind
	Number of biomass-based power generation projects that were designed based on the biomass resource assessment data	0 projects	4 projects	5 projects planned	**Target exceeded**
Outcome 3: Increased affordability of photovoltaic solar (including LED lanterns (PVSLs)) and other Renewable Energy Power system for low income households	Number of government-certified PVSL models that meet international standards for functionality and durability that are imported into the country	1 model	5 models	5 models	*Inappropriate target, outside revised SREPGen scope* **Target achieved**, but SREPGen did not contribute as not an area of SREPGen engagement
	Number of low income households that have new access to RE power are able to afford monthly payments from established and operational financial mechanisms for the purchase and use of PVSLs	0 households	Direct: 6,000 (Tier 1) 2,500 (Tier 3+) Indirect: 50,000 (Tier 1) 40,000 (Tier 3)	Direct: 6,170 (Tier 1) 2,000-2.500 (Tier 3+) Indirect: 50,000 (Tier 1) 60,000 (Tier 3)	**Target reached**, in terms of direct households reached by SREPGen sub-projects. Unclear whether, SREPGen made an indirect contribution to the number of households reached by IDCOL without SREPGen funding
	Number of PVSL supply and delivery chains that also provide product support and credit collection by Year 2	0 supply chains	1 supply chain	?	*Inappropriate target, outside revised SREPGen scope* **No data provided**, and not an area of SREPGen engagement

	Number of households with direct and improved quality of access to electricity and productivity using renewable energy technology outside of the project by EOP	0 households	400,000 (Tier 1 & 2) 62,500 (Tier 3)	400,000 (PVSL + SHS; Tier1 & 2) 62,500 (Tier 3)	**Target exceeded**, but cannot be attributed to SREPGen. A small contribution made through sub-projects, and an indirect contribution through improved SREDA capacity and regulatory framework
Outcome 4: Renewable energy accounts for an increased share of Bangladesh's power generation mix	Number of RE projects that are financed through RE funds where SREDA has had involvement in operationalization	0 projects	2 projects	20 projects approved	*Inappropriate target, beyond the control of SREPGen* **Target exceeded**, but role/contribution of SREDA unclear
	MW of RE on-grid projects installed by EOP	1.9 MW	1,392 (SREDA plan)	369.58 MW	*Inappropriate target, beyond the control of SREPGen* **Target not achieved**. Increase cannot be attributed to SREPGen. A small contribution made through sub-projects and pilot projects
	MW of RE off-grid projects installed by EOP	162 MW	395 MW (SREDA plan)	331.03 MW	*Inappropriate target, beyond the control of SREPGen* **Target not achieved**. Increase cannot be attributed to SREPGen. A small contribution made through sub-projects and pilot projects
	% increase of RE in Bangladesh's power generation mix by EOP	1.5%	9.2% (SREDA plan)	3.15%	*Inappropriate target, beyond the control of SREPGen* **Target not achieved**. Increase cannot be attributed to SREPGen. A small contribution made through sub-projects and pilot projects

					Duplication of the 2nd objective indicator
	MW capacity of RE generation projects (on-grid and off-grid) in planning and design stages by EOP	0 MW	1,790 MW (SREDA plan)	2,110.56 MW	*Inappropriate target, beyond the control of SREPGen* **Target exceeded**. Increase cannot be attributed to SREPGen. An indirect contribution made through sub-project demonstration
Source: 2020 PIR					

5.3.2 Relevance

87. SREPgen was fully aligned with the GEF's priorities vis-à-vis reducing carbon emission through promoting innovation and demonstrating mitigation options. SREPGen fell under the GEF's climate change (mitigation) focal area, under which it supported Bangladesh vis-à-vis the following GEF objectives: a) *promote innovation and technology transfer for sustainable energy breakthroughs*, and b) *demonstrate mitigation options with systemic impacts*.

88. The project was also aligned with, and supportive of, the clean and affordable energy signature solution in the UNDP Strategic Plan 2018-2021, and with UNDP's priorities in the Country Programme Document for Bangladesh 2017-2020 of a) ensuring economic growth is inclusive and supports economic opportunities, and b) improving environmental sustainability. Specifically, SREPGen addressed the following outcomes and outputs in the UNDP Strategic Plan, Country Programme Document, and UNDAF:
    - Country Programme Document Outcome 1/UNDAF Outcome 3: Increase opportunities, especially for women and disadvantaged groups to contribute to and benefit from economic progress as well as
    - Country Programme Document Output 1.3: Government has the capacity to create an enabling environment for pro-poor and green growth
    - UNDP Strategic Plan Outcome 1: Advance Poverty Eradication in all its forms and dimensions
    - UNDP Strategic Plan Output 1.5.1: Solutions adopted to achieve universal access to clean, affordable and sustainable energy

89. SREPGen directly contributed to the following Sustainable Development Goals (SDGs):
    - SDG7: *Ensure access to affordable, reliable, sustainable and modern energy for all*:
        - Target 7.1: *By 2030, ensure universal access to affordable, reliable and modern energy services*
        - Target 7.2: *By 2030, increase substantially the share of renewable energy in the global energy mix*
    - SDG 13: *Take urgent action to combat climate change and its impacts*:
        - Target 13.2: *Integrate climate change measures into national policies, strategies and planning*
        - Target 13.3: *Improve education, awareness-raising and* ***human and institutional capacity on climate change mitigation****, adaptation, impact reduction and early warning*

90. SREPGen was fully aligned with, and supportive of, GoB's policy commitment to increase the proportion of RE in Bangladesh's energy mix as spelled out in the 2009 Renewable Energy Policy. It contributed to enhancing GoB's capacity to promote RE, through support for enabling SREDA to become functional and implement its mandate vis-à-vis RE development and promotion as well as increasing the access to RE relevant information for knowledge-based decision-making. The project was not only aligned with, but also

directly contributed to the development of government policies and regulations, in particular in relation to net metering for grid integration of RE systems.

91. The rapidly evolving context and major changes in the nature of energy demand, the significant delays before the project implementation could start up, as well as the design being overly prescriptive in terms of RE technology, the project faced major problems vis-à-vis supporting sub-projects that responded to the actual demand for RE solutions. Nonetheless, this shortcoming was rectified with the project redesign.

92. Stakeholders had been consulted during the design and were involved in the implementation of activities. SREDA staff engaged proactively, the sub-projects were implemented by organisations active in the sector, stakeholders were trained on maintenance, and pico-hydropower beneficiaries contributed significantly with labour. Moreover, the sub-projects were implemented in remote and underserved poor areas. The beneficiaries of the pico-hydropower were indigenous peoples. However, while SREPGen aimed at demonstrating commercially viable RE models, the sub-project financier was a public company, the loans were concessional rather than commercial, and several of the grant recipients for sub-projects and pilot projects were NGOs or social enterprises, rather than private companies with commercial objective for investing.

93. SREPgen was complementarity to the capacity development support provided by GIZ to SREDA, there was cooperation (albeit no joined activities) between the two and no overlaps or duplication were identified. Moreover, following World Bank support for the development of the draft Net Metering Policy, SREPGen provided further support for its finalisation and the development of the Net Metering Guidelines. Moreover, some of the initially planned activities were already supported by other development partners and were thus dropped.

5.3.3 Effectiveness

94. The majority of outcome targets were achieved or even exceeded (except for outcome 4), although the extent to which these results can be attributed to SREPGen varied among the indicators, mainly not due to the nature of several of the indicators rather than implementation shortcomings. This indicator definition concern also applies to all the outcome targets that were not achieved.

95. The first objective target, the expected tonnes CO_2 emission reduction over ten years will be exceeded, with a calculated ten year reduction of 2.35 MT compared to the target of 1.64 MT. The sub-projects delivered RE energy to previously unserved or underserved poor communities and thereby contributed to improving their livelihoods, as the access power enabled new income-generating activities.

96. The second objective target, the expected increase of RE's share of Bangladesh's power generation mix by end of project and increased RE capacity in MW, was significantly below target. This target was highly overambitious and well beyond what SREPGen could be expected to deliver. The influence of SREPGen on this was mainly indirect, through improved capacities, policies and regulations, and access to RE information, as well as

the demonstration value of the installed RE systems. The installed systems themselves also made a contribution increased RE generation, but not at a level that significantly enhance the share of the power mix at the national level. The main reasons for the lack of achievement of this target relates to significant increase in fossil fuel generation and a market in Bangladesh that is perhaps still not fully developed for RE.

97. So far, there is little evidence of replication of the RE models tested by SREPGen, probably due to the rapid expansion of national electricity grid, the remoteness of the locations which can be challenging for the private sector to engage in, the COVID-19 pandemic, and also since several sub-projects and pilot projects were not implemented with commercial financing and RE firms, thus not fully demonstrating the business potential. Even with a 50 percent grant, it was challenging to find investors that were willing to assume the residual 50 percent risk and engage in sub-projects.

98. Nonetheless, SREPGen made an important contribution to the enabling and regulatory environment for RE investment. The net metering guidelines in particular contributed to creating conducive conditions for investing in RE with the opportunity for selling excess electricity as well as accessing supplementary grid electricity. There is already early evidence of investments in grid integration of RE, e.g. by the Asian Development Bank. Similarly, the PV/solar irradiation and biomass studies provided important knowledge of the available potential, which will facilitate further RE investments.

5.3.4 Efficiency

99. The project faced significant delays, slow progress and low budget execution prior to the mid-term review. This was made up for through a no-cost extension of the completion date, and good progress was made after the mid-term review, making up for the initial slow progress and underspending (see table 5.3.2). However, extending the implementation period also came additional management costs, such as increased PMU salary expenses to cover the additional implementation period. Nonetheless, the project management costs were low, at 4 percent of the total GEF grant. The majority of the project funding went to the sub-projects and pilot projects under components 3 and 4.

Table 5.3.2: Spending, GEF grant

Component	Amount (US$)	Percentage of GEF grant
Component 1	394,006	10%
Component 2	505,523	12%
Component 3	1,981,888	49%
Component 4	955,665	23%
Project management	161,614	4%
Total	**3,998,696**	**98%**

Source: UNDP Atlas 28 Dec 2020

100. The principle of requiring typically 50 percent co-financing (loans, equity) enabled more efficient spending of project resources and allowed for a larger number of sub-projects. However, this requirement at times created challenges vis-à-vis identifying willing implementing partners. The project was able to mobilise significant co-financing, including a

significant unexpected contribution from civil society. Moreover, unquantified but significant amounts in-kind contributions were mobilised from GoB and community beneficiaries. However, the co-financing was still significantly below expectations, in particular, the private sector contribution was much lower than anticipated, but the co-financing expectations also appear to have been overambitious.

101. In terms of human resources, SREPGen had access to a fulltime PMU with a small but dedicated team of qualified professionals. Moreover, the project mobilised highly qualified, mostly national, experts as consultants for specific deliverables (e.g. studies) under components 1 and 2. Component 3 benefitted from the oversight and established and proven procedures of IDCOL.

Table 5.3.3: Rating of outcomes	
Assessment of outcomes	**Rating***
Relevance	Satisfactory (S)
Effectiveness	Satisfactory (S)
Efficiency	Moderately Satisfactory (MS)
Overall project outcome rating	**Satisfactory (S)**
**See annex 7 for the rating scale applied*	

5.3.5 Sustainability

102. No second phase of SREPGen is planned. UNDP and GEF will continue support RE in Bangladesh through the upcoming Promoting Energy-Related Low Carbon Urban Development in Bangladesh (LCUD) project. SREDA will be the GEF executing entity for LCUD, and the cooperation with, and support for SREDA will thus continue. Moreover, IDCOL will provide loan financing under LCUD. However, LCUD will have an urban focus, and will thus have a different geographic and contextual focus for its pilot interventions than SREPGen.

103. Financial sustainability: Considering that LCUD, GIZ and other donors will continue supporting SREDA, and that GoB is financing the staff of SREDA from its own resources. As such, it seems likely that the capacity and policy results of SREPGen will be further consolidated and sustained. The sub-projects under component 3 and 4 were planned to be commercially viable and designed to fully recover operation and maintenance costs from the electricity tariffs paid by the users/customers and the tariffs appear affordable for the beneficiaries. Hence, the financial sustainability of the results of SREPGen appears likely. However, the solar ice-making plant does not operate at full capacity, due to lack of access to electricity after sunset, and the volume produced is much lower than the demand and too small to be fully commercially viable. Moreover, the size (10 kg) of the ice blocks produced is smaller than the preferred size for fishing boats (20 kg). For the solar mini-grids beneficiaries report the fixed line tariff is high and it also appears high compared to other mini-grids in Bangladesh.

104. The extent to which the RE models of SREPGen will be replicated by the private sector is uncertain and may only happen to a modest degree, when considering the focus on SREPGen on poor and remote areas and general reliance on not-for-profit entities for

pilot project implementation. Moreover, the extent to which SREDA will prioritise updating the studies carried out by SREPGen is less certain.

105. Socio-political sustainability: Overall, there is political support for RE promotion, and SREDA staff and pilot project stakeholders showed ownership and interest in SREPGen, as demonstrated by the willingness of project partners to co-finance sub-projects and one pilot project. So far, there is little evidence of replication of the RE models tested by SREPGen, probably due to the remoteness of the locations which can be challenging for the private sector to engage in, and also since the sub-projects and pilot projects were often not implemented with commercial financing and RE firms, thus not fully demonstrating the business potential.

106. Institutional and governance sustainability: The policies and guidelines supported by SREPGen will remain valid. However, the capacities built at SREDA may be affected by staff turnover at both leadership and technical levels. SREDA is still a young institution, and while it has evolved significantly, there is still a need for support for further consolidation and capacity development, and there are still development partners working with SREDA, including LCUD. However, the extent to which other partners will take over the role of supporting SREDA in the development of commercially viable RE solutions for remote rural areas appears unclear.

107. Environmental sustainability: The promotion of RE as an alternative to fossil fuel has a positive environmental impact in terms of contributing to reduced air pollution and reduced environmental damage related to extraction of oil, gas and coal. The main environmental risk associated with SREPGen was the disposal of waste, such as batteries and solar panel. IDCOL ensured that agreements were in place with battery recycling facilities, but this was not feasible for solar panels. However, it is expected that SREDA will have regulations for PV waste in place in a few years, well before the panels installed are expected to require replacement, with an estimated lifespan of 20 years. The pico-hydropower systems installed were small run-of-river systems with limited environmental risk. SREPGen had planned to assist SREDA in the development of regulations and enforcement plans for proper disposal of waste from PV systems, including batteries and solar panels, but this support was disrupted by COVID-19. While SREPGen had the objective to reduce growth in greenhouse gas emissions, the pilot infrastructure installed in chars and coastal areas may be affected by the projected enhanced frequency and intensity of floods and storms due to climate change.

Table 5.3.4: Rating of Sustainability

Sustainability	Rating*
Financial resources	Likely (L)
Socio-political	Moderately Likely (ML)
Institutional framework and governance	Moderately Likely (ML)
Environmental	Likely (L)
Overall likelihood of sustainability	Moderately Likely (ML)
**See annex 7 for the rating scale applied*	

5.3.6 Country ownership

108. SREDA was closely involved in SREPGen activities, and work under component 1 centred on supporting SREDA in the development of formal policy and guidelines that provided a basis for SREDA to carry out its mandate vis-à-vis facilitation of RE investments. Moreover, the PMU staff, implementing partners and majority of consultants engaged were Bangladeshi, thereby SREPGen was fully owned and driven by range of national stakeholders, who will remain actors in the sector after project completion. The implementing partners invested their own financial resources (equity, loans from IDCOL) in the sub-projects and pilot projects, and thus have a direct economic interest in maintaining the functionality of the infrastructure put in place. Similarly, the end beneficiaries provided in-kind contributions to the sub-projects and pilot projects, in particular for the pico-hydropower, and had also been trained in operation and maintenance. End beneficiaries of the sub-projects and pilot projects have also experienced tangible livelihoods improvements, include income generation, from the electricity provided. Overall, there is a high degree of country ownership.

5.3.7 Gender equality and women's empowerment

109. Gender empowerment was not a central feature of SREPGen, and the project design did not include measures vis-à-vis gender and inclusion and empowerment of women, and the gender marker assigned to the project was GEN1. However, the energy demands and benefits for women, men and children are different. The measures implemented to ensure the participation of women in the project (and in a sector that appears to be dominated by men) are unclear from the PIRs, which tended to be limited to brief general statements or indications of intention vis-à-vis gender, with the exception of the PIR 2020 which contained some general reflection on energy and gender and information on the gender aspects of three sub-projects. The majority of staff among the implementing partners involved in SREPGen implementation were men. The mid-term review found that more attention to gender issues were needed. The indicators and targets were not gender disaggregated, and the reporting on how women were involved in the implementation (e.g. number and categories of women trained) was limited, although the number of women benefitting from three of the sub-projects were reported in the 2020 PIR. The 2016 PIR contained the following statement: "*Use of gender sensitive, sex-disaggregated indicators is not relevant with project nature*", indicating an insufficient understanding of the gender dimension of rural energy. The gender action plan did not contain specific measures for gender action other than a single indicator: "*Number of low income households (**women headed households**) that have new access to RE (Renewable Energy) power*", but this was not reported on a systematic manner.

110. Nonetheless, for some sub-projects, the inclusion of, and specific benefits for, women were clear, for example:

- The solar ice-making plant is run by UBOMUS, a women social enterprise. Of the approximately 10,000 households benefiting from the plant, 8,000 are reportedly female-headed households involved in fishing and unable to collect ice from distant locations.
- The pico-hydropower plant provides electricity for 62 indigenous peoples' households, including an unclear number of female-headed households and people living with disabilities.
- The 23 solar irrigation pumps benefit 20,000 households, including an unclear

number of female-headed households and people living with disabilities. Women's participation in the management was ensured by the project.

- Women ("*solar grandmas*") led the dissemination of 6,170 PVSLs for poor households. The improved quality of light from PVSLs is also providing women more security at night against theft and intrusion.

111. Overall, the access to electricity enabled women to increase their incomes through energy for new income opportunities and from the ability to carry out work after sunset.

5.3.8 Cross-cutting issues

112. No negative impacts were identified by the terminal evaluation.

113. Poverty alleviation and inclusion: By targeting poor, remote and off-grid locations, the SREPGen sub-projects contributed to reducing poverty by providing energy for new or enhanced livelihood opportunities. The sub-projects reached vulnerable people. The pico-hydropower plants specifically targeted remote indigenous peoples' villages in the Chittagong Hill Tracts (Bandarban). Moreover, the pico-hydropower pilot project focused on people living with disabilities and was implemented by Oporajeo in partnership with the Bandarban Disabled Peoples' Organization to Development (Bandarban DPOD). The solar mini-grids targeted remote and poor coastal fishing communities. The solar powered ice-making plant was implemented and managed by woman-led social enterprise. Female-headed households benefitted from several sub-projects, including the solar-powered ice-making plant, the solar min-grids and pico-hydropower plants, and the solar irrigation pumps. The solar PVSL distribution was led by women.

114. Governance and human rights: Through strengthening SREAD's capacity, the RE regulatory framework and the access to RE information, the project contributed to improving the governance of the RE sector and the capacity of GoB as duty-bearers vis-à-vis providing universal access to clean energy in Bangladesh. Moreover, the targeting of vulnerable communities, contributed to improved education, e.g. through lighting that allowed homework after sunset, and empowerment through economic opportunities.

115. Climate change: The overarching objective of SREPGen was to contribute to reducing the growth in greenhouse gas emissions from increased power generation and use in Bangladesh, by promoting RE.

116. Environment: A positive contribution to the environment was made through the promotion of clean energy, thereby reducing air pollution from the combustion of carbon-based energy, and possibly also reduced pressure on wood biomass.

5.3.9 GEF Additionality

117. As shown in table 5.3.5 the GEF support provided through SREPGen enabled the realisation of additional benefits, which would not have been realised without the project.

Table 5.3.5: GEF additionality	
Additionality type	**SREPGen additionality**

Specific environmental additionality	The sub-projects and pilot projects contributed to reduced or avoided greenhouse gas emissions and air pollution, through the provision of RE as an alternative to fossil fuels for electricity generation and light. An indirect contribution was made for larger emission impacts through the improvements made to policy, capacity and data access
Legal/regulatory additionality	An important policy and regulation contribution was made with the Net Metering Policy, Net Metering Guidelines, draft National Solar Energy Road Map 2021-2041
Institutional additionality/governance additionality	A significant contribution was made to strengthening the new institution SREDA and its ability to facilitate RE investments through training, exposure visits and participation in project activity implementation.
Financial additionality	The grants provided for sub-projects leveraged IDCOL loan financing and/or equity from civil society and to a lesser extent the private sector for investment in RE systems that would otherwise be difficult to finance. The Net Metering Guidelines have contributed to creating an enabling environment for investment in grid integrated RE systems
Socio-economic additionality	The sub-projects led to tangible livelihoods improvements for poor communities through the provision of energy for income-generating and other socio-economic activities.
Innovation additionality	The sub-projects and pilot projects to some extent tested and demonstrated the commercial/financial viability of different RE solutions, such as solar-powered boats, solar-powered ice-making and net integration of solar irrigation pumps

5.3.10 Catalytic/replication effect

118. The enhanced capacity of SREDA, the net metering policy and guidelines and draft National Solar Energy Road Map 2021-2041 as well as the improved access to RE information contribute to the creating of an enabling environment for increased investments in RE and can be considered catalytic; a tangible example is the interest of the Asian Development Bank to invest in grid integration of already solar irrigation pumps already under installation. After the approval of net metering guidelines, the investment in rooftop PV systems has increased, including the ongoing development of the largest rooftop PV system (40 MW) in Bangladesh. Moreover, GoB has approved a waste-to-energy project, which has been informed by SREPGen's waste-to-energy study.

