100 MW SOLAR PV PROJECT BY ERBL, BANGLADESH

Document Prepared by First Climate (India) Pvt. Ltd.

Project Title	100 MW Solar PV project by ERBL, Bangladesh
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1 PROJECT DETAILS

1.1 Summary Description of the Project

Power and energy are vital factors that determine the growth path of a developing country like Bangladesh where electricity is the major source of power for the country's most economic activities. Energon Renewables (BD) Limited (ERBL) is a special purpose vehicle (SPV) formed by Orion Group is implementing a 100MW solar PV plant near Moidhara village of Bagerhat district in the Khulna division of Bangladesh to support the country's growing energy requirements. The project site is located around the co-ordinates 22°34'12.26"N, 89°34'2.78"E.

With 95% of Bangladesh's power generation stemming from gas, diesel and coal, this 100MW plant, which is the equivalent to power produced by over 90,000 tons of coal a year, marks a step-change in generating energy from renewable sources and is acting as a blueprint to help to define a road map for a further 1,000MW worth of solar power project developments across the country.

The proposed project is a greenfield project activity. The project will achieve the greenhouse gas (GHG) emission reductions through the displacement of grid electricity which is mainly fossil-fuel dominated, by electricity generated through solar power which is a renewable source. In absence of this project activity equivalent amount of electricity would have been delivered to the grid by existing fossil fuel-based power plants or by addition of more fossil fuel based power plants. The baseline scenario of the proposed project is the same as the scenario prior to the start of the implementation of the project activity.

The estimated annual average net electricity supplied to the grid is 179,998 MWh and corresponding estimated average emission reduction is 106,019 tCO2e annually.

The proposed project makes contribution to the local sustainable development as follows:

- The project will help reduce the greenhouse gas GHG emissions and the emission of SOx, NOx, by replacing the electricity generation from the fossil-fuel fired power plants of the grid.
- The conducting of the proposed project will create employment opportunities during the construction phase and operational period.

1.2 Sectoral Scope and Project Type

The project activity falls under the following Sectoral scope and Project Type:

Sectoral Scope: 1 - Energy industries (renewable / non-renewable sources)

Project Type: Renewable energy project

The project is not a grouped project.

1.3 Project Eligibility

In line with the Section 2.1.1 of VCS Standard V4.3, the project eligibility is assessed below:

- It results in CO_2 emission reductions, one of the six Kyoto Protocol greenhouse gases.
- It consists in grid-connected electricity generation using (large scale) solar power plant in Bangladesh, which is one of the Least Developed Countries (LDC) as per United Nations list of LDC[1].

Thus, the proposed project is eligible under the scope of the VCS program.

1.4 Project Design

The project has been designed to be a single installation of an activity, not a grouped project.

Eligibility Criteria

The project activity is not a grouped project, hence this is not applicable.

1.5 Project Proponent

Organization name	Energon Renewables (BD) Ltd.
Contact person	Mehedi Islam Aneek
Title	Assistant Vice President
Address	153-154 Tejgaon Industrial Area, Dhaka-1208, Bangladesh
Telephone	+8801714082308, +8801552402427
Email	mehedi.opesl@orion-group.net

1.6 Other Entities Involved in the Project

First Climate (India) Pvt. Ltd. is the consultant and project representative for this project activity.

Organization name	First Climate (India) Pvt. Ltd.
Role in the project	Project Representative
Contact person	Partha Pratim Chaudhuri

[1] https://unctad.org/topic/least-developed-countries/list

Title	Managing Director
Address	Unit 903, ERGO Tower, Plot No. A1/4, Block EP & GP, Sector V, Salt Lake, Kolkata- 700 091
Telephone	+91-98310 12824
Email	partha.chaudhuri@firstclimate.co.in

1.7 Ownership

ERBL is the legal owner of this project activity. The commissioning certificate for project activity demonstrates the project ownership. This demonstrates the right of use according to clause 3.7.1 of VCS Standard (v4.4) – "project ownership arising by virtue of a statutory, property or contractual / right in the plant, equipment or process that generates GHG emission reductions and/or removals". Also, other legal compliance may be considered such as Environmental and Social Impact Assessment.

1.8 Project Start Date

As per the para 3.8 of VCS Standard (v 4.4), "The project start date of a non-AFOLU project is the date on which the project began generating GHG emission reductions or removals." The operational start date of the project is 29/12/2021.

1.9 Project Crediting Period

Start date of crediting period: 29/12/2021

End date of crediting period: 28/12/2028

First Crediting period duration: 7 years

The project activity adopts renewable crediting period of 7 years which can be renewed for maximum 2 times.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Project Scale	
Large project	

Year	Estimated GHG emission reductions or removals (tCO_2e)
Year 1	109,141
Year 2	106958
Year 3	106370
Year 4	105785
Year 5	105203
Year 6	104625
Year 7	104049
Total estimated ERs	**742,132**
Total number of crediting years	**07**
Average annual ERs	**106,019**

1.11 Description of the Project Activity

The project is grid connected PV system of total capacity 100 MW (AC). Solar radiations incident on the solar panels receives the radiation and converts it into electricity (DC). The DC power produced by PV modules is fed into grid connected inverter. In the grid connected inverter, DC current is converted into AC current, flowing through 33kV transformer. Power generated from the project will be evacuated to Mongla PGCB grid sub-station. The solar PV plant has the PV modules, Central Inverters, Transformers and other relay and protection system. The output of the plant will be limited to 100 MW (AC) through the monitoring system, generated power will be evacuated to nearby grid, finally to Bangladesh Power Development Board.

