Gold Standard for the Global Goals

Climate Security & Sustainable Development

MONITORING REPORT

PUBLICATION DATE **14.10.2020**

VERSION **v. 1.1**

RELATED SUPPORT **- TEMPLATE GUIDE Monitoring Report v. 1.1**

This document contains the following Sections

Key Project Information

GS ID (s) of Project (s)	GS5866
Title of the project (s) covered by monitoring report	40 MW Orange Charanka Solar Power Project in Gujarat, India
Version number of the PDD/VPA-DD (s) applicable to this monitoring report	04
Version number of the monitoring report	05
Completion date of the monitoring report	07/05/2024
Date of project design certification	19/04/2018
Date of Last Annual Report	18/08/2023
Monitoring period number	04
Duration of this monitoring period	01/01/2021 to 31/12/2022
Project Representative	Infinite Environmental Solutions LLP
Host Country	India
Activity Requirements applied	☐ Community Services Activities ☒ Renewable Energy Activities ☐ Land Use and Forestry Activities/Risks & Capacities ☐ N/A
Methodology (ies) applied and version number	ACM0002 "Grid-connected electricity generation from renewable sources" Version 17.0
Product Requirements applied	☒ GHG Emissions Reduction & Sequestration ☐ Renewable Energy Label ☐ N/A

Table 1 - Sustainable Development Contributions Achieved

Sustainable Development Goals Targeted	SDG Impact	Amount Achieved	Units/ Products
SDG 7	Renewable Electricity Generated	171,114.96	MWh
SDG 8	Trainings provided to O&M staff	37	Nos

	Cost Spent on O&M	25.748	Mn.
	Number of Jobs generated	39	Nos
SDG 13	Emission Reduction	167,298	VERs

Table 2 – Product Vintages

		Amount Achieved		
Start Dates	**End Dates**	**SDG 7** **Affordable and Clean Energy**	**SDG 8** **Decent Work and Economic Growth**	**SDG 13** **Climate Action (VERs)**
01/01/2021	31/12/2021	84,471.06 MWh	18 Trainings, 44 employees and Cost Spent on O&M 12.581 Mn.	82,587 VERs
01/01/2022	31/12/2022	86,643.90 MWh	19 Trainings, 34[1] employees and Cost Spent on O&M 13.167 Mn.	84,711 VERs

[1] Average 39 employments given during the current monitoring period. The no employees in 2022 is lower than no employees in 2021. This reduction is attributed to the absence of temporary employees.

SECTION A. DESCRIPTION OF PROJECT

A.1. General description of project

The project activity is a 40 MW solar power project, promoted by Orange Charanka Solar Power Private Limited (OCSPPL) but the name "Orange Charanka Solar Power Private Limited" is now changed to "Greenko Charanka Solar Power Private Limited". The purpose of the project activity is to generate clean electricity with utilization of solar energy. The project activity aims to harness solar energy through installation of PV with total installed capacity of 40MWac (corresponding to 53.4MWp) solar power project in Gujarat. The project is replacing anthropogenic emissions of greenhouse gases (GHG's) estimated to be approximately 84,421 tCO_2e per annum, thereon displacing 86,347 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 details of the project are mentioned in the table:

Project developers' Name	**Capacity in MW_{AC}**	**Capacity in MW_p**	**State**
Orange Charanka Solar Energy Private Limited[2]	40	53.4	Gujarat

The electricity generated by the project is exported to the Indian electricity grid. The project activity therefore displaces an equivalent amount of electricity which would have otherwise been generated by fossil fuel dominant electricity grid and there by reduces the associated CO_2 emissions.

Sustainable Development:

The project's contribution towards sustainable development has been addressed based on the following sustainable development aspects:

- **Social well being:**

[2] As per registration documents, Orange Charanka Solar Power Private Limited was project owner, but Greenko acquired Orange Renewable Assets on 18/01/2021, hence the name has been changed from Orange Charanka Solar Power Private Limited to Greenko Charanka Solar Power Private Limited from the same day i.e., 18/01/2021.

The project activity provided / provides job opportunity to local people during erection, commissioning and maintenance of the solar project. Frequency of visiting to villages and nearby areas by skilled, technical and industrialist has increased due to installation /site visit/operation and maintenance work related to solar plant. This directly and indirectly positively effects the economy of nearby populace.