119. The sub-projects and pilot projects have demonstrated various rural RE options. So far, there is little evidence of replication of the RE models tested by SREPGen, probably due to the rapid expansion of national electricity grid, the remoteness of the locations which can be challenging for the private sector to engage in, the COVID-19 pandemic, and also since the sub-projects and pilot projects were often not implemented with commercial financing and RE firms, thus not fully demonstrating the business potential.

5.3.11 Progress to impact

120. A tangible **policy and regulatory impact** of SREPGen is that it through the net metering policy and guidelines has provided a regulatory framework that allows RE system owners to sell (or be provided credits) surplus power to the grid. Grid integration also enables RE system owners to purchase grid power (e.g. during night), thereby reducing the

need for investing in batteries for storing electricity. This makes investment in RE systems, such as rooftop solar systems and solar irrigation pumps more financially attractive, since the installation costs are reduced, and the export of surplus power has a monetary value. Sector stakeholders report that investments in solar rooftop systems have increased after the adoption of the net metering guidelines. Stakeholders also find SREPGen made an important contribution the development of SREDA into a functional agency that is proactively engages in facilitating RE investments and project development. The National Solar Energy Road Map 2021-2041 prepared with support from SREPGen, contributed to the in integration of RE in the Perspective Plan 2020-30 and the draft 8th Five Year Plan. Moreover, the improved access to RE information, e.g. on waste-to-energy, is reported to have informed new RE projects.

121. The RE systems installed through SPREPGen sub-projects and pilot projects have had direct positive **environmental impact** in terms of reducing or preventing greenhouse gas emissions. SREPGen has calculated that a total of 1.2 MT CO_2 will be avoided within a ten-year period and 2.0 MT within 20 years. Air pollution from the combustion of fossil fuels, firewood and charcoal will also have been avoided, but the amount has not been estimated. The policy and regulatory impacts a likely make a significant indirect contribution to reduced emissions by facilitation further investment in RE.

122. The SREPGen sub-projects mainly focused remote communities without access to the national grid, and thereby provided electricity to communities previously without electricity access. While there is an absence quantitative data on the livelihoods impacts, since a) for many sub-projects it is premature to assess this, and b) the COVID-19 pandemic hampered the gathering of field data in 2020.

123. Nonetheless, anecdotal evidence found by project stakeholders and confirmed by the terminal evaluation's field visits illustrate the **socio-economic impact** of the sub-projects and pilot projects. For example, project beneficiaries interviewed report that the access to electricity provided by the two solar-minigrids have yielded a range of benefits, including:
    - Ability to work after sunset, e.g. processing agricultural products, making handicrafts, keeping shops open, carrying out domestic chores in the evening and freeing up time for agriculture – thereby increasing productivity, sales and incomes
    - Making it easier children for to do homework after dark – thereby improving their education
    - Enhancing or engaging in new economic activities using electricity, e.g. working as electrician, using electric sewing machines – thereby increased incomes
    - Making life more comfortable, using electric fans during hot days and watching TV
    - Reduced costs of lighting, as kerosene is more expensive than electricity

124. Due to the low volume and relatively small size (10 kg) of the ice blocks produced, the solar ice-making only serves small-scale fishermen with small boats for coastal fisheries. Interviewed beneficiaries of report the following benefits:

- Reduced costs of ice
- Reduced time spent on purchasing and transporting ice
- Improved availability of ice
- Ability to preserve and store fish and maintain their quality and sell them at higher prices (e.g. compared to dried fish) – increased incomes for small-scale fishermen

125. Project stakeholders report similar benefits from the other sub-projects. For example, solar irrigation pumps have reduced the costs of irrigation compared to diesel pumps, thereby enabling farmers to irrigate for longer periods and increase and diversify crop production, which has increased incomes.

6. Main findings, conclusions, recommendations and lessons

6.1 Main Findings

126. Table 6.1.1. presents the main findings of the terminal evaluation and answers to the evaluation questions.

Table 6.1.1: Main findings and answers to evaluation questions	
Evaluation questions	**Findings**
Project design	
1. Was the project design and strategy appropriate and realistic vis-à-vis achieving the intended results?	• The overall strategy for facilitating an increased use of RE was rational, as it addressed key challenges faced in the RE sector and promoted the establishment of a conducive and enabling environment for RE investments • Component 3 and outcome 3 were overly specific and narrowly defined with an exclusive focus on PVSLs with no room for other RE solutions (rectified after mid-term review). • Outcome 4 would be impossible for the project to deliver on its own: "*Renewable energy accounts for an increased share of Bangladesh's power generation mix*". • Component 4 had a focus on upscaling and little room to engage in piloting, which in practice was the focus of the implementation. • Two key risks of importance to component 3 and 4 had not been identified: a) Rapid national grid expansion, and b) the rapid improvement of RE technology and reduced prices – hence, the project did not have any measures in place for mitigating these risks.
2. Was the project design building on previous experiences of UNDP and GoB?	• The ProDoc contained an analysis of lesson and results from several earlier interventions and experiences in the RE sector, including earlier GEF project. • IDCOL's existing financing model was used for sub-projects under component 3.
3. Was the project design participatory?	• A range of stakeholders were consulted meetings and workshops, incl. UNDP, GoB, development partners and the private sector • The consultations appear not fully sufficient, as design included two inappropriate outputs: rice husk power though not a SREDA priority, wind investment plan already planned by USAID. An output of national priority was ruled out: biomass assessment.
4. Was the project complementing and coherent with other RE interventions?	• SREPGen did not have joint activities or outputs with other projects. • SREPGen was in dialogue and coordination with other development partners supporting SREDA, in particular through SREDA's monthly coordination meetings, and avoided duplication. • SREPGen continued interventions of other projects, such as the World Bank support for the development of a net metering policy, by supporting the finalisation of the policy and the development of net metering guidelines.
Project management	
5. Were changes made to the project design	• Grid expansion and reduced costs of RE systems led to a major drop in demand for PVSLs and solar home systems.

	during implementation to enhance the likeliness of achieving the intended results or in response to contextual changes?	• The changes, and the overly prescriptive design vis-à-vis technology choice, hampered progress of SREPGen, in particular component 3 (55% of total budget). • Component 4 promoted replication and upscaling but was in practice implemented as an innovation and piloting component. • The mid-term review proposed results framework revisions to make it less prescriptive, more flexible and with space for piloting. • Outcome 3 was revised, but outcome 4 remained unchanged.
6.	Was the project implementation participatory?	• Day-to-day implementation fell under the responsibility of GoB. The SREDA Chairperson oversaw project implementation. • Day-to-day project implementation was managed by a PMU housed at SREDA, but with staff contracted by UNDP. No technical level SREDA staff were designated to work with the PMU on the day-to-day management of the project. • Grants and procurement were handled by UNDP. • SREDA proactively engaged in SREPGen implementation, and there was good interaction and cooperation between the PMU and SREDA. • The sub-projects were co-financed with grants from SREPGen, soft loans from IDCOL, and/or equity from the private companies and NGOs implementing the sub-projects and one pilot project. IDCOL played a pivotal role in the identification of the companies and NGOs. • The majority of the pilot project implementers were not commercial enterprises, which were difficult to mobilise due to the remoteness of several locations and uncertainty about the commercial viability and business potential even with grant funding. • Local stakeholders were consulted for the installation of RE systems. The communities made significant labour contributions to the pico-hydropower plant and solar-powered ice-making plant.
7.	Was the anticipated project budget available and spent?	• By 28 December 2020, 98% of the GEF grant had been spent. • The expected cash co-financing from UNDP and other development partners did not materialise, and the private sector contribution was less than 5% of the anticipated contribution. • A significant unexpected amount of co-financing came from civil society organisations. • The total co-financing realised was 38% of the expected co-financing.
8.	Was the monitoring system outcome-oriented and used as a management tool?	• The indicators at the objective and outcome level were SMART and for the larger part appropriate for measuring the intended change and measurable with clear baseline values and end targets. • The outcome 1 did not measure the regulations and guidelines introduced and their appropriateness and utility as perceived by sector stakeholders. • Some outcome indicators were difficult to attribute to the project. • The PIRs reported on the indicators. Since the indicators for component three were largely meaningless as they related to PVSL, the progress was reported vis-à-vis the RE systems actually installed.

9. Did UNDP provide adequate oversight and guidance?	• UNDP provided strong technical support to the project revision. • The UNDP Regional Bureau in Bangkok engaged to ensure the project did not deviate significantly from the objective and outcomes. • Initially, UNDP procurement had been slow and could take up to four months, but this issue was rectified with grant recipients and contractors reporting procurement being timely and smooth.
10. Was SREDA execution of the project adequate?	• SREDA staff engaged readily and constructively in SREPGen implementation and project stakeholders often perceived project activities as being implemented by SREDA rather than by a project. • SREDA's engagement was at times affected by staff turnover. At times, this had a disruptive effect, for example leading to a three-month gap between the departure of the previous National Project Director to the engagement of his successor towards. • The SREDA Chairperson facilitated the interaction with SREDA staff. • SREDA was hesitant towards contracting sub-projects to other entities than IDCOL. This seems to have contributed to the lack of engagement of private financing institutions, and an opportunity to demonstrate the feasibility of commercially financed RE projects may have been missed. • SREDA ensured that development partner interventions that involved SREDA were well-coordinated and did not overlap.
11. Was risk adequately managed?	• In most cases, the responses implemented to mitigate the risks encountered were appropriate but could/should in some cased have been implemented earlier to avoid major delays. • Risks related to the engagement of the private investors and financing institutions appear not sufficiently addressed. • At project approval, SREPGen was screened and assessed as having no significant environmental or social risk. No further environmental or social screening was carried out of the revised SREPGen design, even though the revision implied significant changes in the RE technologies promoted. • The component 3 sub-projects receiving loans from IDCOL were subject to environmental and social screening as per IDCOL procedures.
Progress towards objectives and expected outcomes	
12. Were the main outputs delivered?	• All targets for outcome 1 were achieved or exceeded, as SREDA was able to facilitate the development and approval of RE projects. SREPGen contributed through staff capacity development and support for policy and guideline formulation. SREPGen was not the only project contributing to increasing SREDA's capacity and improving the policy framework. • All targets for outcome 2 were achieved or exceeded. SREPGen provided access to information on solar irradiation, biomass resources, waste-to-energy, and the installation of a web-based information management system. • All targets for outcome 3 were achieved or exceeded. SREPGen sub-projects provided electricity to the expected number of households, but the contribution to reaching indirect beneficiaries is unclear, but the capacity and policy support likely contributed indirectly.
13. Were the intended outcomes achieved?	

	• Two targets for outcome 4 were exceeded, but the targets vis-a-vies installed MW capacity and increased the RE share of the power mix were not fully achieved. SREPGen's made direct contribution in terms of MW and indirect contribution through demonstration, capacity and policy. The targets were unrealistic.
14. Was the objective met?	• The expected CO2 emission reduction of 1.64 MT over 10 years was exceeded, with a calculated total reduction of 2.35 MT. • The expected 6 percent share of the power mix was not achieved; by end 2020, the share was 3.15 percent. The target was unrealistic to expect SREPGen to deliver. • The target of 1,000 MW Re was not reached; by the end of 2020, the total RE capacity in Bangladesh was 700.61 MW. The target was unrealistic to expect SREPGen to deliver. • SREPGen made a catalytic contribution to developing an enabling environment for RE, in particular for grid integration of RE systems, and a small direct contribution through sub-project.
Relevance	
15. Did the project support national policy priorities?	• SREPGen was aligned with, and supportive of, GoB's policy commitment to increase the proportion of RE in the energy mix. • SREPGen contributed to enhancing SREDA's capacity to promote RE, as well as increasing the access to RE relevant information for decision-making. The project directly contributed to the development of policies and regulations, in particular in relation to grid integration of RE systems.
16. Did the project objective and outcomes respond to GEF strategic priorities for climate change mitigation?	• SREPgen was fully aligned with the GEF's priorities vis-à-vis reducing carbon emission through promoting innovation and demonstrating mitigation options.
17. Was the project supportive of UNDP climate change priorities and strategies for Bangladesh?	• SREPGen was supportive of the clean and affordable energy signature solution in the UNDP Strategic Plan 2018-2021, and with UNDP's priorities in the Country Programme Document for Bangladesh 2017-2020 of a) ensuring economic growth is inclusive and supports economic opportunities, and b) improving environmental sustainability.
18. Did the project seek to address the energy needs and demand of sub-project beneficiaries?	• Initially, the project faced major problems vis-à-vis supporting sub-projects that responded to the actual demand for RE solutions. This shortcoming was rectified with the project redesign, and the sub-projects and pilot projects responded well to energy demands.
Effectiveness	
19. To what extent did the project contribute to the achievement of GoB, UNDP and GEF priorities?	• SREPGen made an important contribution to the enabling and regulatory environment for RE investment. • The net metering guidelines contributed to creating conducive conditions for investing in RE with the opportunity for selling excess electricity as well as accessing supplementary grid electricity.
20. What were the key factors contributing	

to project success or underachievement?	• The PV/solar irradiation and biomass studies provided important knowledge of the available potential, which will facilitate further RE investments. • There is little evidence of replication of the RE models tested by SREPGen, probably due to the rapid expansion of national electricity grid, the remoteness of the locations, the COVID-19 pandemic, and also since sub-projects and pilot projects were often not implemented with commercial financing and RE firms, thus not fully demonstrating the business potential. • Even with a 50 percent grant, it was challenging to find investors that were willing to assume the residual 50 percent risk and engage in sub-projects.
Efficiency	
21. Was the project cost-effective?	• The 50 percent co-financing requirement enabled more efficient spending of project resources and allowed for a larger number of sub-projects, but created challenges vis-à-vis identifying willing implementing partners. • The project was able to mobilise significant co-financing, including a significant contribution from civil society. • Unquantified but significant amounts in-kind contributions were mobilised from GoB and community beneficiaries. • The private sector co-financing was much lower than anticipated.
22. Was the project implemented in a timely manner?	• The project faced significant delays, slow progress and low budget execution prior to the mid-term review. This was made up for through a no-cost extension of the completion date, and good progress was made after the mid-term review, making up for the initial slow progress and underspending.
Sustainability	
23. Do SREDA and the Power Division and other stakeholders have access to sufficient financial resources to maintain project and sub-project results?	• LCUD, GIZ and other donors will continue supporting SREDA, and GoB is financing the staff of SREDA from its own resources, so it seems likely that the capacity and policy results will be further consolidated and sustained. • The sub-projects were planned to be commercially viable and designed to fully recover operation and maintenance costs from the electricity tariffs, and the tariffs appear affordable for the beneficiaries. • Project stakeholders showed ownership and interest, as demonstrated by the willingness of project partners to co-finance sub-projects and pilot projects. • The extent to which SREDA will prioritise updating the studies carried out by SREPGen is uncertain.
24. Can beneficiaries/electricity users afford the operation, maintenance and replacement costs of the energy solutions provided/installed by the sub-projects?	
25. Are SREDA and the Power Division positioned to continue with the practices	• There is political support for RE promotion • The policies and guidelines supported by SREPGen will remain valid. • The capacities built at SREDA may be affected by staff turnover at both leadership and technical levels.

and approaches established with help from the project?	• While SREDA has evolved significantly, there is still a need for support for further consolidation and capacity development, and there are still development partners working with SREDA. • The extent to which other partners will take over the role of supporting SREDA in the development of commercially viable RE solutions for remote rural areas appears unclear.
26. Are there any significant environmental or climate risks that can undermine the continued functioning of the sub-projects?	• The promotion of RE as an alternative to fossil fuel has a positive environmental impact by contributing to reduced air pollution and environmental damage related to extraction of oil, gas and coal. • The main environmental risk associated with SREPGen was the disposal of waste, such as batteries and solar panel. In relation to battery. IDCOL ensured that agreements were in place with battery recycling facilities. It is expected that SREDA will have regulations for PV waste in place well before the panels require replacement. • The pico-hydropower systems installed were small run-of-river systems with limited environmental risk. • The pilot infrastructure installed in chars and coastal areas may be affected by the projected enhanced frequency and intensity of floods, cyclones and storms due to climate change.
Country ownership	
27. Do key stakeholders and beneficiaries have an adequate level of interest in ensuring that project benefits are maintained?	• SREDA was closely involved in SREPGen activities, and work under component 1 centred on supporting SREDA in the development of formal policy and guidelines that provided a basis for SREDA to carry out its mandate. • The PMU staff, implementing partners and majority of consultants engaged were Bangladeshi, thereby SREPGen was fully owned and driven by range of national stakeholders, who will remain actors in the sector after project completion. • Implementing partners invested their own financial resources (equity, loans) in the sub-projects and one pilot project, and have a direct economic interest in maintaining the functionality of the infrastructure • End beneficiaries of the sub-projects have also experienced tangible livelihoods improvements, include income generation, from the electricity provided.
Gender equality and women's empowerment	
28. To what extent did the project ensure that women benefitted equally from the project and contribute to their empowerment?	• Gender empowerment was not a central feature of SREPGen, and the project design did not include measures vis-à-vis gender and inclusion and empowerment of women. • Three sub-projects had clear benefits for women. The solar ice-making plant is run by UBOMUS, a women social enterprise and 75% of the households benefiting are reportedly female-headed. Overall, the access to electricity enabled women to increase their incomes through energy for new income opportunities.
Cross-cutting issues	
29. To what extent did the project ensure that vulnerable groups (e.g. ultra-	• By targeting poor, remote and off-grid locations, SREPGen contributed to reducing poverty by providing energy for new or enhanced livelihood opportunities.

poor, people living with disabilities ethnic minorities) benefitted equally from the project and contribute to their empowerment?	• The sub-projects reached vulnerable people, including indigenous peoples in the Chittagong Hill Tracts (Bandarban), coastal fishing communities, female-headed households, and people living with disabilities.
30. To what extent were adequate measures implemented to avoid negative environmental impacts?	• A positive contribution to the environment was made through the promotion of clean energy, thereby reducing air pollution from the combustion of carbon-based energy, and possibly also reduced pressure on wood biomass. • At the time of project approval, SREPGen was screened and assessed as having no significant environmental or social risk. No further environmental or social screening was carried out, even though the revision implied a significant change in the RE technologies promoted. • The component 3 sub-projects receiving loans from IDCOL were subjected to environmental and social screening as per IDCOL procedures.
31. Did sub-projects have any significant negative environmental or social effects?	• No negative impacts were identified by the terminal evaluation.
GEF additionality	
32. Did the GEF funding lead to additional/incremental benefits, in particular vis-à-vis SREDA's and MoPEMR's ability and willingness to promote RE and environment-friendly energy solutions?	• Sub-projects and pilot projects contributed to reduced or avoided greenhouse gas emissions and air pollution, through the provision of RE as an alternative to fossil fuels. An indirect contribution was made for larger emission impacts through policy, capacity and data access. • An important policy and regulation contribution, especially vis-à-vis net metering and grid integration of RE systems. • A significant contribution was made to strengthening the new institution SREDA and its ability to facilitate RE investments. • Grants provided for sub-projects leveraged IDCOL loan financing and/or equity from civil society and to a lesser extent the private sector for investment in RE systems, that would otherwise be difficult to finance. The Net Metering Guidelines contributed to enabling environment for investment in RE systems. • Sub-projects led to tangible livelihoods improvements for poor communities through the provision of energy. • The sub-projects and pilot projects tested and demonstrated the financial viability of different RE solutions.
Catalytic/replication effect	
33. Are the project approaches likely to be upscaled and replicated?	• The enhanced capacity of SREDA, the net metering policy and guidelines and draft National Solar Energy Road Map 2021-2041 as well as the improved access to RE information contribute to the creating of an enabling environment for increased investments in RE and can be considered catalytic.

	• After the approval of net metering guidelines, the investment in rooftop PV systems has increased, including the ongoing development of the largest rooftop PV system (40 MW) in Bangladesh. • GoB has approved a waste-to-energy project, which has been informed by SREPGen's waste-to-energy study. • So far, there is little evidence of replication of the RE models tested by SREPGen sub-projects and pilot projects, due to the rapid expansion of national electricity grid, the remoteness of the locations, the COVID-19 pandemic, and since sub-projects and pilot projects were often not implemented with commercial financing and RE firms, thus not fully demonstrating the business potential.
Progress to impact	
34. Has SREDA become an effective facilitation centre?	• The net metering policy and guidelines provided a regulatory framework that allows RE system owners to export surplus power to the grid. Grid integration also reduced the need for investing in batteries for storing electricity. This makes investment in RE systems, more financially attractive. • SREPGen made an important contribution the development of SREDA into a functional agency that is proactively engages in facilitating RE investments and project development.
35. Are GoB agencies effectively providing reliable RE information for improved decision-making and investment planning?	• SREPGen improved the access to RE information with the web-based data management system and PV, biomass and waste-to-energy assessments.
36. Has poor households' access to RE improved?	• The SREPGen sub-projects mainly focused remote communities without access to the national grid, and thereby provided electricity to communities previously without electricity access.
37. Has the share of RE in Bangladesh's power generation mix increased?	• The share of RE in the power mix increased from 1% at baseline to 3.15 by end 2020, but the end-of-project target was 6%. • SREPGen sub-projects and pilot projects made a small direct contribution. • An indirect contribution was made through improvement of SREDA's capacity and the regulatory framework.
38. Has the projected growth in CO_2 emissions reduced?	• SREPGen sub-projects and pilot projects are projected to lead to 2.35 MT CO_2 emissions avoided over 10 years, thus exceeding the target of 1.64 MT by end-of-project.
39. Have households benefitting from SREPGen sub-projects experienced livelihoods improvements as a result of RE access?	• Early evidence shows that pilot project beneficiaries achieved a wide range of livelihoods benefits from the access to electricity, including: a) increased incomes from new income-generating opportunities, and the ability to work after sunset, b) increased agricultural productivity due to reduced costs of pumping water for irrigation, and c) improved education as homework is now easier after sunset.

