



**Verified Carbon
Standard**

GROUPED ROOFTOP SOLAR PROJECT BY TATA POWER RENEWABLE ENERGY LIMITED

Document Prepared by Tata Power Renewable Energy limited

Project Title	Grouped Rooftop Solar Project by Tata Power Renewable Energy Limited
Version	1.0
Date of Issue	18-July-2022
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1 PROJECT DETAILS

1.1 Summary Description of the Project

The project involves installation of Solar Photovoltaic (SPV) Panels on rooftops in various states of India. The sole purpose of project activity is to install solar power plant for captive purpose and surplus generated electricity can be supplied to grid and further equivalent energy will be consumed from grid through net metering arrangement with state electricity board.

Under the concept of Net Metering, the customers are charged only for the net power that they consume from the electricity service provider that has accumulated over a specific period. In other words, if their renewable energy generating systems make more electricity than consumed, they may be credited or paid for the excess electricity contributed to the grid over the same period. Net metering is also a way to increase the energy in the power grid to keep up with increase in demand during peak power use times, and this is of particular interest to states facing power shortages.

The location of the project.

The project location is entire India as geographical region. The project locations for Project Activity Instances are in India and details are provided in Section 1.12 of this document. The project location details, KML files for India country are submitted along with this joint PD & MR.

An explanation of how the project is expected to generate GHG emission reductions or removals.

The project activity will displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit i.e., in the absence of the project activity, the users would have been supplied electricity from one or more sources listed below:

- a) A national or a regional grid (grid hereafter);
- (b) Fossil fuel fired captive power plant;
- (c) A carbon intensive mini-grid

A brief description of the scenario existing prior to the implementation of the project.

The baseline scenario would be either continued use of fossil fuel dominated grid connected electricity generation or fossil fuel used in power plant or carbon intensive electricity.

An estimate of annual average and total GHG emission reductions and removals.

During registration of project activity, first project activity instances are included. The average annual GHG emission reduction from the first project activity instance is 17,764 t CO₂e

Project Activity instance:

The details of the first/current project activity instance are as below-

S.I No.	Customer	Installed Capacity (kW)	Date of Commissioning
1	Tinplate Company of India Limited	200.64	01-October-2020
2	Duraline India Private Limited	980	07-October-2020
3	GE T&D India Limited, Hosur	832	11-October-2020
4	Arya Anathalay I	80	20-December-2020
5	Time of India, Airoli	186.9	19-January-2021
6	Asian Paints Limited	451	18-February-2021
7	Time of India, Kolkata	226.95	22-February-2021
8	TATA Lockheed Martin Aerostructures Limited	999.6	03-March-2021
9	TSPDCL, Demag	318	31-March-2021
10	Apollo Gleneagles Hospital Limited	335	01-April-2021
11	Tata Metaliks Limited	1059	15-May-2021
12	Arya Anathalay II	202.29	03-June-2021
13	Tata Motors Limited (Car Plant)	6250	18-June-2021

1.2 Sectoral Scope and Project Type

The project activity falls under consideration of the grouped project activity. The project activity instances as part of the grouped project will have the following parameters

Sectoral Scope : 01 - Energy industries (renewable / non-renewable sources)

Project Type : I - Renewable Energy Projects

Project Category: Each project activity instances will apply only small-scale solar technology

Methodology : AMS-I.F.: Renewable electricity generation for captive use and mini-grid - Ver 3.0

The project activity under consideration is a grouped project activity.

1.3 Project Eligibility

The project activity involves installation and generation of electricity using renewable energy resources i.e. by using the solar energy (renewable sources) replacing electricity supply from a fossil-fuel dominated electricity, thus leads to reductions of anthropogenic GHG emissions from atmosphere. Hence the project activity is eligible Sectoral scope 1 i.e. energy industries (renewable/ non-renewable sources) under the scope of the VCS Program. In line with methodology, project activity may displace electricity from fossil fuel fired captive power plant or displaces electricity from carbon intensive mini grid.

As the electricity produced by all the project activity instance involved in the proposed project is primarily intended to be used by the captive consumers and excess of the electricity to be

supplied to the grid, 100% of the electricity generated by the solar PV units is to be accounted for emission reduction, even though the project is grid-connected, given that the main purpose is the delivery to the captive consumer.

1.4 Project Design

The proposed project activity is a grouped project activity.

Eligibility Criteria

The project is a grouped project and following are the eligibility criteria for inclusion of new project activity instances into the grouped project activity:

- 1) Applicability Conditions: The project activity instances shall meet applicability conditions for applicable methodology AMS I.F version 3.0 as defined in section 3.2
- 2) Geographical Area: The project activity instances to be included in the grouped project activity will be activities involving renewable electricity generation power plants connection using solar technology located within India that would be generating electricity for captive purpose.
- 3) Baseline scenario: All Project Activity Instances shall meet the baseline definition as defined in respective methodology and as explained in section 3.4
- 4) Technology type: The project activity instances to be included in the grouped project activity will be Greenfield activities involving renewable electricity generation power plants (minigrid or captive use) using solar technology.
- 5) Additionality: The project activity instances to be added as part of the grouped project will meet additionality criteria as set out in the methodology.
 - a. **For small scale project activity instances** - As per Guidelines on the Methodological Tool for the demonstration of additionality of small- scale project activities - Version 13.0.0¹ (EB 105, Annex 4), a positive list of grid-connected renewable electricity generation technologies are listed that are automatically defined as additional, without further documentation of barriers.
 - i. The positive list comprises of the following grid-connected renewable electricity generation technologies of installed capacity up to 15 MW:
 1. Solar technologies (photovoltaic and solar thermal electricity generation);
 2. Off-shore wind technologies;
 3. Marine technologies (wave, tidal).
 4. Building-integrated wind turbines or household rooftop wind turbines of a size up to 100 KW;

¹ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-21-v13.0.pdf>

Since the small-scale project activity instances involve solar photovoltaic electricity generation projects, it can be concluded from the above list that this project activity is automatically additional and does not require demonstration of barriers.

- 6) Start Date: The start date of each project activity instance under the grouped project should not be prior to the start date of the grouped project. The start date of each project activity instance will be determined through documentary evidence.
- 7) Conditions that avoid double counting of emission reductions like unique identifications of project and claiming emission reduction only under one GHG program.
- 8) The Grouped Project specific requirements stipulated by the Entity responsible for coordinating and managing grouped project for conducting local stakeholder consultations and environmental impact assessment (EIA), as applicable.
- 9) The project activity using solar project will supply electricity to grid or to users through grid network (micro grid) or in house captive consumption.

