MYANMAR SATOKETAYAR SOLAR POWER PLANT PROJECT

Document Prepared by Timing Carbon Asset Management Co., Ltd.

Contact Information

Project Title	Myanmar Satoketayar Solar Power Plant Project
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1 PROJECT DETAILS

1.1 Summary Description of the Project

The Myanmar Satoketayar Solar Power Plant Project is the construction of a new solar photovoltaic power plant project located 76km northwest from the capital city of Magway Division, Myanmar.

The main purpose of the project is to generate power from clean renewable solar power and supply electricity to the Myanmar Power Grid while contributing to the sustainability of power generation of the Myanmar Power Grid.

The scenario existing prior to the start of the implementation of the project is the same as the baseline scenario, i.e. electricity would have otherwise been generated by the operation of existing power plants connected to Myanmar Power Grid and by the addition of new generation sources of Myanmar Power Grid. After the project is put into operation, the power generated will replace a part of power supply in Myanmar Power Grid which is dominated by fuel-fired power plants and thus reduce greenhouse gas (GHG) emission through avoiding CO_2 emissions produced by Myanmar Power Grid.

The project scenario consists of the installation of 74,592 pieces of 540Wp polycrystalline silicon PV module, providing a total capacity of 40.28MWp. The expected net annual power supply to the grid is 63779.85MWh. The expected full load operating hours are 1,583 h annually, and the plant load factor is 18.08%. The power generated by the project will be routed via an on-site step-up station to 66 kV and then connected to the Myanmar Power Grid.

By displacing fossil fuel fired power generation within the Grid by clean renewable energy, the project leads to the reduction of CO_2 emissions into the atmosphere. Total annual Green House Gases emissions reduction is estimated to be of 23,014 tCO_2e annually. The total emission reductions during the renewable 7-year crediting period will be 161,098 tCO_2e.

1.2 Sectoral Scope and Project Type

Sectoral scope 1: energy industries (renewable-/non-renewable sources).

Project type: grid connected renewable (solar PV) power project

The project is not a grouped project.

1.3 Project Eligibility

The project is a solar PV power project, which reduces CO_2 by replacing electricity from fossil fuel power plants in Myanmar, which is an LDC. This complies with the scope of VCS program.

1.4 Project Design

☒ The project includes a single location or installation only

☐ The project includes multiple locations or project activity instances, but is not being developed as a grouped project

☐ The project is a grouped project

The project has been designed to include a single location only and is not being developed as a grouped project.

Eligibility Criteria

N/A as the project is not a grouped project.

1.5 Project Proponent

Organization name	Timing Carbon Asset Management Co., Ltd.
Contact person	Liu Yanyan
Title	V.P
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1.6 Other Entities Involved in the Project

Organization name	Myanmar Satoketayar Solar Power Company Limited
Role in the project	Project Owner
Contact person	Mr. Chen Guoliang
Title	/
Address	Corner Of Malikha Street and Pathonemar 5th Street, A-031 Shwe Kyar Pin Quarter, Zubuthiri Township, Naypyitaw, Myanmar
Telephone	09266681100
Email	chenguoliang-sdht@powerchina.cn

1.7 Ownership

The project owner *Myanmar Satoketayar Solar Power Company Limited* has been registered under Myanmar Companies Law 2017, and attained the Letter of Acceptance issued by the Ministry of Electricity and Energy (MOEE) of Myanmar government, establishing the project ownership of *Myanmar Satoketayar Solar Power Company Limited.* The purchasing contract of solar PV modules, and the power purchase agreement are the evidences for the property and contractual right in the plant, equipment and electricity.

1.8 Project Start Date

The started operation on 07/02/2023, which is the date on which the project started to generate GHG emission reductions and therefore is the project start date.

1.9 Project Crediting Period

7 years of renewable crediting period, from 07/02/2023 to 06/02/2030

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

The estimated annual GHG emission reductions/removals of the project are:

☐ <20,000 tCO_2e/year

☒ 20,000 – 100,000 tCO_2e/year

☐ 100,001 – 1,000,000 tCO_2e/year

☐ >1,000,000 tCO_2e/year

Project Scale	
Project	Yes
Large project	No

Year	Estimated GHG emission reductions or removals (tCO_2e)
Year 2023 (07/02/2023 to 31/12/2023, 328 days)	20,919
Year 2024 (01/01/2024 to 31/12/2024)	23,201

Year 2025 (01/01/2025 to 31/12/2025)	23,114
Year 2026 (01/01/2026 to 31/12/2026)	23,025
Year 2027 (01/01/2027 to 31/12/2027)	22,936
Year 2028 (01/01/2028 to 31/12/2028)	22,845
Year 2029 (01/01/2029 to 31/12/2029)	22,755
Year 2030 (01/01/2030 to 06/02/2030, 37 days)	2,305
Total estimated ERs	161,098
Total number of crediting years	7
Average annual ERs	23,014

1.11 Description of the Project Activity

The scenario prior to the implementation of the project activity is that electricity delivered to the grid is generated by the operation of grid-connected power plants and by the addition of new generation sources. The baseline scenario is the same as the scenario existing prior to the start of the project activity.

The project installs standard solar power technology and equipments which are applied over the whole world. The project does not involve technology transfer.

The project scenario consists of the installation of 74,592 pieces of 540Wp polycrystalline silicon PV module, providing a total capacity of 40.28MWp. The expected net annual power supply to the grid is 63779.85MWh. The main technical specifications of each turbine are listed in table A.1.

Table A.1 Key technological parameters of the equipments

540Wp polycrystalline silicon PV module	
Model	JAM72D30-540/MB
Peak power	540Wp
photon-to-electron conversion efficiency	≥22.8
Size	2278*1134*35 (mm)

Life time	20 years
Manufacturer	Jinko Solar Co., Ltd.
Inverter	
Model	SUN2000-215KTL-H0
Max input voltage	1500V
Rated output power	204kVA@40°C
Max efficiency	⩾99%
Life time	20 years
Manufacturer	Huawei Digital Technology (Suzhou) Co., Ltd.

The power generated by the project will be routed via an on-site step-up station to 66 kV and then connected to the Myanmar Power Grid. The net supply of power will be measured by bi-directional electricity meter at the grid side.

The spatial extent of the project boundary includes all power plants connected physically to the electricity system that the project power plant is connected to, including the project power plant itself. Data for installed capacity and power generation within the grid are provided in section B.

In accordance with the applied methodology, the greenhouse gases involved in the project activity consist of CO_2 emissions from electricity generation in fossil fuel fired power plants that is displaced due to the project activity.

1.12 Project Location

The project located 76km northwest from the capital city of Magway Division, Myanmar, and the geographic coordinates of the project location area 94°14'55''-94°15'37'E and 20°24'27''-20°25'13''N. Figure 1.1 are the location of the project.

Figure 1.1 Project location

1.13 Conditions Prior to Project Initiation

Prior to project initiation, electricity delivered to the grid (Myanmar Power 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. It is the same as the baseline scenario, referring to the Section 3.4 (Baseline Scenario).