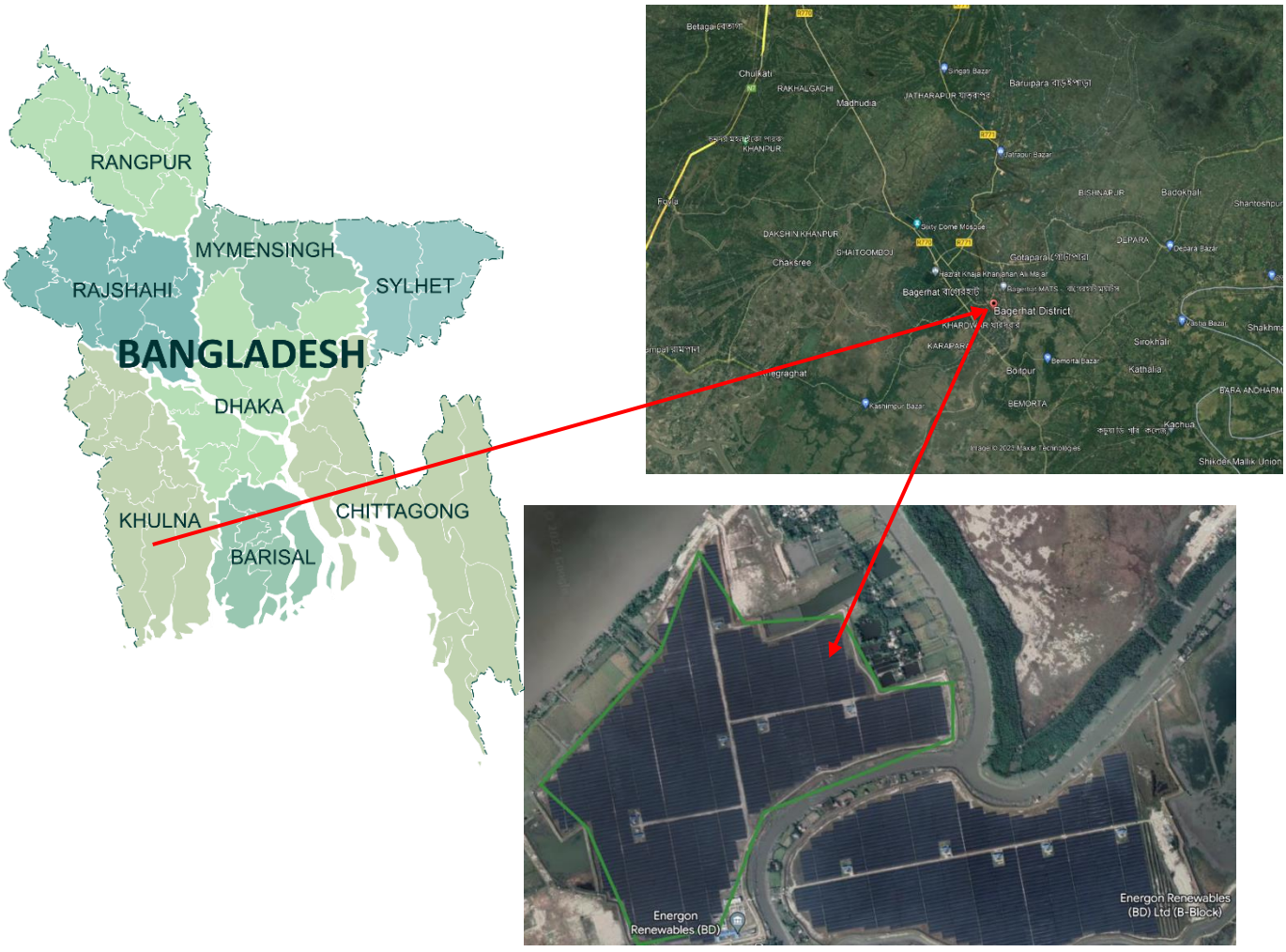
Technical specification of the components:

Equipment	Parameter	Unit	Technology Standards		
Solar PV module	Make		V1-1.34 E-W Longi_535/540/545		
	Peak Power	Wp	535	540	545
	Mounting Type		Fixed		
	No. of PV modules		248528		
	Make & Model		Sungrow SG3125HV-30		
Inverter	Rated capacity	kW	3125		
	Power factor		0.980		

The operational lifetime of major project equipment is estimated to be 25 years.

1.12 Project Location

Physical Address	Moidhara and Bora Durgapur Village sub-district under Mongla & Rampal Upazila, Bagerhat District in Khulna Division
Latitude	22° 34' 12.26" N
Longitude	89° 34' 2.78" E
Roadway Connectivity	Project site is 2 km away from Khulna-Mongla highway
Nearest Railway Station	-
Nearest Airport	The nearest airport is the Jessore Domestic Airport which is approximately 100 kms from Mongla sub-district. The international airport at Dhaka is approximately 135 kms (aerial distance) away from Jessore.



1.13 Conditions Prior to Project Initiation

In absence of the project activity, electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid connected power plants and by the addition of new generation sources which would have been mostly fossil fuel based. The project activity is the installation of a new grid-connected photovoltaic power project, and the generated power will be exported to the Bangladesh Power Development Board. This is a green field project activity. There was no activity at the site of the project participant prior to the implementation of this project activity. Hence pre-project scenario and baseline scenario are the same.

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project has obtained necessary approvals for development and commissioning in the name of the project owners and is in compliance to the local laws and regulations. The project has also received Environmental and Social Impact Assessment (ESIA) by Bangladesh Centre for Advanced Studies. There is no legal requirement on the choice of a particular technology or fuel for power generation. Implementation of Solar Power projects is therefore a voluntary activity and is not mandated by any legal mandates in Bangladesh.

1.15 Participation under Other GHG Programs

1.15.1 Projects Registered (or seeking registration) under Other GHG Program(s)

The project activity is green field project activity. Project activity neither registered nor seeking registration in any other voluntary or compliance GHG program nor the project activity is delisted component of any group project or POA or rejected by any other GHG program.

1.15.2 Projects Rejected by Other GHG Programs

The project has not been rejected by any other GHG program.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

Net GHG emission reductions or removals generated by the Project will not be used for compliance with an emissions trading program or to meet binding limits on GHG emissions in any emission trading program or other binding limits.

1.16.2 Other Forms of Environmental Credit

The Project has no intent to generate any other form of GHG-related environmental credit for GHG emission reductions or removals claimed under the VCS Program. The initial project activity

instances are neither has nor intends to generate any other form of GHG related environmental credit for GHG emission reductions or removals claimed under the VCS Program.

Supply Chain (Scope 3) Emissions

This is a solar power project which generates electricity using solar energy and exports it to the Bangladesh Power Development Board (BPDB). So, this is not applicable for this project activity.

1.17 Sustainable Development Contributions

The project activity is 100 MW grid connected solar power project in Bangladesh. The electricity generated by the project activity is clean and renewable based electricity which is supplied to Bangladesh Power Development Board. Installation of the project activity will enhance the current renewable energy share in the national grid as well as contribute towards reducing greenhouse gas emissions which would have otherwise been emitted due to generation of electricity by fossil fuel based power plants.

Sustainable Development indicators are as follows:

Goal 7-" Ensure access to affordable, reliable, sustainable, and modern energy for all"

The project activity has an installed capacity 100 MW of renewable energy generated by solar power and will feed the clean energy to Bangladesh Power Development Board. The project will increase the share of renewable energy in the Bangladesh grid mix.

Goal 8- "Promote sustained, inclusive, and sustainable economic growth, full and productive employment and decent work for all"

The project activity creates new employment in both the phases, construction phase and operational phase, which positively contributes to the sustainable economic growth of the locality.

Goal 13- "Take urgent action to combat climate change and its impacts"

The solar power plant contributes directly to achieving this SDG target, because the project activity delivers renewable energy, which would otherwise be generated by fossil fuel dominated grid power plants. Thereby, the project activity helps mitigate climate change caused by GHG emissions in the baseline scenario.

1.18 Additional Information Relevant to the Project

Leakage Management

Leakage management is not applicable for this project activity.

Commercially Sensitive Information

No commercially sensitive information has been excluded from the public version of this project description.

Further Information

No further information is applicable.