- **Environmental well being :**
  Solar power is one of the cleanest renewable energy powers and does not involve any fossil fuel. There are no GHG emissions. The impact on land, water, air and soil is negligible. Thus, the project activity contributes to environmental well-being without causing any negative impact on the surrounding environment.
- **Economic well being :**
  The project activity generates permanent and temporary employment opportunity within the vicinity of the project. The electricity supply in the nearby area improves which directly and indirectly improves the economy and life style of the area.
- **Technological well being**
  The project activity is step forward in harnessing the untapped solar potential and further diffusion of the solar technology in the region. The project activity leads to the promotion and demonstrates the success of solar projects in the region which further motivate more investors to invest in solar power projects. Hence, the project activity leads to technological well-being.

- **Other Forms of Environmental Credit:**
  The project activity has not availed any other form of environmental credit as confirmed by the project proponent through the declaration of no double counting. Furthermore, the project activity is not availing any benefits from REC's mechanism which can be confirmed from the link below:
  https://www.recregistryindia.nic.in/index.php/publics/accredited_regens
  The project activity is registered only in GS. There is no double counting with any national climate policies and the project activity is not registered with any other compliance or voluntary market-based mechanism. So VERs are not claimed in any other standard other than GS for the same vintage; hence, GHG emissions reductions from the project activity is not accounted for within the relevant system of the host country/regional regulator, or voluntary mechanism.

Placements of the Purchase Orders i.e., start date of the project activity 19/12/2016. Commissioning Date of the project activity is 04/08/2017. The project is in continuous operation since the implementation. No Major breakdown details were identified for the present monitoring period. The monitoring of SDG indicators has been carried out in accordance to respective registered PDD/GS4GG Transition annex.

The project proponent has chosen to start the crediting period from 04/08/2017. The project proponent has chosen the 1st crediting period from 04/08/2017 to 03/08/2024. The present monitoring period is from 01/01/2021 to 31/12/2022 through which the net electricity generation 171,114.96 MWh and emission reduction claimed is 167,298 tCO_2e.

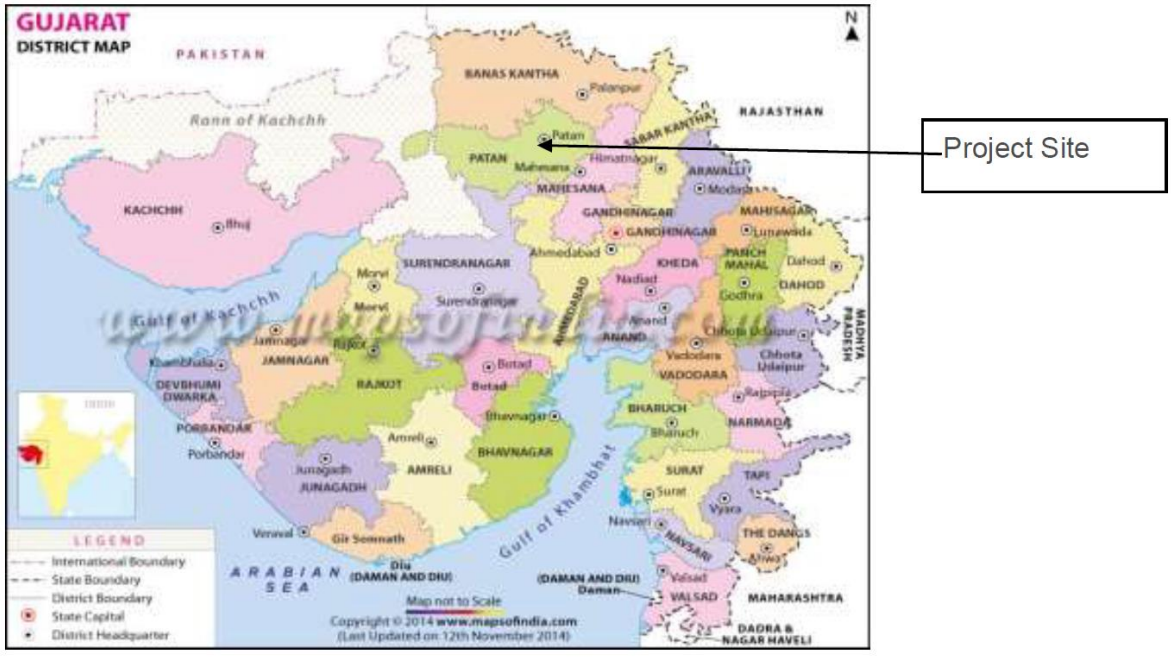
A.2. Location of project

OCSPPL has installed solar PV panels at Charanka, Santalpur, District Patan in the State of Gujarat, India.