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The project is a project utilizing renewable energy. The Environmental Impact Assessment has been finalized in August 2022 as per the requirements of the government of Myanmar. The project owner has attained the Letter of Acceptance on 15/03/2022, which demonstrates that the project meets the requirement of national laws and regulations.

1.15 Participation under Other GHG Programs

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

The project has not been registered and is not seeking registration under any other GHG programs.

1.15.2 Projects Rejected by Other GHG Programs

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

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

Does the project reduce GHG emissions from activities that are included in an emissions trading program or any other mechanism that includes GHG allowance trading?

☐ Yes ☒ No

There is not any emission trading program or any mechanism that includes GHG allowance trading in Myanmar.

1.16.2 Other Forms of Environmental Credit

Has the project sought or received another form of GHG-related credit, including renewable energy certificates?

☐ Yes ☒ No

The project has not sought or received another form of GHG-related environmental credit, including renewable energy certificates.

Supply Chain (Scope 3) Emissions

Have the owner(s) or retailer(s) of the impacted goods and services[1] posted a public statement saying, "VCUs may be issued for the greenhouse gas emission reductions and removals associated with [organization name(s)] [name of good or service]" since the project's start date?

☐ Yes ☒ No

The project owner of the project which supplies electricity to the grid posted a public statement saying, "VCUs may be issued for the greenhouse gas emission reductions and removals associated with electricity supplied from Myanmar Satoketayar Solar Power Plant Project to the Myanmar Power Grid".

Has the project proponent posted a public statement saying, "VCUs may be issued for the greenhouse gas emission reductions and removals associated with [name of good or service][describe the region or location, including organization name(s), where practicable]."

☒ Yes ☐ No

The project owner of the project which supplies electricity to the grid posted a public statement saying, "VCUs may be issued for the greenhouse gas emission reductions and removals associated with electricity supplied from Myanmar Satoketayar Solar Power Plant Project to the Myanmar Power Grid".

Have the producer(s) or retailer(s) of the impacted good or service been notified of the project and the potential risk of Scope 3 emissions double claiming via email?

☐ Yes ☒ No

As a zero emission project, there is no Scope 3 emissions related to producer(s) or retailer(s) of the supplied electricity.

1.17 Sustainable Development Contributions

SDG Target	SDG Indicator	Net Impact on SDG Indicator	Contributions Over Project Lifetime

[1] Impacted goods and services are all goods and services directly impacted by the technologies and measures specified as project activities in the project description. Please see the VCS Program document *VCS Program Definitions* for additional information.

7.1	7.1.1 Proportion of population with access to electricity	The project generates electricity from renewable resources, and supply affordable, reliable, and sustainable electricity for local residents.	The tariff keep fixed during the project lifetime, which is affordable to the local residents for a long period. Annual net electricity supplied to the grid is expected to be 63779.85 MWh and total net electricity supplied to the grid is expected to be 1,275,597 MWh during the 20 years of project lifetime.
8.5	8.5.1 Average hourly earnings of employees	The project generates job opportunities and income	The project creates 6 long-term job opportunities and generates income for employees.
13.3	13.3 Tonnes of greenhouse gas emissions avoided or removed	The project will utilize renewable resources for power generation and supply power for the Grid, and will replace the electricity generated by the fossil fuel fired power plant which dominates the Grid	Prevented the release of 23,014 annually and in total 460,280 tonnes of carbon into the atmosphere during the whole lifetime of the project.

1.18 Additional Information Relevant to the Project

Leakage Management

According to the methodology ACM0002 Version 21.0, the leakage of the project is not considered. No leakage management involved as the project is not an AFOLU project.

Commercially Sensitive Information

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

Further Information

There's not any further information.

2 SAFEGUARDS

2.1 No Net Harm

There is no net harm resulted from the project as a solar PV power project. Environment impact of the project is analysed in Section 2.3.

2.2 Local Stakeholder Consultation

Local stakeholders mean the public, including individuals, groups or communities, affected, or likely to be affected, by the project. Regarding the project the local stakeholders include the local residents and communities. To evaluate the economic, social and environmental effects of the project, the project owner has carried out local stakeholder consultation on the public's comments in the formats of questionnaires. In order to collect local stakeholders' comments, public consultation meeting concerning with the Environmental Management Plan (EMP) for the construction and operation of the project was held on 26/05/2022, during the Environmental Impact Assessment process. The objective of the meeting is to disclose information of the project, potential impacts of project activities and mitigation measures and to receive public recommendations and feedbacks for the project. The project owner invited local people by negotiating with village administrators. In total 19 attendees attended this public consultation meeting. Most of the local residents knew about solar PV power projects and all of them held positive and supportive attitude towards the construction of the proposed project.

The project owner has set out the mechanism for on-going communication with local stakeholders and the communications with local stakeholders are being carried out in any time. The project owner published the contact information of the contact person who is responsible for stakeholders comments. Stakeholders were informed of the contact information, and their comments can be directly collected by the contact person. The comments would be fed back to the stakeholders by the contact person for a timely response. Once the contact person received negative comments from the stakeholders, the contact person would record the negative comments and the feedback.

2.3 Environmental Impact

The Environmental Impact Assessment (EIA) has been finalized in August 2022 as per the requirements of the government of Myanmar. During the finalization of the EIA, the possible environmental impacts of the project and responding measurements taken by project owner are analyzed as follows:

1 Impact on air environment

The main air pollutant during construction period is dust, which is temporary. It won't cause influences on the normal life of local people. Some measures avoiding stack materials outdoors, etc, will be carried out to minimize the impact on local air environment. The assess road was be upgraded into paved road to control the dust emission. Regular water spraying on access roads and working places must be carried out in order to control dust emission by increasing humidity of working area. During operation period, the project will not produce exhaust gas pollution.

Dust emission from the operation activities of the project is insignificant.

2 Impact on water environment

Water discharged from construction activities of solar power plant may lead to water pollution. During the operation phase, water pollution can be caused by oil and waste spillage and leakage from transformers, improper waste storage, fuel storage and refueling. Regular inspection for construction machines, generators, construction vehicles and transportation vehicles has been done to prevent oil leak and spillage. Toilets, washing basins and septic tanks will be provided adequately for the construction workers to reduce impacts on water. The project owner makes sure that untreated site runoff water does not flow into the nearby water body and manage well.

3. Noise and Vibration Impact

During the construction phase, operating construction vehicles such as loaders, excavators, dumpers, bulldozers, backhoes, road rollers, water bowsers, cranes, trucks and concrete mixers as well as transportation vehicles and generators generated noise and vibration. Construction machines, construction vehicles and transportation vehicles used in construction activities were inspected and maintained regularly for reducing noise and vibration. Drivers drive carefully with low speed at public road while passing through the villages. Personal Protective Equipment (PPEs) such as earplugs and earmuffs were provided for construction workers who work in excessive noise generated area. During the operation phase, this impact is insignificant.