6.2 Conclusions

127.SREPGen faced major delays, slow progress and low budget execution prior to the mid-

term review. Underlying reasons for the delay start-up included a lengthy approval process for the GoB project document after the GEF had approved the grant, and slow recruitment of the National Project Manager, and an overly prescriptive design of component 3 in terms of technology choice, which was overtaken by rapid developments in the sector, with rapid grid expansion and significantly reduced prices for RE systems, so that there was little demand for the PVSLs for which 55% of the budget had been allocated. In 2018, after the project design was revised, the design shortcomings had been overcome and the completion date extended, project implementation picked up. However, valuable time could have been saved, if the design shortcomings had been addressed already in the inception phase. In 2020, implementation was significantly affected by the COVID-19 pandemic and a second extension till end 2020 was approved. By the end of the project, 98 percent of the budget had been executed.

128. Most outcome targets were reached or exceeded, although not always entirely as a result of SREPGen. The objective target for direct CO_2 emission reductions from SREPGen was exceeded. However, not all targets for outcome 4 were achieved, but these targets were overambitious and beyond what SREPGen could be expected to deliver. Similarly, the objective target of increasing the RE percentage in Bangladesh's power generation mix was well beyond the control of the project.

129. SRPEGen made some significant contributions towards creating an enabling environment for increased RE investments. The most tangible contribution is the Net Metering Guidelines has laid the economic foundation for grid integration of RE systems, with the dual economic benefits of a) financial compensation for exporting surplus energy to the grid, and b) reducing the need to invest in batteries for storing energy, since the grid can be accessed when the RE system is not producing energy (e.g. during night for PV systems). With early evidence of increased investment in rooftop PV systems, this can be considered a catalytic contribution from SREPGen and the GEF. Moreover, the National Solar Energy Road Map 2021-2041 contributed to the in integration of RE in the Perspective Plan 2020-30 and the draft 8th Five Year Plan. Other important contributions were the enhanced capacity of SREDA, which now proactively engages in facilitating RE projects and the improved access to RE data from the establishment of an online data management system and the solar irradiation, biomass and waste-to-energy assessments. While not the only partner to SREDA, SREPGen has still played an important role in enhancing SREDA's capacity.

130. The sub-projects provided energy to poor and remote off-grid communities and vulnerable people, including indigenous peoples in the Chittagong Hill Tracts, small-scale fishing communities on remote islands, female-headed households, and people living with disabilities. SREPGen met its target number of households provided with electricity. The electricity provided led to a number of tangible livelihoods improvements, including new and improved income opportunities, increased agricultural productivity, and improved education. Moreover, the sub-projects and pilot projects made a positive contribution to the environment by providing clean energy, thereby reducing local air pollution from the combustion of carbon-based energy (e.g. from diesel generators and kerosene

lamps). The sub-projects and pilot projects are projected to lead to 2.35 MT CO_2 emissions avoided over ten years, thereby exceeding the target of 1.64 MT CO_2 emission reductions.

131. The sub-projects and pilot projects were intended to demonstrate commercially viable RE solutions that would be attractive to the private sector to replicate and upscale. Hence, the sub-projects and one pilot project were implemented as blending projects, where SREPGen provided a grant which was complemented by concessional loans provided by IDCOL and/or equity from project investors. This model also promoted sustainability as the implementing partners invested their own resources. Furthermore, it allowed SREPGen to implement a larger number sub-projects and reach more beneficiaries than would otherwise have been possible. However, the participation of the private sector from a commercial perspective in the sub-projects and pilot projects proved challenging to ensure and was much lower than expected and most pilot project were implemented with not-for-profit partners, such as NGOs, social enterprises, social/CSR branches of private companies, and government entities. Only two sub-projects were invested in by private companies with a commercial objective for the investment. The reasons for this appear to include a) the remoteness and limited (or perceived limited) scope for commercial investments in some locations, and b) a perception that investment would be risky even with a 50 percent grant. Moreover, it was chosen to engage only with IDCOL as a grant provider given their prior experience with RE financing, whereas there was reluctance towards engaging with commercial financing institutions. Moreover, the loans provided were provided on concessional rather than commercial terms.

132. So far, there is little evidence of replication of the sub-projects and pilot projects. This could in part be since most sub-projects and pilot projects were implemented recently, and also due to the COVID-19 pandemic. However, since many sub-projects and pilot projects were not implemented with a commercial perspective of the implementing partners and were not based on commercial financing but on concessional loans, they did not fully demonstrate the business potential and may thus not appear fully convincing for private companies.

133. The implementation of SREPGen was led by national stakeholders. SREDA was proactively engaged in the implementation of activities and ensured that SREPGen was coordinated with other initiatives supporting SREDA. However, SREDA's engagement was at times affected by staff turnover. IDCOL played a major role in the identification of implementing partners for the sub-projects, and IDCOL's standard financing model and procedures were applied for the sub-projects under component 3. Implementing partners invested their own financial resources in the sub-projects and one pilot project and thus had a direct economic interest in them. Beneficiaries made an in-kind contribution, which in some cases was substantial (e.g. in the pico-hydropower pilot project). The PMU staff, implementing partners and majority of consultants engaged were Bangladeshi, who will remain actors in the sector after project completion. The day-to-day management of SRPEGen was handled by a PMU recruited by UNDP (but housed at

SREDA), and grants and procurement were handled by UNDP.

134. SREDA has evolved significantly, but there is still need for further support for consolidation, and there are still development partners working with SREDA, including UNDP-GEF through the upcoming LCUD project. As such, it seems likely that the capacity and policy results of SREPGen will be further consolidated and sustained. However, the extent to which SREDA will prioritise updating the assessments carried out by SREPGen is less certain. Moreover, with LCUD having an urban focus, and it is unclear whether there will be support for SREDA in the development of commercially viable RE solutions for remote rural areas. The sub-projects under component 3 and 4 were planned to be commercially viable and designed to fully recover operation and maintenance costs from the electricity tariffs paid by the users/customers and the tariffs appear affordable for the beneficiaries.

135. No negative environmental or social impacts were identified by the terminal evaluation. The project had been duly screened at design and found to be of low environmental risk. However, while the revision of the design led to a significant shift in the RE technologies promoted under the sub-projects, no follow-up screening was carried out. Nonetheless, the component 3 sub-projects that were co-financed by IDCOL were subject to environmental and social screening as per IDCOL procedures.

136. Similarly, while some sub-projects provided positive benefits for women and the solar ice-making factory was implemented by a woman enterprise, the project design did not include any measures vis-à-vis gender and inclusion and empowerment of women, and the monitoring and reporting did not reflect careful gender considerations. However, the energy needs and benefits are different for women, men, and children. Overall, there appears to have been an insufficient understanding of the gender dimension of rural energy. Nonetheless, some sub-projects clearly included women and delivered specific benefits for women; the women-led solar powered ice-making plant being the most prominent example.

6.3 Recommendations

137. Table 7.2.1. presents the recommendations of the terminal evaluation.

Table 7.2.1: Recommendations

Rec #	TE recommendation	Entity responsible	Timeframe
A	Category 1: Private sector involvement		
A.1	Analyse commercial and financial viability of the different sub-projects and pilot projects and identify potential areas of improvement vis-à-vis commercialisation of similar projects in the future.	SREDA, UNDP	2021-22
A.2	Engage in dialogue with the private sector to understand how a) the private sector can be atterrated to engage in future piloting, and b)	SREDA, UNDP	2021-22

	how sub-projects and pilot projects can undertake demonstration that is relevant for the private sector.		
A.3	Assess how approaches from successful private sector development projects can be adapted to RE sector projects.	UNDP	2021-22
A.4	Engage with commercial financing institutions and RE companies to explore how the sub-projects and pilot projects can be replicated and tested under more commercial terms.	SREDA	2021-22
A.5	Explore possible ways to further reduce risk for the private sector – for example: a) risk insurance for losses, and b) increasing the grant share, for high risk and highly innovative sub-projects and pilot projects.	IDCOL, SREDA	2022-2023
B	Category 2: GoB institutional capacity to promote RE		
B.1	Carry out capacity needs assessments of key GoB institutions in the energy sector, vis-à-vis the technical capacity to engage more comprehensively in RE promotion and shifting priorities from hydro-carbons towards RE.	Power Division	2022
C	Category 3: Upscaling and replication		
C.1	Engage in dialogue with other development partners on how they can be mobilised to a) replicate the experiences and lessons from SREPGen sub-projects and pilot projects, and b) support SREDA and IDCOL vis-à-vis rural RE.	SREDA, IDCOL, UNDP	2021
D	Category 4: Analysing pilot project impacts		
D.1	Carry out impact studies on the livelihood benefits achieved by the sub-projects and pilot projects.	SREDA, UNDP	2021-2022
D.2	Carry out ex post environmental and social impact (positive and negative) assessments of the sub-projects and pilot projects.	UNDP	2021-2022
E	Category 5: Specific sub-projects		
E.1	Assess the reasons behind the size of the fixed line charge and compare it with the charges of other mini-grid systems in Bangladesh. Explore options for reducing the charge and rationalising the fixed costs.	WREL, IDCOL	2021
E.2	Explore the feasibility and financial viability of connecting wind-power to the solar ice-making factory to increase the production capacity of the existing facility.	UBOMUS, SREDA, IDCOL	2021
E.3	Explore options for mobilising financing to increase the capacity of the solar ice-making factory and making it more commercially viable.	UBOMUS, SREDA, IDCOL	2021

E.4	Consider installing capacity to produce larger ice blocks at the solar ice-making factory – and analyse the potential risk of large boat operators displacing small boat operators from purchasing ice, and develop mechanisms to ensure that small boat operators still have access to ice (e.g. maximum limit for daily/weekly purchases.	UBOMUS	2022

6.4 Lessons Learned

138. SREPGen has generated the following lessons, which are of relevance to other UNDP-GEF RE projects.

139. A major cause of limited progress and low spending was the design of component 3 with an exclusive focus on PVSLs. Hence, when the context changed and the demand for PVSLs dropped to a minimal level, the project did not have the flexibility to adapt to the needs without formal GEF approval.
Lesson 1: **RE project designs should not be overly prescriptive in terms of RE technology or systems, as the RE sector is rapidly evolving so projects should be able to respond to the available options and changes in demands**

140. The approval process took a long time from project design till implementation commenced. In the meantime, the context, needs and demand had evolved drastically and the original project design dd not remain entirely relevant. This shortcoming was not addressed for a few years (until the midterm review) but could have been identified and rectified much earlier.
Lesson 2: **When the process from design to implementation takes a long time, stock-taking of contextual changes and the potential need for project revision should be carried out during the inception phase**

141. The original project design duly underwent an environmental and social screening and weas found to be low risk. However, component 3 was redesigned to invest the construction of energy infrastructure instead of the distribution of PVSLs. Despite this major change, SREPGen was not subjected to a follow-up environment and social screening by UNDP or SREDA.
Lesson 3: **When significant changes are made to the RE activities on the ground, an environmental and social screening should be carried out, even if the screening at design found the project to be low risk**

142. While SREPGen in practice provided tangible benefits for women, the project did not have a systematic gender approach, spelled out. Despite the differences in the energy needs of women, the project design did not address this issue and the indicators and targets were not gender segregated.
Lesson 4: **The energy needs of men and women are not the same, so RE project designs and implementation should include concrete gender strategies and gender disaggregated indicators and targets**

143. Several of the objective and outcome indicators were overambitious and focused on overall national or sectorial changes, which SREPGen only had limited influence over and only contributed indirectly. As such, the achievement or lack of achievement of these targets could no be attributed to SREPGen.
Lesson 5: **Indicators and targets at the outcome/component level should be realistic and attributable to project interventions, and indicators at objective and outcome levels should not overlap**

144. SREPGen made a tangible contribution to improving livelihoods and incomes through the provision of access to clean energy. However, these impacts were not reflected in the objective and outcome indicators and were thus not monitored or reported on in a systematic manner.
Lesson 6: **Socio-economic/livelihoods indicators should be included for sub-projects and pilot projects, to enable assessment of the impact of the RE investment made**

145. While SREPGen engaged in tangible RE investments with blended finance to demonstrate the commercial viability for the private sector to invest in RE, the engagement of the private sector with a commercial focus proved difficult, and the majority of sub-projects and pilot projects were implemented with partners that engaged mainly with a social perspective. The co-financing mobilised from the private sector was much lower than anticipated, whereas NGOs provided a significant amount of co-financing.
Lesson 7: **It can be difficult to engage the private sector in testing of RE solutions, due to the perceived risk, but it is important to workout models that are viable for engaging the private sector in piloting to facilitate an interest from the private sector in further investing in upscaling and replication**

7. Annexes

Annex 1: TE ToR (excluding ToR annexes)

GLOBAL ENVIRONMENT FACILITY
UNITED NATIONS DEVELOPMENT PROGRAMME

TERMS OF REFERENCE

TERMINAL EVALUATION OF DEVELOPMENT OF SUSTAINABLE RENEWABLE ENERGY POWER GENERATION (SREPGEN) PROJECT

Project Title: Development of Sustainable Renewable Energy Power Generation (SREPGen) Project
Functional Title: International Consultant and National Consultant for Terminal Evaluation
Duration: Estimated 30 days (per consultant) over a period of October-December 2020, including field mission to Char Montaz in Rangabali Upazila at Patuakhali district, South Sakuchia Union, Monpura Upazilla, Bhola District, Monpura Union, Monpura Upazilla, Bhola District, Chuadanga, Thanchi, Ruma, Bandarban hill district).

1. INTRODUCTION

In accordance with UNDP and GEF M&E policies and procedures, all full and medium-sized UNDP-supported GEF financed projects are required to undergo a terminal evaluation (TE) upon completion of implementation. This terms of reference (TOR) sets out the expectations for the TE of the full-sized project titled Development of Sustainable Renewable Energy Power Generation (SREPGen) Project (PIMS #3948) implemented through the Sustainable and Renewable Energy Development Authority (SREDA) under the Power Division, Ministry of Power Energy and Mineral Resources (MoPEMR). The project stared on November 26, 2013 and it is in its five (05) years of implementation since the inception workshop of the project was held on March 5, 2015. The TE process must follow the guidance outlined in the document 'Guidance for Conducting Terminal Evaluations of UNDP-Supported, GEF-Financed Projects' ('Guidance for Conducting Terminal Evaluations of UNDP-Supported, GEF-Financed Projects').

Basic information of the project to be evaluated is as follows:

PROJECT SUMMARY TABLE

Project Title:	Development of Sustainable Renewable Energy Power Generation (SREPGen) Project			
F Project ID:	4459		*at endorsement (Million US$)*	*at completion (Million US$)*
UNDP Project ID:	00086516	GEF financing:	4.07	4.07
Country:	Bangladesh	IA/EA own:	5.00	
Region:	Asia & Pacific	Government:	21.15	1.03

1

Focal Area:	Climate Change - Mitigation	Other:	23.45	
FA Objectives, (OP/SP):	CCM3 Promote investment in renewable energy technologies	Total co-financing:	49.60	1.03
Executing Agency:	Sustainable and Renewable Energy Development Authority (SREDA)	Total Project Cost:	53.67	5.10
Other Partners involved:	N/A	ProDoc Signature (date project began):		26 November 2013
		(Operational) Closing Date: 31 December 2019		(Actual) Closing Date: 31 December 2020

2. PROJECT BACKGROUND AND CONTEXT [1]

Background

To mitigate the impacts of the increasing intermittency of the power supply, the Government of Bangladesh (GoB) announced targets for capacity additions of 9,000 MW (nearly a tripling of current capacity) by 2015 based on their Power System Master Plan 2010 (PSMP) to improve and expand electricity supply to support the 8% GDP growth. The country's current power-generation capacity stands at 20,430MW, while average production hovers between 6,500MW to 11,500MW according to the Power Cell estimate. The country has a target of generating 24,000MW of electricity by 2021, 40,000MW by 2030, and 60,000MW by 2041. Commendable progression has been made in the renewable energy sector in the last few years. At present, 568.53 MW (3% of total energy) is being generated from renewable energy sources. The PSMP outlined a time bound reform process focusing on infrastructural development, tariff rationalization, efficiency improvement, energy sources and fuel diversification with a target to supply power to all its citizens by the Year 2021.

In recognition of the potential contribution of renewable energy (RE) to sustainable economic growth, Bangladesh has had RE development as a part of its energy policies since 1996. In 2002, a Renewable Energy Policy (REP) was first drafted and a "Vision and Policy Statement on Power Sector Reforms" was issued in 2002 with the objectives of: i) universal access by the year 2020 with improved reliability and quality ; ii) stabilizing the financial status of the power sector and increasing its efficiency; iii) operating the sector on commercial principles and increasing private sector participation; and iv) establishing an independent institution, Sustainable Energy Development Agency (SEDA) , under the Companies Act, 1994, as a focal point for sustainable energy development and promotion, 'sustainable energy' comprising renewable energy and energy efficiency.

Objectives of the project

The overall objective of the SREPGen project is to reduce the annual growth rate of GHG emissions from the fossil fuel-based power generation by exploring Bangladesh's renewable energy resources for

[1] Project Document (ProDoc): https://info.undp.org/docs/pdc/Documents/BGD/PIMS%203948%20BGD%20SREPGen%20ProDoc%20070813%20CEO%20Endorsed.pdf

electricity generation. The basic approach of the project is to promote renewable energy in Bangladesh through the recently established Sustainable and Renewable Energy Development Authority (SREDA). It aims to contribute to helping Bangladesh to achieve a greater share of renewable energy (RE) in its energy mix.

Detailed objectives of the project are to contribute to:

(i) evolving SREDA into a facilitation center to support private sector RE investment development; to enable regulators to determine fair flexible tariff structures, develop RE power plans, and adopt RE power management and incentive regulations; to bring confidence to private RE investors; and to increase the number of approved RE projects;
(ii) increasing capacities of relevant government agencies to generate, process, obtain and disseminate reliable RE resource information for use by GoB and potential project developers and investors;
(iii) increasing affordability and access to solar power and associated livelihood benefits for low income households; and
(iv) increasing the share of RE in Bangladesh's power mix through facilitating the financing, implementation and operation of pilot (RE) energy projects using rice husk and solar panels.

Project components

The SREPGen project has the following 4 components based on which the terminal evaluation is expected to assess the project.

Component 1: RE policy and regulatory support program: This component addresses the barrier concerning the lack of appropriate policy and regulatory framework for RE power investment. The expected outcome is to evolve SREDA into a facilitation center that supports private sector in RE investment development, enable regulators in determining fair flexible tariff structures, develop RE power plans, and adopt RE power management and incentive regulations, bring confidence in private RE investors, and increase the number of approved RE projects.

Component 2: Resource assessment support program:

This component is intended to address the barriers associated with the lack of reliable RE resource data that can be used by prospective RE project developers and investors. The expected outcome from the deliverables of the activities under this component is increased capacity of SREDA and other relevant government agencies in generating, processing, obtaining, and disseminating reliable RE resource information for use by GoB and potential project developers and investors (including increased availability of wind, solar and biomass resource information). Thus, it is important to note the capacity building aspect of the outcome – the target is not just data, but also capacity building. Outcome 2 as originally designed has three target outputs: (1) Output 2.2 Wind resource maps, (2) Output 2.3 Investment grade solar resource data, and (3) Output 2.3 Biomass resource data.

Component 3: Increased affordability and access to of photovoltaic solar power and associated livelihood benefits LED lanterns (PVSLs) for low income households: Component 3, "Increased affordability of photovoltaic solar LED lanterns (PVSLs) for low income households", is fully focused on the distribution of solar PV lanterns with a partial subsidy covered by GEF funds. This component, which represents more than half of the project's GEF budget has been stalled due to the lack of uptake in the Bangladesh market for

solar PV lanterns. The original three outputs, as designed, were all meant to be focused on distribution of solar PV lanterns. The original three outputs were as follows: (a) "established financial mechanism that includes a credit scheme and buy-down" (Output 3.1), (b) "PVSL delivery models that provide product support and credit collection" (Output 3.2), and (c) "PVSL certification procedures and quality oversight of diffusion activities." Based on findings from the mission, the MTR consultant believes that the project should shift its focus away from solar PV lanterns and towards other approaches for getting RE power to the poorest and enhancing the quality of their power access. In this vein, it is recommended that the wording of the component and associated outcome be adjusted slightly as follows, while maintaining the original spirit of using PV power to increase power access of low income households: "Component 3. Affordable Photovoltaic for Low-income Households and associated Livelihood Enhancement." "Outcome 3. Increased affordability and access to photovoltaic solar power and associated livelihood benefits for low income households."

An important result of the MTR mission was that it confirmed the low uptake of solar PV lanterns from multiple sources. Further, some sources offered substantial detail on the decline of the solar PV market. In general, two key conclusions are: (1) With the evolution of the PV market in rural areas, solar lanterns are considered too low level a product; and most households are not interested in them but are instead interested in SHSs. (2) Even the SHS market as accessed by IDCOL's donor supported programs has declined drastically due to the large number of free systems provided by the government, the very low cost Chinese systems that have entered the market, and the saturation of the market segment of those most easily able to afford the systems. These findings suggest that the redesign of Component 3 to focus on something other than solar lantern distribution with partial subsidy and up-front payment by buyers is justified.