Geographical coordinates are given below:

Project Investors' Name	Latitude	Longitude	Commissioning date
Orange Charanka Solar Energy Private Limited	23° 54' 26.45" N	71° 12' 4.79" E	04/08/2017

The geographical location of the project site is as shown below:



A.3. Reference of applied methodology

Title: Consolidated baseline and monitoring methodology for "Grid-connected electricity generation from renewable sources"

References: Approved consolidated baseline methodology ACM0002 "Grid-connected electricity generation from renewable sources", Version 17.0, EB 89, Annex 1[3].

ACM0002 draws upon the following tools which have been used in the PDD:

- Methodological Tool 07: Tool to calculate the emission factor for an electricity system - Version 06.0, EB 97 Annex 7[4].
- Methodological Tool 01: Tool for the demonstration and assessment of additionality - Version 07.0.0, EB 70 Annex 8[5].
- Methodological Tool 05: Baseline, project and/or leakage emissions from electricity consumption and monitoring of electricity generation - Version 03.0, EB 96 Annex 5[6].

A.4. Crediting period of project

Type of Crediting Period: Renewable

Start date of the crediting period: 04/08/2017 (Retroactive crediting start date)

Length of the current crediting period: 7 years.

Crediting period: 04/08/2017 - 03/08/2024.

[3] https://cdm.unfccc.int/UserManagement/FileStorage/D5YFS9I3VKBT18MQNGX0LPZ6U7AWCO
[4] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v6.pdf
[5] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf
[6] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-05-v3.0.pdf

SECTION B. IMPLEMENTATION OF PROJECT

B.1. Description of implemented project

The project activity aims to harness solar energy through installation of PV with total installed capacity of 40MWac (corresponding to 53.4MWp). The solar PV power plant have solar PV modules, inverters, transformers and other protection system and supporting components as under:

Solar PV modules

Make	JA Solar	JA Solar
Technology	60-cell multi-Crystalline	60-cell multi-Crystalline
Model	JAP 6(K) 60 265 4BB	JAP 6(K) 60 270 4BB
Capacity	265 Wp	270 Wp
No. of Modules	80784	118656
Capacity, MW (DC)	21.408 MWp	32.037 MWp
Total Capacity, MW (DC)	53.445 MWp	
Total AC Capacity	40 MW	

Inverters

Make	ABB	Huawei
Model	PVS800-57	SUN2000-43KTL-IN-C1
Rated Capacity	1000 kVA	43 kVA
No. of Inverters	36	94
Rated Input Voltage	1000 V DC	1000 V DC

Transformers

Make	Raychem RPG	Raychem RPG	Crompton Greaves	Recons Power Equipment
Model No.	ADA1419025	ADA1419026	MT 7984	3820/3/17
Capacity	4000 kVA	4000 kVA	20/25 MVA	100 kVA
No. of Transformers	09	01	02	01
Voltage Ratio	4 x 380 V/ 11 kV	2 x 500 V/ 11 kV	11 / 66 kV	415 V / 11 kV

The solar PV modules have a useful life of 25 years. The project was commissioned on 04/08/2017. There are no changes occurred on the project design after the registration of the project.

B.1.1 Forward Action Requests

No Forward Action requests

B.2. Post-Design Certification changes

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B.2.1. Temporary deviations from the approved Monitoring & Reporting Plan, methodology or standardized baseline

There is no deviations/delays regarding the implementation status from registered PDD, Monitoring & Reporting Plan, applied methodology or applied standardized baseline.

