40MW BUNDLED SOLAR PROJECT IN TELANGANA, INDIA

Document Prepared by Infinite Solutions

Project Title	40 MW Bundled Solar Project in Telangana, India
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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The main purpose of this project activity is to generate clean form of electricity through renewable solar energy source for sale of electricity to the grid. The project is a bundle project activity with three individual project promoters detailed below:

Project Investors' Name	Capacity in MWAC	Location
Achintya Solar Power Limited I	10 MW	Village: Mandamarri; District: Mancherial; State: Telangana
Achintya Solar Power Limited-II	10 MW	
Suvarchas Solar Power Limited	10 MW	
Grinibhrit Solar Power Limited	10 MW	

The project activity involves installation of 04 projects of 10 MWAC each, totaling to 40 MWAC (corresponding to 54.525 MWp) solar power project under National Solar Mission, Phase-II, Batch-II, Tranche – I, State Specific Bundling Scheme. All the 4 projects are installed in the common project boundary at Village: Mandamarri, District: Mancherial, State: Telangana. The electricity generated from project activity will be sold under the Power Purchase Agreement (PPA), signed with NTPC Ltd. NTPC has been identified by the Government of India (GoI) as the Implementation Agency for setting up of Grid-connected Solar PV Power Projects under State Specific Bundling Scheme under the National Solar Mission of Government of India (GoI). And NTPC Vidyut Vyapar Nigam Limited (NVVN) on behalf of NTPC will purchase Solar Power from Solar Power Developer, and sell it to Discom. The electricity generated from the project activity will be evacuated through 220/132 kV sub-station located at Mandamarri for consumption in the Indian Electricity Grid. The Project comprises of total 40 MW, out of which 32 MW has been commissioned dated 22/12/2017 and the rest 8 MW has been commissioned dated 17/01/2018. The project will replace anthropogenic emissions of greenhouse gases (GHG's) estimated to be approximately average 77,456 tCO2e per annum, thereon displacing average 82,683 MWh/year amount of electricity from the generation-mix of power plants connected to the Indian electricity grid, which is mainly dominated by thermal/fossil fuel-based power plant. The monitoring period is from 29/09/2019 to 31/12/2020. The total GHG emission reductions or removals generated in this monitoring period are 96,819 tCO2 thereon displacing 103,351 MWh amount of electricity generation.

1.2 Sectoral Scope and Project Type

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

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

Project Type : I - Renewable Energy Projects

Project Category : Grid-connected electricity generation from renewable sources ACM0002- Version 18.1[1]

The project is not a grouped project activity.

1.3 Project Proponent

Organization name	Achintya Solar Power Limited- I and II
Contact person	Murali Krishnam Raju M
Title	Senior Manager - Commercial
Address	PLOT NO. #1131/A, ROAD NO. 36, JUBILEE HILLS, HYDERABAD – 500033, TELANGANA, INDIA.
Telephone	+91 40 40300100
Email	muraliraju.m@greenkogroup.com

Organization name	Suvarchas Solar Power Limited
Contact person	Murali Krishnam Raju M
Title	Senior Manager - Commercial
Address	PLOT NO. #1131/A, ROAD NO. 36, JUBILEE HILLS, HYDERABAD – 500033, TELANGANA, INDIA.
Telephone	+91 40 40300100
Email	muraliraju.m@greenkogroup.com

[1] http://cdm.unfccc.int/methodologies/DB/5725LCHYPYM4I1V8OD9SFYVAMFFWNP

Organization name	Grinibhrit Solar Power Limited
Contact person	Murali Krishnam Raju M
Title	Senior Manager - Commercial
Address	PLOT NO. #1131/A, ROAD NO. 36, JUBILEE HILLS, HYDERABAD – 500033, TELANGANA, INDIA.
Telephone	+91 40 40300100
Email	muraliraju.m@greenkogroup.com

1.4 Other Entities Involved in the Project

Organization name	Infinite Solutions
Role in the Project	Project Consultant
Contact person	Mr. Jimmy Sah
Title	Head – Sustainability
Address	214-215 Milinda Manor, Opp. Next Treasure Island, 2 RNT Marg, Indore – 452001,India
Telephone	+91-9644130430
Email	jimmy@infisolutions.org

1.5 Project Start Date

Project Start Date: 22-Dec-2017. The project start date is the earliest commissioning date amongst projects, which are part of this Project.