Component 4: Renewable energy investment scale-up: Its focus is to increase share of RE in Bangladesh's power generation mix. Its outcome (Outcome 4) is stated as "Renewable Energy accounts for an increased share of Bangladesh's power generation mix." Strangely, project team members involved with this project at present and in the past referred to Component 4 as the "innovation component" and firmly believed its purpose was to demonstrate innovative applications of RE power. They seemed unfamiliar with the idea that the component was intended to be about scaling up investment in RE power generation. Its target outputs are Output 4.1 Financial close and construction begun on pipeline utility-scale PV and wind power projects as a result of barrier-removal support by SREDA; Output 4.2 Bankable documents for financing pilot grid-connected RE projects in biomass related areas; Output 4.3 Operational pilot rice husk grid-connected RE biomass power generation plants; Output 4.4 Implemented projects in key, high power consuming areas that demonstrate innovation in the direct use of solar power and strong potential for commercial viability, carried out under the umbrella of the "SREDA Innovation Lab"; Output 4.5: Replication plans for additional RE projects.

Crosscutting Issues: Gender

The energy poverty has serious consequences on living and social conditions of people and undermines educational and business opportunities. Energy poverty has severely affected women particularly in terms of health, safety, education and economic development and empowerment. Indoor electricity enables people to stop burning candles, kerosene and other highly polluting fuels, and allows them to use refrigerators for food conservation and watch televisions to receive information on health and hygiene standard. Electrification at toilet has a positive impact on women's security because it decreases the crime rate and physical and sexual violence. Having electricity at home and in schools allows for studying and reading at night, watching TV and therefore accessing multiple information sources.

Increased access to electricity reduces working hours of women and women get more opportunities to invest their time in income generating activity. As women contribute to the household's income, they also benefit from personal empowerment, increase their bargaining and decision-making power at household and improve their social status outside the home.

SREPGen project has made available following support for gender equality:

- Distribution of 6170 PVSLs: The lives of women in rural low-income households have been changing with the dissemination of PVSLs. PVSLs helps to improve indoor air quality and allow women and children to do various activities in the evening such as reading, learning, or performing tasks that may generate additional income for their households. The improved quality of light from PVSLs also provides women with more security at night against theft and intrusion. In the long term, women will have more available income to spend on other essentials such as foods and other household needs.
- Micro hydro powerplant project is giving access to electricity to 62 female headed households of indigenous community.
- Solar irrigation pump project is prioritizing 20,000 female headed households who are facing constraints without access to energy for irrigation. The project also gave special attention to people with disabilities. The participation of women in local management of resources was ensured.
- Solar ice plant project is covering 10,000 households of Char Montaz Islands annually including 8,000 female headed household who are involved in fishing but unable to collect ice from distant areas. The project is focusing on the female headed households who mainly face the barriers to collect ice from far distance. 80% direct beneficiaries of the project is female, and they were given preferences. The project is also giving special attention to people with disabilities. On the other hand, the female members of Upokulio Biddutayan O Mohila Unnayan Samity (UBOMUS) has been engaged in project management in their own locality.

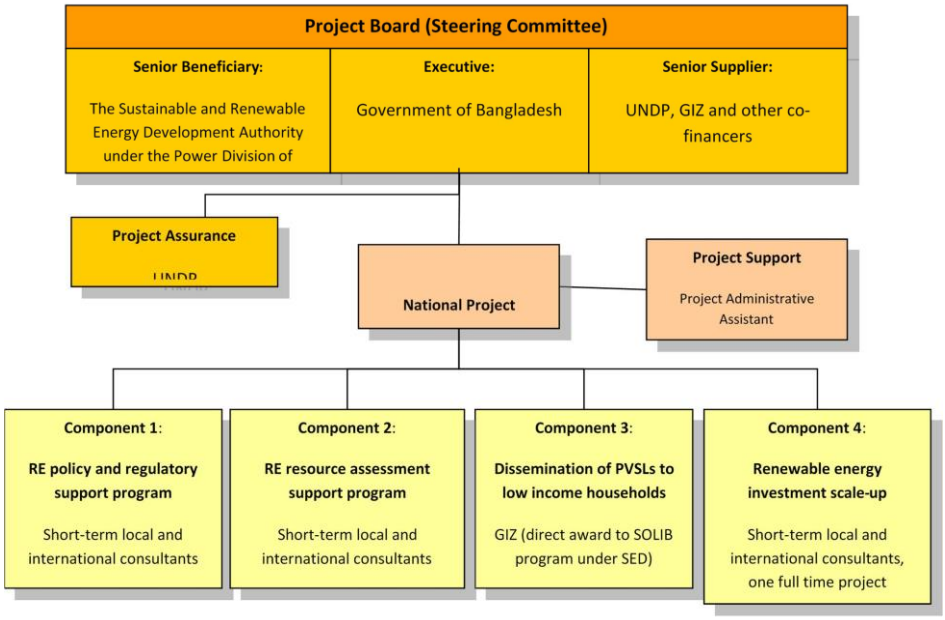
Project sites

The project sites are located across the country, mostly remote and off-grid areas of the country, incluidng Char Montaz in Rangabali Upazila at Patuakhali district, South Sakuchia Union, Monpura Upazilla, Bhola district, Monpura Union, Monpura Upazilla, Bhola District, Chuadanga, Thanchi, Ruma, Bandarban district.

Implementation arrangement

The project is being executed according to UNDP's National Implementation Modality (NIM), as per the NIM project management implementation guidelines agreed by UNDP and the Government of Bangladesh.

Figure 1: Project Organization Structure



Stakeholders of the project

The implementation partner (IP) of the SREPGen project is Sustainable and Renewable Energy Development Authority' (SREDA), Power Division. Stakeholders of the project include the Infrastructure Development Company Limited (IDCOL), Independent Power Producer (IPP), Private sector investors in RE (Renewable Energy) sector, academia, policy makers, and university. Project's beneficiaries are the poor who are living in the remote and off-grid areas of the country, school children, youth group, women, and ethnic minorities. A detailed list of stakeholders includes but not limited to:

Exhibit-1. Stakeholder List

Project Team and UNDP	
Project Monitoring and Evaluation Officer	UNDP Assistant Resident Representative and Programme Specialist (Nature, Climate & Energy)
Project Administrative and Finance Officer	UNDP Programme Specialist (Nature, Climate & Energy)
Current Project Manager	UNDP Programme Associate
UNDP M&E focal point	UNDP Deputy Resident Representative
Government of Bangladesh	
SREDA Member for EE&C	Wind Resource Mapping Project, Power Division
SREDA Chair (who is also NPD)	Bangladesh Energy Regulatory Commission (BERC)

6

REB (Rural Electrification Board) – Director for RE	Blue Economy Cell and 1 other
RE Experts and Consultants to Project	
Project Biomass Expert	United International University (UIU) – PV Expert
Project Capacity Building Expert	Project PV Applications Expert
Project Design Consultant	
Companies and Foundations involved in RE Sector	
IDCOL – CEO, Head of RE, RE Manager	SolShare – CEO
Amity Solar – Chairman	Rahimafrooz – Head of Access to Energy
Amity Solar – Engineer	BGEF – Chairman
Symbior Solar – Country Rep.	Waste Concern – Director
Paragon – Head of Business Development	SolarEn Foundation – Regional Manager
Donors	
World Bank – RE Specialist	ADB – Project Officer
JICA RE Expert	ChinaAid – Economic Office
JICA/ Expert	GIZ – Responsible Officer and Sr. Adviser
USAID – Energy Team Lead, Advisor, PM	
Beneficiary of pico-PV Systems, mini-grid, solar ice plant, hydro power plant, solar irrigation pump	

Project extension

The SREPGen project has been extended twice to bring necessary adjustment into project interventions based on progress of field level implementation and due to COVID-19 situation. The first extension was made on 31 December 2019 for a period of 18 months to redesign the project as per MTR's recommendations. The project, through expeditious implementation of activities in this initial extension period, was put back on track to meet the project goals as per the revised end date on 26 May 2020. With significant progress and high-level impacts achieved, the project registered cumulative financial delivery rate of 81 % as of 31 March 2020. The project was scheduled to be end on 31 December 2020. The evaluation team can further assess the implications of the COVID-19 pandemic in achieving the planned activities until closure in December 2020.

With the ongoing pandemic of COVID-19 around the world, Government of Bangladesh enforced lockdown across the country since March 2020 and therefore, all field level and other activities were completely sopped at this stage. Some major activities were seriously disrupted by the COVID-19 under different component of the project such as installation of solar irrigation pumps, wider dissemination of publication and policy guideline produced by the project, resource assessment support programme and commissioning of terminal evaluation.

3. TE PURPOSE

The TE report will assess the achievement of project results (both at outcome and output level) against what was expected to be achieved, and draw lessons that can both improve the sustainability of benefits from this project, and aid in the overall enhancement of UNDP programming. The TE report promotes accountability and transparency, and assesses the extent of project accomplishments. The TE is part of UNDP Bangladesh Country Office Evaluation Plan (2017-2021).

Detailed objectives of terminal evaluation are as follows:

- Assess to what extent SREPGen project has contributed to address the needs and problems identified during programme design;
- Assess how effectively SREPGen project has achieved its stated development objectives and purposes;
- Measure how efficiently the outcomes and outputs have progressed in attaining the development objective and purpose of the project;
- Assess both negative and positive factors that have facilitated or hampered progress in achieving the project outcomes, including external factors/environment, weakness in design, management and resource allocation;
- Assess the extent to which the application of the rights-based approach and gender mainstreaming are integrated within planning and implementation of the SREPGen project;
- Identify and document substantive lessons learned, good practices and also opportunities for scaling up the future SREPGen project in Bangladesh;
- Provide forward looking programmatic recommendations for the SREPGen project and the relevant portfolio of UNDP

The evaluation will focus on six key evaluation criteria: relevance, efficiency, effectiveness, potential impact, sustainability, and coherence. The evaluation should provide credible, useful, evidence-based information which enables timely incorporation of its findings, recommendations and lessons into decision making processes of UNDP and key stakeholders. It will also assess the potential of the next phase of the project. The evaluation will cover the time span from November 26, 2013 (the beginning of the SREPGen project) to date.

The primary users of the evaluation results will be UNDP, SREDA, and GEF, but the evaluation results will equally be useful to the relevant ministries of Government of Bangladesh, development partners and donors.

The TE will be conducted according to the guidance, rules and procedures established by UNDP and GEF as reflected in the UNDP Evaluation Guidance for GEF Financed Projects.

4. TE APPROACH AND METHODOLOGY

The TE report must provide evidence-based information that is credible, reliable and useful.

The TE team will review all relevant sources of information including documents prepared during the preparation phase (i.e. PIF, UNDP Initiation Plan, UNDP Social and Environmental Screening Procedure/SESP), the Project Document, Annual Work Plans, project reports including annual project implementation reports (PIRs), progress reports, project budget revisions, lesson learned reports, study/survey reports, national strategic and legal documents, policy documents, knowledge products, and any other materials that the team considers useful for this evidence-based evaluation. The TE team will review the baseline and midterm GEF focal area Core Indicators/Tracking Tools submitted to the GEF at the CEO endorsement and midterm stages and the terminal Core Indicators/Tracking Tools that must be completed before the TE field mission begins.

The evaluation will adopt mix methods of qualitative and quantitative approach in data collection and analysis, including key informant interviews and focus group discussions in project's intervention sites. Collected data and information will be triangulated by multiple data sources and evidence.

The TE team is expected to follow a participatory and consultative approach ensuring close engagement with the Project Team, government counterparts (the GEF Operational Focal Point), Implementing Partners, the UNDP Country Office(s), the Regional Technical Advisor, direct beneficiaries and other stakeholders.

Engagement of stakeholders is vital to a successful TE. Stakeholder involvement should include interviews with stakeholders who have project responsibilities, including but not limited to Project Team and UNDP (Project Monitoring and Evaluation Officer, UNDP Assistant Resident Representative and Programme Specialist(Nature, Climate & Energy), Project Administrative and Finance Officer, Project Manager, Programme Associate, Former Project Manager, UNDP Resident Representative, UNDP Deputy Resident Representative, and UNDP Country Office M&E focal point), Government of Bangladesh (SREDA Member for EE&C, SREDA Chair and National Project Director, SREDA Member for EE&C, REB – Director for RE, Wind Resource Mapping Project, Power Division, BERC, Blue Economy Cell and 1 other), RE Experts and Consultants of the project, Companies and Foundations involved in RE Sector, and Donors as well as project beneficiaries in the field.

If the situation allows, the national consultant of TE team is expected to conduct field missions to Char Montaz in Rangabali Upazila at Patuakhali district, South Sakuchia Union, Monpura Upazilla, Bhola District, Monpura Union, Monpura Upazilla, Bhola District), Chuadanga, Thanchi, Ruma, Bandarban district). Key Informant Interviews and Focus Group Discussions are expected for collection of data and information from local stakeholders at the project sites, including project beneficiaries and local administrations.

As of 11 March 2020, the World Health Organization (WHO) declared COVID-19 a global pandemic as the new coronavirus rapidly spread to all regions of the world. Travel to the country has been restricted since 26 March 2020 and travel in the country is also restricted. A national consultant is expected to collect data in the field as mentioned above, if situation allows. But if it is not possible to travel to or within the country for the TE mission then the TE team should develop a methodology that takes this into account the conduct of the TE virtually and remotely, including the use of remote interview methods and extended desk reviews, data analysis, surveys and evaluation questionnaires. This should be detailed in the TE Inception Report and agreed with the Commissioning Unit.

In particular, data collection should consider the COVID-19 situation in the country at the time of evaluation. In case if part of the evaluation is to be carried out virtually then consideration should be taken for stakeholder availability, ability or willingness to be interviewed remotely. An International consultant is expected to work remotely with national evaluator support in the field. No stakeholders, consultants or UNDP staff should be put in harm's way and safety is the key priority.

The specific design and methodology for the TE should emerge from consultations between the TE team and the above-mentioned parties regarding what is appropriate and feasible for meeting the TE purpose and objectives and answering the evaluation questions, given limitations of budget, time and data. The TE team must use gender-responsive methodologies and tools and ensure that gender equality and women's empowerment, as well as other cross-cutting issues and SDGs are incorporated into the TE report.

The final methodological approach including interview schedule, field visits and data to be used in the evaluation must be clearly outlined in the TE Inception Report and be fully discussed and agreed between UNDP, stakeholders and the TE team.

Evaluation Criteria Matrix (evaluation criteria with key questions, indicators, sources of data, and methodology) and KII checklist need to be developed as part of the TE Inception Report. Refer to Annex D of this ToR for evaluation criteria matrix template.

The final report must describe the full TE approach taken and the rationale for the approach making explicit the underlying assumptions, challenges, strengths and weaknesses about the methods and approach of the evaluation.

Gender and Human Rights based Approach

Gender analysis must also be incorporated in the terminal evaluation to measure how gender aspects have been incorporated in the project design/implementation and to what extent the project contributes to promotion of gender equality and empowerment in the project areas, which are geographically isolated in the country. Interviews must cover and focus on female beneficiaries to see the impact of the projects on their livelihood and socio-economic status. The consultant team is also expected to develop detailed methodology on gender analysis and incorporate it in the inception report.

In addition, the methodology used in the terminal evaluation, including data collection and analysis methods should be human rights and gender-sensitive to the greatest extent possible, with evaluation data and findings disaggregated by sex, ethnicity, age, etc. Detailed analysis on disaggregated data will be undertaken as part of terminal evaluation from which findings are consolidated to make recommendations and identify lessons learned for enhanced gender-responsive and rights-based approach of the project.

These evaluation approach and methodology should consider different groups of beneficiaries in the SREPGen project intervention, including women, minorities, vulnerable groups, and people in hard to reach areas.

The evaluators are requested to review *UNEG's Guidance in Integrating Human Rights and Gender Equality in Evaluation* during the inception phase[2].

5. DETAILED SCOPE OF THE TE

The TE will assess project performance against expectations set out in the project's Logical Framework/Results Framework (see ToR Annex A). The TE will assess results according to the criteria outlined in 'Guidance for Conducting Terminal Evaluations of UNDP-Supported, GEF-Financed Projects'. The evaluation will at a minimum cover the criteria of: **relevance, effectiveness (results/achievements towards objective and expected outcome), impact, efficiency, sustainability (financial, socio-economic, institutional framework & governance).** Ratings must be provided on the following performance criteria. The completed table must be included in the evaluation executive summary. The timeframe of terminal evaluation covers the beginning of the project (including project design stage) to the time when terminal evaluation is initiated.

The Findings section of the TE report will cover the topics listed below. A full outline of the TE report's content is provided in Annex C of this ToR.

The asterisk "(*)" indicates criteria for which a rating is required.

[2] Integrating Human Rights and Gender Equality in Evaluation - Towards UNEG Guidance: http://www.uneval.org/papersandpubs/documentdetail.jsp?doc_id=980

Findings

i. Project Design/Formulation

- National priorities and country driven-ness
- Theory of Change
- Gender equality and women's empowerment
- Social and Environmental Standards (Safeguards)
- Analysis of Results Framework: project logic and strategy, indicators
- Assumptions and Risks
- Lessons from other relevant projects (e.g. same focal area) incorporated into project design
- Planned stakeholder participation
- Linkages between project and other interventions within the sector
- Management arrangements

ii. Project Implementation

- Adaptive management (changes to the project design and project outputs during implementation)
- Actual stakeholder participation and partnership arrangements
- Project Finance and Co-finance
- Monitoring & Evaluation: design at entry (*), implementation (*), and overall assessment of M&E (*)
- Implementing Agency (UNDP) (*) and Executing Agency (*), overall project oversight/implementation and execution (*)
- Risk Management, including Social and Environmental Standards (Safeguards)

iii. Project Results

- Assess the achievement of outcomes against indicators by reporting on the level of progress for each objective and outcome indicator at the time of the TE and noting final achievements
- Relevance (*), Effectiveness (*), Efficiency (*) and overall project outcome (*)
- Sustainability: financial (*) , socio-political (*), institutional framework and governance (*), environmental (*), overall likelihood of sustainability (*), resilience to climate risks (*)
- Country ownership
- Gender equality and women's empowerment
- Cross-cutting issues (poverty alleviation, improved governance, climate change mitigation and adaptation, disaster prevention and recovery, human rights, capacity development, South-South cooperation, knowledge management, volunteerism, etc., as relevant)
- GEF Additionality
- Catalytic Role / Replication Effect
- Progress to impact

Project finance / co-finance

The Evaluation will assess the key financial aspects of the project, including the extent of co-financing planned and realized. Project cost and funding data need to be well analysed, including annual expenditures. Variances between planned and actual expenditures need to be assessed and explained. Results from recent financial audits, as available, should be taken into consideration. The evaluator(s) will receive assistance from the Country Office (CO) and Project Team to obtain financial data in order to complete the co-financing table below, which will be included in the terminal evaluation report.

Co-financing (type/source)	UNDP own financing (mill. US$)		Government (mill. US$)		Partner Agency (mill. US$)		Total (mill. US$)	
	Planned	Actual	Planned	Actual	Planned	Actual	Actual	Actual
Grants								
Loans/Concessions								
• In-kind support								
• Other								
Totals								

Impact

The evaluators will assess the extent to which the project is achieving impacts or progressing towards the achievement of impacts. Key findings that should be brought out in the evaluations include whether the project has demonstrated the following results:

Main Findings, Conclusions, Recommendations and Lessons Learned

The TE team will include a summary of the main findings of the TE report. Findings should be presented as statements of fact that are based on analysis of the data.

The section on conclusions will be written in light of the findings. Conclusions should be comprehensive and balanced statements that are well substantiated by evidence and logically connected to the TE findings. They should highlight the strengths, weaknesses and results of the project, respond to key evaluation questions and provide insights into the identification of and/or solutions to important problems or issues pertinent to project beneficiaries, UNDP and the GEF, including issues in relation to gender equality and women's empowerment.

Recommendations should provide concrete, practical, feasible and targeted recommendations directed to the intended users of the evaluation about what actions to take and decisions to make. The recommendations should be specifically supported by the evidence and linked to the findings and conclusions around key questions addressed by the evaluation.

The TE report should also include lessons that can be taken from the evaluation, including best practices in addressing issues relating to relevance, performance and success that can provide knowledge gained from the particular circumstance (programmatic and evaluation methods used, partnerships, financial leveraging, etc.) that are applicable to other GEF and UNDP interventions. When possible, the TE team should include examples of good practices in project design and implementation.

It is important for the conclusions, recommendations and lessons learned of the TE report to incorporate gender equality and empowerment of women.

The TE report will include an Evaluation Ratings Table, as shown below:

Evaluation Ratings Table for *(SREPGen)*

Monitoring & Evaluation (M&E)	Rating[3]
M&E design at entry	
M&E Plan Implementation	
Overall Quality of M&E	
Implementation & Execution	**Rating**
Quality of UNDP Implementation/Oversight	
Quality of Implementing Partner Execution	
Overall quality of Implementation/Execution	
Assessment of Outcomes	**Rating**
Relevance	
Effectiveness	
Efficiency	
Overall Project Outcome Rating	
Sustainability	**Rating**
Financial resources	
Socio-political/economic	
Institutional framework and governance	
Environmental	
Overall Likelihood of Sustainability	

6. TIMEFRAME

The total duration of the TE will be 30 working days (for each consultant) over a period of 8 weeks starting at the end of October *2020.* The tentative TE timeframe is as follows. In case if stakeholder interviews are done virtually, the timeframe may be revised. It shall be detailed in the inception report.