4. Impact on terrestrial ecology

The plants affected by the construction of PV power station are mostly local common species, which are widely distributed in the surrounding areas. There are no large mammals recorded in the project area, mainly rodents and small animals and the implementation of the project will not lead to the disappearance of mammals in the project area. In the long run, the species diversity of terrestrial animals in the project area will not change greatly. There is no national park, reserved forest, protected public forest, protected area and wildlife within the scope of study area for the project.

5. Solid Wastes Generation Impact

During the construction phase, main sources of solid wastes generation from the project are rejected components and packaging materials of electrical equipment and building materials, surplus materials, papers, containers, broken bricks, solvent containers. During the operation phase, there is no operation solid waste which are disposed of from the project's operation processes. However, domestic solid waste such as garbage, rejected office materials and organic waste from multiple-use building, staff quarters, briefing hall, kitchen and dining hall are common solid wastes generation. Recycling, reuse and refurbishment of solid waste reduce the amount of construction waste other than disposal. The project owner defined temporary disposal site within the project, before final disposal and these wastes must be segregated by using different appropriate waste bins.

Environmental Impact Assessment of the project indicates that the project does not have significant impacts on local environment.

2.4 Public Comments

The project owner will demonstrate how due account of possible comments received during the public comment period will be taken.

2.5 AFOLU-Specific Safeguards

This section is not required, as the project is a non-AFOLU project.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

Applied approved CDM methodology:

Version 21.0 of CDM Large-scale Consolidated Methodology ACM0002 "Grid-connected electricity generation from renewable sources".

Applied CDM tools:

Version 07.0.0 of "Tool for the demonstration and assessment of additionality".

Version 07.0 of "Tool to calculate the emission factor for an electricity system".

Version 03.1 of "Common practice".

Version 12.0 of "Investment analysis".

Reference:

https://cdm.unfccc.int/methodologies/index.html

3.2 Applicability of Methodology

The project activity is implemented only for the purpose of producing electricity using solar PV technology and suppling the electricity to Myanmar Power Grid, without the integration of BESS (Battery Energy Storage System). The project activity eligible under the methodology ACM0002 Version 21.0 aims to build and operate a new greenfield solar PV power plant, which are subject to following eligibility conditions:

Eligibility conditions	Justification	Applicability

			(Yes or No)
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).	The project utilizing solar photovoltaic energy to supply electricity to the Myanmar Power Grid, which is a Greenfield power plant.	Yes
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 [2] or wind power plant(s)/unit(s); (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).	N/A, as the project does not involve the integration of a BESS.	Yes
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	The project is a greenfield solar PV project without the integration of BESS.	Yes

[2] In case of retrofit or capacity addition for concentrated solar power projects, stakeholders may submit a request for revision to this methodology, providing an apportioning approach to calculate the project emissions due to any fossil fuel consumption attributed to the increased electricity generation from the BESS.

	exigencies[3] 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 of the methodology. 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:[4]	N/A. The project is not a hydro power project.	Yes
(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/m^2, all of the following conditions shall apply:		
(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:	N/A. The project is not an integrated hydro power project.	Yes

[3] For example, upon deep discharge of the batteries.

[4] Project participants wishing to undertake a hydroelectric project activity that results in a new reservoir or an increase in the volume of an existing reservoir, in particular where reservoirs have no significant vegetative biomass in the catchments area, may request a revision to the approved consolidated methodology.

(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 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.	N/A. The project does not involve switching from fossil fuels to renewable energy sources at the site of the project activity, and is not a biomass fired project.	Yes

The methodology ACM0002 also refers to the latest approved versions of the tools and guidelines of CDM in project. The applicability of the tools is justified as follows:

Eligibility conditions	Justification	Applicability (Yes or No)
Version 07.0 of "Tool to calculate the emission factor for an electricity system".		
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).	This tool is applied to estimate the OM, BM and/or CM for the project.	Yes
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	The emission factor for the project electricity system is calculated for grid power plants only.	Yes

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.		
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.	N/A as the project is not a CDM project.	
Under this tool, the value applied to the CO_2 emission factor of biofuels is zero.	N/A as the project does not involve biofuels.	Yes
Version 07.0.0 of "Tool for the demonstration and assessment of additionality"		
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.	Steps of this tool are applied in the section 3.5 of the PD.	Yes
Once the additionally tool is included in an approved methodology, its application by project participants using this methodology is mandatory.	Steps of this tool are applied in the section 3.5 of the PD.	Yes
Version 12.0 of "Investment analysis".		
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 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.	The project applies the methodological tool "Tool for the demonstration and assessment of additionality".	Yes
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.	N/A	Yes

3.3 Project Boundary

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	N/A	N/A
Project	CO_2 emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants	CO_2	No	No combustion of fossil fuels for electricity generation in solar thermal power plants
		CH_4	No	No combustion of fossil fuels for electricity generation in solar thermal power plants
		N_2O	No	No combustion of fossil fuels for electricity generation in solar thermal power plants
		Other	N/A	N/A
	Charging of BESS using electricity from the grid or from fossil fuel electricity generators.	CO_2	No	The project does not involve charging of BESS.
		CH_4	No	The project does not involve charging of BESS.
		N_2O	No	The project does not involve charging of BESS.
		Other	N/A	N/A