1.6 Project Crediting Period

Crediting Period Start date : 22/12/2017

Crediting Period End date : 21/12/2027

The project activity adopts renewable crediting period of 10 years period, which can be renewed for maximum 2 times.

1.7 Project Location

The project is located at Village: Mandamarri, District: Mancherial, State: Telangana, Country: India. The geological coordinates are:

Name of Investor	Latitude (N)	Longitude (E)
Achintya Solar Power Limited - I	18°58'30" N	79° 25' 33.6"E
Achintya Solar Power Limited - II	18°58'30" N	79° 25' 33.6"E
Grinibhrit Solar Power Limited	18°58'30" N	79° 25' 33.6"E
Suvarchas Solar Power Limited	18°58'30" N	79° 25' 33.6"E

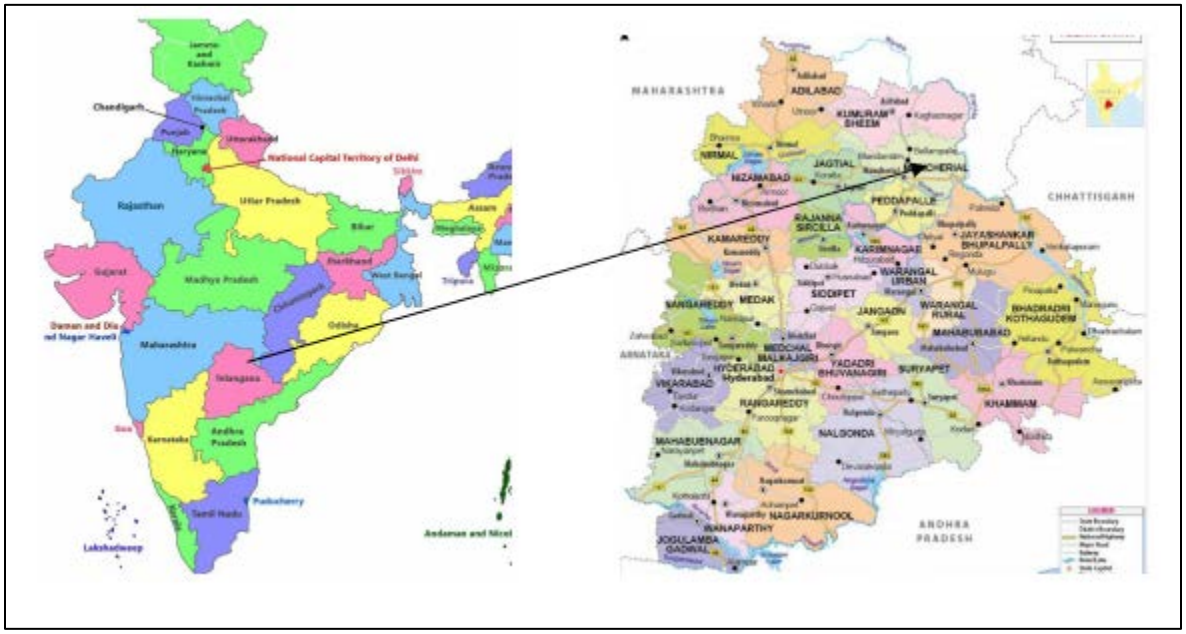


Figure 1 Project Location

1.8 Title and Reference of Methodology

Methodology:

ACM0002: Grid-connected electricity generation from renewable sources --- Version 19.0, Sectoral Scope: 01, EB 100, Annex 6

https://cdm.unfccc.int/methodologies/DB/VJI9AX539D9MLOPXN2AY9UR1N4IYGD

The project activity also takes reference from following Tools from the tools prescribed by applied methodology:

Tool for the demonstration and assessment of additionality --- Version 07.0.0, EB 70, Annex 8*https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf*

Tool to calculate the emission factor for an electricity system --- Version 07.0, EB 100, Annex 4
https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf

1.9 Participation under other GHG Programs

Not Applicable, as the project activity is not registered with any other program.