B.2.2. Corrections

Not applicable

B.2.3. Changes to start date of crediting period

Not applicable

B.2.4. Permanent changes from the Design Certified monitoring plan, applied methodology or applied standardized baseline

Not applicable

B.2.5. Changes to project design of approved project

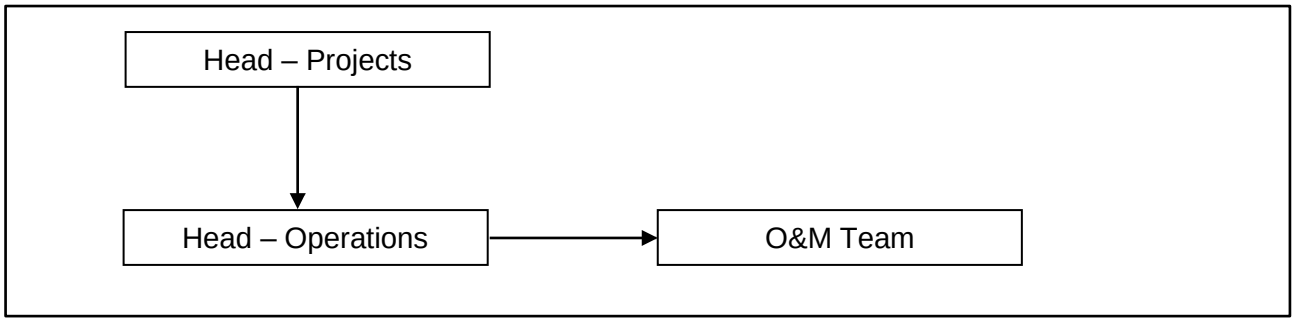
Not applicable

SECTION C. DESCRIPTION OF MONITORING SYSTEM APPLIED BY THE PROJECT

The monitoring plan is developed in accordance with the modalities and procedures for GS4GG project activity and is proposed for grid-connected solar power projects being implemented in Gujarat, India. The monitoring plan describes the monitoring organization, parameters to be monitored, monitoring practices, quality assurance, quality control procedures, data storage and archiving.

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

Organizational Structure for Monitoring:



Responsibilities of Head- Projects: Tracking and reviewing the overall functioning and maintenance of the project activity from Head (Operations). Head (Operations) is reporting to Head (Projects).

Responsibilities of Head - Operations: Overall functioning of the project activity and Coordinating with the O&M Team for the proper functioning of Project activity. He is reporting to Head (Projects).

Responsibilities of O&M Team: O&M team is responsible for Operations and Maintenance related issues, they are also responsible for day-to-day data collection and monitoring, ensures completeness and reliability of data (calibration of equipment).

Data Measurement:

The export and import energy are measured continuously using Main and Check meters. Export & Import readings of Main meters is taken on monthly basis by authorized officer of Gujrat Urja Vikas Nigam Limited (GUVNL) in the presence of PP or representative of PP. Based on the readings, invoices are raised by the Project Participant. These invoices can be used for cross checking the meter readings taken for the project activity.

The monitored data is reported by the PP to the GS consultant on a monthly basis for the calculation and estimation of emission reductions. This data has been checked against invoices raised.

It is to be noted though Project owner or their representatives is available during meter reading, the calculations of net electricity supplied to grid is completely under purview of SEB and Project Participant does not have any control on it. Moreover, accuracy class of meters and calibration frequency is under purview of SEB and Project Participant does not have any control on it. Project Participant gets the monthly credit report from where net electricity supplied to grid is obtained and used for emission reduction calculations.

The location of billing meter is 400kv GETCO, Charanka sub-station.

Data storage and Archiving

Export & Import readings from main and check meters is collected under the supervision of the authorized representatives of PP. The net electricity supplied to grid would be calculated based on export & import readings. The period of storage of the monitored data is 2 years after the end of crediting period or until the last issuance of GS VERs for the project activity whichever occurs later.

Mismatch in Monitoring Period and the Billing Period:

In case the dates of a particular monitoring period do not match with the dates of the billing period, the net electricity exported to the grid would be calculated from:

D = (A/B) *C

A = Difference of number of days which are not matching of billing period and monitoring period.

B = Number of days of the billing period/ month which was not matched with the monitoring period.

C = Net Electricity supplied to the grid for that given billing period/ month.

The calculated value after apportioning would be used for calculation of emission reductions during that 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 both Main meter & Check meter installed at sub-station; the Standby meter will be used for readings. During the monitoring period the main meter and check meter were operating in the acceptable limits of accuracy and there were no issues identified during the monitoring period.