The following table demonstrates how the initial project activity instances being included in the grouped project activity fulfil above mentioned eligibility conditions:

Sr. No.	Eligibility Criteria	Project Activity instances eligibility
1	Applicability Conditions: The project activity instances shall meet applicability conditions for applicable methodology (AMS I.F version 3.0) as defined in section 3.2	All project activity instances meet applicability conditions of methodology (AMS I.F Version 3.0 (project activity instances having capacity less than 15 MW), hence this eligibility criteria is fulfilled. Please refer section 3.2 of this document for methodology applicability criteria.
2	Geographical Area: The project activity instances to be included in the grouped project activity will be activities involving Renewable Electricity Generation for captive use and Mini-grid using solar technology located within India.	All project activity instances being included in the grouped project are located within geographic boundaries of India. Hence this condition is fulfilled. Please refer commissioning certificate for Geographical area of project activity.
3	Baseline scenario: All Project Activity Instances shall meet the baseline definition as defined in respective methodology and as explained in section 2.4	All initial project activity instances have same baseline as per methodology as detailed in subsequent sections. Hence this eligibility criterion is fulfilled. Please refer section 3.4 of this document for baseline scenario.
4	Technology type: The project activity instances to be included in the grouped project activity will be Greenfield activities involving Renewable Electricity Generation	All project activity instances Instance are solar PV power plants supplying electricity for mini grid or captive use. All are Green field projects. Hence this condition is fulfilled.

	for captive use and Mini-grid using solar PV technology. The electricity should be supplied to grid, or to third party or to be used for captive purpose etc.	
5	Additionality: The project activity instances to be added as part of the grouped project will meet additionality criteria as set out in respective methodologies - for Small Scale Project instances the methodology applicable will be AMS-I.F. For small scale project, project activity instance will be auto additional.	The additionality for the all project activity instances included in the grouped project has been demonstrated in section 3.5 of PD. As per CDM Tool for demonstration of additionality for small scale project activities, solar PV projects with capacity up to 15 MW fall in positive list of technologies termed as automatically additional. Here all the project activity instances are small scale projects and are automatically additional.
6	Start Date: The start date of each project activity instance under the grouped project should not be prior to the start date of the grouped project. The start date of each project activity instance will be determined through documentary evidence.	The start date of grouped project is considered as the earliest commissioning date (i.e. 01-October-2020) of project activity instance and start date of all other project activity instances is after this date. Please refer commissioning certificate for start date of grouped project activity.
7	Conditions that avoid double Counting of emission reductions like unique identifications of project and claiming emission reduction only under one GHG program.	The existing and new project activity instances are identified by latitude and longitude and location of the plant. Declaration has been provided and these project activity instances are not participating in any other GHG program. Hence this condition is fulfilled.
8	The Grouped Project specific requirements stipulated by the Entity responsible for coordinating and managing grouped project for conducting local stakeholder consultations and environmental impact assessment (EIA), as applicable.	Local stakeholder consultation has been conducted as a part of grouped project activity. There is no requirement for carrying out EIA for these projects in India, hence this condition is fulfilled.
9	The project activity using solar PV project will supply electricity to grid or to users through grid network or in house captive use.	The existing and new project activity instances are solar PV power plants supplying electricity to grid or user or in house captive use. Hence this condition is fulfilled.

As per clause 3.5.7 of VCS Standard Version 4.1, Non-grouped projects with multiple project activity instances shall not exceed any capacity limits to which a project activity is subject. Thus, capacity limits criteria is applicable for non-grouped project activity. The proposed project activity is grouped project activity, thus capacity limit

As per clause 3.5.10 of VCS Standard Version 4, Grouped project activity allows multiple project activities where meth applied to project allows it. Each project activity instance have total power generation capacity less than 15 MW.

“As with non-grouped projects, grouped projects may incorporate multiple project activities (see Section 3.5.1 – 3.5.3 for more information on multiple project activities). Where a grouped project includes multiple project activities, the project description shall designate which project activities may occur in each geographic area”

As per para 3.5.14 of VCS Standard V4.1, each project activity instances are not exceeding the capacity limit of 15 MW. The project activity instance involves multiple project activity instances and it is not cluster of project activity instances. Thus there is no any requirement of division of clusters of project activity instances and no requirement to demonstrate that each project activity instances are not within one kilometre of each other.

If any project activity instance is bundled project, then that project activity instance capacity is within capacity limit of 15 MW.

1.5 Project Proponent

Organization name	Tata Power Renewable Energy Limited
Contact person	Prashant Kumar Tiwari
Title	Group Head - Carbon Asset Mgmt,
Address	Tata Power Renewable Energy Limited, Corporate Center B, 34 Sant Tukaram Road, Carnac Bunder, Mumbai 400 009, Maharashtra, India
Telephone	+91 9099006418
Email	prashant.tiwari@tatapower.com

1.6 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the project	Project Consultant
Contact person	Anil Kumar Nayakallu
Title	Senior Manager- Operations
Address	EnKing Embassy, Plot 48, Scheme 78 Part-2, Behind Vrindavan Hotel, Vijay Nagar, Indore-452010, Madhya Pradesh, India

Telephone	+91 8341435031
Email	anil.nayakallu@enkingint.org and registry@enkingint.org

1.7 Ownership

The renewable energy technology installed at site of each of the project activities as part of the proposed project activity are under ownership of respective SPV/Project Proponent. Tata Power Renewable Energy Limited is authorized PP by all owners of solar power plant. The commissioning certificate for project activity are the supporting documents to demonstrate the project ownership.

This demonstrates the right of use according to clause 3.6.1 (3) of VCS Standard (v4.3) – “a 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”.

1.8 Project Start Date

Start date of project activity is 01-October-2020², which is the date of commissioning of the earliest commissioned solar unit involved in the grouped project activity.

1.9 Project Crediting Period

Crediting Period Start date: 01-October-2020

Crediting Period End date: 30-September-2027

The grouped project activity adopts renewable crediting period of 7 years period which can be renewed for maximum 2 times. This start date of crediting period will vary based on actual earliest commissioned date within the project activity instances of grouped project activity.

1.10 Project Scale and Estimated GHG Emission Reductions or Removals

Indicate the scale of the project (project or large project) and the estimated annual GHG emission reductions or removals for the project crediting period.

Project Scale	
Project	✓
Large project	

² The current project activity instance 1 is commissioned and the projects commissioned after 01-October-2020 shall be considered under this grouped project.

Year	Estimated GHG emission reductions or removals (tCO ₂ e)
Year 1	17,764
Year 2	17,764
Year 3	17,764
Year 4	17,764
Year 5	17,764
Year 6	17,764
Year 7	17,764
Total estimated ERs	124,348
Total number of crediting years	7
Average annual ERs	17,764

1.11 Description of the Project Activity

The project involves installation of Solar Photovoltaic (SPV) Panels on rooftops in various states of India. The sole purpose of project activity is to install solar power plant for captive purpose and surplus generated electricity can be supplied to grid and further equivalent energy will be consumed from grid through net metering arrangement with state electricity board

Under the concept of Net Metering, the customers are charged only for the net power that they consume from the electricity service provider that has accumulated over a specific period. In other words, if their renewable energy generating systems make more electricity than consumed, they may be credited or paid for the excess electricity contributed to the grid over the same period. Net metering is also a way to increase the energy in the power grid to keep up with increase in demand during peak power use times, and this is of particular interest to states facing power shortages.

