



**Verified Carbon
Standard**

GREENFIELD SOLAR POWER MISSION BY FORTUM INDIA



**INFINITE
SOLUTIONS**

Document Prepared by Infinite Environmental Solutions LLP

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

Fortum India Private Limited is the promoter of the project activity. The project activity involves installation of 250 MW (AC) solar power project. Since the project activity is a large scale project activity, it follows approved large scale CDM methodology ACM0002 Version 19.0 for quantification of GHG emission reductions.

Solar plant was commissioned in two phases, first phase consisting of 150 MW capacity was commissioned on 19-March-2021 and the second phase consisting of 100 MW capacity was commissioned on 01-May-2021. The electricity generated from project activity is sold under the Power Purchase Agreement (PPA), signed with Solar Energy Corporation of India Limited (SECI). The electricity generated from the project activity is supplied to the Indian grid through 400/220 KV GSS, RVPNL Jaisalmer-II substation at Bhensara, Jaisalmer, Rajasthan.

The project activity replaces the anthropogenic emissions of greenhouse gases (GHG's) by displacing approximately 440,514.42 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, estimated to be approximately 412,674 tCO₂e per year over the 10 years of crediting period as per PDD and applied methodology i.e. ACM0002 version 19.0.¹ Total estimated GHG emission reductions for the chosen 10-year renewable crediting period will be around 4,539,413 tCO₂e.

The monitoring period is from 01-April-2022 to 31-March-2023 (inclusive of both the days). The total GHG emission reductions or removals estimated for this monitoring period are 450,841 tCO₂e and the actual emission reductions generated in this monitoring period are 562,123 tCO₂e.

Details of the installation of the project are as follows:

Project Investor	Capacity (MW ac)	COD	Connection with the Grid	State
Fortum India Private Limited	150	19-March-2021	Indian Grid	Rajasthan
	100	01-May-2021		

¹ <https://cdm.unfccc.int/methodologies/DB/5725LCHYPYM4I1V8OD9SFYVAMFFWNP>

Audit Type	Period	Program	VVB Name	Number of years
Validation	13-December-2019	VCS	Earthood Services Private Limited	10 year 0 months 0 days ²
Verification	19-March-2021 - 31-March-2022	VCS	LGAI Technological Center, S.A. (Applus+ Certification)	1 year 0 months 13 days
Verification	01-April-2022 - 31-March-2023 ³	VCS	VKU Certification Private Limited	1 year 0 months 0 days

1.2 Sectoral Scope and Project Type

The project activity is neither an AFOLU project category nor a grouped project. 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

Methodology : ACM0002: Grid-connected electricity generation from renewable sources - Version 19.0⁴

1.3 Project Proponent

Organization name	Fortum India Private Limited ⁵
Contact person	Mr. Atishay Jain
Title	Vice President
Address	1A, Vandana Building 11, Tolstoy Marg, New Delhi, India,110001
Telephone	+91-85276-94527
Email	atishay.jain@fortum.com

1.4 Other Entities Involved in the Project

Organization name	Infinite Solutions
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² <https://registry.terra.org/app/projectDetail/VCS/2069>

³ Current verification i.e. 2nd Monitoring Period.

⁴ <https://cdm.unfccc.int/UserManagement/FileStorage/58IAGB7SZUDE02VN6LYM30K41HFPRQ>

⁵ As per the project description deviation approved during from 1st monitoring period ie, from 19-March-2021 to 31-March-2022.

Role in the Project	Project Consultant
Contact person	Mr. Jimmy Sah
Title	Chief Operating Officer
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: 19-March-2021⁶

The project start date is the commissioning date for 150 MW out of total 250 MW.