2 SAFEGUARDS

2.1 No Net Harm

Parameters	Impact	Mitigation
Air	There are no emissions from an operating solar power plant, however during the construction phase, fugitive dust emissions may temporarily increase in the immediate vicinity of construction site due to soil excavation and vehicular movement.	Such impacts will be confined to the construction site. These will be minimized by sprinkling water and proper maintenance of vehicles.
Water	• Sourcing of water during construction and operation phases and its impact on competing users and hydrology of the area. • Generation of sewage during construction and operation phases.	During the construction stage, water requirement for construction and human consumption shall be made separately. During construction stage, temporary toilets will be provided. The sewage disposal from these temporary toilets shall be appropriately handled considering the proximity of the site to the Pashur River and the likelihood of a low water table to prevent possible contamination of the ground water. An option of constructing a sewage treatment plant to disinfected

		and used for cleaning of modules shall be explored to mitigate the possibility of pollution. There is no process water requirement for PV Solar Power Plants. However, water is required for cleaning the solar panels to maintain the efficiency of power generation. It is proposed to clean the panels twice in a month. No wastewater is generated from cleaning of panels, as the spent water replenishes the ground water table.
Land & Ecology	• Change in land use. • Change in ecology.	The project envisages contributing positively to the ecology of the area by developing green belt. The green belt will be developed by planting of multiple species, mainly shall be selected from the local species of the area. As the plant has been conceptualised as a solar-agricultural project, this would minimise the disruption to the local farmers by allowing them to adhere to their agricultural practices thereby utilising the land more effectively.
Socio-economic Environment	There may be the following impacts: • Land alienation • Loss of some common property resources	Commissioning of the solar power plant will improve the power supply position in the region, which is vital for economic growth as well as improving the quality of life.

	• Improvement in employment opportunities • Improvement in socio-economic condition due to CSR Program and development of rural infrastructure	Implementation of the project shall enhance economic growth of the area in general. Cost of land and other properties in the area will increase. The proposed project is expected to contribute towards improvement in quality of life of local people and it shall generate inputs for industrial / economic development in the region. Following measures are proposed for minimizing the adverse impacts on socio-economic condition and enhancing human interest values: • Communication with the local community to be institutionalized on regular basis by the project authorities to provide opportunity for mutual discussion. • Social welfare activities will be undertaken by the project authorities in collaboration with local administration for better co-ordination and timely implementation. • Provision of Ambulance with Doctor and First Aid facilities, • Contract workers and staff shall be provided with

		Personal Protective Equipment (PPE) and safety gadgets. • Regular awareness programmes shall be conducted to create and sustain a safe working culture. • Rest rooms, canteen and drinking water near the workplace shall be provided for contract workers as well as transporters etc. Hygienic working conditions shall be maintained at the workplace.
Hazardous Waste	PV Solar Plants modules are themselves not hazardous. The only hazardous waste anticipated from the project is used transformer oil.	The transformers require oil replacement after a working cycle of 15 years. The used transformer oil will be supplied to authorized vendors.

2.2 Local Stakeholder Consultation

The project owner organized the stakeholder consultation from 10 April 2022 to 25 April 2022. Focused Group Discussion (FGDs) and key Informant Interviews (KIIs) were carried out in the project influence area to seek opinion and suggestion of the stakeholders.

The team consulted with a diverse range of stakeholders associated with the project. These included governmental agencies and departments, local administration, NGO, as well as the community.

Stakeholder consultation for different groups were conducted on different dates and locations.

Group	Date	Location
Business Group	13.4.2022	House Yard of Sabuj Shekh, Chakgona, Rajnagar Union, Rampal, Bagerhut

Women Group	14.4.2022	House Premises of Renuka Das, Moidhara, Rajnagar Union, Rampal, Bagerhut
Civil Society	15.4.2022	House of AbuBakar, Kaliker Ber, Rajnagar Union, Rampal, Bagerhut
Fishermen Group	16.4.2022	Project Gate, Rajnagar Union, Rampal, Bagerhut

In general, there were no negative notions about the project in the area. However, there were certain queries about the opportunity they will get in the future in the project. The consultants and technical management of ERBL explained the mitigation measures that are being taken to mitigate the issues raised.

2.3 Environmental Impact

No negative environmental impact has been identified from the project activity based on the Environmental and Social Impact Assessment undertaken by the project proponent.

2.4 Public Comments

To be provided during validation.

2.5 AFOLU-Specific Safeguards

This is not an AFOLU project. Hence, this section is not applicable for this project activity.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Title of the approved baseline and monitoring methodology is as follows:

Reference: ACM0002

Title: Grid-connected electricity generation from renewable sources

Version Number: 21.0

Scale: Large Scale

Sectoral Scope: 1

In addition to these methodologies, the following tools shall be applied as applicable:

- Tool 01: Tool for the demonstration and assessment of additionality. Version – 07.0
- Tool 07: Tool to calculate the emission factor for an electricity system. Version – 07.0
- Tool 24: Common practice. Version – 03.1
- Tool 27: Investment analysis. Version – 12.0.

3.2 Applicability of Methodology

The applicability of the methodology ACM0002 Version 21.0 is given below:

Sl. No.	Condition in project category	Applicability
1	"This methodology is applicable to grid-connected renewable energy power generation project activities that: (a) Install a Greenfield power plant; (b) Involve a capacity addition to (an) existing plant(s); (c) Involve a retrofit of (an) existing operating plant(s)/unit(s); (d) Involve a rehabilitation of (an) existing plant(s)/unit(s); or (e) Involve a replacement of (an) existing plant(s)/unit(s)."	Applicable. The project activity is a greenfield grid-connected renewable energy power project.
2	"In case the project activity involves the integration of a BESS, the methodology is applicable to grid-connected renewable energy power generation project activities that: (a) Integrate BESS with a Greenfield power plant; (b) Integrate a BESS together with implementing a capacity addition to (an) existing solar photovoltaic or wind power plant(s)/unit(s);	Not Applicable. The project activity does not involve the integration of BESS. Hence this condition is not applicable.

	(c) Integrate a BESS to (an) existing solar photovoltaic or wind power plant(s)/unit(s) without implementing any other changes to the existing plant(s); (d) Integrate a BESS together with implementing a retrofit of (an) existing solar photovoltaic or wind power plant(s)/unit(s).	
3	"The methodology is applicable under the following conditions: (a) Hydro power plant/unit with or without reservoir, wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit; (b) In the case of capacity additions, retrofits, rehabilitations or replacements (except for wind, solar, wave or tidal power capacity addition projects) the existing plant/unit started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion, retrofit, or rehabilitation of the plant/unit has been undertaken between the start of this minimum historical reference period and the implementation of the project activity; (c) In case of Greenfield project activities applicable under paragraph 5 (a) above, the project participants shall demonstrate that the BESS was an integral part of the design of the renewable energy project activity (e.g. by referring to feasibility studies or investment decision documents); (d) The BESS should be charged with electricity generated from the associated renewable energy power plant(s). Only during	Applicable. The project activity is greenfield solar power plant and does not involve the integration of BESS. Hence this condition is applicable under criterion (a).