The flow diagram of the project boundary is shown in Figure 3.1

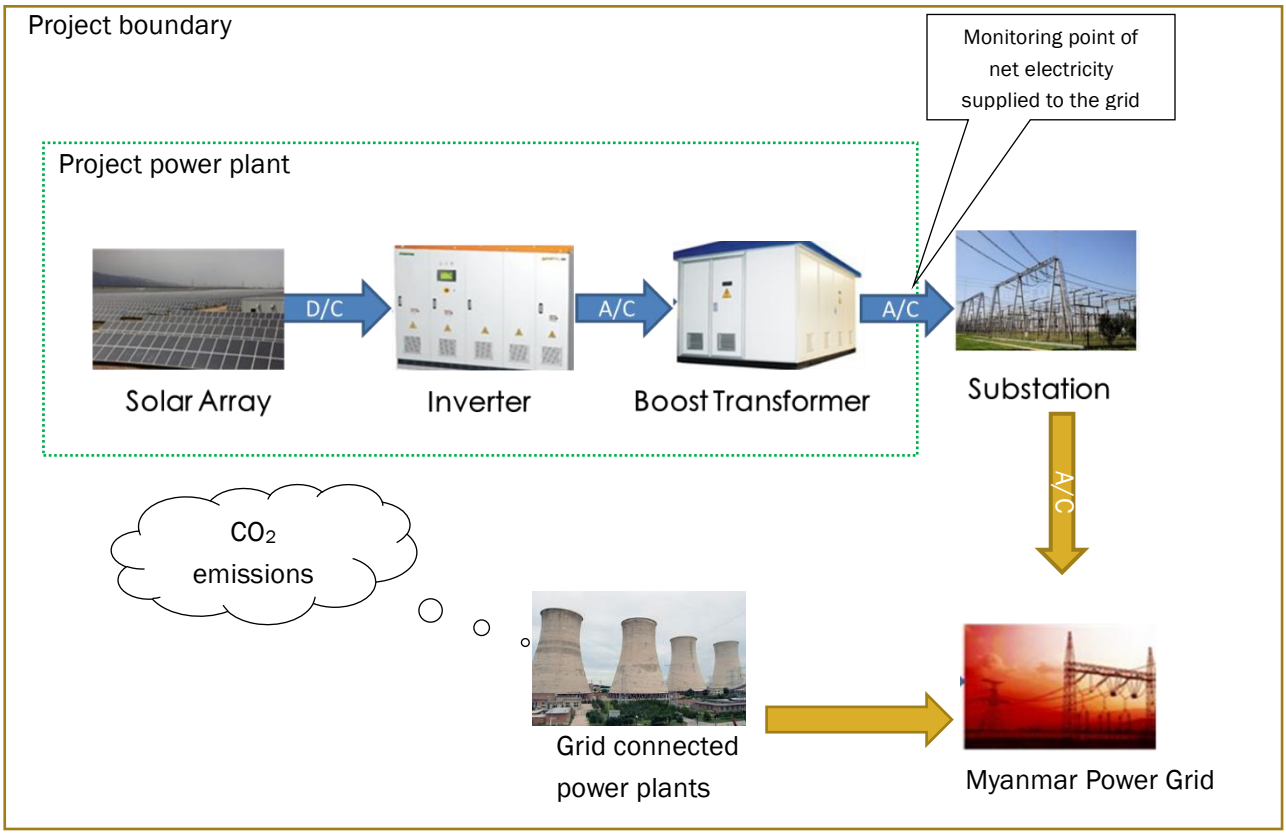

Figure 3.1 The flow diagram of the project boundary

3.4 Baseline Scenario

The project is the installation of a Greenfield power plant without a BESS. As per the methodology ACM0002 Version 21.0, the baseline scenario of the project 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 "Tool to calculate the emission factor for an electricity system".

3.5 Additionality

The project is a greenfield renewable power plant applying solar PV technology, which is not mandated by any law, statute, or other regulatory framework, or for UNFCCC non-Annex I countries, any systematically enforced law, statute, or other regulatory framework.

The following steps are used to demonstrate the additionality of the Project according to the latest version of the "Tool for the demonstration and assessment of additionality" approved by the Executive Board.

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

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

"Tool for the demonstration and assessment of additionality" requires a number of sub-steps to provide realistic and credible alternatives to the project activity. There are only a few alternatives that are prima facie realistic and credible in the context of the Myanmar Power Grid:

(a) The proposed project activity undertaken without being registered as a VCS project activity

(b) Other realistic and credible alternative scenario(s) to the proposed project activity scenario that deliver electricity with comparable quality, properties and application areas

(c) Continuation of the current situation: the same service of power supply provided from grid

These alternatives are in accordance with the description of the methodology (the additionality tool requires that the project activity be included as an alternative, without the benefit from sales of emission reductions)

There is no available hydro, wind, geothermal or biomass renewable resources resulting in the same annual power generation at the project location with comparable quality, properties and application areas, scenario (b) is not feasible and cannot be considered as an alternative. Therefore, **scenario (b)** is excluded.

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

The project activity complies national policies for environmental protection, energy conservation and sustainable development, and there are no binding legal and regulatory requirements for this project type.

Outcome of Step 1: It is concluded that **scenario (a)** and **scenario (c)** are in compliance with the relevant laws and regulations. The following steps are used to demonstrate the additionality of the project according to the "Tool for the demonstration and assessment of additionality":

Step 2. Investment Analysis

Sub-step 2a: Determine appropriate analysis method

The analysis will be performed through Option III of the additionality tool, i.e. benchmark analysis. This method is applicable because:

- Option I: Simple cost analysis is not applicable since the project generates economic returns through the sales of electric power to the grid;

- Option II: Investment comparison analysis is only applicable when alternatives are also investment projects. However, the alternative baseline scenario (c) is the grid providing the same amount of power;
- Option III: Benchmark analysis is applicable as the return on investment relative to the industry benchmark was crucial for the decision to invest the project.

Therefore Option III Benchmark analysis is applied to the project activity.

Sub-step 2b – Option III: Apply benchmark analysis:

The project is not financially attractive due to low return on investment. To illustrate this, benchmark analysis is conducted as per the CDM tool-27 "Investment Analysis". The equity IRR (Internal Rate of Return) is selected as the financial indicator of benchmark analysis to demonstrate additionality. According to the Appendix of the CDM tool-27 "Investment Analysis", **19.29%** is the benchmark of the equity IRR of Group 1 projects, which covers renewable power projects, in Myanmar.

Sub-step 2c: Calculation and comparison of financial indicators

For the calculation of the financial indicators for the project, the parameters listed in Table 3.1 are applied. As per the CDM tool-27 "Investment Analysis", values are expressed in percentages in real terms. Since the project is invested by a company owned by a corporation from China, the currency used in the financial analysis is CNY, which is in accordance with the Feasibility Study Report (FSR).

Table 3.1 Parameters used in the calculation of the equity IRR

Project information	Amount	Unit	Data Source
DC side Peak Capacity (MWp)	40.28	MWp	Feasibility Study Report
AC side Installed Capacity (MWac)	31.824	MWac	Feasibility Study Report
Static total investment	17,756.49	10,000CNY	Feasibility Study Report
Equity	4,511.88	10,000CNY	Feasibility Study Report
Long term loan	13,535.63	10,000CNY	Feasibility Study Report
Interest occurred during construction period	291.02	10,000CNY	Feasibility Study Report
Construction period	1	year	Feasibility Study Report
Operation period	20	year	Feasibility Study Report
Annual net electricity supply (average)	63,779.85	MWh	Feasibility Study Report
Grid tariff (Business tax included)	0.315595	CNY/kWh	Feasibility Study Report
Business tax	5	%	Feasibility Study Report

Corporate Income tax rate	22	%	Feasibility Study Report
Annual average O&M cost	600.69	10,000CNY	Feasibility Study Report
Fair value of the project activity assets at the end of the assessment period	5	%	Feasibility Study Report
Depreciation period	20	year	Feasibility Study Report
Annual depreciation rate	843.43	10,000CNY	Feasibility Study Report

The Feasibility Study Report of the project was designed by the authoritative, professional and independent third party, Kunming Engineering Corporation Limited of PowerChina, which has been authorized design qualification Class A. The values in Feasibility Study Report can be considered independent, appropriate and realistic.

The investment analysis compares the equity internal rate of return (Equity IRR) of the project with the benchmark defined in sub-step 2b. The main results of the investment analysis are presented in Table 3.2, where the IRR for the project has been calculated without VCU revenues.