1.6 Project Crediting Period

Crediting Period Start date: 19-March-2021⁷

Crediting Period End date: 18-March-2031

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

1.7 Project Location

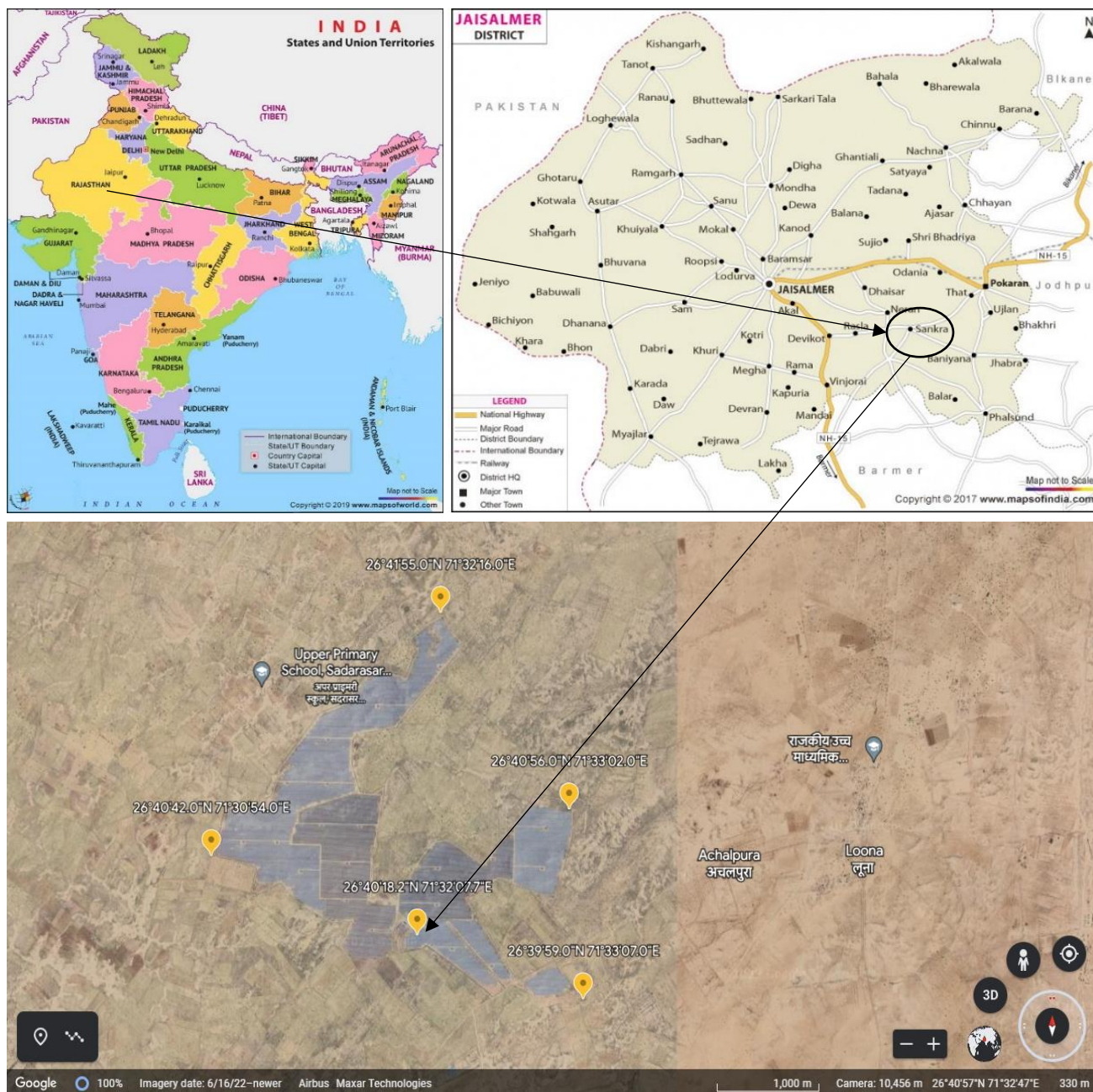
Project investor	Village	District	State	Latitude ⁸	Longitude
Fortum India Private Limited	Luna Khurd, Luna Kala and Betina	Jaisalmer	Rajasthan	26° 40' 18.21" N	71° 32' 07.70" E

The project location has been highlighted in the maps shown below:

⁶ 150 MW out of 250 MW commissioned date is 19-March-2021. The start is revised as 19-March-2021 as per the deviation from project description approved during 1st verification.

⁷ The start of crediting period is revised as 19-March-2021 as per the deviation from project description approved during 1st verification.

⁸ Since at the time of project registration, project activity was not commissioned and the location details were tentative, therefore there is slight change in final location of the commissioned project. The geo coordinates are revised as 26° 40' 18.21" N 71° 32' 07.70" E, in line with the deviation from project description approved during 1st verification.



1.8 Title and Reference of Methodology

Methodology: ACM0002, Grid-connected electricity generation from renewable sources⁹

Project Type: Type-I: Renewable Energy Projects

⁹ <https://cdm.unfccc.int/UserManagement/FileStorage/58IAGB7SZUDE02VN6LYM30K41HFPRO>

Version No.: Version 19.0

Reference: CDM Methodology

The methodology refers to the following CDM Tools:

- Tool for the demonstration and assessment of additionality (Version 07.0.0, EB 70, Annex 8)¹⁰.
- Tool to calculate the emission factor for an electricity system 4 - (Version 07.0 EB 100, Annex 04)¹¹

1.9 Participation under other GHG Programs

The implemented project activity has not been registered and is not seeking registration at moment under any other GHG programs i.e. VCS benefits only will be claimed for this monitoring period. The project has also not applied or registered to claim any national (RECs) or international (IRECs) renewable attributes for the monitoring period.