The undertaking from PP has been submitted for no any double accounting for current monitoring period and project activity is not participated any other GHG program other than VCS.

1.10 Other Forms of Credit

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

Other forms of Environmental Credit

The Project has no intend to generate any other form of GHG-related environmental credit for GHG emission reductions or removals claimed under the VCS Program. The project activity is not availing any REC benefits and the same can be confirmed from publicly available link of REC generators.

Web-link: https://www.recregistryindia.nic.in/index.php/general/publics/registered_regens

Project Proponent has also submitted undertaking for not availing other forms of environmental credit for the same crediting period under consideration.

1.11 Sustainable Development

Contribution to sustainable development:

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 like development of roads 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 will generate power using zero emissions solar energy based power generation which helps to reduce GHG emissions and specific pollutants like SOx, NOx, and SPM associated with the conventional thermal power generation facilities.

- **Technological well-being:** The successful operation of project activity would lead to promotion of solar 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.

2 SAFEGUARDS

2.1 No Net Harm

The project activity does not involve any major construction activity. It primarily requires the installation of the WTGs, interfacing the generators with the State Electricity Board by setting up HT transmission lines and installation of other accessories.

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

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 project has already been registered under VCS mechanism.

The stakeholders of the project activity were invited to attend the stakeholder meeting conducted on 28/04/2016. Personal invitations were also sent to the prominent members of the regions in the vicinity along with public display of invitation letters.

The meeting was attended by local villagers, panchayat members, shopkeepers, suppliers, vendors and representatives of PPs. The stakeholders were explained about the project activity and the various benefits arising out of the project activity. A discussion was held in which the views of the local stakeholders were addressed.

Nevertheless, PP is open for the continuous stakeholder interaction and formed a grievance/suggestion register and a grievance box placed at the project site for the comments at any point of time during the project crediting period. PP has explained this mechanism to the local stakeholders and transparently kept the notice mentioning the grievance register and box at the project site. No issues and grievance for the project activity has been identified during the current monitoring period

2.3 AFOLU-Specific Safeguards

Not applicable to this as this is not an AFOLU project activity.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The main purpose of this project activity is to generate clean form of electricity through renewable solar energy source for sale of electricity to the grid. The project activity involves installation of 04 projects of 10 MWAC each, totaling to 40 MWAC (corresponding to 54.525 MWp) solar power project under National Solar Mission, Phase-II, Batch-II, Tranche – I, State Specific Bundling Scheme.

The Project comprises of total 40 MW, out of which 32 MW has been commissioned dated 22/12/2017 and the rest 8 MW has been commissioned dated 17/01/2018 and it running smoothly with specific schedule maintenance works.

All the projects are installed in the common project boundary at Village: Mandamarri, District: Mancherial, State: Telangana. The solar PV power plant will have solar PV modules, inverters, transformers and other protection system and supporting components as below:

Solar PV modules:

Module Supplier	Module Model	Capacity (p)	Number	Total Capacity (MWp)
Renesola	Poly-crystalline	315	72702	22.901
	Poly-crystalline	320	98826	31.624
			Total Capacity	**54.525**

Sl. No.	Mounting Structure Type	Fixed tilt
1	Tilt	13°
2	Pitch(m)	6
3	Number of modules per string	21
Mounting Structure		
4	Typical mounting unit (rows x columns)	2x21
5	Orientation of modules (East-West)	Portrait
Inverters		
6	Make	SMA
7	Model	Sunny Central 1000CP XT
8	Rated Capacity	900 kW
9	No. of Inverters	11
10	Rated Input Voltage	405

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.In the Pre- project scenario the equivalent amount of electricity, either fetched (under captive cases) or delivered to the grid by the project activity, would have otherwise been generated by the operation of grid connected fossil fuel-based power plants and by the addition of new generation sources. The project shall result in replacing anthropogenic emissions of greenhouse gases (GHG's) estimated to be approximately 77,458 tCO2e per year, thereon displacing 82,683 MWh/year amount of electricity from the gird.