Timeframe	Activity
21/10/2020	Application closes
28/10/2020	Selection of TE consultant (individually not as a team)
30/10/2020	Preparation period for TE team (handover of documentation)
(1-5/11/2020) 5 days	Document review and preparation of TE Inception Report by TE team
(6-8/11/2020)	Finalization and Validation of TE Inception Report; latest start of TE mission
(10-20/11/2020) 10 days	TE mission: stakeholder meetings, interviews, field visits, etc.
(20/11/2020)	Mission wrap-up meeting & presentation of initial findings; earliest end of TE mission

[3] Outcomes, Effectiveness, Efficiency, M&E, Implementation/Oversight & Execution, Relevance are rated on a 6-point scale: 6=Highly Satisfactory (HS), 5=Satisfactory (S), 4=Moderately Satisfactory (MS), 3=Moderately Unsatisfactory (MU), 2=Unsatisfactory (U), 1=Highly Unsatisfactory (HU). Sustainability is rated on a 4-point scale: 4=Likely (L), 3=Moderately Likely (ML), 2=Moderately Unlikely (MU), 1=Unlikely (U)

(03/12/2020) 11 days	Preparation of draft TE report
(04/12/2020)	Circulation of draft TE report for comments
(18/12/2020) 4 days	Incorporation of comments on draft TE report into Audit Trail & finalization of TE report
(20/12/2020)	Preparation and Issuance of Management Response
TBD	Concluding Stakeholder Workshop (optional)
(22/12/2020)	Expected date of full TE completion

7. TE DELIVERABLES

The evaluation team is expected to deliver the following:

#	Deliverable	Description	Timing	Responsibilities
1	TE Inception Report	TE team clarifies objectives, methodology and timing of the TE	No later than 2 weeks before the TE mission: *(by 05/11/2020)*	TE team submits Inception Report to Commissioning Unit and project management
2	Presentation	Initial Findings	End of TE mission: *(20/11/2020)*	TE team presents to Commissioning Unit and project management
3	Draft TE Report	Full draft report *(using guidelines on report content in ToR Annex C)* with annexes	Within 3 weeks of end of TE mission: *(03/12/2020)*	TE team submits to Commissioning Unit; reviewed by RTA, Project Coordinating Unit, GEF OFP
5	Final TE Report* + Annex + Audit Trail + Cleaned datasets (if any)	Revised final report and TE Audit trail in which the TE details how all received comments have (and have not) been addressed in the final TE report *(See template in ToR Annex H)*	Within 1 week of receiving comments on draft report: *(by 18/12/2020)*	TE team submits both documents to the Commissioning Unit

*All final TE reports will be quality assessed by the UNDP Independent Evaluation Office (IEO). Details of the IEO's quality assessment of decentralized evaluations can be found in Section 6 (Page 5-11) of the UNDP Evaluation Guidelines.[4]

8. TE ARRANGEMENTS

The principal responsibility for managing the TE resides with the Commissioning Unit. The Commissioning Unit for this project's TE is UNDP Bangladesh Country Office (Resilience and Inclusive Growth cluster).

The Commissioning Unit will contract the evaluators and ensure the timely provision of per diems and travel arrangements within the country for the TE team. The M&E focal point of UNDP Bangladesh will also be

[4] UNDP Evaluation Guidelines, Section 6: http://web.undp.org/evaluation/guideline/section-6.shtml

responsible for quality assurance of evaluation. The Project Team will be responsible for liaising with the TE team to provide all relevant documents, set up stakeholder interviews, and arrange field visits.

9. TE TEAM COMPOSITION

A team of two independent evaluators will conduct the TE – one international team leader (with experience and exposure to projects and evaluations in other regions) and one national team expert from Bangladesh. Recruitment will be done individually. The consultants shall have prior experience in evaluating similar projects. Experience with GEF financed projects is an advantage. An international consultant will be designated as the team leader and will be responsible for overall evaluation process, including evaluation design and reporting. A national consultant will be designated as a team expert and responsible for conduct of evaluation, particularly data collection in the country.

The evaluator(s) cannot have participated in the project preparation, formulation and/or implementation (including the writing of the project document), must not have conducted this project's Mid-Term Review and should not have a conflict of interest with the project's related activities.

As of 11 March 2020, the World Health Organization (WHO) declared COVID-19 a global pandemic as the new coronavirus rapidly spread to all regions of the world. Travel to the country has been restricted. Due to international travel restrictions, an international consultant (team leader) is expected to conduct evaluation remotely, while a national consultant shall take the lead in on-site data collection, including KIIs and FGDs as well as verification of the results in the project's intervention sites in case of travel restriction being relaxed. Division of roles will be clearly defined before conduct of the TE and discussed and finalized during the inception phase in consultation with UNDP and relevant stakeholders.

The Team members must present the following qualifications. Any individual who has had prior involvement in design, implementation, or Mid-term Review (MTR) of SREPGen project or those who have been directly or indirectly related to the SREPGen project are not eligible for this consultancy due to conflict of interests.

A. INTERNATIONAL LEAD CONSULTANT

- At least Master's degree in a discipline relevant to renewable energy, environmental engineering, environmental science, climate change, development planning, project management & development studies or other closely related field (5%);
- Minimum *7* years of relevant professional experience of project evaluation, particularly GEF financed project evaluations, with proven knowledge of evaluation methodologies (25%);
- Previous experiences in project design/implementation/ evaluation in relevant thematic areas (i.e. renewable energy, environmental science, environmental engineering) (25%);
- Experience of working in *Asia especially South Asian countries* having technical knowledge in the targeted focal area(s) is an advantage (10%);
- Demonstrated understanding of issues related to renewable energy & climate change; experience in gender sensitive evaluation and analysis (5%);
- Excellent communication skills in English;
- Demonstrable analytical skills.
- Experience with implementing evaluations remotely will be considered an asset.
- No involvement in design, implementation, or Mid-term Review (MTR) of SREPGen project.

Responsibilities

- Conduct document review and data gathering;
- Design and develop appropriate, detailed evaluation methodologies for TE;
- Lead the TE Team in planning, conducting, and reporting on the evaluation remotely with clear division of labour within the Team, ensuring timeliness of reports;
- Lead drafting and finalization of the Inception Report for the Terminal Evaluation;
- Use of best practice methodologies in conducting evaluation;
- Lead presentation of the draft evaluation findings and recommendations remotely;
- Organize the de-briefing to the UNDP Country Office in Bangladesh and Core Project Management Team;
- Lead the drafting and finalization of the Terminal Evaluation Report

B. NATIONAL CONSULTANT

- At least Master's degree in a discipline relevant to renewable energy, environmental engineering, environmental science, climate change, development planning, project management or other relevant discipline (5%);
- Minimum *7* years of relevant professional experience of project evaluation, particularly GEF financed project evaluations, with proven knowledge of evaluation methodologies (25%);
- Previous experiences in project design/implementation/evaluation in relevant thematic areas (i.e. renewable energy, environmental science, environmental engineering) (25%);
- Proven experiences in field level data collection with adequate knowledge of data collection tools, including KIIs and FGDs (10%);
- Demonstrated understanding of issues related to gender and forestry & climate change; experience in gender sensitive evaluation and analysis (5%);
- Excellent communication skills in native language and English;
- Demonstrable analytical skills.
- No involvement in design, implementation, or Mid-term Review (MTR) of SREPGen project.

Responsibilities

- Conduct document review and data gathering;
- Contribute to the development of the evaluation plan and methodology;
- Lead data collection in the field, including KIIs and FGDs;
- Conduct field studies and analysis under the guidance of the international consultant due to the COVID-19 crisis;
- Conducting other elements of the evaluation determined jointly with the international consultant and UNDP;
- Contribute to presentation of the review findings and recommendations at the wrap-up meeting;
- Contribute to the drafting and finalization of the TE report

10. EVALUATOR ETHICS

The TE team will be held to the highest ethical standards and is required to sign a code of conduct upon acceptance of the assignment. This evaluation will be conducted in accordance with the principles outlined

in the UNEG 'Ethical Guidelines for Evaluation'[5]. The evaluator must safeguard the rights and confidentiality of information providers, interviewees and stakeholders through measures to ensure compliance with legal and other relevant codes governing collection of data and reporting on data. The evaluator must also ensure security of collected information before and after the evaluation and protocols to ensure anonymity and confidentiality of sources of information where that is expected. The information knowledge and data gathered in the evaluation process must also be solely used for the evaluation and not for other uses without the express authorization of UNDP and partners.

11. PAYMENT SCHEDULE

- 20% payment upon satisfactory delivery of the final TE Inception Report and approval by the Commissioning Unit
- 40% payment upon satisfactory delivery of the draft TE report to the Commissioning Unit
- 40% payment upon satisfactory delivery of the final TE report and approval by the Commissioning Unit and RTA (via signatures on the TE Report Clearance Form) and delivery of completed TE Audit Trail

Criteria for issuing the final payment of 40%[6]:

- The final TE report includes all requirements outlined in the TE TOR and is in accordance with the TE guidance.
- The final TE report is clearly written, logically organized, and is specific for this project (i.e. text has not been cut & pasted from other TE reports).
- The Audit Trail includes responses to and justification for each comment listed.

In line with the UNDP's financial regulations, when determined by the Commissioning Unit and/or the consultant that a deliverable or service cannot be satisfactorily completed due to the impact of COVID-19 and limitations to the TE, that deliverable or service will not be paid. Due to the current COVID-19 situation and its implications, a partial payment may be considered if the consultant invested time towards the deliverable but was unable to complete to circumstances beyond his/her control.

12. APPLICATION PROCESS[7]

[5] UNEG 'Ethical Guidelines for Evaluation' http://www.unevaluation.org/document/detail/102

[6] The Commissioning Unit is obligated to issue payments to the TE team as soon as the terms under the ToR are fulfilled. If there is an ongoing discussion regarding the quality and completeness of the final deliverables that cannot be resolved between the Commissioning Unit and the TE team, the Regional M&E Advisor and Vertical Fund Directorate will be consulted. If needed, the Commissioning Unit's senior management, Procurement Services Unit and Legal Support Office will be notified as well so that a decision can be made about whether or not to withhold payment of any amounts that may be due to the evaluator(s), suspend or terminate the contract and/or remove the individual contractor from any applicable rosters. See the UNDP Individual Contract Policy for further details:
https://popp.undp.org/_layouts/15/WopiFrame.aspx?sourcedoc=/UNDP_POPP_DOCUMENT_LIBRARY/Public/PSU_Individual%20Contract_Individual%20Contract%20Policy.docx&action=default

[7] Engagement of evaluators should be done in line with guidelines for hiring consultants in the POPP
https://popp.undp.org/SitePages/POPPRoot.aspx

Interested individual consultants must submit the following documents/information to demonstrate their qualifications. Please group them into one (1) single PDF document as the application only allows to upload maximum one document. Consultants will be recruited individually not as a team.

Recommended Presentation of Proposal:

a) **Letter of Confirmation of Interest and Availability** using the template[8] provided by UNDP;
b) **CV** and a **Personal History Form** (P11 form[9]);
c) Brief description **of approach to work/technical proposal** of why the individual considers him/herself as the most suitable for the assignment, and a proposed methodology on how they will approach and complete the assignment; (max 1 page)
d) **Financial Proposal** that indicates the all-inclusive fixed total contract price and all other travel related costs (such as flight ticket, per diem, etc.), supported by a breakdown of costs, as per template attached to the Letter of Confirmation of Interest template**.** If an applicant is employed by an organization/company/institution, and he/she expects his/her employer to charge a management fee in the process of releasing him/her to UNDP under Reimbursable Loan Agreement (RLA), the applicant must indicate at this point, and ensure that all such costs are duly incorporated in the financial proposal submitted to UNDP.

Criteria for Evaluation of Proposal: Only those applications which are responsive and compliant will be evaluated. Offers will be evaluated according to the Combined Scoring method – where the educational background and experience on similar assignments will be weighted at 70% and the price proposal will weigh as 30% of the total scoring. The applicant receiving the Highest Combined Score that has also accepted UNDP's General Terms and Conditions will be awarded the contract.

Technical Criteria for Evaluation for internationals (Maximum 70 points):

- Criteria-01: At least Master's degree in a discipline relevant to Natural Resource Management/ forestry/ environmental science, energy, climate change, & development studies or other closely related field - **Max Point 5;**
- Criteria-02: Minimum 7 years of relevant professional experience of project evaluation, particularly GEF financed project evaluations, with proven knowledge of evaluation methodologies - **Max Point 25;**
- Criteria-03: Previous experiences with project design/implementation/evaluation in relevant thematic areas (i.e. renewable energy, environmental engineering) **-Max Point 25;**
- Criteria-04: Experience of working in Asia especially South Asian countries having technical knowledge in the targeted focal area(s) is an advantage **- Max Point 10**;
- Criteria-05: Demonstrated understanding of issues related to gender and forestry & climate change; experience in gender sensitive evaluation and analysis **- Max Point 5.**

Technical Criteria for Evaluation for national candidates (Maximum 70 points):

- Criteria-01: At least Master's degree in a discipline relevant to Natural Resource Management/ forestry/ environmental science, energy, climate change & development studies or other closely related field - **Max Point 5;**

[8] https://intranet.undp.org/unit/bom/pso/Support%20documents%20on%20IC%20Guidelines/Template%20for%20Confirmation%20of%20Interest%20and%20Submission%20of%20Financial%20Proposal.docx

[9] http://www.undp.org/content/dam/undp/library/corporate/Careers/P11_Personal_history_form.doc

- Criteria-02: Minimum 7 years of relevant professional experience of project evaluation, particularly GEF financed project evaluations, with proven knowledge of evaluation methodologies **- Max Point 25;**
- Criteria-03: Previous experiences in project design/implementation/evaluation in relevant thematic areas (i.e. renewable energy, environmental engineering) **- Max Point 25;**
- Criteria-04: Proven experiences in field level data collection with adequate knowledge of data collection tools, including KIIs and FGDs - **Max Point 10**;
- Criteria-05: Demonstrated understanding of issues related to gender and forestry & climate change; experience in gender sensitive evaluation and analysis **- Max Point 5.**

Financial Evaluation (Total 30 marks)
All technical qualified proposals will be scored out 30 based on the formula provided below.
The maximum points (30) will be assigned to the lowest financial proposal. All other proposals received points according to the following formula:
p = y (μ/
Where:

- p = points for the financial proposal being evaluated;
- y = maximum number of points for the financial proposal;
- μ = price of the lowest priced proposal;
- z = price of the proposal being evaluated.

Please combine all your documents into one (1) single PDF document as the system only allows to upload maximum one document.

UNDP is committed to achieving workforce diversity in terms of gender, nationality and culture. Individuals from minority groups, indigenous groups and persons with disabilities are equally encouraged to apply. All applications will be treated with the strictest confidence.

UNDP does not tolerate sexual exploitation and abuse, any kind of harassment, including sexual harassment, and discrimination. All selected candidates will, therefore, undergo rigorous reference and background checks.

13. TOR ANNEXES

- ToR Annex A: Project Logical/Results Framework
- ToR Annex B: Project Information Package to be reviewed by TE team
- ToR Annex C: Content of the TE report
- ToR Annex D: Evaluation Criteria Matrix template
- ToR Annex E: UNEG Code of Conduct for Evaluators
- ToR Annex F: TE Rating Scales
- ToR Annex G: TE Report Clearance Form
- ToR Annex H: TE Audit Trail

Annex 2: TE itinerary, including summary of field visits

Date	Programme
4 Dec	Field Visit: Grid integration of solar irrigation pump – Kalinathpur, Mirpur, Kushtia
5 Dec	
6 Dec	VoIP interview: SREPGen PMU
	VoIP interview: UNDP Country Office
7 Dec	VoIP interview: Capacity building consultant
	VoIP interview: PV consultant
	VoIP interview: Former SREPGen NPD and SREDA chairman
8 Dec	VoIP interview: Rahimafrooz
	VoIP interview: UBOMUS – solar ice-making plant
9 Dec	VoIP interview: Oporajeo – pico hydropower plant
10 Dec	Field Visit: solar mini-grid – Monpura, Bhola
11 Dec	
12 Dec	Field Visit: Solar ice-making plant – Char Mantaz
13 Dec	VoIP interview: Power Division, fomer SREPGen Chairperson
	VoIP interview: IDCOL
14 Dec	VoIP interview: NACOM – national biomass assessment
15 Dec	VoIP interview: ADB
16 Dec	VoIP interview: BRSEA + BGEF – grid integration of solar irrigation pump
	VoIP interview: Power Division
21 Dec	VoIP interview: GIZ

Field Visit Report
SIP Grid Integration Project
Kalinathpur, Mirpur, Kushtia

Date of visit: 4-5 December 2020
Project name: Grid Integration of Solar Irrigation Pumping System at Kushtia

Project Implemented by: Green Energy Foundation (BGEF)

Location of the Project:

Sl	Site Name	Village	Union	Upazila	District
1	Kalinathpur 1	Kalinathpur	Satiyan	Mirpur	Kushtia

Installed solar panel capacity = 25 KWp.
Total land coverage = 70 Bighas
Total no. of farmers = 80-100
UNDP approval of the project = 29 July 2019
Project mobilization = 31 July,2019
Grid integration of the project = November 2019
No. of grid tied inverter installed = 3 inverters (8KW X 2, 3KW X 1 = 19 KW)
Brand of inverter: ABB (Made in ABB India facility)
Total exported electricity to the national grid = 10.52 MWh (November 2019 – November 2020)

The local consultant on the SREPGen Terminal Evaluation team Mr. Siddique Zobair started from Dhaka by road for Kushtia at 6:30am on 3 December 2020. Mr. Mahmudul Bari, a professional photographer and Mr. Kazi Ahsan Uddin, Manager, IDCOL accompanied him. Team reached Kushtia at 11:30am. Dr. Taibur Rahman, Project Manager, SREPGen and Mr. S. M. Imran Hasan, Project Manager of Bright Green Energy Foundation (BGEF) joined the team at Kushtia and went to visit the grid integration of the solar irrigation project at Kalinathpur village at Mirpur Upazia of Kushtia District. The BGEF official informed that this irrigation system was installed four years back and supplies water for irrigation throughout the year for different types of crops. The catchment area is about 70 bighas and BGEF has four more similar irrigation systems in the same area. The farmers are more inclined towards cultivating cash crops, such as onion, garlic, wheat, corn, jute, vegetables, pulses etc., rather than paddy, which is very common in other parts of the country. In the Northern and Southern parts of Bangladesh, farmers mostly cultivate paddy and therefore, require frequent irrigation of the field. As a result, the utilization factor of solar energy in this field is relatively lower than in other areas. BGEF has a good num-

ber of solar irrigation systems in the Northern part of the country, where the utilization factor is much higher in comparison. Therefore, they selected this site to do grid integration piloting with technical and financial support from SREPGen, provided through IDCOL. As financial intermediatory (FI), IDCOL identified the project site and implementing partner in consultation with SREPGen and carried out the necessary due diligence of BGEF. SREPGen identified the technology provider.

80-100 farmers are the beneficiaries of this particular solar irrigation system. The team observed that some small capacity diesel run irrigation pumps are individually operated by the farmers to irrigate their own land. But their number is low. The fuel costs for diesel run irrigation systems is relatively higher than the costs of solar irrigation pumps. Most of the paddy was already harvested at the time of the visit. Only few farmers were working in the field, seeding different types of cash crops, such as vegetables, pulses, wheat.

The maintenance of the solar irrigation system is quite satisfactory. The pump room, inverter, and PV panels are clean. The BGEF official informed that before grid integration, almost 40 percent of the energy generated was wasted due to low consumption of water for irrigation, except during the Boro season which requires intense irrigation. From the integration of the system into the grid till now (from November 2019 to November 2020) a total of 10.52 MWh electricity has been transmitted into the grid. However, the local distribution grid operator, BREB, had not paid for the electricity yet. The local technician informed that the performance of the ABB inverter was not satisfactory. Since the installation last year, it was required to repair it twice, which had not happened for other brands. Frequent breakdown of the inverter interrupted the free flow of electricity into the grid.

The team interviewed local farmers, especially women working in the local vicinity processing the harvested rice. They informed that this year, the rice production was higher than last year. Due to favourable weather and uninterrupted irrigation, the yield has become better than previously. Irrigation with diesel pumps was costly, and the quantity of water supplied was insufficient. They requested further reduction of the irrigation costs. Prior to the installation of the solar pump, irrigation water was only available in the Boro season, in other seasons the pump owners did not run their pumps due to low requirements of water. Now irrigation is available throughout the year. As a result, farmers

can cultivate different types of seasonal cash crops based on market demand. This has improved their livelihood.

On 5 December 2020, the team met officials of the Northwest Zone Power Distribution Company Limited (NWZPDC), Bangladesh Rural Electrification Board (BREB), the Infrastructure Development Company Limited (IDCOL), Bright Green Energy Foundation (BGEFL) and the Project Manager of SREPGen in IDCOL's Regional Office in Kushtia. The Superintendent Engineer of NWZPDCL, the Assistant General Manager of BREB, the Divisional Manager for Renewable Energy of IDCOL, the Project Manager of BGEF and the Project Manager of SREPGen represented their respective organisations. The issues were discussed at the meeting were mainly grid stability and payment for the electricity feed from the solar irrigation pump into the grid. The SREPGen Project Manager explained that the overall approach of this SIP integration project was to optimize the use of energy generated from the solar system. In most cases the SIP was used seasonally. In off-season when irrigation is not required at full capacity, the energy generated by the system was wasted. There are around 1,900 SIPs in operation across the country with an aggregated capacity of 42 MWp, of which 30-50% of the generated energy is lost. Since grid electricity has already reached most parts of the country, those SIPs can potentially be integrated into the grid and feed the excess energy into the grid. Therefore, the main objective of this pilot project was to prove the feasibility of grid integration and generate lessons.