SECTION D. DATA AND PARAMETERS

D.1. Data and parameters fixed ex ante or at renewal of crediting period

Data/Parameter	**$EF_{OM, y}$**
Unit	tCO_2/MWh
Description	Operating Margin CO_2 emission factor for the Indian Grid in year y
Source of data	CEA's "Baseline Carbon Dioxide Emission Database Version 11.0"[7]
Value(s) applied	0.9941
Choice of data or measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for n electricity system, version 06.0.0" as 3-year generation weighted average using data for the years 2012-2013, 2013-2014 &2014- 15. The data are obtained from "CO_2 Baseline Database for Indian Power Sector" version 11.0, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of data	Calculation of baseline emissions
Additional comment	The value is fixed ex-ante

Data/Parameter	**$EF_{BM, y}$**
Unit	tCO_2/MWh
Description	Build Margin CO_2 emission factor for the Indian Grid in year y
Source of data	CEA's "Baseline Carbon Dioxide Emission Database Version 11.0"
Value(s) applied	0.9285

[7] https://cea.nic.in/cdm-co2-baseline-database/?lang=en

Choice of data or measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 06.0.0". The data are obtained from "CO_2 Baseline Database for Indian Power Sector" version 11.0, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of data	Calculation of baseline emissions
Additional comment	The value is fixed ex-ante

Data/Parameter	**$EF_{grid,CM,y}$**
Unit	tCO_2/MWh
Description	Combined Margin CO_2 emission factor for the Indian Grid in year y
Source of data	Central Electricity Authority (CEA) of India Database Version 11.0
Value(s) applied	0.9777
Choice of data or measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 06". The data is obtained from "CO_2 Baseline Database for Indian Power Sector" version 11.0, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of data	Calculation of baseline emissions
Additional comment	The value is fixed ex-ante

D.2 Data and parameters monitored

SDG 7:

Data/parameter:	$EG_{facility,y}$
Unit	MWh
Description	Quantity of net electricity supplied by the project plant to the grid
Measured/calculated/default	Calculated (based on the measured values of electricity exported and imported)
Source of data	Monthly Meter Reading Reports

<table>
<tr><td>Value(s) of monitored parameter</td><td>
<table>
<tr><th>Vintage</th><th>Net Generation (MWh)</th></tr>
<tr><td>01/01/2021 to 31/12/2021</td><td>84,471.06</td></tr>
<tr><td>01/01/2022 to 31/12/2022</td><td>86,643.90</td></tr>
<tr><td>Total</td><td>171,114.96</td></tr>
</table>
</td></tr>
<tr><td>Monitoring equipment</td><td>
The electricity exported & imported are measured by Energy meter installed at substations.
The reading is recorded and the difference from last month reading gives the number of units imported/exported.
Three energy meters (main, check and standby) installed. The details are the meters are given below:
Meters of Charanka Solar Park Substation site.
<table>
<tr><th>Details</th><th>Main meter</th><th>Check meter</th><th>Standby</th></tr>
<tr><td>Meter Number</td><td>GJ3845A</td><td>GJ3846A</td><td>GJ3887A</td></tr>
<tr><td>Make</td><td>Secure</td><td>Secure</td><td>Secure</td></tr>
<tr><td>Accuracy class</td><td>0.2S</td><td>0.2S</td><td>0.2S</td></tr>
<tr><td>Location</td><td>Substation</td><td>Substation</td><td>Substation</td></tr>
<tr><td>Meters Commissioned</td><td>12/06/2017</td><td>12/06/2017</td><td>12/06/2017</td></tr>
<tr><td>Meters synchronization date</td><td>28/07/2017</td><td>28/07/2017</td><td>28/07/2017</td></tr>
<tr><td rowspan="2">Calibration</td><td>30/08/2017 (Valid up to 29/08/2022)</td><td>06/10/2017 (Valid up to 05/10/2022)</td><td>30/08/2017 (Valid up to 29/08/2022)</td></tr>
<tr><td>22/02/2022 (Valid up to 21/02/2027)</td><td>07/04/2022 (Valid up to 06/04/2027)</td><td>07/04/2022 (Valid up to 06/04/2027)</td></tr>
</table>
All the meters are of “Secure Make: with 0.2s Accuracy class.
Calibration frequency: Once in 5 years as per CEA guidelines.
</td></tr>
<tr><td>Measuring/reading/recording frequency:</td><td>Measurement: Continuous
Recording: Monthly</td></tr>
<tr><td>Calculation method (if applicable):</td><td>The Net electricity supplied to the grid by the project activity is calculated as a difference of electricity exported to the grid, electricity imported from the grid obtained from Monthly Meter reading reports provided by SEB as per below equation:
$EG_{facility,y} = EG_{Export} - EG_{Import}$</td></tr>
</table>