3.2 Deviations

2.3.1 Methodology Deviations

No methodology deviation is applied during the monitoring period.

2.3.2 Project Description Deviations

No deviation has taken place in project description during the monitoring period.

3.3 Grouped Projects

The project is not a grouped project thus this is not applicable.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{grid, OM, y}$
Data unit	tCO_2/MWh
Description	Operating margin CO_2 emission factor for the project electricity system in year y
Source of data	Calculated from CEA database, Version 14 December 2018[3]
Value applied	0.9610 (Indian Grid)
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07" as 3-year generation weighted average using data for the years 2015-16, 2016-17 & 2017-18. The data are obtained from "CO2 Baseline Database for Indian Power Sector" version 14, published by the Central Electricity Authority, Ministry of Power, and Government of India.
Purpose of Data	For the calculation of the Baseline Emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	$EF_{grid, BM, y}$
Data unit	tCO_2/MWh
Description	Build margin CO_2 emission factor for the project electricity system in year y
Source of data	Central Electricity Authority (CEA) of India Database Version 14[2]
Value applied	0.8644 (Indian Grid)
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07.0" as per the latest data available for the most recent year 2017-18. The data is obtained from "CO_2 Baseline Database for Indian Power Sector" version 14, published by the Central Electricity Authority, Ministry of Power, and Government of India.
Purpose of Data	Calculation of baseline emissions

[2] http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver14.pdf

Comments	The above value is fixed and it is same for the entire crediting period

Data / Parameter	$EF_{grid, CM, y}$
Data unit	tCO_2/MWh
Description	Combined margin CO_2 emission factor for the project electricity system in year y
Source of data	Calculated from CEA database, Version 14, Dec 2018[3]
Value applied	0.9368 (Indian Grid)
Justification of choice of data or description of measurement methods and procedures applied	The combined margin emissions factor is calculated as follows: $EF_{grid,CM,y} = EF_{grid,OM,y} * WOM + EF_{grid, BM,y} * WB_M$ Where: $EF_{grid,BM,y}$= Build margin CO2 emission factor in year y (tCO_2/MWh) $EF_{grid,OM,y}$= Operating margin CO2 emission factor in year y (tCO_2/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	The above value is fixed and it is same for the entire crediting period

4.2 Data and Parameters Monitored

Data / Parameter	$EG_{PJ, y}$
Data unit	MWh/y
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh)
Source of data	Joint Meter Reading statement provided by TSSPDCL every month.
Description of measurement methods and procedures to be applied	Electricity exported and imported to the grid is in kWh. However, for the calculation purpose electricity exported and imported is converted in MWh. The Net electricity supplied to the grid by the project activity will be calculated as a difference of electricity exported to the grid and electricity imported from the grid

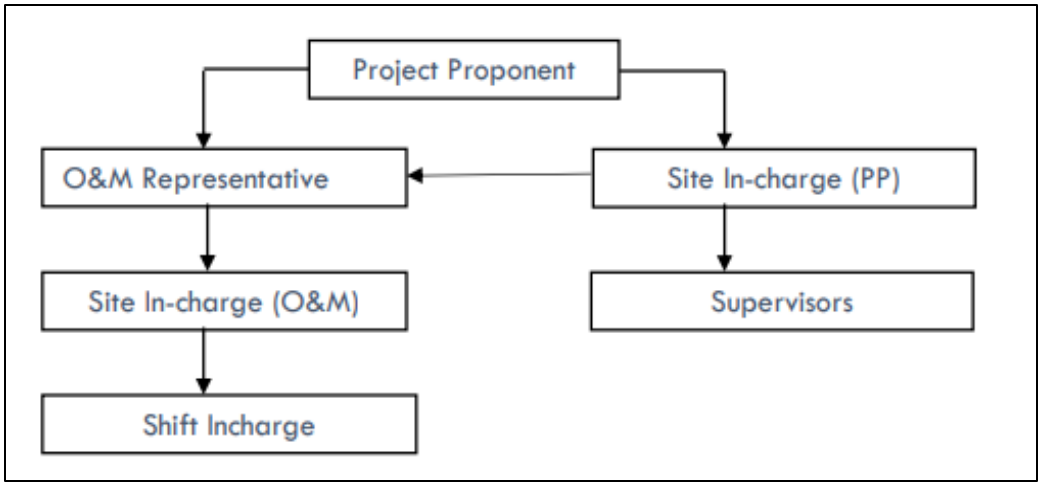
[3] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver13.pdf