1.10 Other Forms of Credit and Supply Chain (Scope 3) Emissions

The 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.

1. Emission Trading Programs and Other Binding Limits: The project is hosted in India, a non-annex country and there is no compliance with an emission trading program or to meet binding limits of GHG emissions for this project activity.
2. Other Forms of Environmental Credit: Project has not applied or registered to claim any national (RECs) or international (IRECs) renewable/ environmental attributes for the monitoring period.
3. Supply Chain (Scope 3) Emissions: As per December 2022 VCS Program Update: Overview of Substantive Updates to Program Rules and Requirements and Effective Dates, this section effective from 1 July 2023¹², Hence this section is not applicable for current monitoring period.

1.11 Sustainable Development Contributions

The Project contributions to the sustainable development of the local area as well as the host country are as follows:

¹⁰ <https://cdm.unfccc.int/UserManagement/FileStorage/FJUZLIKOG8NPT4HSCWR1692703A5VX>

¹¹ <https://cdm.unfccc.int/UserManagement/FileStorage/TJUNP2WBS15MZGYXRD07HEOQ83ILF6>

¹² <https://verra.org/wp-content/uploads/2022/12/VCS-Summary-of-Effective-Dates-2022-Q4-FINAL2.pdf>

Social well-being: The project activity results in creating job opportunities for the local population on temporary and permanent basis. This would result in an improvement in the living standards of the local community. The installation of the renewable energy projects also led to development of basic infrastructure like roads, communication with the nearby cities etc. which also improved the living standards of the local population.

Environmental well-being: Solar power is one of the cleanest renewable energy powers and does not involve any fossil fuel. Hence, there are no GHG emissions. The impact on land, water, air and soil is also 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 opportunities within the vicinity of the project. The electricity supply in the nearby area and the investment in the project activity leads to an improvement in the economic activity in the local area, which directly and indirectly improves the economy and lifestyle of the area.

Technological well-being: The project activity is a 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 motivates more investors to invest in solar power projects. Hence, the project activity leads to technological well-being.

The project's contribution to SDGs with respect to current monitoring period are as follows:



For SDG 7: About 600,047 MWh renewable electricity has been supplied to Indian grid during the reported monitoring period i.e. 01-April-2022 to 31-March-2023, that helps to increase the renewable energy share in the energy mix.



For SDG 13: By supplying 600,047 MWh clean electricity to Indian grid, the project avoided release of 562,123 tCO₂e into the atmosphere during the reporting period i.e. 01-April-2022 to 31-March-2023.



For SDG 8: Project proponent is committed to provide employment opportunities and ensures the proper health & safety trainings. During the current monitoring period the project proponent provided employment to 94 persons.

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 the renewable energy share in the energy mix.	About 600,047 MWh of renewable electricity has been supplied to Indian Electricity grid during the current monitoring period which helps to increase the renewable energy share in the energy mix.	A total of 1,181,324 MWh (581,277 MWh in 1 st verification ¹³ + 600,047 MWh during current MP) of renewable electricity has been supplied to the Indian grid by the project activity since start date of the project activity.
2	8.5	8.5: By 2030, achieve full and productive employment and decent work for all women and men, including for young people and persons with disabilities, and equal pay for work of equal value	Implemented activities to increase employment opportunities and quality of work.	Total 94 people are employed during this reporting period(40 skilled and 54 unskilled).	94 people were employed since start date of the project activity.

¹³ <https://registry.verra.org/app/projectDetail/VCS/2069>

3	13.2	13.2.2: Total greenhouse gas emissions per year	Implemented activities to decrease the total greenhouse gas emissions.	By generating 600,047 MWh of renewable electricity the project has avoided the emission of 562,123 tCO ₂ e in the atmosphere.	Since start date of the project activity the project has avoided the emission of 1,106,662 tCO ₂ e (544,539 tCO ₂ e in 1 st verification ¹⁴ + 562,123 tCO ₂ e during current MP) in the atmosphere.
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¹⁴ <https://registry.verra.org/app/projectDetail/VCS/2069>

2 SAFEGUARDS

2.1 No Net Harm

Being a renewable solar PV technology-based power generation project, it is considered as one of the cleanest forms of electricity generation projects. The solar PV based power generation neither involves any moving mechanical parts or any type of emission in air nor generates any kind of effluent to the environment during its construction and operation phase. Project activity is not having any negative environmental impacts.