The BREB representative explained that they worked jointly with BGEF and the technology provider to develop an interconnection facility between the solar irrigation system and the grid. So far, they had not identified any interruptions in the feeder, due to the integration of this intermittent energy supply. It may because the amount of electricity fed into the grid from solar is negligible compared to the feeder load that it hardly can create any interruptions. He also mentioned that BREB was unaware about the amount of electricity transmitted into the grid. BGEF had not submitted any bills yet to BREB and BREB had also not received any instructions from the Government to pay of such bills.

The BGEF representative explained that the solar irrigation system interconnection cost is relatively high when only integrating a single system into the grid. But if several solar systems with a minimum capacity of 100 kWp are combined and interconnected to the grid through a single arrangement, then the cost of interconnection would be cost effective and profitable for the system operator.

Another issue raised by the BGEF representative, was that the tariff fixed by the Government for energy fed into the grid is relatively low. It is equal to the 33 kV bulk tariff, which is BDT

4.00 per kWh for BREB fixed by the Bangladesh Energy Regulatory Commission (BERC). However, it is much higher for other distribution utilities like DESCO or DPDC. He requested that the low tariff was reconsidered by the Government.

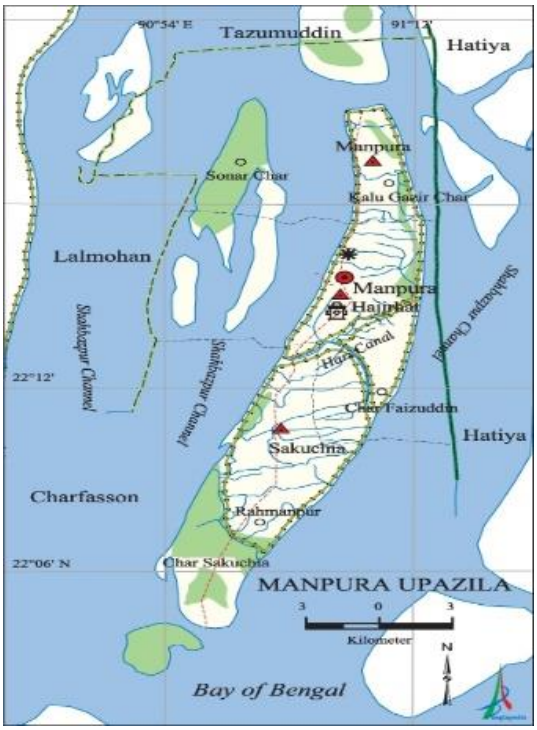
The NWZPDCL representative noted that such feeders are normally very long and usually run with undervoltage. The additional generation at the user end will help maintaining grid stability in distant feeders.

The SIP integration piloting project has fulfilled its primary objective. Following this piloting, SREDA has already prepared and approved the “Guidelines for the Grid Integration of Solar Irrigation Pumps – 2020” on 26 July 2020 with assistance of SREPGen. But operationalizing it would require that the tariff for the energy fed into the grid is rationalized.

Field Visit to Monpura, Bhola
Date: 10-11 December 2020

On 10 December 2020 a team of four members leave Dhaka for Manpura, Bhala by water-craft. The team was comprised of following members:

1. Mr. Siddique Zobair, Local Consultant, SREPGen Terminal Evaluation Team
2. Mr. Mahmudul Bari, Photographer and subject expert
3. Mr. Nurul Alam, Finance and Administrative Officer of SREPGen Project
4. Mr. Zia Uddin Jwel, Senior Officer (Technical), IDCOL



The team started for Bhola from Dhaka at 2-30pm. It was an overnight journey to reach at Monpura. Early morning at 4.30am, the team arrived and approached Zila Parishad Rest House of Manpura.

The area of Manpura Upazila is 373.18 km^2. It is bordered by Tazumuddin Upazila on the north, Bay of Bengal on the south, Hatiya Upazila on the east, Lalmohan and Char Fassion Upazila on the west. According to the Population and Houshold Census 2011, the total population of the Upazila is 76,582, 38,746 males and is 337,836 females. The annual compound growth rate of the population is 1.28%. The total number of households is 17,080, and the average household size is 4.48. Density of population per sq km is 205. The literacy rate is only 32.1%.

After breakfast, the team went to visit the 1st solar mini-grid called WREL-1, which was constructed by Western Renewable Energy Limited with financial assistance from SREPGen. The peak capacity of this plant is 279.5 kWp. The technical details of the project are as follows:

Western Renewable Energy Ltd.(WREL-01) 279.5 kWp Solar Mini Grid
Project Site : South Sakuchia Union,Monpura Island,Bhola
A Sister Concern of Western Engineering (Pvt.) Ltd.

COD		22-Jul-20			Plant Picture
	Project Cost	**BDT 105.47 Million**			Inverter Room
	Grant	**BDT 52.73 Million**			
	Loan	**BDT 31.64 Million**			
	Plant Land	**140 Decimal**			
	Constraction Start & End Date	**10-11-2018 To 20-07-2019**			
Sl. No.	**Asset Name**	**Description**	**Quantity**	**Brand Name**	
1	Solar Panal	JA 370 wp	760 Pics	Chaina	Battery Room
2	Field Combiner	use ror Fuse	20 pics	Local	
3	Genarator	Perkins 150 KVA / 120 KW	1 Pic	UK	
4	Multi Cluster Box	Multi Cluster Box	1 Pic	SMA	
5	Feeder Box	Use Distributon	1 Pic	Local	
6	On Grid combiner	On Grid combiner	1 Pic	Local	
7	On grid Inverter	STP 50 kW On grid Inverter	5 pics	SMA	
8	SMA Cluster Controler	SMA Cluster Controler for online	1 pic	SMA	
9	Cisco Switch	8 port Cisco switch	1 pic	Local	Gererator
10	Off Grid inverter	6 kw Off Grid inverter	21 pics	SMA	
11	Battery	2v , 1625 AH Gaston	336 Pics	Local	
12	Distribution	1. Total Line = 18.9 Km 2. Single Phase= 12.3 Km 3.Three Phase = 6.6 Km 4. Total poles = 446 Pics 5. 9 Meter Poles = 150 Pics 6. 7.62 Meter Poles = 296 Pics	1. Total Line = 18.9 Km 2. Total pole = 446 Pics	Local	
13	Electric Pre-paid Meter single phase	(1000 imp/kWh), (230 V),(5(60)A)	902 pics conect /1000 pics	Joy Meter	PV Panel
14	Electric Pre-paid Meter 3 phase	(1000 imp/kWh), (3*230/400v),(5(80)A)	5 pics conect /20 pics	Joy Meter	
15	Pic Kwh Load	75-85 kwh			
16	Total Generation **COD To November-2020**	563.908 Mwh			
17	Total Generator Generation **Feb-2020 To November-2020**	30.773 Mwh			

The total length of distribution line is 18.9 circuit km. Most consumers are households, but there are some commercial consumers as well. Three phase commercial consumers mostly recharge batteries for three wheelers. The total number of consumers are 907, 902 single phase consumers are 902 and 5 three phase consumers. This is consistent with the feasibility study report of the project. All customers use pre-paid meters. The maintenance of the project is satisfactory, except for the PV panels. During the visit, accumulated dust and bird droppings were observed on the panels. Plant officials informed they normally the clean the panels once in a week. But as winter was approaching and there was no rain, the accumulation of dust was significantly higher than during summer. The plant staff was advised to clean the panels at least twice a week. Otherwise, panel efficiency will be significantly reduced. This is a solar-diesel hybrid plant. From construction of the project till November 2020, the total power generation from solar was 563.908 MWh. The diesel generator Parkins 150 KVA with 120 kW capacity was installed in February 2020 and during the visit it was observed that as of November 2020 generation had been negligible at only 30.77 MWh, since the generation from solar had been sufficient to supply the electricity load.

Normally, the peak load is in the evening. Therefore, the surplus day generation from solar is stored in the batteries, which supply electricity the rest of the time, including during peak hours. A total 336 number of 2-volt 1625 AH Gaston batteries are used to store the generated electricity. There is a good number of shops and small workshops who use the electric-

ity to run light, fans, mobile chargesr, sewing machines, small motors etc. Plant officials informed that since commercial operation had commenced they had not faced any breakdowns or difficulties.

Sl. No.	Consumer Category	Number Of Consumer	Remark
1	Households	577	
2	Shop	285	
3	Mosque	20	
4	Madrasha	9	
5	School	4	
6	Sawmill	0	
7	Furniture Workshop	3	
8	Charging (Garage)	13	
9	Office	3	
10	Bank	0	
11	Workshop	6	
12	Others	5	
	Total=	925	

After visit the plant complex, the team went to the Ishwarganj village to talk with the consumers. The team interviewed the following household consumers:

1. Mrs. Waziun Nesa (60 yrs), housekeeper.
   Village: Ishwarganj, Monpura, Bhola.
   She got electricity connection in March 2020. She has four LED lamps with a capacity of 9W each and three fans in her house. Her connection is prepaid. A recharge of BDT 300 provides her with electricity for around 1-1.5 months. This electricity connection costs are much lower than her previous option of using kerosene oil, which cost around BDT 80 per liter. Electricity is more convenient than kerosene lamps, as she said. The electricity enables an increased number of working hours. Previously she completed all her household activities like cooking, cleaning etc. during daylight to save kerosene. Now she can perform all those tasks conveniently under electric light. Her children can make their homework in clear light, which was difficult with kerosene light. Now she can dedicate more time to processing agricultural products after harvesting from the field during daylight. Earlier she has to share time for cooking as well for processing crops. The electricity access has improved their lives.

2. Md. Arif (23 yrs), Student.
   Village: Ishwarganj, Monpura, Bhola.
   He too got electricity connection in March 2020. He got 9 units of 9W LED lamp and 3 fans in his house. He recharges his prepaid electricity connection with BDT 500 each

time which serves him for around 1.5-2 months. Electricity help to give them more comfort in hot summer day. His father has a shop in nearby market where they also took electricity connection. Earlier after sunset his father had to close the shop. Now he can run his shop till 9-00pm, sales proceeds of the shop also increase.

3. Md. Shahin (30 yrs), Tailor.
   Sifat Clothe Store, Chowdhury Bazar, Monpura, Bhola.
   Mr. Shahin has a tailor shop at the center of Chowdhury Bazar. He has been in this profession for past 20 years. He used to have a manual sewing machine before he replaced it with an electric in June 2020, after getting the electricity connection. He also has a 9W LED lamp and a small fan in his shop. He recharges with BDT 450-500 each month for his electricity consumption. The electricity enables him to run his business even after sunset. He can now do more work because of the electric sewing machine and the prolonged working time. The quality of work has also improved. But he finds the electricity bill too high, especially the fixed cost of BDT 70.00 every month. The fixed charge covers line and meter rent.

4. Md. Shahin (21 yrs), Businessman
   Shahin Electronics, Chowdhury Bazar, Monpura, Bhola.
   Mr. Shahin sells mobile phones, lights, fans and other electrical appliances. He has a computer, a printer, four LED lights and a ceiling fan in his store. He got his prepaid electricity connection in June 2020. His electricity consumption in the shop costs him around BDT 1,500-1,600 per month. He normally uses several mobile chargers, the computer and the printer most of the time in a day. Electricity played a positive role in improving the livelihood of the local people. After electrification, the sale of electric gazettes has increased. Earlier, there was hardly any motor vehicle on the island. Now there are several motodriven auto rickshaws in the island. Previously the main means of travel in the island was on foot, but now people ride auto rickshaws.

After discussion with the beneficiaries of the WREL-1 Solar mini-grid, the team moved to the WREL-2 solar mini-grid project. At 1.30pm, the team arrived at the project site and visited the plant facilities. The distance between the two plants is about 5.6 km. The location of WREL-2 is at Kawartak Union of Manpura Upa Zila. The technical details of the project are as follows:

	Western Renewable Energy Ltd.(WREL-02) 218.4 kWp Solar Mini Grid Project Site : kawartak Union,Monpura Island,Bhola A Sister Concern of Western Engineering (Pvt.) Ltd.				Project Picture
COD		23-Nov-19			Panel
	Project Cost	BDT 82.85 Million			
	Grant	BDT 41.43 Million			
	Loan	BDT 24.85 Million			
	Plant Land	132 Decimal			
	Constraction Start & End Date	Start: 05-01-2019 End: 25-10-2019			
Sl. No.	Asset Name	Description	Quantity	Brand Name	Battery room
1	Solar Panal	JA 370 wp	590 Pics	Chaina	
2	Field Combiner	use ror Fuse	20 pics	Local	
3	Genarator	Perkins 150 KVA / 120 KW	1 Pic	UK	
4	Multi Cluster Box	Multi Cluster Box	1 Pic	SMA	
5	Feeder Box	Use Distributon	1 Pic	Local	
6	On Grid combiner	On Grid combiner	1 Pic	Local	
7	On grid Inverter	STP 50 kW On grid Inverter	4 pics	SMA	
8	SMA Cluster Controler	SMA Cluster Controler for online	1 pic	SMA	
10	Off Grid inverter	6 kw Off Grid inverter	18 pics	SMA	Control Room
11	Battery	2v , 1625 AH Gaston	288 Pics	Local	
12	Distribution	1. Total Line = 13.24 Km 2. Single Phase= 8.47km 3.Three Phase = 4.77 Km 4. Total poles = 301 Pics 5. 9 Meter Poles = 120 Pics 6. 7.62 Meter Poles = 181 Pics	1. Total Line = 13.24 Km 2. Total pole = 301 Pics	Local	
13	Electric Pre-paid Meter single phase	(1000 imp/kWh), (230 V),(5(60)A)	681 Pics Connect/904 Pics	Joy Meter	Genarator Room
14	Electric Pre-paid Meter 3 phase	(1000 imp/kWh), (3*230/400v),(5(80)A)	2 Connect/19pics	Joy Meter	
16	Pic Kwh Load	65-70 kwh			
14	Total Generation COD To November-2020	351.640 Mwh			
15	Total Generator Generation July-2020 To November-20	15.560 Mwh			

The commercial operation date (COD) of this plant was 23 November 2019. Total plant capacity is 218.4 kWp. 590 solar PV modules are installed over a steel structure. The capacity of each PV module is 370 Wp. The producer of the PV modules is JV solar, China. All are Tier-1 modules. The performance of the panels is so far satisfactory, according to the plant operator.

The battery room and generator room are well maintained but dust accumulated on the solar modules is a concern. The plant operators were advised to ensure regular cleaning of the modules at least twice a week. Otherwise, the efficiency of the solar cells will degrade fast. Like WREL-1 plant in this plant also has a Parkins 150 KVA 120 kW UK made one set diesel generator. The plant has total of 288 2v, 1625 AH Gaston battery banks to store the electricity 96roject i by the system during daytime and supply the customers during peak hours in the evening. AS of November 2020, a total of 351.640 MWh electricity had been generated from the solar PV system. The total generation from the diesel generator from July till November 2020 is only 15.560 MWh, since the solar generation is sufficient to take care of the present electricity need of the customers. So far, 698 connection have been made, of which about 50% is household connections; the rest are primarily shops as well as some auto rickshaw charging garages and other establishments. Customers details are as follows:

Sl. No.	Consumer Category	Number Of Consumer	Remark
1	Residential	340	
2	Shop	311	
3	Mosque	12	
4	Madrasha	5	
5	School	6	
7	Furniture Workshop	1	
8	Charging (Garage)	8	
9	Office	2	
10	Factory	2	
11	Workshop	8	
12	Mondir	3	
	Total=	698	

After visiting the plant, the team went to meet the beneficiaries of the solar energy. The following customers were consulted:

1. Ms. Gulnahar Begam (age 31), housekeeper
   Village: Kawartak, Upazila: Manpura
   She got the electricity connection in March 2020. There are three LED lights and one fan in her house. A charge of BDT 300.00 covers 1-1.5 months, depending on uses. Thre electricity has made the life of her family easier than before. Electricity has increased their a status in the community. Previously, after sunset it was completely dark. It was difficult to do any domestic work after sunset. Now they can do some work, like stitching of cloth, cooking and other necessary chores with light from electric bulbs. Now they can do domestic farming in daytime and cook in the evening. Previously they had to complete all activities before sunset. The present energy cost is much less than the kerosene costs they incurred previously. They would like the price of electricity to be reduced and the supply to be increased, so that they can watch TV. She has the skills to stitch Nakshikatha (bedcover with handstitched decorative designs). She requests assistance from the Government for training women on sewing and other handwork. Since women have more working hours now because of electricity access, they could earn some extra money from such activities.

2. Ms Afia Khatun (age 42), informal labourer
   Village: Shakuchia, Manpura
   She works in a fish drying plant. She does not have any electricity connection. She cannot afford the connection fee and monthly electricity bill. It is for well-off people in her view. When team asked her whether she knew monthly electricity bill, she turned back her face and relpied that she cannot afford it. Then team questioned her how much money she spends monthly on kerosene for lighting her house. She informed that she spends BDT 100-200.00, but her husband take care of those costs. Her husband is also a day labourer. The day wage is very low at BDT 400-500.00 per

day, depending on the season. During the monsoon, it is hard to get work. Electricity did not bring any change to her life. She would like to have electricity, if the Government helps. The access to electricity in the area had not created any job opportunity for her. But she recognizes that due to the availability of auto rickshaw, it has become easier for her and her husband to travel far from her village in search of work. The lifestyle of the islanders has improved in recent times.

3. Ali Imam (age 38 yrs), Auto Rickshaw Pooler
   South Sakuchia Market
   Mr. Ali imam live in south sakuchia village. He has 5 members family. His wife is housemaker and have two daughter and one son. He informed that earlier he was a day laborer. It was very difficult to run his family. Earning was very low and it was difficult to arrange work every day. His earning was not sufficient to run family expense. After construction of solar minigrid gradually auto rikshaw start to play. He also decided to learn driving of auto rikshaw. For last one year he is playing auto and his earning is much batter than before. Now he has electricity connection from WREL-2 project. Now children can read and prepare their home task in the evening. Their quality of education also improving. He informed that from electricity supplier side there is restriction of using more electric gazettes than sectioned. Therefore, he cannot use a fan what he like to use. Plant officials inform that they have to ensure the stability of electricity. If any customer use mare load than sanction then the feeder become destabilize. As a result, system collapse and every customer have to suffer. Therefore, demand management has to perform properly. But if anyone apply for additional load, they allow within the plant capacity. Mr. Ali Imam also inform that until to date he did not incurred any maintenance cost on his own. Electricity supplier do those by themselves.

4. Mr. Shahar Ali (age 69), Shopkeeper
   Galachipa Bazer, Manpura
   He has run a grocery shop in the market for the last 40 years. Previously, it was a thatched house, now it has become a semi-permanent building. Forty years back, the population of the island was low, only around 20,000. Fishing was the profession of 95% of the population. Marketing of fish was difficult and living conditions were miserable. Gradually, the population increased. Due to the introduction of engine boats, the mobility of the people also increased. This was a major breakthrough for the islanders. Subsequently, a launch service opened from Manpura to Dhaka and livelihood of the community improved significantly. Previously, Mr. Ali ran his shop only during the first half of the day and rest of the time he worked in the field. The sales volume was very small. Slowly, it improved and before the electricity access, he had to close the shop immediate after sunset.
   Now he has electricity connection in his shop and run the shop from 7.00am to 9.00pm. The variety of items in the shop has increased and the sales volume has also surged. He has four LED light and two fans in his shop. This is one of the big grocery shops in the market. A charge of BDT 500.00 lasts for at least a month. He requests that the monthly line rent is removed.

5. Mr. Taher Mollah (age 51yrs)
   Fishery Ghat, Manpura
   Mr. Taher run a tea stall near a wholesale fish market. He has a small TV in his shop. He purchases the TV six months ago, after getting the electricity connection. He has one light and one TV in the shop. A charge of BDT 400.00 and covers at least a month. After introduce TV in his shop customer increase a lot. The sales volume has increased three-fold, as have the earnings. Now he is very happy with his family. He would like to have grid electricity from the Government, so that there will be no restrictions on capacity enhancement and he could run a bigger TV and install a fan. Mr. Taher mentioned that compared to government tariff, the electricity tariff fixed by the present private electricity producer is remarkably high. He demands it to be brought down the present electricity tariff to the same level as the government electricity tariff.

6. Mr. Abul Kalam (age 31yrs), Electrician
   Fishery Ghat, Manpura
   Mr. Azad worked for a radio repairing shop. After electrification in the island, he started working as electrician. Many household, shops and workshops are getting electricity connections. Hence, there is demand for electricians for installing and repairing lights and fans etc. His workload is quite high. There are now as many as 7-10 electricians working in the island. Since electricity became available, a good number of electric gazettes and mobile repairing shops have been established. So, electrification has helped improving the livelihoods on the island.

   After visiting both solar mini-grid projects, the team left Manpura at 4.00pm by speedboat for Char Mantaz to visit the solar ice making plant, and on the way stay overnight at Char Kukri Mukri. At 8.30am, the team left for Char Kukri Mukri for Char Mantaz.