	obtained from Monthly Meter reading reports provided by TSTRANSCO /TSNPDCL as per below equation: $EG_{PJ,y} = EG_{Export} - EG_{Import}$
Frequency of monitoring/recording	Continuous measurement & monthly recording
Value monitored	103,351 MWh
Monitoring equipment	Electricity Meters of 0.2s Class
QA/QC procedures to be applied	The meters is approved, tested & sealed by the State Utility. The meters are in the custody of State Utility. The frequency of calibration is once in 5 years[4] The monthly electricity supplied/exported by the project activity in the JMR report is cross checked with the monthly invoices of sale. In the absence or delay in the meter calibration appropriate Guidelines will be applied appropriately to confirm the conservativeness of metering. The metering arrangement, accuracy class of meters, calibration frequency is under control of state electricity board and PP does not have any control on it. PP is getting value of net electricity supplied to grid and the same is considered the monitoring parameter. The billing is raised based on substation meters.
Purpose of the data	Calculation of baseline emissions
Calculation method	Thus, Net electricity supplied to the grid by the project plant in a given month = Export, kWh– Import, kWh. The Net electricity, kWh is then converted to MWh units to obtain the $EG_{PJ,y}$ value.
Comments	Data will be archived in paper & electronic form for two years after the end of crediting period or of the last issuance of VERs for this project activity, whichever occurs later.

4.3 Monitoring Plan

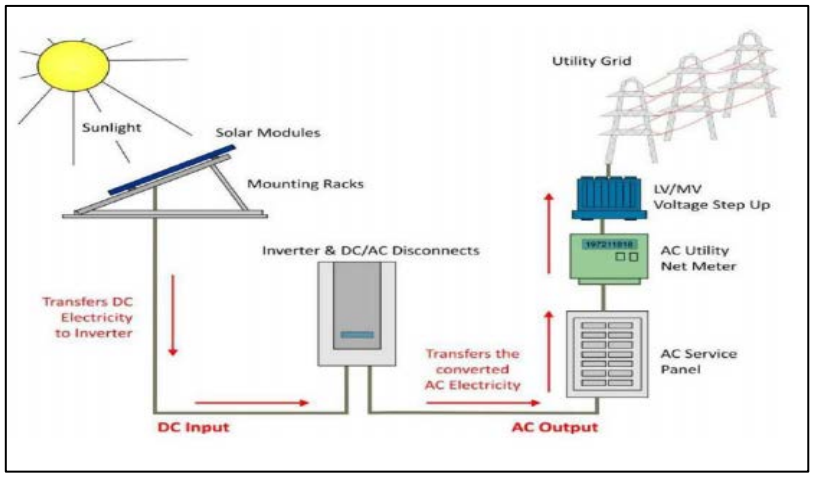
The monitoring plan is developed in accordance with the modalities and procedures for CDM project activities and is proposed for grid-connected solar power project/ unit being implemented in Telangana, India. The monitoring plan, which will be implemented by the project participant describes about the monitoring organisation, parameters to be monitored, monitoring practices, quality assurance, quality control procedures, data storage and archiving.

[4] http://www.aegcl.co.in/Metering_Regulations_Of_CEA_17_03_2006.pdf



Data Measurement

The export and import energy will be measured continuously using above-mentioned Main & Check meters. Authorized officer of TSNPDCL in the presence of PP or representative of PP. shall take Export & Import readings of Main & Check meters installed at the substation on monthly basis. The meter reading will be taken jointly and signed by the representatives of the TSNPDCL and project investors. Based on the readings, invoices will be raised by project investors. These invoices can be used for cross checking the meter readings taken for the project activity. It is to be noted though PP or PP representative is available during meter reading, the electricity exported and imported by the Solar Project is completely under purview of TSNPDCL officer and PP do not have any control on it. In addition, accuracy class of meters and calibration frequency is under purview of TSNPDCL officer and PP do not have any control on it. PP get the monthly JMR report from where electricity export and import values are obtained to calculate net electricity supplied to grid and used for emission reduction calculations.