Moreover, renewable solar PV based power generation projects are promoted by Indian government. According to Final Document on Revised Classification of Industrial Sectors Under Red, Orange, Green and White Categories (29-February-2016)¹⁵, the Solar power generation through photovoltaic cell comes under White category of industries which are practically non-polluting. Therefore, does not require an Environmental Impact Assessment (EIA) and There is no necessity of obtaining the Consent to Operate.

As per section 04 page 31 of the report published by Ministry of New and Renewable Energy (MNRE) on September 2013 (Developmental Impacts and Sustainable Governance Aspects of Renewable Energy)¹⁶, “As established by life-cycle assessment, RE projects have comparatively low environmental externalities that too are limited to project development phase. The RE projects don’t generate solid or liquid effluents during operations and thereby pollution of land, surface water or ground water resources is not anticipated from such projects. During the operations phase the impacts on the surrounding environment are negligible and are reversible in nature and can be mitigated by proper Environmental Management plan.”

Thus, there are no harm identified from the project and hence no mitigations measures are applicable.

2.2 Local Stakeholder Consultation

The Local Stakeholder Meetings were organized for local stakeholder consultation and informed local stakeholder regarding the meeting. The followings are the local stakeholders for the project activity:

- Local community
- Local village administration
- Technology suppliers
- Local vendors

¹⁵ https://moef.gov.in/wp-content/uploads/2017/07/Latest_118_Final_Directions.pdf

¹⁶ <http://164.100.94.214/sites/default/files/uploads/report-on-developmental-impacts-of-RE.pdf>

All the stakeholders have been invited through invitation letters (delivered in hand) and public notice to attend the stakeholders meeting.

The details of the Stakeholder Meetings are as follows:

Date of invitation – 26-April-2019

Date of Meeting – 02-May-2019

Location of Meeting - Project site, Rajasthan

In the introductory speech, the representatives of Project Investor welcomed the gathering and given a brief about the VCS project activity. Subsequent to the introductory speech, stakeholders were explained that electricity generation from solar project is an environmentally friendly power generation technology contributing to reduction in GHG emissions. They were also explained about the benefits of the solar power projects like, increasing energy availability and improving quality of power and its assistance to the local population by providing employment opportunities to both skilled & unskilled labors.

After the speech, the villagers raise the following questions as summarized below: -

Q: How does the project activity benefit the villages around the project site and their residents?

A: The project activity will benefit the nearby villagers by providing employment opportunities to local or nearby people and also provides immense opportunity for economic development of the area like increase in business opportunities, improvement in transportation social activities helps to uplift the standard of living.

Q: Attendees were eager to know about the scope of employment generation during the operation of the PV Plant?

A: It was responded that the preference would be given to the local villagers for the skilled and unskilled requirements.

Q: In any case, the project operation will affect the fertility of nearby fertile land?

A: It was explained that plants have nothing to do with the fertility of the soil.

Q: Villagers asked about company's future plans regarding the growth of local infrastructure/ facilities/ educations?

A: The project will provide economic development of the area and will surely contribute to the improvement of necessary facilities in the nearby areas.

Project Proponent is open for continuous interaction with stakeholders and maintaining the stakeholder feedback register place at the project site for the comments at any point of time during the project crediting period. PP has explained this mechanism for on-going communication to the local stakeholders and transparently kept the notice mentioning the grievance register and box at the project site.

The accounting of all and any input received during ongoing communication should be taken in consideration to take the appropriate measure to resolve the grievance. No issues and grievance for the project activity has been identified during the current monitoring period.

2.3 AFOLU-Specific Safeguards

For non-AFOLU projects, this section is not required.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project activity involves installation of 250 MW solar power project at Jaisalmer, Rajasthan. Solar plant was commissioned in two phases, first phase consisting of 150 MW capacity was commissioned on 19-March-2021 and the second phase consisting of 100 MW capacity was commissioned on 01-May-2021. The electricity generated from project activity is exported to the unified Indian grid under the Power Purchase Agreement (PPA), signed with Solar Energy Corporation of India Limited (SECI). The energy meters are located at 400/220 KV GSS, RVPNL Jaisalmer-II substation at Bhensara, Jaisalmer, Rajasthan, which is 11.353 kilometres away from the solar power plant.