Table 3.2 IRR calculation result

Scenario	Equity IRR
Project without revenues from the sale of VCUs	3.11%

The IRR calculation is based on real and fixed values. The use of fixed input values is appropriate in case both the input values and the benchmark are defined in real terms and when there is no expectation that the change in the nominal value of the input parameters will differ significantly from the rate of inflation. The use of fixed real input values (such as the grid tariff) is common practice in investment analysis of solar PV projects and is in accordance with guidance for the preparation of feasibility studies which demonstrates that the benchmark is defined in real terms and therefore the application of fixed real input values is appropriate.

From the result in Table B.2 it is clear that the Equity IRR on investment for the Myanmar Satoketayar Solar Power Plant Project without the revenues from the sales of VCUs is lower than the benchmark applied in the investment analysis. This demonstrates that the project activity is not a commercially viable option to supply power.

Sub-step 2d. Sensitivity analysis

The 'Tool for the demonstration and assessment of additionality' requires that a sensitivity analysis be conducted to check whether the financial attractiveness remains unaltered for reasonable variations in the critical assumptions. The following parameters were used as critical assumptions:

- Annual net electricity supplied to the grid
- Grid tariff
- Static total investment
- Annual O&M Cost

In the sensitivity analysis, variations of ±10% have been considered in the critical assumptions. Such variation is considered appropriate as it is in accordance with the Feasibility Study Report.

Table B.4 summarizes the results of the sensitivity analysis, while Figure B.2 provides a graphic depiction.

Table 3.4 Results of the sensitivity analysis – impact of variations in critical assumptions on IRR

Percentage Variation / Critical assumption	-10%	-5%	0%	+5%	+10%
Annual net electricity supplied to the grid	-1.37%	0.93%	3.11%	5.23%	7.33%
Grid tariff	-1.37%	0.93%	3.11%	5.23%	7.33%
Static total investment	6.82%	4.89%	3.11%	1.46%	-0.09%
Annual O&M Cost	4.60%	3.86%	3.11%	2.34%	1.55%

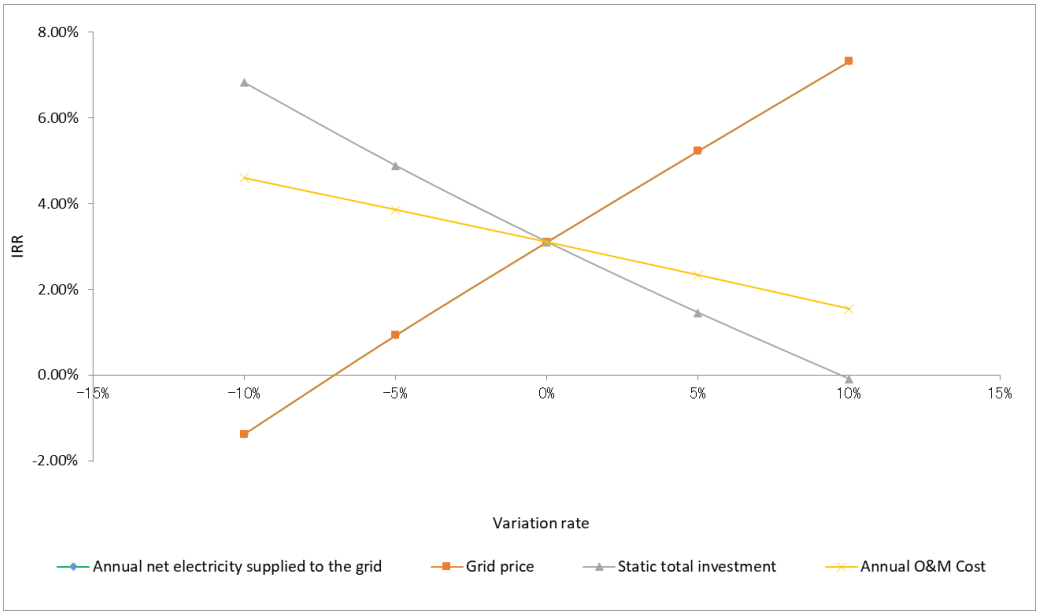

Figure 3.2 Results of the sensitivity analysis

The equity IRR of the project activity without VCU revenues remains below the 19.29% benchmark with the fluctuation rate of 10% of the key parameters. The sensitivity analysis of the Internal Rate of Return confirms that the project remains commercially non-viable without VCU revenues.

In addition it is not considered likely that the project's return will exceed the benchmark due to the following reasons:

- ***Annual net electricity supplied to the grid:***

If annual net electricity supplied to the grid increase by 39.14%, the IRR of project begins to exceed the benchmark. However this growth rate of output is unlikely to occur. The annual designed electricity generation of the project is based on long term historical solar radiation data sourced from databases of Meteonorm, SolarGIS, and NASA, which is relatively stable during a long period and can represent the average level during the lifetime of the project.

- ***Electricity tariff***

In case the tariff increased by more than 39.14%, the IRR of the project would exceed the benchmark. The grid tariff applied in the IRR calculation is the actual tariff determined in the power purchase agreement (PPA) signed between the project owner and the grid company, which is fixed during the operation period. Therefore it is impossible that the grid tariff would increase 39.14% than the estimated value.

- ***Static total investment:***

In case the total investment decreased by more than 33.54%, the IRR of the project would exceed the benchmark. According to the EPC contracts, the contract value consists of only solar PV modules and construction & installation was 17,805.16 *10,000RMB, which is higher than the total expected static total investment. Therefore, it is impossible that the static investment decreases more than 33.54%, and the IRR of the project cannot exceed the benchmark result from the fluctuate of the static investment.

- ***Annual O&M cost:***

Annual O&M costs are expected to rise rather than fall due to increases in the wage level and material price. If the annual O&M cost decreased by more than 124.43%, the IRR of the project begins to exceed the benchmark, which is impossible to occur.

The results of the sensitivity analysis therefore confirm that the project is not economically attractive without VCU revenues.

Step 3. Barrier analysis

The investment analysis has fully demonstrated and explained the additionality of the project, so step 3 is skipped.

Step 4. Common practice analysis

According to *Tool for the demonstration and assessment of additionality*, *Common practice Version 03.1* is used in this step.

Sub-step 4.1. Calculate applicable capacity or output range as +/-50% of the total design capacity or output of the project activity

The capacity of the project is 40.28MWp. Therefore, the projects in the range of 20.14MWp~60.42MWp should be chosen for this analysis.

Sub-step 4.2. Identify similar projects (both CDM and non-CDM) which fulfill all of the following conditions:

(a) The projects are located in the applicable geographical area;

(b) The projects apply the same measure as the project activity;

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

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

(e) The capacity or output of the projects is within the applicable capacity or output range calculated in Sub-Step 4.2;

(f) The projects started commercial operation before the PD is published for global stakeholder consultation or before the start date of project activity, whichever is earlier for the project activity.

In this case, the solar PV projects with 20.14MWp~60.42MWp, which have started commercial operation before 15/03/2022 (date of Letter of Acceptance) in Myanmar, will be chosen for this analysis. There is no similar project which meets the criteria above.