Field Visit Report: Solar Ice-making Factory at Char Mantaz
Date: 12-12-2020

At 10:00am, the team arrived at Char Mantaz ferry ghat and was received by the members of the executive body of UBOMUS, who developed and owned the solar ice-making project. The project title is "Capacity building of UBOMUS to support island community in improving their livelihood by making ice available". The full form of UBOMUS is Upokulio Biddutayan O Mohila Unnayan Samity (UBOMUS) in English 'Costal Electricity and Woman Development Cooperatives'.

During preparation of the project proposal, UBOMUS conducted a primary survey jointly with IDCOL for selecting the project site, considering the socio-economic conditions, geographical conditions, population size, economic opportunities, etc. and selected Char Montaz Island of Rangabali Upazila of Patuakhali district for establishing the solar ice-making plant.

A. General Information on Char Montaz

1. Location: Rangabali Upazila, Patuakhali
2. Communication: Minimum 4 hours by boat from mainland
3. Population of the Island: 40000
4. High Schools: 2
5. Government primary schools: 14

B. Project Information:

Agreement Signing: 6 December 2018
Project Completion date: 20^{t} June 2019
Test production date: 1 July 2019
Commercial production: 10 July 2019
Daily Production: 2 batches (it takes 6 hours per batch); 650 kg per batch
Number of beneficiaries: 100 fishermen, incl. 11 women
Project Cost: BDT 15,118,000/
UNDP Grant: BDT 8,500,000 (56%)
Equity (without land): BDT 66,18,000 (44%)

Technical Information

Equipment details:

1. Solar panel 91.08 Kw for ice production Plant
2. 2 Kw solar pumping system for water lifting from deep tube well
3. Hybrid inverter: 60Kw
4. Battery: deep cycle battery: 160Ah, 148 pcs

The project officials informed the team that in initial survey, the project selected 10,000 households, including 8,000 female-headed households, who are involved in fishing but unable to collect ice from distant areas. It was found that nearly half of the households earn BDT 15,000 or more in a month, while 30% of the households have an monthly income of BDT 10,000 or less. People spend a significant share of their income on food; more than 92% of the people spend between BDT 2,000 to BDT 5,000 on food. Food accounts for a major share of monthly cost, followed by transport, clothing, energy, and rent. Spending a major proportion of the income on food is a common characteristics of lower income populations. A good number of people from the sample live in their own house (nearly 60%). Among the rest, the average rent is BDT 2,580, albeit with significant differences.

During the visit, the following members were present:

1. Ms Shahida Gazi (42 yrs), General Secretary
2. Ms Zakia Begum (52 yrs), Assistant General Secretary
3. Ms Airin Begum (38 yrs), Assistant General Secretary
4. Ms Khaleda Begum (48 yrs), Marketing Secretary
5. Ms Komola Begum (30 yrs), Credit Management Secretary
6. Ms Minara Begum (42 yrs), Social Welfare Secretary
7. Ms Shahinur Begum (44 yrs), General Member
8. Mr Md. Shafikul Alam Masud (52 yrs), Regional Coordinator
9. Mr Md. Rasel (28 yrs), Machine Operator
10. Mr Amadul Hoque (38 yrs), Assistant Operator
11. Mr Md. Ashraful Alam (35 yrs), Technician, Solar-E-Technology (EPC)

UBOMUS Char Montaz has 35 female members in the committee. Previously, they were involved in making LED lamps, charge controllers, and other equipment. Due to the saturation of the solar home system market, all of them are now involved in the solar powered ice-making factory.

The factory has been operational for 15 months. The project was designed with a production capacity of 2.5 tonnes/day with an average slab size of 10 kg. There are 126 cans in the ice-making factory. Each can produces one 10kg ice slab daily. Ice is being sold at the rate of BDT 30 per 10kg slab. They use ground water for making ice. Water collect from underground through a submersible pump which runs on solar electricity.

The main customer of the ice-making factory are the fishermen. There is limited use of the ice by the shops to preserve cool drinks during hot summer. The block ice is better suited for preserving fish, especially in the coastal area. Larger boats typically sail for 7-10 days. They prefer larger 20 kg slabs as these are easy to store. Each boat need 1-2 tonnes of ice for each trip. 10 kg slabs are not very attractive to them. On the other hand, a day's production of ice from the solar ice-making plant is can only cater for one boat. Instead, the project has been designed for the end product and end users. The project has been designed with production capacity of 2.5 tonnes/day with an average slab size of 10 Kg. One advantage of this type of block ice is its longevity in storage compared to other forms of ice. This factor makes them a suitable option for many small fishermen. The project also aims to serve woman-led businesses, since there a large number of such businesses, especially the fish business which is run and managed by women. UBOMUS has been able to penetrate this sector easily due to its established work channels and managerial resources in such areas. When fishermen go for fishing, they buy ice worth BDT 10,000-15,000 and store the slabs for 7-8 days in cold storages. As their demand for ice is big, they prefer bigger chunks of ice. The small fishermen are hence the main customers of the ice-making factory.

The plant executives mentioned that the main challenge the ice-making factory is facing is that the size of their ice slabs and the daily production are smaller than the market demand. It would be better for business if they could produce 20 kg slabs and a large volume of ice. The members also showed interest in installing wind power, as the place is abundant with air and space for the installation.

There is also the Manta community who used to live on boats and catch fish for living. The Manta people are mainly Muslim. There are now around 100 Manta families living in Char Montaz. Now they live in barracks. An organization named 'Muslim Society' has made a floating school inside a trawler to educate Manta children. Generation by generation, the major profession of the Manta community is to catch fish from river and sell these on the market. They also buy ice from the factory for fish preservation.

Beneficiaries of UBOMUS Solar powered ice-making factory in Char Montaz:

Mr. Babul (27 yrs), Fisherman.
Char Montaz, Rangabali, Patuakhali.
Mr. Babul buys ice directly from thr factory. The length of his boat is 17-18 feet. He buys ice for preserving fish. But he prefers bigger size of ice blocks when he goes to sea for fishing. Previously, he haf to by ice from the open market, which imports ice from mainland. At that times, the cost of ice was high and not easily available. He finds the price of UBOMUS ice reasonable and provides a regular supply. This helps him run his business smoothly.

Mr. Monowar Hossain (55 yrs), Fisherman.
Manta Community, Char Montaz, Rangabali, Patuakhali.
Monowar is a member of a Manta family. He is a regular customer of the factory as he needs ice for preserving fish for long time. Every day, he buys 20-30 slabs of ice. He has been involved in this profession for last 40 years. Previously, he suffered a lot due to non-availability of ice. He could not preserve the fish when he caught an abundance. Either he had to sell the fish at a cheaper rate, dry them, or throw them out. Now he can preserve all the fish he catches and store them to obtain better prices and he can also maintain the quality of the fish.

Mr. Al Amin (41 yrs), Businessman
Char Mantaz. Patuakhali
Mr. Amin is a primary school teacher, live in the vicinity of the ice-making factory. In his opinion this project helps the buyers of the ice a lot, enabling them to preserve the fish with ice blocks in insulated boxes. This has enabled proper handling and preservation of fish and hence better prices for better quality fish can be obtained in local and other markets. He finds this has improved the livelihoods of the fishermen. The people in the project area directly benefit from the project by saving time and money when getting ice for preserving the fish.

During the visit, it was observed that UBOMUS has the capacity to store 18,000 kg ice at a time and has the capacity to preserve ice for 72 hours. The fishing community collects ice from the plant. There are at least 10,000 vulnerable fishermen on Char Montaz and in the surrounding areas needing to preserve their fish. Many of them collect ice from this plant.

Major outputs of the project:

- Solar hybrid ice-making plant established
- Fishing community, particularly female-headed families, have timely access to reasonably priced ic ice
- Improved fish preservation
- Increased incomes of fishing community

Major challenges:

- Short duration of the project
- Disrupted communication system created barriers to procuring the necessary equipment on time
- Supplying ice to distant community is a challenge
- Market demand is for larger slabs

Lessons Learned:

- Support and cooperation from local community is remarkable
- Community engagement in project implementation geared up project implementation process
- Huge demand for ice in the local market and communities are very interested in collecting ice from their own locality

In this project, no people were dislocated due the construction of project facilities, which were constructed on barren land. The ice price is relatively lower than that of imported ice. Therefore, local fisherman are happy with the plant. They request the production capacity of the plant is increased and larger slabs are produced. The local community has positive attitude towards the project.

Annex 3: List of persons interviewed

Name	Position	Organisation
Mr. Md. Khushid Alam	UNDP Assistant Resident Representative and Programme Specialist (Nature, Climate & Energy)	UNDP Bangladesh
Mr. Taibur Rahman	National Project Manager	SREPGen PMU
Ms. Mahsin Hamuda	Monitoring and Evaluation Officer	
Mr. Nurul Alam	Administrative and Finance Officer	
Mr. Md. Helal Uddin	Former Chairman + former National Project Director	SREDA
Dr. Shaikh Mohammad Helal Uddin	Joint Secretary (Planning)	Power Division
Mr. Monwar Hasan Khan	Deputy Secretary (Planning) + former National Project Manager	
Mr. Utpal Bhattacharya	Biomass Expert + Project Capacity Building Expert	
Prof. Shahriar	PV Expert	United International University (UIU)
Mr. Enamul Karim Pavel	Head of RE	IDCOL
Mr. Nasir Uddin		UBOMUS
Mr. Faruque	Head of Access to Energy	Rahimafrooz
Mr Dipal Chandra Barua	President	Bangladesh Solar and Renewable Energy Association (BRSEA)
	Chairman	Bright Green Energy Foundation (BGEF
Mr. Rashiduzzaman Ahmed		NACOM
Mr. Kazi Monir Hossain		Oporajeo
Ms. Nazmun Nahar	Sr. Project Officer (Energy)	Asian Development Bank
Mr. Muddabir Anam	Senior Adviser	GIZ

Annex 4: List of documents reviewed

1. SREPGen mid-term review, Nov 2017
2. GEF Secretariat: CEO project preparation grant approval, Sep 2011
3. GEF Secretariat: CEO endorsement, Aug 2013
4. GEF Secretariat: CEO project preparation grant approval, Sep 2011
5. GEF Secretariat: project review, Jun 2013
6. UNDP: Bangladesh Country Programme Document for Bangladesh (2017-2020), Jul 2016
7. UNDP: SREPGen mid-term review management response, Nov 2017
8. UNDP: SREPGen project summary report, www.undp.org, Oct 2020
9. UNDP: SREPGen project initiation plan, Nov 2016
10. UNDP: SREPGen 106roject identification Form (PIF), Sep 2011
11. UNDP: SREPGen project document, CEO Endorsed, Aug 2013
12. UNDP: SREPGen annual work plans, 2014 + 2018
13. UNDP: SREPGen gender action plan, 2020
14. UNDP: SREPGen PIRs, 2015, 2016, 2017, 2018, 2019, 2020
15. UNDP: SREPGen GEF tracking tool, Jun 2013
16. UNDP: SREPGen GEF tracking tool, Nov 2017
17. UNDP: SREPGen GEF tracking tool, Dec 2020
18. UNDP: List of sub-projects and pilot projects under SREPGen Project, Nov 2020
19. UNDP: LCUD project document, 2019
20. UNDP: SREPGen LPAC meeting minutes, May 2013
21. UNDP: SREPGen co-financing table, Jan 2020
22. UNDP: SREPGen Annual Result Report 2018, Dec 2018
23. UNDP: ATLAS financial information: project budget balance 2015-2020
24. NACOM: A Comprehensive Assessment of the Availability and Use of Biomass Fuels for Various End-Uses with Special Attention to Power Generation, Jan 2020
25. MoPEMR: SREPGen inception workshop report, Mar 2015
26. MoPEMR: SREPGen annual progress reports 2014
27. SREDA: SREPGen annual progress reports 2015
28. SREDA: Transforming Monpura Island Through Solar Mini-grid Electricity, final report, 2020
29. SREPGen: Annual Work Plan, Jan 2020
30. SREPGen: Direct emission reduction calculations, Dec 2020
31. SREPGen: Co-financing table, Dec 2020
32. SREPGen co-financing letters, 2013
33. List of CPD outcome/output statements
34. SREPGen: knowledge documents, training materials, videos and photos
35. SREPGen: summary list of formal meetings, workshops, etc., Dec 2020
36. Low Value Grant: Check-list on Conditions for the Selection of LVG – for BDPOD, BGEF
37. IDCOL: Credit Memo for solar mini-grid projects, May 2018
38. BDPOD: Non-Governmental Organization (NGO)/Civil Society Organization (CSO) Technical and Capacity Assessment Form for Issuance of the Low Value Grant (LVG) for Non-Credit Purposes – for BDPOD, BGEF
39. Social and Environmental Screening – for BDPOD, BGEF, UBOMUS

40. NGO/CSO Technical and Capacity Assessment Form for Issuance of the Micro-Capital Grant for Non-Credit Purposes – for UBOMUS
41. UBOMUS: Project Proposal Format for Micro-Capital Grant (Non-Credit Related Activities)
42. UBOMUS: complete financial analysis – Solar Ice Block Project
43. Micro-Capital Grants: Check-list on Conditions for the Selection of MCG – for UBOMUS
44. UNDP-UBOMUS: Grant Agreement (Micro-Capital Grant Agreement) for Non-Credit Related Activities
45. Shahriar Ahmed Chowdhury, SREPGen: Feasibility Study on Wind Energy Integration into Solar Mini-Grid at Monpura Island, Nov 2018
46. Ahsanul Kabir, Khulna University: Solar Park Design and Conduction of baseline study and impact evaluation design to measure the effectiveness of mini-grid, Apr 2019
47. Financing agreement between SREPGen and IDCOL, Nov 2017
48. SREPGen PSC meeting minutes, 2015-2020
49. SREPGen PIC meeting minutes, 2015-2020
50. SREDA: Net Metering Guidelines – 2018, Nov 2019
51. SREDA: Training on Practice of Net Metering Guideline-2018
52. SREPGen: Workshop report, Inception Workshop, Mar 2015
53. SREPGen: Workshop report, Workshop on Scaling up Solar Irrigation in Bangladesh, Sep 2015
54. SREPGen: Report, Workshop on “Solar Rooftop – Its Viable Option for Bangladesh”, December 2015
55. SREPGen: Meeting minutes, roundtable discussion “Development of a Model in Solar Irrigation Projects to ensure optimize commercial use”, Sep 2016
56. SREPGen: Seminar report, Seminar on “Role of Renewable Energy in Meeting the Climate Change Challenges”, Mar 2016

Annex 5: Evaluation Question Matrix

Evaluative criteria questions	Indicators	Sources	Method-ology
Project design			
40. Was the project design and strategy appropriate and realistic vis-à-vis achieving the intended results?	• Coherence and appropriateness of theory of change • Comprehensiveness of results framework (results and indicators) • Comprehensiveness and appropriateness of assumptions and risks identified	• ProDoc • MTR	• Document review
41. Was the project design building on previous experiences of UNDP and GoB?	• Evidence of consideration paid to lessons from previous projects	• ProDoc • CEO Endorsement • PIF • MTR	• Document review
42. Was the project design participatory?	• Evidence of key stakeholders being involved in and understanding the project design (e.g. number of meetings held, project development processes incorporating stakeholder input	• ProDoc • CEO Endorsement • PIF • MTR • UNDP staff • SREDA staff • Power Division staff • IDCOL staff	• Document review • Interviews
43. Was the project complementing and coherent with other RE interventions?	• Adequacy of measures taken to avoid overlap duplication • Evidence of measures taken to ensure synergy with other interventions	• ProDoc • PIRs • MTR • PMU staff • UNDP staff • SREDA staff • Power Division staff • IDCOL staff • BSREA staff	• Document review • Interviews
Project management			
44. Were changes made to the project design during implementation to enhance the likeliness of achieving the intended results or in response to contextual changes?	• Changes made to outputs, targets of approached based on lessons from implementation or in response to challenges faced	• ProDoc • PIRs • Project meeting minutes • MTR • PMU staff • UNDP staff • SREDA staff • Power Division staff	• Document review • Interviews
45. Was the project implementation participatory?	• Level of stakeholder participation in the planning and implementation of activities • Presence of clear partnership arrangements with key stakeholders and their degree of alignment with partners' mandates and strengths	• ProDoc • PIRs • MTR • PMU staff • UNDP staff • SREDA staff • Power Division staff	• Document review • Interviews

		• RE companies and foundations • Consultants • Beneficiaries	• Field visits
46. Was the anticipated project budget available and spent?	• Level of spending of GEF grant • Amount of cash and in-kind co-financing mobilised	• ProDoc • PIRs • Financial statements • MTR • PMU staff • SREDA staff • Power Division staff • RE companies and foundations	• Document review • Interviews
47. Was the monitoring system outcome-oriented and used as a management tool?	• Extent to which outcome and objective indicators were SMART • Availability of baseline data for outcome and objective indicators • Comprehensiveness and realism of monitoring plan • Budget and staff resources allocated to M&E • Degree of capturing and reporting on outcomes and impacts • Evidence of monitoring data being used to adjust programme design, targets or approaches	• ProDoc • PIRs • Monitoring tools • MTR • Project meeting minutes • PMU staff	• Document review • Interviews
48. Did UNDP provide adequate oversight and guidance?	• Timeliness and adequacy of guidance and support provided to the PMU and executing entity	• ProDoc • PIRs • MTR • Project meeting minutes • PMU staff • UNDP staff • SREDA staff • Power Division staff	• Document review • Interviews
49. Was SREDA execution of the project adequate?	• Sufficiency of facilities provided to the PMU • Timeliness of the guidance provided to the PMU • Timeliness of activity implementation, procurement and contracting • Sufficiency of coordination with different GoB entities	• PIRs • Monitoring tools • Work plans • MTR • Project meeting minutes • PMU staff • UNDP staff • SREDA staff • Power Division staff • REB staff • RE companies and foundations	• Document review • Interviews
50. Was risk adequately managed?	• Regularity and comprehensiveness of risk and monitoring and reporting • Regularity and rigour of risk matrix updating • Sufficiency and effectiveness of measures implemented to reduce or mitigate risks	• ProDoc • PIRs • Monitoring tools • Environmental and social screening check-list • MTR	• Document review • Interviews

	• Degree and rigour of application of social and environmental standards (safeguards)	• PSC meeting minutes • PMU staff • UNDP staff • SREDA staff • RE companies and foundations • Consultants • Beneficiaries	• Field visits
Progress towards objectives and expected outcomes			
51. Were the main outputs delivered?	• Achievement of main output targets • Extent to which lack of output delivery was due to external or internal factors/barriers	• ProDoc • PIRs • Monitoring tools • MTR • PMU staff • SREDA staff • Power Division staff • RE companies and foundations • Consultants • Beneficiaries • Field observation	• Document review • Interviews • Field visits
52. Were the intended outcomes achieved?	• Achievement of end-of-project outcome targets • Significance of the contribution of project outputs to the outcomes • Significance of external factors contributing or hampering outcome achievement	• National statistical data • ProDoc • PIRs • Monitoring tools • MTR • PMU staff • UNDP staff • SREDA staff • Power Division staff • REB • RE companies and foundations • Consultants • Other donors • Beneficiaries • Field observation	• Document review • Interviews • Field visits
53. Was the objective met?	• Achievement of end-of-project target for indicator A • Achievement of end-of-project target for indicator B • Significance of the contribution of project outcomes to the objective • Significance of external factors contributing or hampering objective achievement	• National statistical data • ProDoc • CEO Endorsement • PIF • PIRs • Monitoring tools • MTR • PMU staff • UNDP staff • SREDA staff • Power Division staff • REB • RE companies and foundations • Consultants	• Document review • Interviews • Field visits

		• Other donors • Beneficiaries	
Relevance			
54. Did the project support national policy priorities?	• Alignment with national energy sector policies and strategies • Alignment with national climate policies and strategies	• National RE and climate change policies and strategies • ProDoc • CEO Endorsement • PIF • PIRs • MTR • SREDA staff • Power Division staff • BSREA staff • REB staff	• Document review • Interviews
55. Did the project objective and outcomes respond to GEF strategic priorities for climate change mitigation?	• Level of coherence between project objective and outcomes and GEF strategic priorities and indicators for climate change mitigation	• GEF strategic priority documents at project approval and currently • ProDoc • CEO Endorsement • PIF • MTR	• Document review
56. Was the project supportive of UNDP climate change priorities and strategies for Bangladesh?	• Level of coherence between project objective and outcomes and UNDAF	• UNDAF • ProDoc • CEO Endorsement • PIF • MTR	• Document review
57. Did the project seek to address the energy needs and demand of sub-project beneficiaries?	• Demand and uptake of energy solutions and technologies promoted under components 3 and 4	• ProDoc • PIRs • MTR • PMU staff • SREDA staff • Power Division staff • REB staff • RE companies and foundations • Consultants • Beneficiaries • Field observation	• Document review • Interviews • Field visits
Effectiveness			
58. To what extent did the project contribute to the achievement of GoB, UNDP and GEF priorities?	• Contribution made to achieving national RE, energy access and climate change mitigation policy and strategy priorities/outcomes • Contribution made to UNDAF RE, energy access and climate change mitigation priorities/outcomes • Contribution made to GEF and climate change mitigation priorities/outcomes	• National RE and climate change policies and strategies • UNDAF • GEF strategic priority documents at project approval and currently • ProDoc • CEO Endorsement • PIF • MTR	• Document review • Interviews