	exigencies may the BESS be charged with electricity from the grid or a fossil fuel electricity generator. In such cases, the corresponding GHG emissions shall be accounted for as project emissions following the requirements under section 5.4.4 below. The charging using the grid or using fossil fuel electricity generator should not amount to more than 2 per cent of the electricity generated by the project renewable energy plant during a monitoring period. During the time periods (e.g. week(s), months(s)) when the BESS consumes more than 2 per cent of the electricity for charging, the project participant shall not be entitled to issuance of the certified emission reductions for the concerned periods of the monitoring period."	
4	"In case of hydro power plants, one of the following conditions shall apply: (a) The project activity is implemented in existing single or multiple reservoirs, with no change in the volume of any of the reservoirs; or (b) The project activity is implemented in existing single or multiple reservoirs, where the volume of the reservoir(s) is increased and the power density, calculated using equation (7), is greater than 4 W/m^2 ; or (c) The project activity results in new single or multiple reservoirs and the power density, calculated using equation (7), is greater than 4 W/m^2 ; or (d) The project activity is an integrated hydro power project involving multiple reservoirs, where the power density for any of the reservoirs, calculated using equation (7), is lower than or equal to 4 W/m2 , all of the following conditions shall apply:	Not Applicable. The project is not a hydro power plant. Hence, the condition is not considered.

	i. The power density calculated using the total installed capacity of the integrated project, as per equation (8), is greater than 4 W/m^2 ; ii. Water flow between reservoirs is not used by any other hydropower unit which is not a part of the project activity; iii. Installed capacity of the power plant(s) with power density lower than or equal to 4 W/m^2 shall be: a) Lower than or equal to 15 MW; and b) Less than 10 per cent of the total installed capacity of integrated hydro power project."	
5	"In the case of integrated hydro power projects, project participants shall: (a) Demonstrate that water flow from upstream power plants/units spill directly to the downstream reservoir and that collectively constitute to the generation capacity of the integrated hydro power project; or (b) Provide an analysis of the water balance covering the water fed to power units, with all possible combinations of reservoirs and without the construction of reservoirs. The purpose of water balance is to demonstrate the requirement of specific combination of reservoirs constructed under CDM project activity for the optimization of power output. This demonstration has to be carried out in the specific scenario of water availability in different seasons to optimize the water flow at the inlet of power units. Therefore, this	Not Applicable. The project is not a hydro power plant. Hence the condition is not considered.

	water balance will take into account seasonal flows from river, tributaries (if any), and rainfall for minimum of five years prior to the implementation of the CDM project activity."	
6	The methodology is not applicable to: (a) Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; (b) Biomass fired power plants/units.	Applicable The project activity does not involve switching from fossil fuels to renewable energy at the site of the project activity and the project activity is not a biomass fired power plant.
7	"In the case of retrofits, rehabilitations, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is "the continuation of the current situation, that is to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance".	Not Applicable The project is greenfield solar power project.

The applicability of Tool 01 is as follows:

Sl. No	Condition as per Tool 01	Applicability
1	"The use of the "Tool for the demonstration and assessment of additionality" is not mandatory for project participants when proposing new methodologies. Project participants may propose alternative methods to demonstrate additionality for consideration by the Executive Board. They may also submit revisions to approved methodologies using the additionality tool."	Applicable. The methodology selected for the project activity requires the use of this tool.

2	"Once the additionally tool is included in an approved methodology, its application by project participants using this methodology is mandatory."	Applicable. The methodology selected for the project activity requires the use of this tool.

The applicability of Tool 07 is as follows:

Sl. No	Condition as per Tool 07	Applicability
1	"This tool may be applied to estimate the OM, BM and/or CM when calculating baseline emissions for a project activity that substitutes grid electricity that is where a project activity supplies electricity to a grid or a project activity that results in savings of electricity that would have been provided by the grid (e.g. demand-side energy efficiency projects)."	Applicable. The project activity is grid connected solar power project and supplies electricity to the grid.
2	"Under this tool, the emission factor for the project electricity system can be calculated either for grid power plants only or, as an option, can include off-grid power plants. In the latter case, two sub-options under the step 2 of the tool are available to the project participants, i.e. option IIa and option IIb. If option IIa is chosen, the conditions specified in "Appendix 1: Procedures related to off-grid power generation" should be met. Namely, the total capacity of off-grid power plants (in MW) should be at least 10 per cent of the total capacity of grid power plants in the electricity system; or the total electricity generation by off-grid power plants (in MWh) should be at least 10 per cent of the total electricity generation by grid power plants in the electricity system; and that factors which negatively affect the reliability and stability of the grid are primarily due to constraints in generation and not to other aspects such as transmission capacity."	Applicable. As the project is grid connected, the emission factor for the project electricity is calculated for grid power plants only.

3	"In case of CDM projects the tool is not applicable if the project electricity system is located partially or totally in an Annex I country."	The project electricity system is located in Non-Annex I country.

The applicability of Tool 24 is as follows:

Sl. No.	Condition as per Tool 24	Applicability
1	"This methodological tool is applicable to project activities that apply the methodological tool "Tool for the demonstration and assessment of additionality", the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality", or baseline and monitoring methodologies that use the common practice test for the demonstration of additionality."	Applicable. The project activity applies the methodological tool "Tool for the demonstration and assessment of additionality". Hence this condition is applicable.
2	"In case the applied approved baseline and monitoring methodology defines approaches for the conduction of the common practice test that are different from those described in this methodological tool, the requirements contained in the methodology shall prevail."	Applicable. The methodology ACM0002 (version 21.0) used in this project activity requires the use of the "tool for common practice".

The applicability of Tool 27 is as follows:

Sl. No.	Condition as per Tool 27	Applicability
1	"This methodological tool is applicable to project activities that apply the methodological tool "Tool for the demonstration and assessment of additionality", the methodological tool "Combined tool to identify the baseline scenario and demonstrate additionality", the guidelines "Non-binding best practice examples to demonstrate additionality for	Applicable. The project activity applies the methodological tool "Tool for the demonstration and assessment of additionality".

	SSC project activities", or baseline and monitoring methodologies that use the investment analysis for the demonstration of additionality and/or the identification of the baseline scenario."	Hence this condition is applicable.
2	"In case the applied approved baseline and monitoring methodology contains requirements for the investment analysis that are different from those described in this methodological tool, the requirements contained in the methodology shall prevail."	Applicable. The methodology ACM0002 (version 21.0) used in this project activity requires the use of the "tool for common practice".