QA/QC procedures:	Quantity of net electricity supplied to the grid is cross checked from the Invoices/ Monthly Bill raised by the Project Participant to SECI.
Purpose of data:	To monitor the contribution to SDG 7 (Ensure access to affordable, reliable, sustainable and modern energy for all
Additional comments:	-

SDG 8:

Data/parameter:	Quality of employment
Unit	Number of Trainings provided to project employees
Description	Trainings provided to employees
Measured/calculated/default	Measured
Source of data	Training Records
Value(s) of monitored parameter	PP has conducted 58 training programmes to its employees and O&M staffs. **Vintage** / **Number of Training** 01/01/2021 to 31/12/2021 / 18 01/01/2022 to 31/12/2022 / 19 **Total** / **37**
Monitoring equipment	No monitoring equipment involved. List of training programmes conducted and the number of beneficiaries is recorded
Measuring/reading/recordingfrequency:	Yearly Once
Calculation method(if applicable):	Manually by PP representative
QA/QC procedures:	Transparent data collection, analysis and reporting is done to identify and record the no. of trainings provided to the employees as well as employment generated due to project activity.
Purpose of data:	To monitor the contribution to SDG 8 (Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all)
Additional comments:	-

SDG 8:

<table>
<tr><td>Data/parameter:</td><td>Quantitative employment and income generation</td></tr>
<tr><td>Unit</td><td>• Cost spent for O&M
• Number of O&M staffs involved in the project</td></tr>
<tr><td>Description</td><td>Total employment generated due to the implementation of project activity and the amount spent for O&M activities due to the project.</td></tr>
<tr><td>Measured/calculated/default</td><td>Measured</td></tr>
<tr><td>Source of data</td><td>Training records, pay slips and Plant employment records</td></tr>
<tr><td>Value(s) of monitored parameter</td><td>Cost spent on O&M
<table><tr><th>Vintage</th><th>O&M Cost Spent (INR Mn.)</th></tr><tr><td>01/01/2021 to 31/12/2021</td><td>12.581</td></tr><tr><td>01/01/2022 to 31/12/2022</td><td>13.167</td></tr><tr><td>Total</td><td>25.748</td></tr></table>
Total Employment Generation
<table><tr><th>Vintage</th><th>Number of Jobs provided</th></tr><tr><td>01/01/2021 to 31/12/2021</td><td>44</td></tr><tr><td>01/01/2022 to 31/12/2022</td><td>34</td></tr><tr><td>Total (Average)</td><td>39</td></tr></table></td></tr>
<tr><td>Monitoring equipment</td><td>No monitoring equipment is involved</td></tr>
<tr><td>Measuring/reading/recording frequency:</td><td>Yearly Once</td></tr>
<tr><td>Calculation method (if applicable):</td><td>Manually by PP representative</td></tr>
<tr><td>QA/QC procedures:</td><td>The number of persons employed would be mentioned in the plant register, which can be crossed checked with daily attendance register.</td></tr>
<tr><td>Purpose of data:</td><td>To monitor the contribution to SDG 8 (Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all)</td></tr>
<tr><td>Additional comments:</td><td>-</td></tr>
</table>

SDG 13:

Data/parameter:	Emission Reduction
Unit	tCO_2
Description	Emission reduction achieved during the monitoring period
Measured/calculated/default	Calculated
Source of data	ER calculation sheet
Value(s) of monitored parameter	<table><tr><th>Vintage</th><th>Emission Reduction (tCO_2)</th></tr><tr><td>01/01/2021 to 31/12/2021</td><td>82,587</td></tr><tr><td>01/01/2022 to 31/12/2022</td><td>84,711</td></tr><tr><td>**Total**</td><td>**167,298**</td></tr></table>
Monitoring equipment	NA
Measuring/reading/recording frequency:	Annual
Calculation method (if applicable):	Refer Section E below
QA/QC procedures:	NA
Purpose of data:	Monitoring of SDG 13 (Climate Action)
Additional comments:	NA

D.3. Comparison of monitored parameters with last monitoring period

Data/Parameter	Value obtained in this monitoring period	Value obtained last monitoring period
NA		
NA		

Not applicable for non- Community Service Activities

D.4. Implementation of sampling plan

Sampling is not required for the given project activity.