As per para 3.5.14 of VCS Standard V.4.3, each project activity instance of grouped project activity is less than 15 MW capacity. Thus small scale methodology AMS I.F is applicable for proposed grouped project activity.

As per the applicable methodology, a Greenfield power plant is defined as “a new renewable energy power plant that is constructed and operated at a site where no renewable energy power plant was operated prior to the implementation of the project activity”.

The Project activity is a new facility (Greenfield) and the electricity generated by the Project will be exported to the Indian Grid. The Project will therefore displace an equivalent amount of

electricity which would have otherwise been generated by fossil fuel dominant electricity grid. The Project Proponent plans to avail the VCS benefits for the Project.

1.12 Project Location

The details of the project locations are mentioned in the table below:

S.I No.	Customer	Installed Capacity (kW)	Longitude	Latitude
1	Tinplate Company of India Limited	200.64	22.7936	86.2295
2	Duraline India Private Limited	980	17.1699	78.2926
3	GE T&D India Limited, Hosur	832	12.7532	77.8098
4	Arya Anathalay I	80	28.5571	77.2552
5	Time of India, Airoli	186.9	19.1641	73.0012
6	Asian Paints Limited	451	19.0593	73.1221
7	Time of India, Kolkata	226.95	22.5748	88.4266
8	TATA Lockheed Martin Aerostructures Limited	999.6	17.2292	78.5523
9	TSPDCL, Demag	318	22.7700	86.2200
10	Apollo Gleneagles Hospital Limited	335	22.5739	88.4011
11	Tata Metaliks Limited	1059	22.3845	87.2849
12	Arya Anathalay II	202.29	28.5571	77.2552
13	Tata Motors Limited (Car Plant)	6250	18.6488	73.8165

This is a grouped project activity and the India is the boundary of the project activity. The KML file shared with the DOE.



A KML file have been submitted in order to indicate the project location and geographic boundaries

1.13 Conditions Prior to Project Initiation

The project is a Greenfield solar power project and does not involve generation of GHG emissions for the purpose of their subsequent reduction, removal or destruction. Prior to the initiation of the project activity, the equivalent amount of electricity would have been drawn from grid connected or new power plants, in Indian Grid. The grid is predominantly coal based and therefore is a major source of carbon dioxide emissions in India. The main emission in the pre project scenario is the power plants connected to the Indian Grid, and main GHG involved is CO₂. The baseline identified in section 2.4 is same as the pre-project scenario.

As per methodology, the baseline scenario would be either continued use of fossil fuel dominated grid connected electricity generation or fossil fuel used in power plant or carbon intensive electricity.

- **Ecosystem type:** Not Applicable
- **Current and historical land-use:** Not Applicable
- **Has the land been cleared of native ecosystems within 10 years of the project start date?**

☐ Yes

☒ No

1.14 Compliance with Laws, Statutes and Other Regulatory Frameworks

The Project has received necessary approvals for development and commissioning for each PV Plant from the state Nodal agencies and is in compliance to the local laws and regulations.

The relevant national laws and regulations pertaining to generation of energy in India are:

- Electricity Act 2003
- National Electricity Policy 2005
- Tariff Policy 2006
- The Project activity conforms to all the applicable laws and regulations in India:
- Power generation using solar energy is not a legal requirement or a mandatory option.
- There are state and sectoral policies, framed primarily to encourage solar power projects. These policies have also been drafted realizing the extent of risks involved in the projects and to attract private investments.
- The Indian Electricity Act, 2003 (May 2007 Amendment) does not influence the choice of fuel used for power generation.
- There is no legal requirement on the choice of a particular technology for power generation.

1.15 Participation under Other GHG Programs

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

The proposed grouped project activity has not been registered and is not seeking registration at moment under any other GHG programs.

The initial project activity instances are not participating in any other GHG program.

1.15.2 Projects Rejected by Other GHG Programs

The proposed grouped project activity is neither participating in any other GHG Programme nor rejected by any other GHG programs.

1.16 Other Forms of Credit

1.16.1 Emissions Trading Programs and Other Binding Limits

The grouped project activity under consideration is not participating in any other Emission trading programme and other binding limits.

All project activity instances are not participating at moment in any other emission trading programme and other binding limits. The GHG emission reductions generated during the current monitoring period have not been used for compliance of other mechanism.

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

1.16.2 Other Forms of Environmental Credit

The proposed grouped project activity 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. 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.

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

☐ Yes

☒ No

1.17 Sustainable Development Contributions

1.17.1 Sustainable Development Contributions Activity Description

Contribution to sustainable development:

Apart from generation of renewable electricity, the grouped project activity and project activity instances proposed to be included under it would contribute to the sustainable development of the region - socially, environmentally and economically. Ministry of Environment and Forests, has stipulated economic, social, environment and technological well-being as the four indicators of sustainable development. The project contributes to sustainable development using the following ways.

- **Social well-being:** The project would help in generating employment opportunities during the construction and operation phases. The project activity will lead to development in infrastructure in the region and also may promote business with improved power generation.
- **Economic well-being:** The project is a clean technology investment in the region, which would not have been taken place in the absence of the VCS benefits the project activity will also help to reduce the demand supply gap in the state. The project activity creates local employment generation which helps economic well-being of local people.
- **Technological well-being:** The successful operation of project activity would lead to promotion of solar based power generation and would encourage other entrepreneurs to participate in similar projects.
- **Environmental well-being:** Solar being a renewable source of energy, it reduces the dependence on fossil fuels and conserves natural resources which are on the verge of depletion. Due to its zero emission the Project activity also helps in avoiding significant amount of GHG emissions.

1.17.2 Sustainable Development Contributions Activity Monitoring

The project activity contributes to the sustainable development by the involves installation of Solar Photovoltaic (SPV) Panels on rooftops in various states of India. solar power plant for captive purpose and surplus generated electricity can be supplied to grid.

The total estimated emission reductions during the entire crediting period of 7 years will be approximately 124,348 tCO₂e.

For SDG -7. The project activity has produced **14,648** MWh of clean energy and supplied it to Indian grid. The evidence for the same will be provided after the verification of the project activity.

For SDG -13, The project activity has prevented the release of 13,759 tCO₂e into the atmosphere during the current monitoring period. The evidence for the same will be provided after the verification of the project activity.