Data collection and archiving

Export & Import readings from the meters will be collected under the supervision of the authorized representatives of PP. The net electricity supplied to grid would be calculated based on export & import readings. Export and Import data would be recorded and stored in electronic &/or Paper format. The records are checked periodically by the Head (Operations) and discussed thoroughly with the O&M Team. The period of storage of the monitored data will be 2 years after the end of crediting period.

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. In the unlikely event of failure of all Main, Check as well as Standby meter installed at Substation, where all the faulty meters are required to be repaired or replaced simultaneously, the export & import readings from Main, Check & Standby Meters installed at the inter-connection point at the project site will be used for monitoring of net electricity exported to the grid.

Personnel training

In order to ensure a proper functioning of the project activity and a proper 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.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

As per the approved consolidated Methodology ACM0002 (Version 18.1) para 42:

Baseline emissions include only CO2 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 to be calculated as follows:

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

Where:

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

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

$EF_{grid, CM,y}$ = Combined margin CO_2 emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (t CO_2/MWh)

Grid Emission Factor:

The GEF is fixed ex-ante in the PD as given below:

Parameter	Value
OM	0.9610
BM	0.8644
CM	0.9368

Therefore,

BEy = 103,351 x 0.9368

= 96,819 tCO_2e (Round down values)

5.2 Project Emissions

Not Applicable, since emissions from the project activity is zero as per ACM0002 methodology. Hence, $PE_y = 0$.

5.3 Leakage

Not Applicable, since leakage emissions from the project activity is zero as per ACM0002 methodology. Hence, $LE_y = 0$.

5.4 Net GHG Emission Reductions and Removals

The Formula used to calculate the net emission reduction for the project activity

$$ER_Y = BE_y - PE_y$$

Where,

ER_y = Emission Reduction in tCO2/year
BE_y = Baseline emission in tCO2/year
PE_y = Project emissions in tCO2/year
LE_y = Leakage Emissions in tCO2/year

For the project activity during the current monitoring period, as per section 5.1

BE_y = 96,819 tCO2e
PE_y = 0 tCO2e
LE_y = 0 tCO_2e

:

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
29/09/2019 to 28/12/2019	18,220	0	0	18,220
29/12/2019 to 31/12/2020	78,599	0	0	78,599
Total	96,819	0	0	96,819

The actual emission reduction for the current monitoring period is 1**%** lower than the estimated values in the registered VCS PD corresponding to the similar period.

The variation in the Emission Reductions is due to higher PLF observed. The Values are within the sensitivity analysis carried out for the project activity.

APPENDIX-I: CALIBRATION RECORDS

Achintya Solar Power Limited-I			
	Meter Number	Calibration Date	Due Date of calibration
Main	0017250981	21/09/2017	20/09/2022
Check	0017250982	21/09/2017	20/09/2022
Standby	0017250983	21/09/2017	20/09/2022

Achintya Solar Power Limited-II			
	Meter Number	Calibration Date	Due Date of calibration
Main	0017250984	21/09/2017	20/09/2022
Check	0017250985	21/09/2017	20/09/2022
Standby	0017250986	21/09/2017	20/09/2022

Grinibhrit Solar Power Limited			
	Meter Number	Calibration Date	Due Date of calibration
Main	0017250987	21/09/2017	20/09/2022
Check	0017250988	21/09/2017	20/09/2022
Standby	0017250989	21/09/2017	20/09/2022

Suvarchas Solar Power Limited			
	Meter Number	Calibration Date	Due Date of calibration
Main	0017250990	21/09/2017	20/09/2022
Check	0017250991	21/09/2017	20/09/2022
Standby	0017250992	21/09/2017	20/09/2022