SECTION E. CALCULATION OF SDG IMPACTS

E.1. Calculation of baseline value or estimation of baseline situation of each SDG Impact

SDG 7 Affordable and Clean Energy:

The monitoring parameter for the SDG 7 is Quantity of net electricity supplied to the grid during the year y. Since baseline and pre-project scenario are same, in the baseline condition no renewable electricity is supplied to grid from the project location. Hence, the baseline value is zero.

Vintage	Baseline Value Quantity of net electricity supplied to the grid (MWh)
01/01/2021 to 31/12/2021	0
01/01/2022 to 31/12/2022	0
Total	0

SDG 8: Decent Work and Economic Growth

The monitoring parameter for the SDG 8 are Number of trainings provided to employees & O&M staff, Cost spent for O&M and Number of O&M staffs involved in the project. Since baseline and pre-project scenario are same, in the baseline condition these values are zero.

Vintage	Baseline Value		
	Number of trainings	Cost Spent on O&M	Number of O&M Staff
01/01/2021 to 31/12/2021	0	0	0
01/01/2022 to 31/12/2022	0	0	0
Total	0	0	0

SDG 13 Climate Actions

The monitoring parameter for the SDG 13 is GHG emission reduction. In the baseline condition the project was not present and hence there is no emission reduction in the baseline scenario.

Vintage	Baseline Value Emission Reduction (tCO_2)
01/01/2021 to 31/12/2021	0
01/01/2022 to 31/12/2022	0
Total	0

However, the baseline GHG emission baseline GHG emissions are estimated as below:

The baseline emission is calculated in line with para 44 of ACM0002, Version 17, using equation below

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

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 asa 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" (tCO_2/MWh)

AS per para 46 of ACM0002, version 17, when the project activity is installation of Greenfield power plant, then:

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

Where,

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

The Electricity export & import are monitored continuously and reported monthly in the Monthly meter reading report (JMR). The net electricity is calculated based on the difference between export & Import reported in the JMR.

$$\mathbf{BE_y = EG_{facility,\ y} \times EF_{grid,CM.y}}$$

Based on the net electricity export calculated & the grid emission factor, the baseline emission is calculated as below:

Vintage	Quantity of net electricity supplied to the grid (MWh)	Grid Emission Factor (tCO2/MWh)	Project Value Quantity of net electricity supplied to the grid (MWh)
01/01/2021 to 31/12/2021	84,471.06	0.9777	82,587
01/01/2022 to 31/12/2022	86,643.90	0.9777	84,711

Total	**171,114.96**	**0.9777**	**167,298**

E.2. Calculation of project value or estimation of project situation of each SDG Impact

SDG 7 Affordable and Clean Energy:

The monitoring parameter for the SDG 7 is Quantity of net electricity supplied to the grid during the year y. In the project situation, the project supplied 171,114.96 MWh electricity during the monitoring period. This can be crosschecked from electricity Invoices.

The Net electricity supplied to the grid by the project activity is calculated as a difference of electricity exported to the grid, electricity imported from the grid obtained from Monthly Meter reading reports provided by SEB as per below equation:

$EG_{facility,}y = EG_{Export} - EG_{Import}$

Vintage	EG_{Export} **(MWh)**	EG_{Import} **(MWh)**	**Project Value Quantity of net electricity supplied to the grid (MWh)**
01/01/2021 to 31/12/2021	84,866.185	395.126	84,471.06
01/01/2022 to 31/12/2022	87,037.647	393.748	86,643.90
Total	**171,903.832**	**788.874**	**171,114.96**

SDG 8: Decent Work and Economic Growth:

The monitoring parameter for the SDG 8 are Number of trainings provided to employees & O&M staff, Cost spent for O&M & Number of O&M staffs involved in the project. During the project scenario, the following is achieved:

Vintage	Project Value		
	Number of trainings	Number of O&M Staff	Cost Spent on O&M (INR Mn.)
01/01/2021 to 31/12/2021	18	44	12.581
01/01/2022 to 31/12/2022	19	34	13.167
Total	**37**	**39**[8]	25.748

These can be crosschecked from the training records, O&M records and empowerment records.

SDG 13 Climate Actions

As per the approved consolidated Methodology ACM0002 (Version 17.0) para 31:

"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 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 CO_2e/yr)
$PE_{FF,y}$	=	Project emissions from fossil fuel consumption in year y (t CO_2/yr)
$PE_{GP,y}$	=	Project emissions from the operation of dry, flash steam or binarygeothermal power plants in year y (t CO_2e/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/ unit 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,

$PE_y = 0$.