Sub-step 4.3. within the projects identified in Sub-Step 4.2, identify those that are neither registered CDM (VCS, GS, GCC, CCER) project activities, project activities submitted for registration, nor project activities undergoing validation. Note their number N_{all}.

There is no similar project which meets the criteria above. Therefore, the N_{all}=0.

Sub-step 4.4. Within similar projects identified in Sub-Step 4.3, identify those that apply technologies that are different to the technology applied in the project activity. Note their number N_{diff}.

N_{diff}=0

Sub-step 4.5. Calculate factor $F=1-N_{diff}/N_{all}$ representing the share of similar projects (penetration rate of the measure/technology) using a measure/technology similar to the measure/technology used in the project activity that deliver the same output or capacity as the project activity.

N_{all}=0, N_{diff}=0,

Therefore,

$F=1-N_{diff}/N_{all}$=0<0.2;

N_{all}- N_{diff}=0<3

Outcome of step 4:

From the above analysis and discussion, it is concluded that the project is not common practice.

Therefore, the project activity is additional.

3.6 Methodology Deviations

There are no methodology deviations for this project.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

According to the methodology, the baseline emissions include only CO_2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are calculated as follows:

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

where

BE_y		Baseline emissions in year y (t CO_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 the latest version of "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh)

Calculation of $EG_{PJ,y}$

As the project activity is the installation of a new grid-connected renewable power plant/unit at a site where no renewable power plant was operated prior to the implementation of the project activity, the following applies:

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

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)

Calculation of $EF_{grid,CM,y}$

The baseline emission factor ($EF_{grid,CM,y}$), is calculated as the combination of operating margin ($EF_{grid,OM,y}$) and build margin ($EF_{grid,BM,y}$) factors according to the "Tool to calculate the emission factor for an electricity system".

Step 1. Identify the relevant electricity systems

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 center responsible for scheduling and dispatching electricity generated by the project activity. Where the dispatch area is controlled by more than one dispatch center, 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 centers are required to comply with dispatch orders of the national dispatch center then area controlled by the national dispatch center 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.

Option 2 is employed. The project is connected to the Myanmar Power Grid, and the dispatch area, Myanmar Power Grid is delineated as the project electricity system.

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

Only grid power plants are included in the calculation.

Step 3. Select a method to determine the Operating Margin (OM)

The calculation of *the operating margin emission factor* ($EF_{grid,OM,y}$) is based on one of the four following methods:

(a) Simple OM, or

(b) Simple Adjusted OM, or

(c) Dispatch Data Analysis OM, or

(d) Average OM.

Since share of low cost / must run plants is higher than 50%, the method (a) Simple OM method cannot be used to calculate the OM emission factor. Because the detailed hourly load data of Nepal Power Grid is unavailable, method (b) and method (c) are not applicable. Therefore, method (d) Average OM is used.

For the average OM method, the emission factor can be calculated using either of the two following data vintages:

- Ex ante option: A 3-year generation-weighted average, based on the most recent data available at the time of submission of the PD for validation, without requirement to monitor and recalculate the emissions factor during the crediting period, or
- Ex post option: The year in which the project activity displaces grid electricity, requiring the emission factor to be updated annually during monitoring.

The project chose to use the ex-ante vintages and fix the emission factor for the duration of the crediting period. Considering the data availability [5], data of 3-year between 2014-2016 is used for ex ante calculation.

Step 4. Calculate the Operating Margin emission factor according to the selected method

The average OM emission factor ($EF_{grid,OM-ave,y}$) is calculated as the average emission rate of all power plants serving the grid, also including the low-cost/must-run power plants in all equations. Because of data availability, as per the *Tool to calculate the emission factor for an electricity*

[5] The only available data source is Myanmar Energe Statistics 2019, which includes data between 2014-2016, while this data source has not been updated yet.

system, Option B of the method Simple OM is employed to calculate the average OM emission factor:

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 is applicable since:

(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.

Under this option, the average OM emission factor is calculated based on the net electricity supplied to the grid by all power plants serving the system, not including low-cost/must-run power plants/units, and based on the fuel type(s) and total fuel consumption of the project electricity system, as follows:

$$EF_{grid,OM-ave,y} = \frac{\sum_i FC_{i,y} \times NCV_{i,y} \times EF_{CO2,i,y}}{EG_y}$$

Where:

$EF_{grid,OM-ave,y}$ =Average operating margin CO_2 emission factor in year y (t CO_2/MWh)

$FC_{i,y}$ = Amount of fuel type i consumed in the project electricity system 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 (t CO_2/GJ)

EG_y = Net electricity generated and delivered to the grid by all power sources serving the system, including low-cost/must-run power plants/units, in year y (MWh)

i = All fuel types combusted in power sources in the project electricity system in year y

y = The relevant year as per the data vintage chosen in Step 3

The average OM of the Myanmar Power Grid are shown as follows:

Table 4.1 Total electricity generation in the grid

Year	2016	Source:

Net electricity generated and delivered to the grid by all power sources serving the system (GWh)		*Electricity Generation*	*Rate of own use*	*The electricity connected to the grid (Electricity Generation*(1-Rate of own use))*
1 Gas-fired (steam and gas)	1.1 Steam	514.64	2.00%	504.35
	1.2 Gas	7,537.79	2.00%	7,387.03
2 Oil-fired		61.12	3.50%	58.98
3 Coal-fired		9.59	5.00%	9.11
4 Hydro		9,743.85	0.50%	9,695.13
5 Photovoltaic (Electricity)		9.47	0.00%	9.47
6 Wind Turbine		0.02	0.00%	0.02
7 Micro Hydro		1.25	0.50%	1.24
Total		/	/	**17,665.34**
Year		**2015**		
Net electricity generated and delivered to the grid by all power sources serving the system (GWh)		*Electricity Generation*	*Rate of own use*	*The electricity connected to the grid (Electricity Generation*(1-Rate of own use))*
1 Gas-fired (steam and gas)	1.1 Steam	284.98	2.00%	279.28
	1.2 Gas	6,232.77	2.00%	6,108.11
2 Oil-fired		55.23	3.50%	53.30
3 Coal-fired		0.00	5.00%	0.00
4 Hydro		9,398.98	0.50%	9,351.99
5 Photovoltaic (Electricity)		10.94	0.00%	10.94
6 Wind Turbine		0.01	0.00%	0.01
7 Micro Hydro		1.25	0.50%	1.24
Total		/	/	**15,804.87**
Year		**2014**		
Net electricity generated and delivered to the grid by all power sources serving the system (GWh)		*Electricity Generation*	*Rate of own use*	*The electricity connected to the grid (Electricity Generation*(1-Rate of own use))*
1 Gas-fired (steam and gas)	1.1 Steam	216.01	2.00%	211.69
	1.2 Gas	4,977.03	2.00%	4,877.49
2 Oil-fired		64.89	3.50%	62.62
3 Coal-fired		69.53	5.00%	66.05
4 Hydro		8,828.85	0.50%	8,784.71
5 Photovoltaic (Electricity)		13.91	0.00%	13.91