3.3 Project Boundary

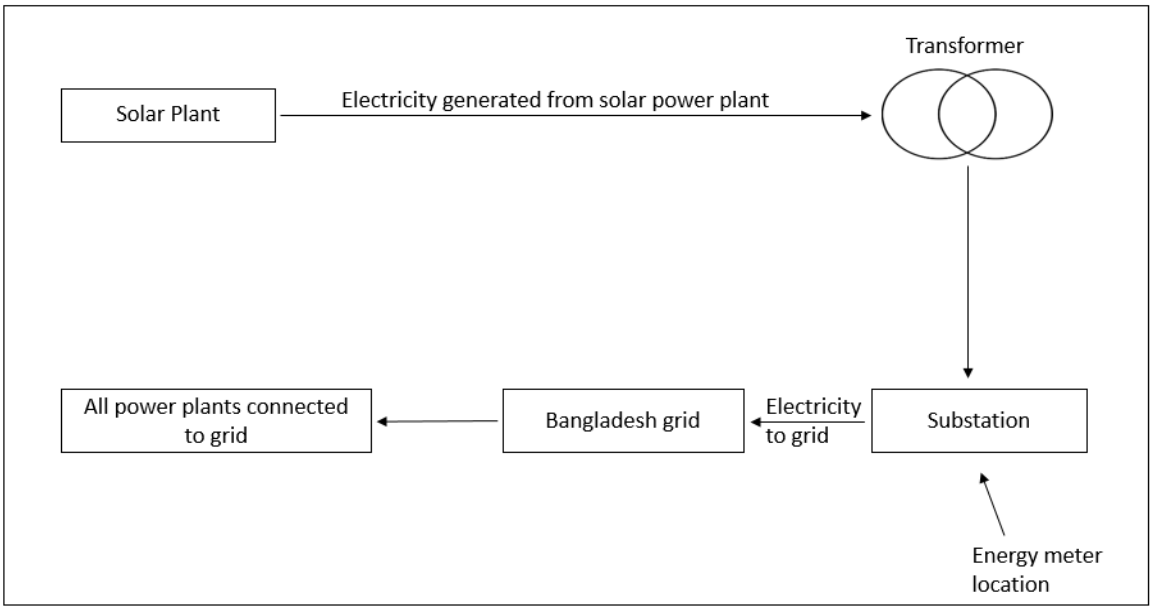
The project boundary includes the project site where the power plant has been installed, associated power evacuation infrastructure, energy metering points, switch yards and other civil constructions and the connected grid (Bangladesh Power Development Board).

In absence of the project activity, CO_2 emissions would have been released in the atmosphere from the operation of grid connected fossil fuel-based power plant.

The table below provides an overview of the emissions sources included or excluded from the project boundary for determination of baseline and project emissions.

Source		Gas	Included?	Justification/Explanation
Baseline	CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity	CO_2	Yes	Main emission source
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
		Other	No	No other emission source
Project	Solar PV Power Project Activity	CO_2	No	Project activity does not emit CO_2
		CH_4	No	Project activity does not emit CH_4
		N_2O	No	Project activity does not emit N_2O
		Other	No	No other emission source

Following diagram shows the project boundary:



3.4 Baseline Scenario

As per the approved consolidated methodology ACM0002 (version 21.0) para 24, "If the project activity is the installation of a Greenfield power plant with or without a BESS the baseline scenario is electricity delivered to the grid by the project activity that would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in TOOL07.

The project activity involves erecting solar panels to harness the power of solar energy to produce electricity that is supplied to the grid. In the absence of the project activity, the equivalent amount of power would have been supplied by the Bangladesh grid, which is fed mainly by fossil fuel fired plants.

3.5 Additionality

In accordance with the methodology ACM0002 (Version 21.0), the additionality of the project activity is demonstrated and assessed using the latest version of the "Tool for the demonstration and assessment of additionality" (version 7.0). The tool provides a step-wise approach to demonstrate and assess the additionality of a project as below:

a) Step 0 Demonstration whether the proposed project activity is the first-of-its-kind;

b) Step 1 Identification of alternatives to the project activity;

c) Step 2 Investment analysis;

d) Step 3 Barriers analysis; and

e) Step 4 Common practice analysis.

Step 0: Demonstration whether the proposed project activity is the first-of its-kind

The project activity is not first of its kind in Bangladesh. Hence step 0 is not applicable.

Step 1: Identification of alternatives to the project activity consistent with current laws and regulations

Define realistic and credible alternatives to the project activity(s) through the following Sub-steps:

Sub-step 1a: Define alternatives to the project activity

Alternative (a): The proposed project activity not undertaken as VERRA project activity.

The project proponent could proceed with the implementation of the project without Carbon credit benefits. The electricity produced from the renewable energy project would have been sold to the grid. This is in compliance with all applicable legal and regulatory requirements and can be a part of the baseline. However, the Project activity is not feasible without revenues from sale of carbon credits.

Alternative (b): Continuation of the current situation (no project activity or other alternatives undertaken).

This scenario is equivalent to the baseline situation where electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources. Hence, the new capacity add-on from a fossil fuel-based power plant is appropriate, realistic & credible baseline alternative for the project activity.

Outcome of Sub-step 1a: Identified realistic and credible alternative scenario(s) to the project activity

Of the two alternatives outlined above, the first alternative is not possible as project activity is not feasible without carbon credit benefits and second alternative is the baseline scenario for the project activity as per methodology. Therefore, continuation of the current situation is the likely alternative to the project activity.

Sub-step 1b: Consistency with mandatory laws and regulations

The alternative(s) shall be in compliance with all mandatory applicable legal and regulatory requirements, even if these laws and regulations have objectives other than GHG reductions, e.g., to mitigate local air pollution. (This sub-step does not consider national and local policies that do not have legally binding status.)

Both alternatives (a) and (b) are realistic and credible alternatives to the project which are consistent with mandatory laws and regulations.

Outcome of Step 1b: Identified realistic and credible alternative scenario(s) to the project activity that are in compliance with mandatory legislation and regulations taking into account the enforcement in the region or country and EB decisions on national and/or sectoral policies and regulations.

Hence, both the alternatives identified above are found to comply with the mandatory laws and regulations taking into account the enforcement of the legislations in the region/country and EB decisions on national and/or sectoral policies and regulations.

However, Alternative 2 has been selected as the appropriate baseline alternative for this project activity in line with methodology.

Step 2: Investment analysis

Step 4: Common practice analysis

Stepwise approach for common practice analysis has been carried out as per the Methodological tool 24: Common Practice (version 03.1)

Step 1: calculate applicable capacity or output range as +/-50% of the total design capacity or output of the proposed project activity.

The install capacity of the project is 100 MW, thus the range of a capacity of +/-50% can be calculated to be from 50 MW to 150 MW.

Step 2: identify similar projects (both CDM and non-CDM) which fulfil all of the following conditions:

i. The projects are located in the applicable geographical area;

   The project is located in Bangladesh, therefore the projects in geographical area of Bangladesh have been chosen for analysis.

ii. The projects apply the same measure as the proposed project activity;

   The applicable measure is solar power generation, same as the project activity.

iii. The projects use the same energy source/fuel and feedstock as the proposed project activity, if a technology switch measure is implemented by the proposed project activity;

   The energy source is solar based renewable power same as the project activity.

iv. The plants in which the projects are implemented produce goods or services with comparable quality, properties and applications areas (e.g., clinker) as the proposed project plant;

The applicable project generates electricity and does not produce goods or services.

v. The capacity or output of the projects is within the applicable capacity or output range calculated in Step 1;

The applicable capacity or output ranges between 50 MW to 150 MW.

vi. The projects started commercial operation before the project design document (CDM-PDD) is published for global stakeholder consultation or before the start date of proposed project activity, whichever is earlier for the proposed project activity.

The start date of proposed project is 29/12/2021, hence all projects which were commissioned before this date has been considered for analysis.

Only one solar PV project was identified which falls within the above mentioned range and was operational before the project start date.

Project	Capacity (MW)	Ref Link
50 MW (AC) Solar Park at Suitakhali, Gouripur, Mymensingh	50	*https://registry.verra.org/app/projectDetail/VCS/3545*

Step 3: within the projects identified in Step 2, identify those that are neither registered CDM project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number N_{all}.