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	7.2	7.2.1 Renewable energy share in the total final energy consumption	Implemented activities to increase	About 19,497 MWh/year renewable electricity is supplied to the grid that helps in the increase renewable energy share in the energy mix. This will be updated during the verification of the project activity.	This will be updated during the verification of the project activity
2)	8.5	Average hourly earnings of female and male employees by occupation, age and persons with disabilities	Implemented activities to increase	In total 5 people are employed and 5 trainings will be conducted during the project activity. This will be further updated during the verification of the project activity.	This will be updated during the verification of the project activity
3)	13.0	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	By supplying 19,497 MWh clean electricity to Indian grid, the project avoided the release of 17,764 tCO ₂ e/year in to the atmosphere during the reporting period	This will be updated during the verification of the project activity

1.18 Additional Information Relevant to the Project

Leakage Management

Since the project activity instances to be included into the grouped project activity are renewable energy projects based on solar technology, no leakage emissions are considered - in line with paragraph 27 of the small-scale methodology AMS.I. F (version 3.0).

Thus, leakage management plan and implementation of leakage and risk mitigation measures are not applicable for this grouped project activity.

Commercially Sensitive Information

Not applicable. No any commercially sensitive information has been excluded from the public version of the project description. There is no commercially sensitive information

Further Information

Not applicable.

2 SAFEGUARDS

2.1 No Net Harm

The project activity promotes environmental and socio-economic well-being as it results in zero GHG emissions due to installation and operation of clean, renewable energy technology for electricity generation.

The report on “Developmental Impacts and Sustainable Governance Aspects of Renewable Energy Projects” prepared by MNRE dated September 2013. This report clearly mentioned that solar project activity operations do not result in direct air pollution, noise pollution. Please refer below web link for the same³.

Thus, there are no any significant impacts due to implementation of project activity on air, water, soil quality and ambience are envisaged due to the project activity.

2.2 Local Stakeholder Consultation

The local stakeholder consultation section will be completed during registration stage

³ <http://mnre.gov.in/file-manager/UserFiles/report-on-developmental-impacts-of-RE.pdf>

2.3 Environmental Impact

The guidelines on Environmental Impact Assessment have been published by Ministry of Environment, Forests and Climate Change (MoEFCC), Government of India (GOI) under Environmental Impact Assessment notification 14/09/2006⁴. Further amendments to the notification have been done on 14/07/2018⁵. As per the notification:

The following projects or activities shall require prior environmental clearance from the concerned regulatory authority, which shall hereinafter referred to be as the Central Government in the Ministry of Environment and Forests for matters falling under Category 'A' in the Schedule and at State level the State Environment Impact Assessment Authority (SEIAA) for matters falling under Category 'B' in the said Schedule, before any construction work, or preparation of land by the project management except for securing the land, is started on the project or activity:

- (i) All new projects or activities listed in the Schedule to this notification;
- (ii) Expansion and modernization of existing projects or activities listed in the Schedule to this notification with addition of capacity beyond the limits specified for the concerned sector, that is, projects or activities which cross the threshold limits given in the Schedule, after expansion or modernization;
- (iii) Any change in product - mix in an existing manufacturing unit included in Schedule beyond the specified range."

As the solar power generation projects are not listed in any of the categories of the schedule. So, the project is considered environmentally safe and as per Host party- India no EIA is required.

2.4 Public Comments

This section will complete after 30 days public comment period.

2.5 AFOLU-Specific Safeguards

This section is not required as this project activity is a non-AFOLU project activity.

3 APPLICATION OF METHODOLOGY

3.1 Title and Reference of Methodology

The project activity instances as part of the proposed grouped project activity will be small scale project activity instances with power generation capacity less than or equal to 15 MW as per CDM terminology. Accordingly, below mentioned methodology will be used for each of the project activity instances.

The project activity instance based on its capacity:

⁴ EIA Notification 2006: <http://envfor.nic.in/legis/eia/so1533.pdf>

⁵ EIA Notification 2018: <http://www.egcipl.com/Doc/Gazette%20Notification.pdf>

The methodology for the project activity instances will be the approved methodology for small-scale CDM project activities. The details of the methodology are as follows:

Methodology : AMS.I. F

Project Type : Type-I: Renewable Energy Projects

Title : Renewable Electricity Generation for captive use and Mini-grid, Ver 3.0; EB 81

Reference : CDM Methodologies⁶

3.2 Applicability of Methodology

The Small-scale grid connected project activity instances under grouped project activity will meets the applicability conditions of the approved methodology AMS I.F., Version 3.0, Sectoral Scope 1, as described below-

Applicability Condition of AMS I F Ver. 3	Project activity vis-à-vis applicability Conditions
This methodology comprises renewable energy generation units, such as photovoltaic, hydro, tidal/wave, wind, geothermal and renewable biomass that supply electricity to user(s). The project activity will displace electricity from an electricity distribution system that is or would have been supplied by at least one fossil fuel fired generating unit i.e., in the absence of the project activity, the users would have been supplied electricity from one or more sources listed below: - A national or a regional grid (grid hereafter); - Fossil fuel fired captive power plant; - A carbon intensive mini-grid.	The project activity instances comprise of renewable electricity generation using solar energy units which supply power to grid, to the users through grid network and/or in house captive consumption. The solar plant unit is located at the respective rooftop of the mentioned site at section 1. The project activity will displace electricity from INDAN Grid, which is supplied by predominantly fossil fuel plants. The project activity instances would replace equivalent quantum of fossil fuel dominated grid power that's being used prior to the project activity instances. Hence, the project activity instances justifies this applicability conditions. Also project activity instances which diaplaces Fossil fuel fired captive power plant; or A carbon intensive mini-grid are eligible under this grouped project activity

⁶ (<https://cdm.unfccc.int/methodologies/DB/9KJWQ1GOWEG6LKHX21MLPS8BQR7242>)

Illustration of respective situations under which each of the methodology (AMS-I.D., AMS-I.F. and AMS-I.A.) applies is included in Table 3.	The project activity applies methodology AMS I.F and the detailed scenario has been explained after end of this table.
Hydro power plants with reservoirs that satisfy at least one of the following conditions are eligible to apply this methodology: a. The project activity is implemented in an existing reservoir with no change in the volume of reservoir; b. The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the project emissions section, is greater than 4 W/m² c. The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the project emissions section, is greater than 4 W/m².	Project activity instances does not include hydro power generation.
This methodology is applicable for project activities that: a) Install a new power plant at a site where there was no renewable energy power plant operating prior to the implementation of the project activity (Greenfield plant); b) Involve a capacity addition, c) Involve a retrofit of (an) existing plant(s); or d) Involve a replacement of (an) existing plant(s).	All project activity instances are installation of greenfield power plants. Hence the condition (a) justifies by the project activity instances. For future project activity instances, option b, c and d may be applicable and applicability will be justified for each project activity instance.
In the case of project activities that involve the capacity addition of renewable energy generation units at an existing renewable power generation facility, the added capacity of the units added by the project should be lower than 15 MW and should be physically distinct from the existing units.	Project instances are not capacity addition. All instances are green field installation. If any project activity instance involves any capacity addition, then total capacity of each project activity instance is less than 15 MW.