"Table 1.23. Electricity Generation by Source, Myanmar Energe Statistics 2019, P20
Table 1.26. Renewable Energy Supply, Myanmar Energe Statistics 2019, P22"

Myanmar Energy Statistics 2019, P80

6 Wind Turbine	0.00	0.00%	0.00	
7 Micro Hydro	5.75	0.50%	5.72	
Total	/	/	**14,022.19**	

Table 4.2 Average OM of the Myanmar Power Grid

Fuel Type		Fuel Consumption		Net Calorific Value	Fuel Specific EF	CO2 Emission
		FCi,y		NCVi,y	EFCO2,m,i,y	FCi,y x $EF_{CO2,m,i,y}$ x $NCV_{i,y}$
		Unit	Value	MJ/Unit	$kgCO_2/TJ$	tCO_2
2016	gas	million cubic metres	3,144.26	36,351.22	54,300	6,206,365.09
	coal	1,000 metric tons	26.87	11,896.61	90,900	29,057.27
	Sub-bituminous Coal	1,000 metric tons	15.84			0.00
	Lignite	1,000 metric tons	11.03			0.00
	oil	kilotons of oil equivalent	19.00	41,868.00	72,600	57,752.72
	Total Emission					**6,293,175.08**
2015	gas	million cubic metres	2,746.06	36,351.22	54,300	5,420,369.47
	coal	1,000 metric tons	19.99	11,896.61	90,900	21,617.23
	Sub-bituminous Coal	1,000 metric tons	12.02			
	Lignite	1,000 metric tons	7.97			
	oil	kilotons of oil equivalent	17.00	41,868.00	72,600	51,673.49
	Total Emission					**5,493,660.18**
2014	gas	million cubic metres	2,437.08	36,351.22	54,300	4,810,482.67
	coal	1,000 metric tons	25.63	11,896.61	90,900	27,716.33
	Sub-bituminous Coal	1,000 metric tons	8.96			
	Lignite	1,000 metric tons	16.67			
	oil	kilotons of oil equivalent	20.00	41,868.00	72,600	60,792.34
	Total Emission					**4,898,991.34**
Operating Margin Emission Factor / yr						**0.35133**
Source		Myanmar Energe Statistics 2019			IPCC 2006, Guidelines for National Greenhouse Gas Inventories	/

Step 5. Calculate the Build Margin (BM) emission factor

According to the tool applied, the simplified CM method (Option b) can only be used if, the project activity is located in a Least Developed Country (LDC), or in a country with less than 10 registered projects at the starting date of validation. Besides, The simplified CM method can only be used if the data requirements for the application of Step 5 (calculation of build margin emission factor) of the above applied tool cannot be met.

The project is located in Myanmar which is an LDC, and the data requirements for the application of Step 5 of the above applied tool cannot be met. Therefore the simplified CM method is applied and combined margin emission factor equals to operation margin emission factor.

Step 6. Calculate the Combined Margin emission factor

The combined margin emissions factor is calculated as follows:

$$EF_{grid,CM,y} = \omega_{OM} \cdot EF_{grid,OM,y} + \omega_{BM} \cdot EF_{grid,BM,y}$$

Where:

$EF_{,grid,BM,,y}$ = Build Margin CO_2 emission factor in year *y* (tCO_2e/MWh)

$EF_{grid,OM,,y}$ = Operating margin CO_2 emission factor in year *y* (tCO_2e/MWh)

ω_{OM} = Weighting of operating margin emissions factor (%)

ω_{BM} = Weighting of build margin emissions factor (%)

As described above, for the simplified CM, w_{BM}= 0, w_{OM}= 1, and $EF_{grid,CM,,y}$ = $EF_{grid,OM,,y}$ = 0.35133tCO2e/MWh.

4.2 Project Emissions

As per the applied methodology, PE_y = 0 since:

- The project is a solar PV project without fossil fuel consumption
- The project does not involve the integration of a BESS using electricity from the grid or from fossil fuel electricity generators

4.3 Leakage

According to the applied methodology, no leakage is considered for the project activity.

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)

The summary of ex ante estimates of emission reductions is shown as follows:

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 2023 (07/02/2023 to 31/12/2023, 328 days)	20,919.64	0	0	20,919
Year 2024 (01/01/2024 to 31/12/2024)	23,201.50	0	0	23,201
Year 2025 (01/01/2025 to 31/12/2025)	23,114.09	0	0	23,114
Year 2026 (01/01/2026 to 31/12/2026)	23,025.34	0	0	23,025
Year 2027 (01/01/2027 to 31/12/2027)	22,936.14	0	0	22,936
Year 2028 (01/01/2028 to 31/12/2028)	22,845.95	0	0	22,845
Year 2029 (01/01/2029 to 31/12/2029)	22,755.03	0	0	22,755
Year 2030 (01/01/2030 to 06/02/2030, 37 days)	2,305.74	0	0	2,305
Total	161,103.43	0	0	161,098

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Baseline combined margin emission factor of Myanmar Power Grid
Source of data	Myanmar Energe Statistics 2019
Value applied	0.35133
Justification of choice of data or description of measurement methods and procedures applied	Sourced from official public data Myanmar Energe Statistics 2019
Purpose of Data	Calculation of baseline emissions
Comments	/

5.2 Data and Parameters Monitored

Data / Parameter	$EG_{facility,y}$
Data unit	MWh
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y.
Source of data	Calculated based on the data of $EG_{export,y}$, $EG_{import,y}$, which are measured by electricity meter
Description of measurement methods and procedures to be applied	$EG_{facility,y} = EG_{export,y} - EG_{import,y}$ $EG_{export,y}$: Electricity supplied to the grid by the project $EG_{import,y}$: Electricity imported from the grid by the project The data will be measured continuously, recorded monthly. All data collected as part of monitoring should be archived electronically and be kept at least for two years after the end of the last crediting period.
Frequency of monitoring/recording	measured continuously, recorded monthly
Value applied	Year 2023 (07/02/2023 to 31/12/2023, 328 days): 59,544 Year 2024 (01/01/2024 to 31/12/2024): 66,039

	Year 2025 (01/01/2025 to 31/12/2025)	65,790
	Year 2026 (01/01/2026 to 31/12/2026)	65,538
	Year 2027 (01/01/2027 to 31/12/2027)	65,284
	Year 2028 (01/01/2028 to 31/12/2028)	65,027
	Year 2029 (01/01/2029 to 31/12/2029)	64,768
	Year 2030 (01/01/2030 to 06/02/2030, 37 days)	6,563
Monitoring equipment	Bi-directional meter M for monitoring $EG_{export,y}$ and $EG_{import,y}$: Type: electricity meter Accuracy class: 0.5S Serial number: 012200072631	
QA/QC procedures to be applied	The metering equipment is calibrated and checked for accuracy periodically as per manufacturer guidance or industrial/national standard. Data measured by meters will be cross checked by receipts of sales.	
Purpose of data	Calculation of baseline emissions	
Calculation method	$EG_{facility,y} = EG_{export,y} - EG_{import,y}$	
Comments	/	