The 50 MW (AC) Solar Park at Suitakhali, Gouripur, Mymensingh is registered under voluntary carbon mechanism.

Therefore $N_{all} = 0$

Step 4: within similar projects identified in Step 3, identify those that apply technologies that are different to the technology applied in the proposed project activity. Note their number N_{diff}.

According to Tool 24, section 4, Different Technologies are technologies that deliver the same output, but differ by at least one of several criteria. Among these criteria is the dimension of (d) Investment climate on the date of the investment decision, inter alia:

- Access to technology;

- Subsidies or other financial flows;
- Promotional policies;
- Legal regulations.

Therefore, $N_{diff} = 0$

Step 5: calculate factor F=1-Ndiff/Nall representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the proposed project activity that deliver the same output or capacity as the proposed project activity.

F = 1 – 0 / 0 = 1

It can also be determined by, $N_{all} - N_{diff} = 0 - 0 = 0$, which is lower than 3. Therefore, the proposed project activity is not regarded as common practice.

3.6 Methodology Deviations

The proposed project activity does not seek any methodology deviations. Hence, this section is not applicable for this project.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

As per para 47 of methodology ACM0002 (version 21.0) baseline emissions are determined as follows:

$$BE_y = EG_{PJ,y} \times EF_{grid,CM,y}$$

Where:

BE_y = Baseline emissions in year y (tCO_2/yr)

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)

$EF_{grid,CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using TOOL 07 (tCO_2/MWh)

Since the project activity is installation of Greenfield power plant, then

$$EG_{PJ,y} = EG_{facility,y}$$

Where:

$EG_{PJ,y}$ = Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)

As per the "Tool to calculate the emission factor for an electricity system" version 07, combined margin is calculated as below:

Step 1. Identify the relevant electricity system

According to the" Tool to calculate the emission factor for an electricity system (Version 07.0)", project participants may delineate the project electricity system using any of the following options:

Option 1. A delineation of the project electricity system and connected electricity systems published by the DNA or the group of the DNAs of the host country(ies), In case a delineation is provided by a group of DNAs, the same delineation should be used by all the project participants applying the tool in these countries;

Option 2. A delineation of the project electricity system defined by the dispatch area of the dispatch centre responsible for scheduling and dispatching electricity generated by the project activity.

Where the dispatch area is controlled by more than one dispatch centre, i.e. layered dispatch area, the higher-level area shall be used as a delineation of the project electricity system (e.g. where regional dispatch centres are required to comply with dispatch orders of the national dispatch centre then area controlled by the national dispatch centre shall be used);

Option 3. A delineation of the project electricity system defined by more than one independent dispatch areas, e.g. multi-national power pools.

Keeping the options into consideration, Department of Environment (DoE), Ministry of the Environment and Forest (MoEF) of Bangladesh, has considered the national grid of Bangladesh while developing national baseline on power and energy sector. Power Grid Company of Bangladesh is the sole grid operating agency and wheels the entire grid connected power. It is a government owned company operating in Bangladesh and a subsidiary of Bangladesh Power Development Board.

Step 2. Choose whether to include off-grid power plants in the project electricity system (optional)

Project participants may choose between the following two options to calculate the operating margin and build margin emission factor:

Option I: Only grid power plants are included in the calculation.

Option II: Both grid power plants and off-grid power plants are included in the calculation.

The Project Participant has chosen only grid power plants in the calculation.

Step 3. Select a method to determine the operating margin (OM)

The calculation of the operating margin emission factor (EFgrid,OM,y) is based on the following methods:

(a) Simple OM, or

(b) Simple adjusted OM, or

(c) Dispatch Data Analysis OM, or

(d) Average OM.

The data required to calculate Simple adjusted OM and Dispatch data analysis OM is not possible due to lack of availability of data to project developers. The choice of other two options for calculating operating margin emission factor depends on generation of electricity from low -cost/must-run sources. In the context of the methodology low cost/must run resources typically include hydro, geothermal, wind, low -cost biomass, nuclear and solar generation.

In accordance to the tool the simple OM method can only be used if any one of the following requirements is satisfied:

1. Low-cost/must-run resources constitute less than 50 per cent of total grid generation (excluding electricity generated by off -grid power plants) in:

1) average of the five most recent years, and the average of the five most recent years shall be determined by using one of the approaches described under the tools; or

2) based on long-term averages for hydroelectricity production (minimum time frame of 15 years).

2. The average amount of load (MW) supplied by low -cost/must-run resources in a grid in the most recent three year.

	2015-16	2016-17	2017-18	2018-19	2019-20
Total Generation (GWh)	52,193	57,276	62,678	70,534	71,419
Power Generation by Hydro (GWh)	962.20	982.04	1,024.31	724.65	825.19
Power Generation by other renewable energy (GWh)	0.13	0.09	3.79	39.00	62.00

Share of low-cost / must-run, %	1.84	1.71	1.64	1.08	1.24

(Source: Annual Report of Bangladesh Power Development Board)

The above data clearly shows that the percentage of total grid generation by low -cost/ must-run plants (on the basis of average of five most recent years) for the Bangladesh grid is less than 50 % of the total generation. Thus, the Average OM method cannot be applied, as low cost/must run resources constitute less than 50% of total grid generation. The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

For the simple OM, the simple adjusted OM and the average OM, the emissions factor can be calculated using either of the two following data vintages:

i. Ex-ante option: if the ex-ante option is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required.

OR

ii. Ex-post option: if the ex-post option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring.

Project proponent has chosen ex-ante option for calculation of Simple OM emission factor using a 3-year generation-weighted average, based on the most recent data available at the time of submission of the PD to the VVB for project validation. OM determined at project validation stage will be the same throughout the crediting period. There will be no requirement to monitor & recalculate the emission factor during the crediting period.

Step 4: Calculate the operating margin emission factor according to the selected method

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (t CO2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units. The simple OM may be calculated by one of the following two options:

(a) Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit; or

(b) Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system. Option B can only be used if:

i. The necessary data for Option A is not available; and

ii. Only nuclear and renewable power generation are considered as low cost/must -run power sources and the quantity of electricity supplied to the grid by these sources is known; and

iii. Off-grid power plants are not included in the calculation (i.e., if Option I has been chosen in Step 2).

Option A: Calculation based on average efficiency and electricity generation of each plant

Under this option, the simple OM emission factor is calculated based on the net electricity generation of each power unit and an emission factor for each power unit, as follows:

$$EF_{grid,OMsimple,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where:

$EF_{grid,OMsimple,y}$ = Simple operating margin CO_2 emission factor in year y (tCO_2 /MWh)
$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit m in the year y (MWh)
$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2 /MWh)
m = All power units serving the grid in year y except low-cost / must-run power units
y = The relevant year as per data vintage chosen in Step 3

Determination of $EF_{EL,m,y}$

Option A1 - If for a power unit m data on fuel consumption and electricity generation is available, the emission factor ($EF_{EL,m,y}$) should be determined as follows:

$$EF_{EL,m,y} = \frac{\sum_i FC_{i,m,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_{m,y}}$$

Where:

$EF_{EL,m,y}$ = CO_2 emission factor of power unit m in year y (tCO_2 /MWh)
$FC_{i,m,y}$ = Amount of fuel type i consumed by power unit m in year y (Mass or volume unit)
$NCV_{i,y}$ = Net calorific value (energy content) of fuel type i in year y (GJ/mass or volume unit)
$EF_{CO2,i,y}$ = CO_2 emission factor of fuel type i in year y (tCO_2/GJ)
i = All fuel types combusted in power unit m in year y

Electricity imports are treated as one power plant, as per the tool guidance.