In the case of retrofit or replacement, to qualify as a small-scale project, the total output of the retrofitted or replacement unit shall not exceed the limit of 15 MW.	This Project activity instances are not a retrofit or replacement of existing project activity. If any project activity instance involves any retrofit or replacement, then total capacity of each project activity instance is less than 15 MW
If the unit added has both renewable and non-renewable components (e.g. a wind/diesel unit), the eligibility limit of 15 MW for a small-scale CDM project activity applies only to the renewable component. If the unit added co-fires fossil fuel, the capacity of the entire unit shall not exceed the limit of 15 MW.	The project activity instances does not have a non-renewable component.
Combined heat and power (co-generation) systems are not eligible under this category.	The project activity instances does not involved with co-generation.
If electricity and/or steam/heat produced by the project activity is delivered to a third party, i.e. another facility or facilities within the project boundary, a contract between the supplier and consumer(s) of the energy will have to be entered that ensures that there is no double counting of emission reductions.	Every project activity instance having a contractual agreement between supplier and consumers in order to specifically avoid double counting.
In case biomass is sourced from dedicated plantations, the applicability criteria in the tool "Project emissions from cultivation of biomass" shall apply.	The project activity instances does not involved with biomass usage.

Differentiation amongst applicability of AMS – I.A, AMS-I.D and AMS- I.F

	Project type	AMS-I.A	AMS-I.D	AMS-I.F
1	Project supplies electricity to a national/regional grid		√	
2	Project displaces grid electricity consumption (e.g. grid import) and/or captive fossil fuel electricity generation at the user end (excess electricity may be supplied to a grid)			√
3	Project supplies electricity to an identified consumer facility via national/regional grid (through a contractual arrangement such as wheeling)		√	
4	Project supplies electricity to a mini grid system where in the baseline all generators use exclusively fuel oil and/or diesel fuel			√
5	Project supplies electricity to household users (included in the project boundary) located in off grid areas	√		

As the solar units involved in the proposed project generate electricity primarily to deliver to captive consumers and excess electricity is to be supplied to the grid, this resembles the scenario listed at S.I no. 2 of the above table and hence the methodology, AMS I F is applied appropriately.

Tool to calculate the emission factor for an electricity system⁷ - Version 07.0 (EB 100, Annex 04)

Applicability Criterion	Project Case
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).	The project is a grid connected Greenfield solar power project and thus the tool is applicable.
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 2: 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.	Steps involved in calculation of Emission Factor is included in section 4.1 of the PD as per the requirement of the tool.
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.	Project activity instances are located in non-Annex I country and hence the tool is applicable
Under this tool, the value applied to the CO ₂ emission factor of biofuels is zero.	The individual project activity instances is a solar project and there is no involvement of biofuels.

The project activity qualifies as Type I during every year of the crediting period in accordance with applicable provisions for project activity eligibility as discussed above. Also, the total installed capacity of each project instance is less than 15 MW threshold limit of small-scale project activity instances and respective methodology will be applicable for that project activity instances.

⁷<https://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-07-v7.0.pdf>

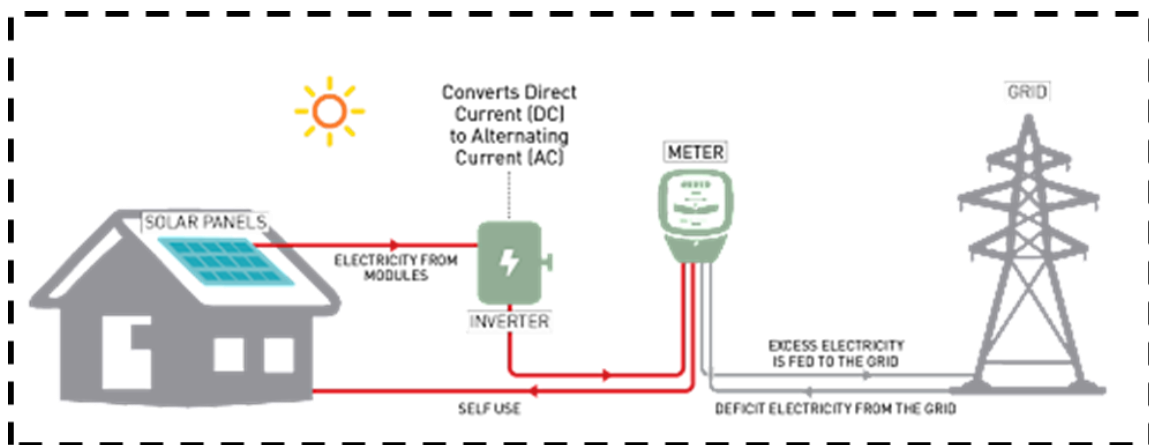
3.3 Project Boundary

As per AMS I.F, Version 3.0 “The spatial extent of the project boundary includes industrial, commercial facilities consuming energy generated by the system. In the case of electricity generated and supplied to distributed users (e.g., residential users) via mini/isolated grid(s) the project boundary may be confined to physical, geographical site of renewable generating units. The boundary also extends to the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.”

The project boundary includes the solar project installed at the user’s premises. Users might also be connected to the Indian grid. Therefore, the entire Indian grid and all connected power plants have been considered in the project boundary for the proposed VCS project activity. 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	Grid connected electricity generation	CO ₂	Yes	Main emission source
		CH ₄	NO	Minor emission source
		N ₂ O	NO	Minor emission source
Project	Greenfield Solar Power Project activity	CO ₂	NO	No CO ₂ emissions are emitted from the project
		CH ₄	NO	Project activity does not emit CH ₄
		N ₂ O	NO	Project activity does not emit N ₂ O

The pictorial depiction of the project boundary is given below:



The proposed project activities will be rooftop solar projects, however main purpose is captive.

3.4 Baseline Scenario

As per the applicable methodology, a Greenfield power plant is defined as “a new renewable energy power plant that is constructed and operated at a site where no renewable energy power plant was operated prior to the implementation of the project activity”.

As per para 20 of AMS I.F Version 3.0; “For project activities that displace grid electricity and fossil fuel fired on-site captive electricity, the baseline emission factor should reflect the emissions intensity of the grid and the captive power plant in the baseline scenario i.e., the weighted average emission factor for the displaced electricity is calculated using values based on the historical, prior three-year ratios of electricity from captive plants and the grid. For new facilities, the most conservative (lowest) of the emission factor for the two power sources should be used.

Hence, the baseline for the project activity is the equivalent amount of power from the INDIAN grid. The combined margin ($EF_{CO_2,y}$) is the result of a weighted average of two emission factor pertaining to the electricity system: the operating margin (OM) (having weightage 75%) and build margin (BM) (having weightage 25%). Calculations for this combined margin must be based on data from an official source of CEA database (where available) and made publicly available.