5.3 Monitoring Plan

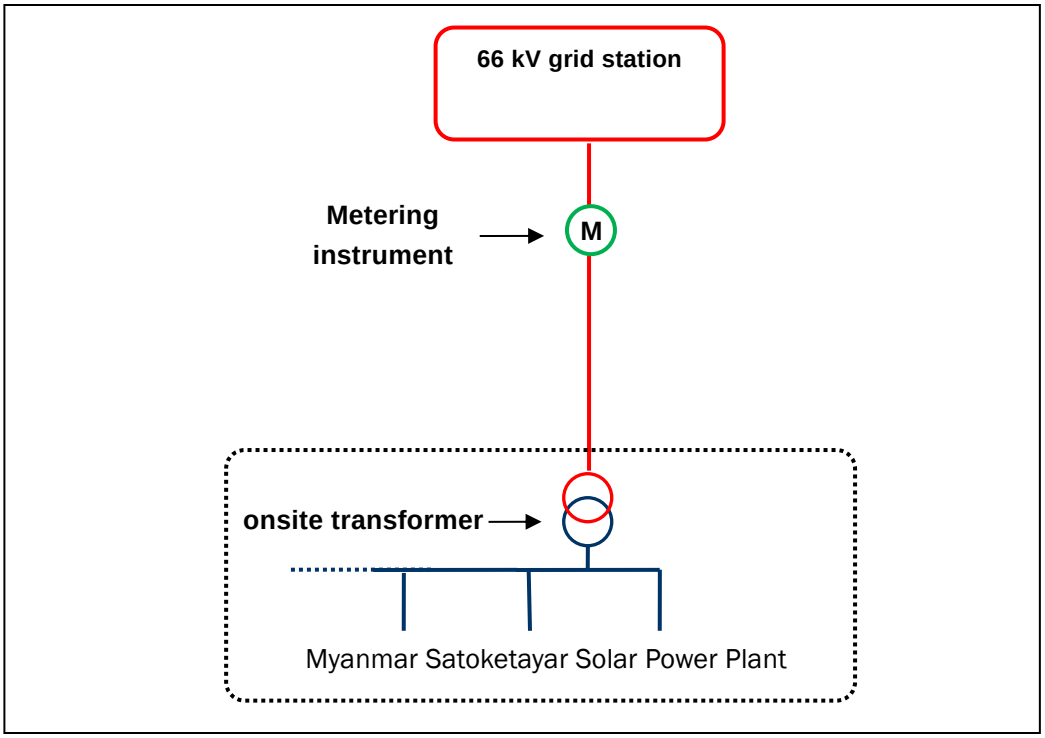

Figure 5.1 Simplified electrical grid connection diagram

As indicated in Figure B.3 the project is connected to the 66 kV grid station through 66 kV transmission line, and the bi-directional electricity meter M is installed at the grid side. Quantity of net electricity generation supplied by the project plant to the grid in year y is measured by continuously measuring the quantities:

(a) Electricity supplied to the grid by the project ($EG_{export,y}$); and

(b) Electricity imported from the grid by the project ($EG_{import,y}$);

The $EG_{facility,y}$ is calculated by $EG_{export,y}$ - $EG_{import,y}$

Meter readings will be recorded monthly and based on the readings of meter M. The project owner will crosscheck the amount of monthly meter reading records against the electricity sales receipts issued by the grid company. In case of discrepancies between meter reading records and that on electricity sales receipts, the conservative value, i.e. the lower $EG_{export,y}$ and the higher $EG_{import,y}$ will be taken into account for emission reductions calculation.

Calibrations of metering device M are carried out as per the grid operator as per manufacturer guidance or industrial/national standard. If there are any substantial discrepancies between the readings of the metering instruments throughout the year, the instrument will be recalibrated.

Operational and management structure for monitoring

The monitoring of the emission reductions will be carried out according to the scheme shown in Figure 5.2. The General Manager will hold the overall responsibility for the monitoring process.

The first step is the measurement of the electrical data and reporting of daily operations, which will be carried out by the plant manager.

The project owner will appoint a monitoring officer who will be responsible for the measurement, collection of meter reading records and the calculation of the emissions reductions. Finally, the monitoring reports will be reviewed by the General Manager.

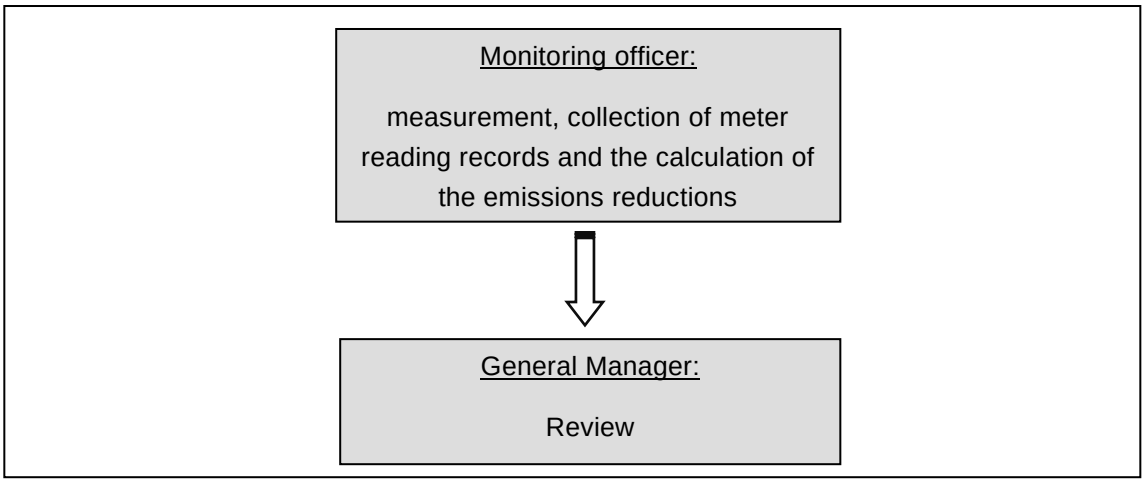

Figure 5.2 Management structure in order to monitor emission reductions

Reporting, archiving and preparation for periodic verification

All meter reading records and electricity sales receipts will be collected and safe kept by the project entity. Generally, the project owner will report the monitoring data periodically. The project owner will ensure that all required documentation is made available to the verifier. Data records will be archived for a period of 2 years after the last crediting period.

Emergency plan

In case metering equipment is damaged and no reliable readings can be recorded the project entity will estimate net supply by the project activity according to the following procedure:

If the meter M is non-functional, the metering data recorded by the grid company, evidenced by electricity sales receipts, will be used as record of net power supplied to the grid for the days for which no record could be recorded.