		• UNDP staff • SREDA staff • Power Division staff • Other donors	
59. What were the key factors contributing to project success or underachievement?	• Significance of design and approach strengths • Significance of design and approach shortcomings • Conduciveness of institutional capacities of the executing entities • Extent to which capacity constraints of executing entities and key stakeholders were addressed and overcome • Conduciveness of the external political and socio-economic context	• ProDoc • PIRs • MTR • Project meeting minutes • PMU staff • UNDP staff • SREDA staff • Power Division staff • REB staff • RE companies and foundations • Consultants • Beneficiaries	• Document review • Interviews • Field visits
Efficiency			
60. Was the project cost-effective?	• Financial delivery rate vs. expected rate • Management costs as a percentage of total costs • Actual unit costs vs. planned unit costs for sub-projects • Level of mobilisation of additional resources/co-financing (cash and in-kind) from other donors, GoB, stakeholders, beneficiaries • Adequacy and availability of the required human resources and skills	• ProDoc • PIRs • Financial statements • Annual budgets • MTR • PMU staff • UNDP staff • SREDA staff • Power Division staff • REB staff • RE companies and foundations • Consultants • Beneficiaries • Field observation	• Document review • Interviews • Field visits
61. Was the project implemented in a timely manner?	• Planned vs. actual delivery date of project milestones • Extent to which activities and outputs were delivered on time or were affected by delays • Conduciveness of UNDP and GoB rules and procedures for timely delivery • Extent to which delays could have been avoided	• ProDoc • PIRs • Work plans • MTR • Project meeting minutes • PMU staff • UNDP staff • SREDA staff • Power Division staff • REB staff • RE companies and foundations • Consultants	• Document review • Interviews
Sustainability			
62. Do SREDA and the Power Division and other stakeholders have access to	• Financial requirements for maintenance of project benefits • Inclusion of SREPGen results, practices and approaches in SREDA and MoPEMR budgets	• SREDA budgets • MoPEMR budgets • MTR • PMU staff • UNDP staff	• Document review

sufficient financial resources to maintain project and sub-project results?	• Level of expected financial resources available from GoB for SREDA and MoPEMR budgets • Potential for mobilising additional financial resources to support maintenance of project benefits (e.g. from LCUD, other UNDP projects, other donors, private sector)	• SREDA staff • Power Division staff • REB staff • RE companies and foundations • Consultants	• Interviews
63. Can beneficiaries/electricity users afford the operation, maintenance and replacement costs of the energy solutions provided/installed by the sub-projects?	• Operation and maintenance costs and fee levels compared to beneficiary incomes • Replacements costs compared to costs of other solutions on the market and beneficiary incomes	• PIRs • Monitoring tools • MTR • PMU staff • UNDP staff • SREDA staff • REB staff • RE companies and foundations • Consultants • Beneficiaries • Field observation	• Document review • Interviews • Field visits
64. Are SREDA and the Power Division positioned to continue with the practices and approaches established with help from the project?	• Level of staff resources and technical capacities within SREAD and MoPEMR to continue after project completion • Inclusion of SREPGen results, practices and approaches in SREDA and MoPEMR work plans • Degree of continuity between SREPGen and LCUD	• SREDA work plans • Power Division work plans • MTR • PMU staff • UNDP staff • SREDA staff • Power Division staff	• Document review • Interviews
65. Are there any significant environmental or climate risks that can undermine the continued functioning of the sub-projects?	• Existence of environmental risks to project benefits • Resilience to the impact of climate change (e.g. of hydropower sub-projects)	• ProDoc • CEO Endorsement • PIF • PIRs • Monitoring tools • MTR • PMU staff • UNDP staff • SREDA staff • Power Division staff • REB staff • RE companies and foundations • Consultants • Beneficiaries • Field observation	• Document review • Interviews • Field visits
Country ownership			
66. Do key stakeholders and beneficiaries have an adequate level of interest in ensuring that	• Inclusion of SREPGen results, practices and approaches in SREDA and MoPEMR work plans and budgets • Sub-project beneficiaries' appreciation and satisfaction with the energy solutions received – and understanding of	• Evaluation questions 23 and 25 • PIRs • MTR • PMU staff • UNDP staff • SREDA staff	• Document review • Interviews

project benefits are maintained?	their own responsibilities vis-à-vis operation, maintenance and cost recovery	• Power Division staff • REB staff • RE companies and foundations • Consultants • Beneficiaries • Field observation	• Field visits
Gender equality and women's empowerment			
67. To what extent did the project ensure that women benefitted equally from the project and contribute to their empowerment?	• Existence of mechanisms to ensure the inclusion of women in decision-making related to sub-projects • Existence of clear targets and approaches to ensure that women benefitted significantly from sub-projects • Gender-disaggregation of project indicators • Evidence of women's energy needs being served • Evidence that the RE electricity access enabled women to engage in new economic activities • Evidence of electricity access reducing the exposure of women to smoke from the burning of fossil or wood-based fuels • Evidence that electrification improved outdoor lighting and created a sense of improved security for women	• ProDoc • PIRs • Monitoring tools • Gender Action Plan • MTR • PMU staff • SREDA staff • Power Division staff • REB staff • RE companies and foundations • Consultants • Beneficiaries • Field observation	• Document review • Interviews • Field visits
Cross-cutting issues			
68. To what extent did the project ensure that vulnerable groups (e.g. ultra-poor, people living with disabilities ethnic minorities) benefitted equally from the project and contribute to their empowerment?	• Existence of mechanisms to ensure the inclusion of vulnerable groups in decision-making related to sub-projects • Existence of clear targets and approaches to ensure that vulnerable groups benefitted significantly from sub-projects • Use of poverty and vulnerability criteria in the selection of sub-project sites • Disaggregation of project indicators by ethnicity, age and other vulnerability markers • Evidence of vulnerable people's energy needs being served • Evidence that the RE electricity access enabled vulnerable people to engage in new economic activities	• ProDoc • PIRs • Monitoring tools • Gender Action Plan • Work plans • MTR • PMU staff • SREDA staff • Power Division staff • BSREA staff • REB staff • RE companies and foundations • Consultants • Beneficiaries • Field observation	• Document review • Interviews • Field visits
69. To what extent were adequate measures implemented to avoid negative environmental impacts?	• Use of environmental and social impact screenings and assessments for sub-projects • Degree and rigour of application of social and environmental standards (safeguards)	• Evaluation question 11 • ProDoc • PIRs • Monitoring tools • Environmental and social screening check-list • Work plans	• Document review • Interviews

		• MTR • PMU staff • SREDA staff • Power Division staff • REB staff • RE companies and foundations • Consultants • Beneficiaries • Field observation	• Field visits
70. Did sub-projects have any significant negative environmental or social effects?	• Stakeholders, beneficiaries of TE team have observed negative environmental effects (e.g. displacement of vulnerable people, negative effects on water availability or aquatic life of hydropower sub-projects, clearance of natural vegetation, improver disposal of waste such as batteries and defunct equipment)	• PIRs • Monitoring tools • MTR • PMU staff • UNDP staff • SREDA staff • Power Division staff • BSREA staff • REB staff • RE companies and foundations • Consultants • Other donors • Beneficiaries • Field observation	• Document review • Interviews • Field visits
GEF additionality			
71. Did the GEF funding lead to additional/incremental benefits, in particular vis-à-vis SREDA's and MoPEMR's ability and willingness to promote RE and environment-friendly energy solutions?	• Degree to which data and information gathered provides evidence of GEF additionality – measured vis-à-vis the six areas of GEF additionality: ○ Specific Environmental Additionality ○ Legal/Regulatory Additionality ○ Institutional Additionality/Governance additionality ○ Financial Additionality ○ Socio-Economic Additionality ○ Innovation Additionality	• Other evaluation questions • CEO Endorsement • PIF • GEF Core Indicators and Tracking Tools • MTR • PMU staff • UNDP staff • SREDA staff • Power Division staff	• Document review • Interviews
Catalytic/replication effect			
72. Are the project approaches likely to be upscaled and replicated?	• Integration of SREPGen approaches in SREDA and Power Division work plans • Integration of SREPGen approaches in GoB energy and climate policies and strategies • Use of SREPGen approaches by other projects • Upscaling and replication of SREPGen sub-projects • Communication of SREPGen lessons to other stakeholders in the energy sector • Development of new approaches or technologies by SREPGen	• Evaluation question 25 • National RE and climate change policies and strategies • SREDA work plans • Power Division work plans • PIRs • MTR • PMU staff • UNDP staff • SREDA staff • Power Division staff	• Document review • Interviews

		• REB staff • RE companies and foundations • Consultants • Other donors	
Progress to impact			
73. Has SREDA become an effective facilitation centre?	• Achievement of end-of-project outcome 1 targets • Extent to which regulators report an improved capacity to determine tariff structure and can identify SREPGen's/SREDA's contribution	• Evaluation question 13 • SREDA work plans • PIRs • Monitoring tools • GEF Core Indicators and Tracking Tools • MTR • PMU staff • UNDP staff • SREDA staff • Power Division staff • BSREA staff • REB staff • RE companies and foundations • Consultants • Other donors	• Document review • Interviews
74. Are GoB agencies effectively providing reliable RE information for improved decision-making and investment planning?	• Achievement of end-of-project outcome 2 targets • Extent to which GoB entities and RE investors report an improved capacity to determine tariff structure and can identify SREPGen's/MoPEMR's contribution	• Evaluation question 13 • PIRs • Monitoring tools • GEF Core Indicators and Tracking Tools • MTR • PMU staff • UNDP staff • SREDA staff • Power Division staff • BSREA staff • REB staff • RE companies and foundations • Consultants • Other donors	• Document review • Interviews
75. Has poor households' access to RE improved?	• Achievement of end-of-project outcome 3 targets • Change in purchase, operation, maintenance and replacement costs and fee levels from project start to completion – and the contribution of SREPGen to this • Other factors contributing to reduced RE prices (e.g. global market and technology developments)	• Evaluation questions 13 and 24 • National statistical data • PIRs • Monitoring tools • GEF Core Indicators and Tracking Tools • MTR • PMU staff • UNDP staff • SREDA staff • Power Division staff • IDCOL staff	• Document review • Interviews • Field visits

		• REB staff • RE companies and foundations • Consultants • Other donors • Beneficiaries • Field observation	
76. Has the share of RE in Bangladesh's power generation mix increased?	• Achievement of end-of-project outcome 4 targets • Achievement of end-of-project target for indicator B • Other factors contributing to increased RE power generation (e.g. large-scale investments by other donors and the private sector)	• Evaluation questions 13 and 14 • National RE and climate change policies and strategies • National statistical data • PIRs • Monitoring tools • GEF Core Indicators and Tracking Tools • MTR • SREDA staff • Power Division staff	• Document review • Interviews
77. Has the projected growth in CO_2 emissions reduced?	• Achievement of end-of-project target for indicator A • Level of replacement of the use of carbon-based energy sources (e.g. generators, firewood, kerosene lamps) in sub-project locations • Change in projected growth in national CO_2 emissions from project start to project completion • Other factors contributing to replacement of carbon-based energy generation (e.g. large-scale investments by other donors, market availability)	• Evaluation question 14 • National RE and climate change policies and strategies • National statistical data • PIRs • Monitoring tools • GEF Core Indicators and Tracking Tools • MTR • PMU staff • UNDP staff • SREDA staff • Power Division staff	• Document review • Interviews
78. Have households benefitting from SREPGen sub-projects experienced livelihoods improvements as a result of RE access?	• Evidence that the RE electricity access enabled sub-project beneficiaries to engage in new economic activities • Evidence of electricity access made it easier for children to do school homework • Evidence that electrification improved outdoor lighting and created a sense of improved security	• Evaluation questions 28 and 29 • PIRs • Monitoring tools • GEF Core Indicators and Tracking Tools • MTR • Beneficiaries	• Document review • Interviews • Field visits

Annex 6: Questionnaire used for field visits

Project activities:

1. What did the project provide for your community?

Benefits for community:

2. What is the difference between your access to power before the project and now?
3. To what extent are your power needs covered?
4. How many people in the community benefitted?
5. What kind of people benefitted (e.g. women, ultra-poor, people with disabilities, elderly, children)
6. What purposes do you use the power for (men, women, children, ultrapoor, people with disabilities)?
7. What kinds of benefits did you get (e.g. new income, ability to do more homework, safety, other)?

Community participation

8. How were you involved in the planning and implementation of the project activities?
9. What did you do to ensure that women and vulnerable people participated in the planning and decision-making)?
10. Has anything changed in relation to the involvement in women and vulnerable people in the decision-making compared to before the project – and if so, what are the changes?
11. What contribution did you make for the project – e.g. money, materials, labour?
12. Did you receive any training from the project – and if so, what were you trained in?

Negative impacts and challenges

13. What were the main problems and barriers the project encountered?
14. Were the problems solved and barriers overcome – and if so, how?
15. Did you have any discussion on the risk of negative impacts on the environment or certain people?
16. What was done to avoid damage to the environments and people that could have been at risk of losses?
17. Have you observed any negative impacts of the project (e.g. displacement of vulnerable people, negative effects on water availability or aquatic life, clearance of natural vegetation, improver disposal of waste such as batteries and defunct equipment) – and if so, what were they?

Affordability and sustainability

18. How much do you pay for the power (fees, maintenance costs, replacement costs)?
19. Can everybody in the community afford this?
20. How do the costs compare with other energy options available on the market?
21. How much of the maintenance can you do yourself?
22. Are there people with the technical skills needed for maintenance in the village- or do you need to hire help form the outside, or ask the Government for help?
23. Has any replication or upscaling taken place in your community?

Other

24. Did the project live up to your expectations?
25. Do you have any other comments or observations you woud like to share?

Annex 7: TE Rating scales

Monitoring and evaluation rating scale	
Rating	**Description**
6 = Highly Satisfactory (HS)	There were no short comings; quality of M&E design/implementation exceeded expectations
5 = Satisfactory (S)	There were minor shortcomings; quality of M&E design/implementation met expectations
4 = Moderately Satisfactory (MS)	There were moderate shortcomings; quality of M&E design/implementation more or less met expectations There were significant shortcomings; quality of M&E design/implementation was somewhat lower than expected
3 = Moderately Unsatisfactory (MU)	There were no short comings; quality of M&E design/implementation exceeded expectations
2 = Unsatisfactory (U)	There were major shortcomings; quality of M&E design/implementation was substantially lower than expected
1 = Highly Unsatisfactory (HU)	There were severe shortcomings in M&E design/implementation
Unable to Assess (UA)	The available information does not allow an assessment of the quality of M&E design/implementation

Implementation/oversight and execution rating scale	
Rating	**Description**
6 = Highly Satisfactory (HS)	There were no shortcomings; quality of implementation/execution exceeded expectations
5 = Satisfactory (S)	There were no or minor shortcomings; quality of implementation/execution met expectations
4 = Moderately Satisfactory (MS)	There were some shortcomings; quality of implementation/execution more or less met expectations
3 = Moderately Unsatisfactory (MU)	There were significant shortcomings; quality of implementation/execution was somewhat lower than expected
2 = Unsatisfactory (U)	There were major shortcomings; quality of implementation/execution was substantially lower than expected
1 = Highly Unsatisfactory (HU)	There were severe shortcomings in quality of implementation/execution
Unable to Assess (UA)	The available information does not allow an assessment of the quality of implementation and execution

Project outcome rating scale	
Rating	**Description**
6 = Highly Satisfactory (HS)	Level of outcomes achieved clearly exceeds expectations and/or there were no shortcomings
5 = Satisfactory (S)	Level of outcomes achieved was as expected and/or there were no or minor shortcomings
4 = Moderately Satisfactory (MS)	Level of outcomes achieved more or less as expected and/or there were moderate shortcomings.
3 = Moderately Unsatisfactory (MU)	Level of outcomes achieved somewhat lower than expected and/or there were significant shortcomings

2 = Unsatisfactory (U)	Level of outcomes achieved substantially lower than expected and/or there were major shortcomings.
1 = Highly Unsatisfactory (HU)	Only a negligible level of outcomes achieved and/or there were severe shortcomings
Unable to Assess (UA)	The available information does not allow an assessment of the level of outcome achievements

Sustainability rating scale	
Rating	**Description**
4 = Likely (L)	There are little or no risks to sustainability
3 = Moderately Likely (ML)	There are moderate risks to sustainability
2 = Moderately Unlikely (MU)	There are significant risks to sustainability
1 = Unlikely (U)	There are severe risks to sustainability
Unable to Assess (UA)	Unable to assess the expected incidence and magnitude of risks to sustainability

Annex 8: Signed Evaluation Consultant Agreement form

Evaluators/Consultants:

1. Must present information that is complete and fair in its assessment of strengths and weaknesses so that decisions or actions taken are well founded.
2. Must disclose the full set of evaluation findings along with information on their limitations and have this accessible to all affected by the evaluation with expressed legal rights to receive results.
3. Should protect the anonymity and confidentiality of individual informants. They should provide maximum notice, minimize demands on time, and respect people's right not to engage. Evaluators must respect people's right to provide information in confidence, and must ensure that sensitive information cannot be traced to its source. Evaluators are not expected to evaluate individuals, and must balance an evaluation of management functions with this general principle.
4. Sometimes uncover evidence of wrongdoing while conducting evaluations. Such cases must be reported discreetly to the appropriate investigative body. Evaluators should consult with other relevant oversight entities when there is any doubt about if and how issues should be reported.
5. Should be sensitive to beliefs, manners and customs and act with integrity and honesty in their relations with all stakeholders. In line with the UN Universal Declaration of Human Rights, evaluators must be sensitive to and address issues of discrimination and gender equality. They should avoid offending the dignity and self-respect of those persons with whom they come in contact in the course of the evaluation. Knowing that evaluation might negatively affect the interests of some stakeholders, evaluators should conduct the evaluation and communicate its purpose and results in a way that clearly respects the stakeholders' dignity and self-worth.
6. Are responsible for their performance and their product(s). They are responsible for the clear, accurate and fair written and/or oral presentation of study imitations, findings and recommendations.
7. Should reflect sound accounting procedures and be prudent in using the resources of the evaluation.
8. Must ensure that independence of judgement is maintained, and that evaluation findings and recommendations are independently presented.
9. Must confirm that they have not been involved in designing, executing or advising on the project being evaluated and did not carry out the project's Mid-Term Review.

Evaluation Consultant Agreement Form

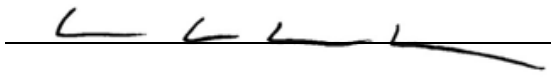
Agreement to abide by the Code of Conduct for Evaluation in the UN System:

Name of Evaluator: Kris Borring Prasada Rao

Name of Consultancy Organization (where relevant):

I confirm that I have received and understood and will abide by the United Nations Code of Conduct for Evaluation.

Signed at Frederiksberg, Denmark on 19 November 2020

Signature: 

Evaluators/Consultants:

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8. Must ensure that independence of judgement is maintained, and that evaluation findings and recommendations are independently presented.
9. Must confirm that they have not been involved in designing, executing or advising on the project being evaluated and did not carry out the project's Mid-Term Review.

Evaluation Consultant Agreement Form

Agreement to abide by the Code of Conduct for Evaluation in the UN System:

Name of Evaluator: Siddique Zobair

Name of Consultancy Organization (where relevant):

I confirm that I have received and understood and will abide by the United Nations Code of Conduct for Evaluation.

Signed at Dhaka, Bangladesh on 19 November 2020

Signature: 

Annex 9: Signed UNEG Code of Conduct form

United Nations Evaluation Group Code of Conduct for Evaluation in the UN System

Evaluation Consultants Agreement Form

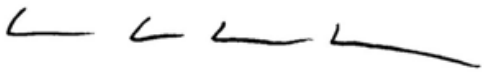
Agreement to abide by the Code of Conduct for Evaluation in the UN System

Name of Consultant: Kris B. Prasada Rao

Name of Consultancy Organisation:

I confirm that I have received and understood and will abide by the United Nations Code of Conduct for Evaluation.

Signed at Frederiksberg on 19 November 2020

Signature: 

United Nations Evaluation Group Code of Conduct for Evaluation in the UN System

Evaluation Consultants Agreement Form

Agreement to abide by the Code of Conduct for Evaluation in the UN System

Name of Consultant: Siddique Zobair

Name of Consultancy Organisation:

I confirm that I have received and understood and will abide by the United Nations Code of Conduct for Evaluation.

Annex 10: Signed TE Report clearance form

Evaluation Report Reviewed and Cleared

UNDP Country Office

Name: Van Nguyen, Deputy Resident Representative, UNDP Bangla-

Signature: _____

Date: 16-Mar-2021

UNDP-GEF Regional Technical Ad-

Name: John O Brien, Regional Technical Advisor,

Signature: _____ Date: 15th March 2021

Annex 11: Annexed in a separate file: TE audit trail

Annex 12: Annexed in a separate file: relevant terminal GEF tracking tool

Annex 13: Tools

FIELD VISIT GUIDE

Field observations/site inspections

- Verification of:
  - the installation being in place
  - its adherence to the planned specifications and capacity
  - its functionality, condition and maintenance status
  - its quality
  - Its actual use by beneficiaries:
    - in households
    - for income-generating activities by women and vulnerable people
    - for streetlights
    - for other purposes
- Assessment of:
  - ease and affordability of maintenance – and availability of spare parts
  - appropriateness vis-à-vis beneficiary demands and numbers
  - appropriateness of its location:
    - from the point of view of women, elderly, people with disabilities
    - from an environment perspective – e.g. risk of pollution, negative effect on hydrology, impacts on wild animals and natural vegetation
    - from a climate change/weather and safety perspective
- Take pictures

Beneficiary interviews/group discussions

<u>Methodology:</u>

- Make sure that women and vulnerable people are heard:
  - make sure many different people answer in group discussions (not only the dominant and bold people)
  - talk to women separately
  - talk to vulnerable people separately
- Take pictures