The combined margin of the INDIAN National Grid used for the project activity is as follows:

Parameter	Value	Nomenclature	Source
$EF_{grid,CM,y}$	0.9305 tCO ₂ /MWh	Combined margin CO ₂ emission factor for the project electricity system in year y	Calculated as the weighted average of the operating margin (0.25) & build margin (0.75) values, sourced from Baseline CO ₂ Emission Database, Version 17.0, October - 21 published by Central Electricity Authority (CEA), Government of India
$EF_{grid,OM,y}$	0.9522 tCO ₂ /MWh	Operating margin CO ₂ emission factor for the project electricity system in year y	Calculated as the last 3-year (2017-18, 2018-19, 2019-20) generation-weighted average, sourced from Baseline CO ₂ Emission Database, Version 17.0, October - 21 published by Central Electricity Authority (CEA), Government of India
$EF_{grid,BM,y}$	0.8653 tCO ₂ /MWh	Build margin CO ₂ emission factor for the project electricity system in year y	Baseline CO ₂ Emission Database, Version 17.0, October - 21 published by Central Electricity Authority (CEA), Government of India

ant references.

3.5 Additionality

The additionality of the Project shall be demonstrated by applying the following approach, consisting of two components:

- (i) A Legal Requirement Test; and
- (ii) An Additionality Test either based on a Positive List test or a projects-specific additionality test.

a) Legal Requirement Test

The project is not enforced by law. The project passes the legal requirement test since there are no enforced laws, statutes, regulations, court orders, environmental-mitigation agreements, permitting conditions of other legally-binding mandates requiring its implementation. Since voluntary commitments/agreements within a sector or by an entity do not constitute the legal requirement, the outcome of the legal requirement test is concluded as positive.

b) *Additionality Test*

Additionality Assessment

As per the 'Guidelines on the demonstration of Additionality of small-scale Project Activity' (version 10.0), a positive list of grid-connected renewable electricity generation technologies are listed that are automatically defined as additional, without further documentation of barriers. The positive list comprises of the following grid-connected renewable electricity generation technologies of installed capacity up to 15 MW:

- 1) Solar technologies (photovoltaic and solar thermal electricity generation);
- 2) Off-shore wind technologies;
- 3) Marine technologies (wave, tidal).
- 4) Building-integrated wind turbines or household rooftop wind turbines of a size up to 100 kW;

Since each project activity instance is installation of solar photovoltaic units at various locations with capacity less than 15 MW, it can be concluded from the above list that the project activity is automatically additional and does not require demonstration of barriers. Thus, it is well established that the proposed project activity is additional

3.6 Methodology Deviations

Not Applicable

4 ESTIMATED GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

For Solar grid connected systems:

As per para 19 of AMS-I.F. version 3.0, the Baseline emissions for other systems are the product of amount electricity displaced with the electricity produced by the renewable generating unit and an emission factor.

$$BE_y = E_{BL,y} \times EF_{grid,y}$$

Where:

BE_y = Baseline emissions in year y (tCO₂/yr)

$E_{BL,y}$ = 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)

$EF_{CO_2,y}$ = Emission factor(tCO₂/MWh)

Emission factor of a grid shall be calculated as per the procedures provided in AMS-I.F;

The spatial extent of the project boundary includes industrial, commercial facilities consuming energy generated by the system. In the case of electricity generated and supplied to distributed users (e.g. residential users) via mini/isolated grid(s) the project boundary may be confined to physical, geographical site of renewable generating units. The boundary also extends to the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to.

- Emission factor for captive electricity generation shall be calculated as per the procedures described in the latest version of the “Tool to calculate baseline, project and/or leakage emissions from electricity consumption”

As per methodology, combined grid emission factor as per the “Tool to calculate the emission factor for an electricity system” version 07 is calculated as below.

CO₂ Baseline Database for the Indian Power Sector, Version 17, October 2021 published by Central Electricity Authority (CEA), Government of India has been used for the calculation of emission reduction.

As per Methodological tool: Tool to calculate the emission factor for an electricity system (Version 7.0, EB 100, Annex 4), following six steps have been followed:

- Step 1:** Identify the relevant electricity systems;
- Step 2:** Choose whether to include off-grid power plants in the project electricity system (optional);
- Step 3:** Select a method to determine the operating margin (OM);
- Step 4:** Calculate the operating margin emission factor according to the selected method;
- Step 5:** Calculate the build margin (BM) emission factor;
- Step 6:** Calculate the combined margin (CM) emission factor.

Step 1: Identify the relevant electricity systems

As described in tool “For determining the electricity emission factors, identify the relevant project electricity system. Similarly, identify any connected electricity systems”. It also states that “If the DNA of the host country has published a delineation of the project electricity system and connected electricity systems, these delineations should be used”. Keeping this into consideration, the Central Electricity Authority (CEA), Government of India have Indian grid.

However, since August 2006, however, all regional grids except the Southern Grid had been integrated and were operating in synchronous mode, i.e. at same frequency. Consequently, the Northern, Eastern, Western and North-Eastern grids were treated as a single grid named as NEWNE grid from FY 2007-08 onwards for the purpose of this CO₂ Baseline Database. As of 31 December 2013, the Southern grid has also been synchronized with the NEWNE grid, hence forming one unified Indian Grid. Since the project supplies electricity to the Indian grid, emissions generated due to the electricity generated by the Indian grid as per CM calculations will serve as the baseline for this project.

Table: Geographical Scope of Indian Electricity Grid

Northern	Eastern	Western	North-Eastern	Southern
Chandigarh	Bihar	Chhattisgarh	Arunachal Pradesh	Andhra Pradesh
Delhi	Jharkhand	Gujarat	Assam	Karnataka
Haryana	Orissa	Daman & Diu	Manipur	Kerala
Himachal Pradesh	West Bengal	Dadar & Nagar Haveli	Meghalaya	Tamil Nadu
Jammu & Kashmir	Sikkim	Madhya Pradesh	Mizoram	Telangana
Punjab	Andaman & Nicobar	Maharashtra	Nagaland	Puducherry
Rajasthan		Goa	Tripura	Lakshadweep
Uttar Pradesh				
Uttarakhand				

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

The project owner 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 owner 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 ($EF_{grid,OM,y}$) is based on one of the following methods, which are described under Step 4:

- (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, solar, low-cost biomass, nuclear and solar generation.

Share of Must-Run (Hydro/Nuclear) (% of Net Generation)

	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21
India	14.6%	14.3%	14.5%	17.0%	16.5%	14.6%

Data Source: Central Electricity Authority (CEA) database Version 17, October 2021⁸

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 Indian 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 CO₂ emissions per unit net electricity generation (tCO₂/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:

- (a) **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

- (b) **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 Owner 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 validation.

⁸<https://cea.nic.in/cdm-co2-baseline-database/?lang=en>

OM determined at 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 ($EF_{grid,OMSimple,y}$) according to the selected method

The operating margin emission factor has been calculated using a 3-year data vintage

Net Generation in Operating Margin (GWH) (incl. Imports)	2018-19	2019-20	2020-21
INDIAN Grid	995,957	965,009	958,218

Simple Operating Margin (tCO ₂ /MWh) (incl. Imports)	2018-19	2019-20	2020-21
INDIAN Grid	0.9603	0.9555	0.9405

Weighted Generation Operating Margin	
INDIAN Grid	0.9522

Step 5: Calculate the build margin (BM) emission factor ($EF_{grid,BM,y}$)

As per Methodological tool: “Tool to calculate the emission factor for an electricity system” (Version 7.0, EB 100, Annex 4) para 72:

In terms of vintage of data, the project owner 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 m at the time of PD submission to the VVB for 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 Project Owner 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.