[8] Average 39 employments given during the current monitoring period. The no employees in 2022 is lower than no employees in 2021. This reduction is attributed to the absence of temporary employees

Since there is no project GHG emission involved in the project, the emission reduction is equal to baseline emission.

Vintage	Baseline Value Emission Reduction (tCO2)
01/01/2021 to 31/12/2021	82,587
01/01/2022 to 31/12/2022	84,711
Total	**167,298**

E.3. Calculation of leakage

As per the registered PDD, no source of leakage emissions identified under proposed project activity.

Hence, $LE_y=0$.

E.4. Calculation of net benefits or direct calculation for each SDG Impact

SDG	SDG Impact	Baseline estimate	Project estimate	Net benefit
SDG 13	Emission Reduction (tCO_2e)	167,298	0	167,298
SDG 7	Renewable Electricity Generated (MWh)	0	171,114.96	171,114.96
SDG 8	Trainings provided to O&M staff (Nos)	0	37	37
	Cost Spent on O&M (Lakh Mn.)	0	25.748	25.748
	Number of Jobs generated (Nos)	0	39	39

E.5. Comparison of actual SDG Impacts with estimates in approved PDD

SDG	Values estimated in ex ante calculation of approved PDD for this monitoring period	Actual values[9] achieved during this monitoring period
7	172,694 MWh electricity generation	171,114.96
8	2 Training provided to O&M Staff	37 Training provided to O&M Staff
8	NA	25.748 INR Mn spent on O&M
8	NA	39 jobs created
13	168,842 tCO_2e emission reduction	167,298 tCO_2e emission reduction

NA indicates no estimation is provided in the PDD

E.5.1. Explanation of calculation of value estimated ex ante calculation of approved PDD for this monitoring period

The estimated value is based on the estimated value provided for 1 year in the PDD and the actual number of operating days in the monitoring period. The calculation is provided below.

SDG Goal	SDG 7	SDG 8			SDG 13
SDG Impact	Electricity generated (MWh)	Trainings provided to O&M staff (Nos)	Money spent on O&M (Mn. INR)	Jobs Created (Nos)	Emission reduction (tCO_2)
Estimation as per PDD (for 1 year)	86,347	1	NA	NA	84,421
Number of days in the monitoring Period	730	730	730	730	730
Estimation for the monitoring Period	172,694	2	NA	NA	168,842

[9] Whenever emission reductions are capped, both the original and capped values used for calculations must be transparently reported. Use brackets to denote original values.

Actual values achieved during the monitoring period	171,114.96	37	25.748	39[10]	167,298

E.6. Remarks on increase in achieved SDG Impacts from estimated value in approved PDD

For SDG 7 & SDG 13, the Net electricity generation and actual emission reduction for the monitoring period is only 0.91% lesser than the estimated emission reduction as per PDD. Hence, no additional justification is required.

SECTION F. SAFEGUARDS REPORTING

Data/parameter:	NA
Mitigation measures followed	NA
Source	NA
Additional comments:	NA

SECTION G. STAKEHOLDER INPUTS AND LEGAL DISPUTES

G.1. List all Inputs and Grievances which have been received via the Continuous Input and Grievance Mechanism together with their respective responses/mitigations.

As a part of continuous feedback from stakeholders, the grievances register is placed at site and is being continuously monitored and addressed through the grievances cell on regular basis and maintained in a register at site office. A copy of the grievance Register has been provided separately. No input or grievances received from any stakeholder during the current monitoring period.

G.2. Report on any stakeholder mitigations that were agreed to be monitored.

Not applicable

[10] Average 39 employments given during the current monitoring period.

G.3. Provide details of any legal contest that has arisen with the project during the monitoring period

No legal contest or dispute arisen with the project during the monitoring period.

Revision History

Version	Date	Remarks
1.1	14 October 2020	Hyperlinked section summary to enable quick access to key sections Improved clarity on Key Project Information Section for POA monitoring Forward action request section Improved Clarity on SDG contribution/SDG Impact term used throughout Clarity on safeguard reporting Clarity on design changes Leakage section added for VER/CER projects Addition of Comparison of monitored parameters with last monitoring period Provision of an accompanying Guide to help the user understand detailed rules and requirements
1.0	10 July 2017	Initial adoption