Option A2 - If for a power unit m only data on electricity generation and the fuel types used is available, the emission factor should be determined based on the CO_2 emission factor of the fuel type used and the efficiency of the power unit, as follows:

$$EF_{EL,m,y} = \frac{EF_{co2,m,i,y} \times 3.6}{\eta_{m,y}}$$

Where:

$EF_{CO2,m,i,y}$ = Average CO_2 emission factor of fuel type i used in power unit m in year y (t CO_2/GJ)

$\eta_{m,y}$ = Average net energy conversion efficiency of power unit m in year y (ratio)

3.6 = Conversion factor (GJ/MWh)

The Simple OM calculation and the data used for the calculation is provided in the EF excel sheet. The resulting values of this calculation are as follows:

The operating margin emission factor ($EF_{grid,OM,y}$) has been calculated using a 3-year data vintage:

Calculation of the Operating Margin (OM) emission factor of Bangladesh National Grid			
Items	2017-2018	2018-2019	2019-2020
Net electricity delivered to the grid (GWh, include imports)	62,678	70,533	71,419
Annual simple OM (tCO_2/MWh)	0.6228	0.6037	0.5743
$EF_{grid,OM,y}$ (tCO_2/MWh)	**0.5992**		

Step 5: Calculate the build margin (BM) emission factor

As per Methodological tool: "Tool to calculate the emission factor for an electricity system" (Version 07.0, EB 100, Annex 4) para 72: In terms of vintage of data, project participants can choose between one of the following two options:

(a) Option 1 - for the first crediting period, calculate the build margin emission factor ex ante based on the most recent information available on units already built for sample group at the time of PDD submission to the VVB for project validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the VVB. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

(b) Option 2 - For the first crediting period, the build margin emission factor shall be updated annually, ex post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex ante, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

Option 1 as described above is chosen by PP to calculate the build margin emission factor for the project activity. BM is calculated ex -ante based on the most recent information available at the time of submission of PD and is fixed for the entire crediting period.

The build margin emissions factor is the generation -weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which electricity generation data is available, calculated as follows:

$$EF_{grid,BM,y} = \frac{\sum_m EG_{m,y} \times EF_{EL,m,y}}{\sum_m EG_{m,y}}$$

Where:

$EF_{grid,BM,y}$ = Build margin CO_2 emission factor in year y (tCO_2/MWh)
$EG_{m,y}$ = Net quantity of electricity generated and delivered to the grid by power unit in year y (MWh)
m = Power units included in the build margin
y = Most recent historical year for which electricity generation data is available

The Year 2019-2020 is selected as the most recent historical year for which electricity generation data is available. The build margin emissions factor is calculated as the generation -weighted average emission factor (tCO_2/MWh) of all power units m during the Year 2019-2020 without adjusted with imports. $EF_{grid,BM,y}$ is calculated to be **0.5300 tCO_2e/MWh**.

Step 6: Calculate the combined margin emissions factor

The calculation of the combined margin (CM) emission factor ($EF_{grid,CM,y}$) is based on one of the following methods:

- Weighted average CM; or
- Simplified CM.

PP has chosen **weighted average CM** to calculate the combined margin emission factor for the project activity.

The combined margin emissions factor is calculated as follows:

$EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}$

The combined margin emissions factor $EF_{grid,CM,y}$ should be calculated as the weighted average of the Operating Margin emission factor ($EF_{grid,OM,y}$) and the Build Margin emission factor ($EF_{grid,BM,y}$), where W_{OM}= 0.75 and W_{BM} = 0.25 for solar power generation project (owing to their intermittent and non-dispatchable nature) for the first crediting period and for subsequent crediting periods. The ($EF_{grid,OM,y}$) and ($EF_{grid,BM,y}$) are calculated as described in Step 4 and 5.

$EF_{grid,CM,y}$ = 0.5992 tCO_2e/MWh * 0.75 + 0.5300 tCO_2e/MWh * 0.25 = **0.5819 tCO_2e/MWh**

4.2 Project Emissions

As per the methodology ACM0002 (version 21.0), project emissions for renewable power generation project activity, PE_y = 0.

4.3 Leakage

According to methodology ACM0002 (version 21.0), leakage is not considered.

4.4 Net GHG Emission Reductions and Removals

Emission reductions are calculated as follows:

$ER_y = BE_y - PE_y$

Where: ER_y = Emission reductions in year y (t CO_2e/yr)

BE_y = Baseline emissions in year y (t CO_2/yr)

PE_y = Project emissions in year y (t CO_2e/yr).

Year	Estimated baseline emissions or removals (tCO_2e)	Estimated project emissions or removals (tCO_2e)	Estimated leakage emissions (tCO_2e)	Estimated net GHG emission reductions or removals (tCO_2e)
Year 1 29-12-2021 – 28-12-2022	109,141	0	0	109,141
Year 2	106,958	0	0	106,958

29-12-2022 – 28-12-2023				
Year C 29-12-2023 – 28-12-2024	106,370	0	0	106,370
Year D 29-12-2024 – 28-12-2025	105,785	0	0	105,785
Year E 29-12-2025 – 28-12-2026	105,203	0	0	105,203
Year F 29-12-2025 – 28-12-2026	104,625	0	0	104,625
Year G 29-12-2026 – 28-12-2027	104,049	0	0	104,049
Total	**742,132**	**0**	**0**	**742,132**

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{grid,OM,y}$
Data unit	tCO_2e/MWh
Description	Simple operating margin CO_2 emission factor in year y
Source of data	Calculated following the "Tool to calculate the emission factor for an electricity system" (Version 07.0) Data source: Annual Reports of Bangladesh Power Development Board https://bpdb.gov.bd/site/page/c4161d54-5b85-4917-a8d2-68a2d1b26dd4/মাসিক-বাসষক-প্রসিববদন
Value applied	0.5992

Justification of choice of data or description of measurement methods and procedures applied	Calculated using the "Tool to calculate the emission factor for an electricity system" (Version 07.0)
Purpose of Data	Calculation of baseline emissions
Comments	N/A

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2e/MWh
Description	Build margin CO_2 emission factor in year y
Source of data	Calculated following the "Tool to calculate the emission factor for an electricity system" (Version 07.0) Data source: Annual Reports of Bangladesh Power Development Board https://bpdb.gov.bd/site/page/c4161d54-5b85-4917-a8d2-68a2d1b26dd4/মাসিক-বাসষক-প্রসিববদন
Value applied	0.5300
Justification of choice of data or description of measurement methods and procedures applied	Calculated using the "Tool to calculate the emission factor for an electricity system" (Version 07.0)
Purpose of Data	Calculation of baseline emissions
Comments	N/A

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2e/MWh
Description	Combine margin CO_2 emission factor in year y
Source of data	Calculated following the "Tool to calculate the emission factor for an electricity system" (Version 07.0)

Value applied	0.5819
Justification of choice of data or description of measurement methods and procedures applied	Calculated using the "Tool to calculate the emission factor for an electricity system" (Version 07.0)
Purpose of Data	Calculation of baseline emissions
Comments	N/A

5.2 Data and Parameters Monitored

Complete the table below for all data and parameters that will be monitored during the project crediting period (copy the table as necessary for each data/parameter). Data and parameters determined or available at validation are included in Section 5.1 (Data and Parameters Available at Validation) above.