Build Margin (tCO ₂ /MWh) (not adjusted for imports)	
	2020-21
INDIAN Grid	0.8653

Step 6: Calculate the combined margin (CM) emission factor ($EF_{grid,CM,y}$)

As per Methodological tool: “Tool to calculate the emission factor for an electricity system” (Version 7.0, EB 100, Annex 4) para 81:

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

- (a) Weighted average CM; or
- (b) Simplified CM

Project Owner has chosen option (a) i.e weighted average CM to calculate the combined margin emission factor for the project activity.

The combined margin emissions factor is calculated as follows:

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

Where:

$EF_{grid,BM,y}$	= Build margin CO ₂ emission factor in year y (t CO ₂ /MWh)
$EF_{grid,OM,y}$	= Operating margin CO ₂ emission factor in year y (t CO ₂ /MWh)
W_{OM}	= Weighting of operating margin emissions factor (percent)
W_{BM}	= Weighting of build margin emissions factor (percent)

The following default values should be used for W_{OM} and W_{BM} :

For solar project activities: $W_{OM} = 0.25$ and $W_{BM} = 0.75$ (owing to their intermittent and non-dispatchable nature) for the second crediting period and for subsequent crediting periods. Since project activity is of power generation by using solar, the above weightage has been considered for OM and BM.

Therefore,

$$\begin{aligned} EF_{grid,CM,y} &= 0.8653 * 0.25 + 0.9522 * 0.75 \\ &= 0.9305 \text{ tCO}_2/\text{MWh} \end{aligned}$$

Therefore, referring para 19 AMS I.F. Version 3.0, the $EF_{CO_2,y}$ for grid connected and mini grid project instances would be $EF_{grid,CM,y}$ i.e. 0.9305 tCO₂e/MWh. The baseline emission factor is ex- ante parameter and will remain constant throughout the crediting period.

$$BE_y = 175 \times 0.9305 = 163 \text{ tCO}_2 \text{ (first year of operation)}$$

4.2 Project Emissions

As per the approved consolidated Methodology AMS I.F. Version 3.0 para 24 “For most renewable energy power generation project activities, $PE_y = 0$. However, some project activities may involve project emissions that can be significant. These emissions shall be accounted for as project emissions by using the following equation:

$$PE_y = PE_{FF,y} + PE_{GP,y} + PE_{HP,y}$$

Where:

PE_y = Project emissions in year y (t CO₂e/yr)

$PE_{FF,y}$ = Project emissions from fossil fuel consumption in year y (t CO₂/yr)

$PE_{GP,y}$ = Project emissions from the operation of dry, flash steam or binary geothermal power plants in year y (t CO₂e/yr)

$PE_{HP,y}$ = Project emissions from water reservoirs of hydro power plants in year y (t CO₂e/yr)

As the project activity is the installation of a new grid-connected solar Power plant and does not involve any project emissions from fossil fuel, operation of dry, flash steam or binary geothermal power plants, and from water reservoirs of hydro power plants. Therefore $PE_{FF,y}$, $PE_{GP,y}$, $PE_{HP,y}$ are equal to zero and thus, $PE_y = 0$.

4.3 Leakage

Since the project activity instances to be included into the grouped project activity are renewable energy projects based on solar PV technology, no leakage emissions are considered - in line with paragraph 27 of the small scale methodology AMS.I.F (version 3.0).

4.4 Estimated Net GHG Emission Reductions and Removals

As per the para 28 of AMS-I.F. version 3.0, the formula to calculate the emission reduction is

$$ER_y = BE_y - PE_y - LE_y$$

Where,

ER_y = Emission reductions in year y (t CO₂e/yr)

BE_y = Baseline emissions in year y (t CO₂/yr)

PE_y = Project emissions in year y (t CO₂e/yr)

LE_y = Leakage emissions in year y (t CO₂e/yr)

As the project activity is a solar project, there is no any leakage emissions from the project activity.

Hence, $LE_y = 0$

Therefore, Emission Reductions for this project activity are calculated as follows:

$$ER_y = BE_y - PE_y$$

Year	Estimated baseline emissions or removals (tCO ₂ e)	Estimated project emissions or removals (tCO ₂ e)	Estimated leakage emissions (tCO ₂ e)	Estimated net GHG emission reductions or removals (tCO ₂ e)
Year 1	17,764	0	0	17,764
Year 2	17,764	0	0	17,764
Year 3	17,764	0	0	17,764

Year 4	17,764	0	0	17,764
Year 5	17,764	0	0	17,764
Year 6	17,764	0	0	17,764
Year 7	17,764	0	0	17,764
Total	124,348	0	0	124,348

5 MONITORING

5.1 Data and Parameters Available at Validation

Data / Parameter	EF _{grid,OM,y}
Data unit	tCO ₂ e/MWh
Description	Operating Margin CO ₂ emission factor in year y
Source of data	CO ₂ Emission Database, Version 17.0, October- 2021 published by Central Electricity Authority (CEA), Government of India.
Value applied:	0.9522
Justification of choice of data or description of measurement methods and procedures applied	Calculated as the last 3-year (2018-19, 2019-20, 2020-21) generation-weighted average, sourced from Baseline CO ₂ Emission Database, Version 17.0, October- 2021 published by Central Electricity Authority (CEA), Government of India.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	EF _{grid,BM,y}
Data unit	tCO ₂ e/MWh
Description	Build Margin CO ₂ emission factor in year y

Source of data	CO ₂ Emission Database, Version 17.0, October- 2021 published by Central Electricity Authority (CEA), Government of India.
Value applied:	0.8653
Justification of choice of data or description of measurement methods and procedures applied	Calculated as the last year (2020-21) build margin, sourced from Baseline CO ₂ Emission Database, Version 17.0, October- 2021 published by Central Electricity Authority (CEA), Government of India.
Purpose of Data	Calculation of baseline emissions
Comments	-

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO ₂ e/MWh
Description	Combined Margin CO ₂ emission factor in year y
Source of data	CO ₂ Emission Database, Version 17.0, October- 2021 published by Central Electricity Authority (CEA), Government of India.
Value applied:	0.9305
Justification of choice of data or description of measurement methods and procedures applied	The combined margin emissions factor is calculated as follows: $EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}$ Where: $EF_{grid,BM,y}$ = Build margin CO₂ emission factor in year y (tCO₂/MWh) $EF_{grid,OM,y}$ = Operating margin CO₂ emission factor in year y (tCO₂/MWh) W_{OM} = Weighting of operating margin emissions factor (%) = 75% W_{BM} = Weighting of build margin emissions factor (%) = 25%
Purpose of Data	Calculation of baseline emissions
Comments	-

5.2 Data and Parameters Monitored

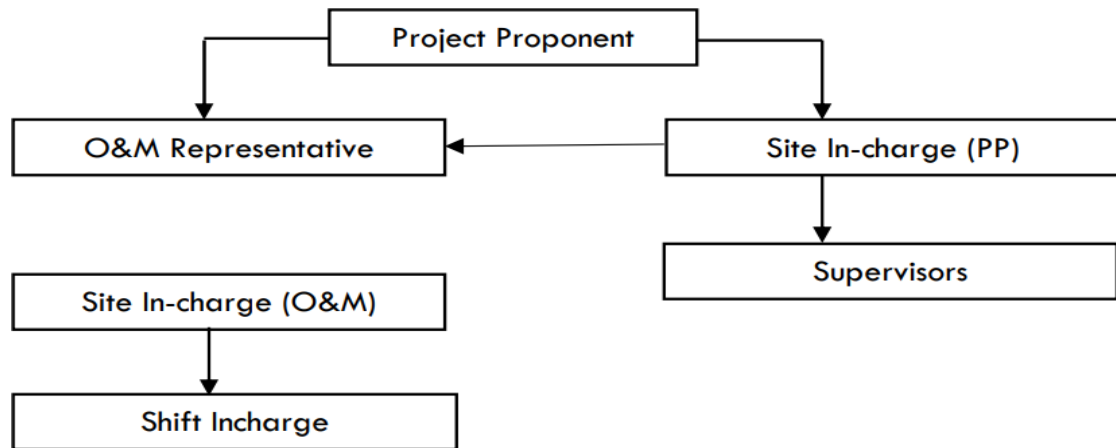
Data / Parameter	EGPJ,y
Data unit	MWh/y
Description	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)
Source of data	Monthly Joint Meter Readings taken at the project site
Description of measurement methods and procedures applied	-
Frequency of monitoring/recording	Continuous measurement & monthly recording
Value applied:	19,497
Monitoring equipment	
QA/QC procedures applied	Net electricity generated by project activity (EGPJ,y) which displaces the baseline scenario.
Purpose of data	Calculation of baseline emissions
Calculation method	The Joint Meter Readings (JMR) taken every month from each meter are added up to arrive at the net value of electricity generated by project activity. Also bills of net metering will be considered for determination of net electricity generated by project activity.
Comments	-

5.3 Monitoring Plan

The monitoring plan is developed in accordance with the modalities and procedures for CDM project activities. The monitoring plan, which will be implemented by the project participant describes about the monitoring organisation, parameters to be monitored, monitoring practices, quality assurance, quality control procedures, data storage and archiving.

Organizational structure and responsibilities:

The authority and responsibility for registration, monitoring, measurement, reporting and reviewing of the data rests with the project participant. PP proposed the following structure for data monitoring, collection, data archiving and calibration of equipment for this project activity. The team comprises of the following members:



Responsibilities of Site Incharge (PP): Overall functioning and maintenance of the project activity, the Site incharge shall coordinate with the O&M operator as well as the site supervisors.

Responsibilities of O&M Representative: Co-ordination between Site incharge of the O&M operator as well as the project participant and further report to PP head office.

Responsibilities of Site In-charge (O&M Operator): Responsibility for maintaining the data records, ensures completeness of data, and reliability of data (calibration of equipment) as well as data recording for all the parameters.

Responsibilities of Shift In-charge: Responsibility for day-to-day data collection and maintains day to day monitored data.

Data Measurement

The export and import energy or net electricity displaced by project will be measured continuously using above mentioned energy meter located after inverters. Readings of meters shall be taken on monthly basis by authorized officer of developer in the presence of PP or representative of PP. In the event of failure of generation meter, the user energy meter or inverter generation value will be used in monitoring the electricity generation data.

Data collection and archiving

Readings from meters will be collected in the presence of the plant in-charge. Export and Import or net electricity displaced by project would be recorded and stored in logs as well as in electronic form on a daily basis. The records are checked periodically by the Plant Manager and discussed thoroughly with the plant supervisor. The period of storage of the monitored data will be 2 years after the end of crediting period or till the last issuance of VERs for the project activity whichever occurs later.

Emergency preparedness

The project activity will not result in any unidentified activity that can result in substantial emissions from the project activity. No need for emergency preparedness in data monitoring is visualized.

QA/QC Procedures

Energy meters are installed at the respective project site. The calibration of all the meters will be undertaken at required intervals (once in five years as per CEA notification) and faulty meters will be duly replaced immediately. Records of calibration certificates will be maintained for verification purposes. Hence, a reliable method will be ensured with monitoring of the parameters. The invoice records will be used and kept for cross checking the consistency of the recorded data.

Sampling Approaches

Not required

Personnel training

In order to ensure a proper functioning of the project activity and a properly monitoring of emission reductions, the staff will be trained. The plant helpers will be trained in equipment operation, data recording, reports writing, operation and maintenance and emergency procedures in compliance with the monitoring plan.

6 ACHIEVED GHG EMISSION REDUCTIONS AND REMOVALS

6.1 Data and Parameters Monitored

Data / Parameter	EG _{PJ,y}
Data unit	MWh/y
Description	Quantity of net electricity supplied to the grid as a result of the implementation of the CDM project activity in year y (MWh)
Value applied:	14648.00
Comments	-

6.2 Baseline Emissions

Baseline emission is the product of Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity multiplied by the Combined margin CO₂ emission factor for grid connected power generation

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

Where,

BE_y = Baseline Emissions in year y; t CO₂

$EG_{PJ,y}$ = 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)

$EF_{grid,CM,y}$ = Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the “Tool to calculate the emission factor for an electricity system Version 7.0” (t CO₂/MWh)

If in the absence of the project activity, the users would have been supplied electricity from one or more sources listed below, the respective emission factor will be used for baseline emissions:

- (a) A national or a regional grid (grid hereafter); = National Grid emission factor
- (b) Fossil fuel fired captive power plant; = Emission factor of baseline fuel displaced
- (c) A carbon intensive mini-grid = Emission Factor of Mini Grid

6.3 Project Emissions

As per methodology AMS I.F. Version 3.0, for renewable energy projects, there is no any project emissions occurred.

Hence, $PE_y = 0$

6.4 Leakage

As per methodology AMS I.F. Version 3.0, for renewable energy projects, there is no any leakage emissions occurred.

Hence, $LE_y = 0$

6.5 Net GHG Emission Reductions and Removals

This section will be completed during validation and verification stage

Year	Baseline emissions or removals (tCO ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
2020	462	0	0	462
2021	9,473	0	0	9,473
2022	3,824	0	0	3,824
Total	13,759	0	0	13,759

APPENDIX X: <TITLE OF APPENDIX>

Use appendices for supporting information. Delete this appendix (title and instructions) where no appendix is required.