Data / Parameter	$EG_{facility,y}$
Data unit	MWh
Description	Quantity of net electricity generation supplied by the project to the Grid in year y.
Source of data	Calculated
Description of measurement methods and procedures to be applied	The net electricity supplied to the grid by the project will be calculated by the electricity exported to the grid ($EG_{export,y}$) and the electricity imported from the grid ($EG_{import,y}$) by the project through the following formula: $EG_{facility,y} = EG_{export,y} - EG_{import,y}$ The electricity exported and imported from the grid monitored and measured by Main Meter and backup Meter installed on-site.
Frequency of monitoring/recording	Monthly
Value applied	*Provide an estimated value for the data/parameter*
Monitoring equipment	Energy meters of accuracy class 0.2s. Main and Check meters are installed at the PGCB substation by the electricity utility to measure the net exported electricity from the plant.

	Main Meter	Back-up Meter

	Make	Landis Gyr E650 Series 4	Landis Gyr E650 Series 4
	Accuracy	0.2s	0.2s
	Serial Number	LGZ59104506	LGZ59104507
	Calibration Frequency	180 days	180 days
	Calibration Status		
QA/QC procedures to be applied	*The data will be cross-checked with electricity sale receipts. The electricity meter(s) will be periodically checked and maintained. Calibration will be carried out periodically to ensure normal operation.*		
Purpose of data	Calculation of baseline emissions		
Calculation method	N/A		
Comments	-		

5.3 Monitoring Plan

The project adopts the approved consolidated monitoring methodology ACM0002 "Grid-connected electricity generation from renewable sources (version 20.0) to determine the emission reductions from the net electricity generation of the solar power plant. The monitoring plan is developed in accordance with the methodological requirement and will be implemented by the project owner. The monitoring plan described in more details as below:

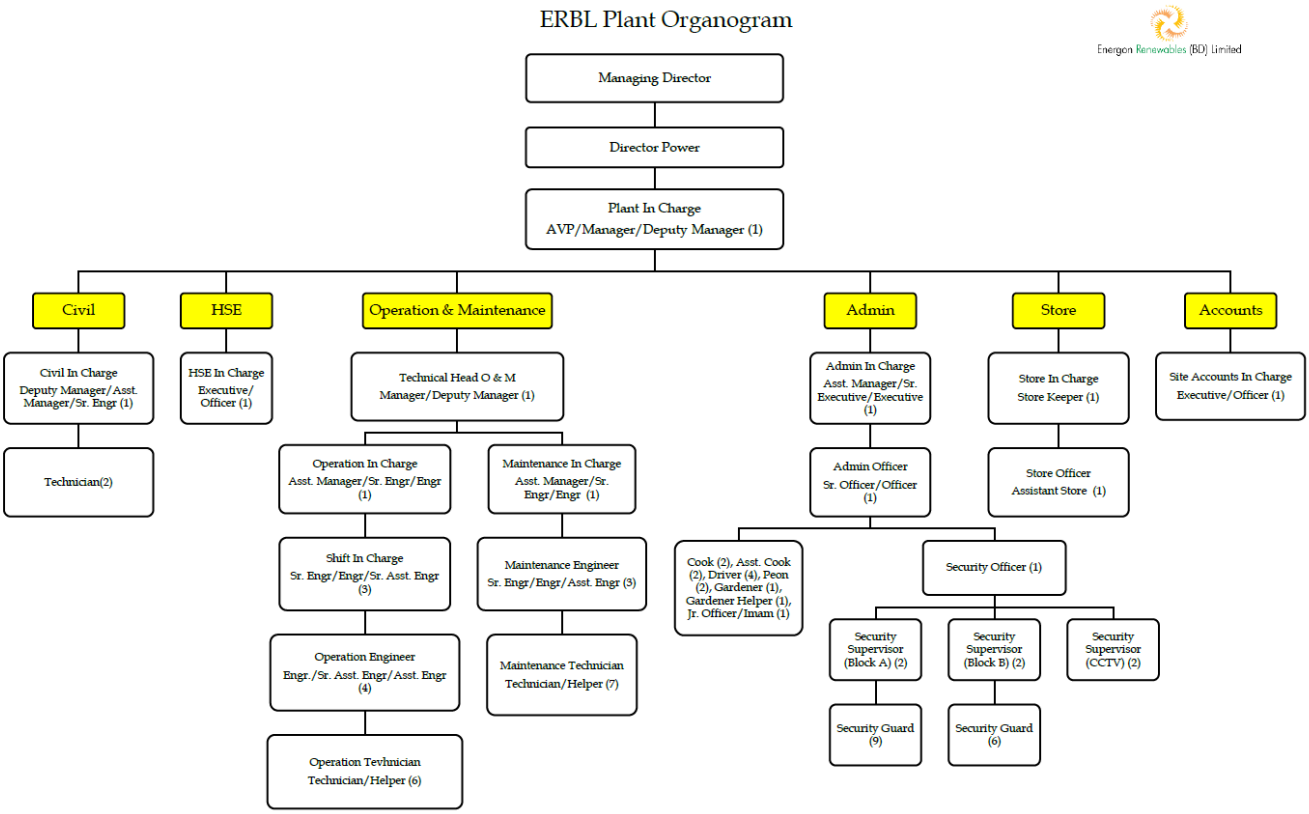
Management Structure:

The management at ERBL responsible for the monitoring of the project is as follows:

- Under the direction and supervision of the Shift In-Charge, assigned Engineers shall perform operational routines of the relevant equipment as and when become necessary.
- Each Engineer shall be responsible for filling out the operational log of the equipment assigned to him as per the prescribed schedule. The Meter readings should be properly recorded on every hour interval.
- On emergency or to meet maintenance requirements isolation of an equipment or system may become necessary. The Shift In-Charge shall decide and assign Engineers to carry out isolation of the relevant machinery following appropriate isolation procedure. On completion of any maintenance work once clearance from maintenance department is obtained the Shift In-Charge shall ensure that the relevant system can be normalized

and assign Engineers to perform the normalization following the appropriate normalization procedure.

- During a shift the duty Shift In-Charge with his Group assisted by the Shift Operation Duty Roster on duty shall be responsible for smooth, prudent, economic and safe operation of the plant meeting the grid dispatch instruction in compliance with all regulatory and environmental requirements. If situation arise, for any type of doubts or necessary decision, he may talk to Operation In Charge or Plant In-Charge.



Data recording & archiving:

The project proponent shall maintain data both in electronic form and hard copies. The monitored data shall be archived till 2 years after the completion of crediting period.