Solar Power Project Technology Details

The technology employed, converts solar energy to electrical energy. The technology is an environment friendly technology since there are no GHG emissions associated with the electricity generation. There is no transfer of technology involved in the project activity. Technical specification of the project are as follows:

PV Module Make	Suntech & Jinko
PV Module type	SunTech – Mono Facial (Polycrystalline) & Jinko – Bifacial (Monocrystalline)
Module Ratings	Suntech (Mono Facial) - 340 & 345 Wp
	Jinko (Bifacial) - 395 & 400 Wp
Total no. of module	Jinko (Bifacial) – 124488 (395Wp) & 184576 (400Wp) Suntech (Mono Facial) – 305310 (340Wp) & 307860 (345 Wp)
Open Circuit Voltage (Voc) of individual panel	Suntech (Mono Facial) – 46.0V (340Wp), 46.2V (345Wp) & Jinko (Bifacial) - 48.26V (395 Wp), 48.35V (400 Wp)
Short Circuit Current (Isc) of individual panel	Suntech (Mono Facial) - 9.39A (340 Wp), 9.48A (345 Wp) & Jinko (Bifacial) - 10.23A (395 Wp), 10.32A (400 Wp)
Temperature Coefficient of Pmax	Suntech (Monofacial) - 0.38 %/°C & Jinko (Bifacial) - 0.35 %/°C

Tilt	Fixed tilt structure at 18 deg (Suntech – Mono facial) & 20 deg (Jinko - Bifacial)
Number of ICoRs	10 Nos
Number of RMUs	10 Nos
No of inverters per ICoRs	78*2 Nos
Step up transformer location, capacity, input and output voltages	20 Inverter duty Transformer at different location within the plant of capacity 12.6MVA, 33/0.8/0.8/0.8 kV
The net electricity as input to the panel at MCR and output	2 Outgoing HT Panels with 125MW output capacity each & Each O/G panel has 5 incomers connected with 25MW capacity.
Transformer specifications at the switchyard	2 Nos. of Power transformer used as 125/150MVA, ONAN/ONAF, 220kV/33kV, YNyn0.
Electric arc insulation in power transformers	Oil type
Number of Feeders	2 Outgoing HT panels and 5 Incoming feeders with 1 Spare Incoming feeder. Also, per incoming feeder capacity of 25MW, 2 Outgoing feeders; 2 Auxiliary Transformer feeders.
The output voltage generated from the plant and synchronised with the grid	220kV
Inverter Make	Huawei
Inverter Capacity	160 KW
No. of Inverter	1563 Nos
Inverter capacity voltage at the output side	800 V
Main Control Room	1 MCR Located at the center of the plant

Emission Reductions from anthropogenic sources:

Since, solar power is Green House Gas (GHG) emissions free, the power generated will prevent the anthropogenic GHG emissions generated by the fossil fuel based thermal power stations comprising coal, diesel, furnace oil and gas. The estimation of GHG reductions by this project is limited to carbon dioxide (CO₂) only.

The project shall result in replacing anthropogenic emissions of greenhouse gases (GHGs) estimated to be approximately 412,674 tCO₂e per year, thereon displacing 440,514.42

MWh/year amount of electricity from the grid over the 10 years crediting period. During current monitoring period the project has generated 600,047 MWh of electricity thereby reduced 562,123 tCO₂e of GHG emissions from the environment.

The plant was operational for 4301.68 hours out of a total of 8760 hours in the current monitoring period i.e. from 01-April-2022 to 31-March-2023. There are no such events during operation of the project activity that may impact the GHG emission reductions or removals in the monitoring period. There were few minor breakdowns occurred due to scheduled maintenance activities and some other reasons. However, the plant was not totally shut down during breakdown hours, only the affected parts were shut down. Total breakdown hours for the current monitoring period are 3537.41 hours. The details of the breakdown/downtime are provided in Appendix-2 for the reference.

3.2 Deviations

3.2.1 Methodology Deviations

This section is not Applicable, as there are no deviations requested under current monitoring period (01-April-2022 to 31-March-2023) from the applied methodology.

3.2.2 Project Description Deviations

The project has not applied/requested for any deviations from Project Description under current monitoring period (01-April-2022 to 31-March-2023). However, the following project description deviations were approved during last verification (1st monitoring period):

- The project activity crediting period start date was 01-December-2020, but due to the Covid-19 restrictions delay occurred in the commissioning of the plant, and the plant is commissioned on 19-March-2021. So, the crediting period start date was revised with the project start date. Therefore, the crediting period start date is 19-March-2021 and crediting period end date is 18-March-2031.
- As found out in the site survey during 1st verification the geo-coordinates of the project activity are latitude - 26° 40' 18.21''N, longitude -71° 32' 7.70''E which are different as per registered VCS PD. Since at the time of project registration, project activity was not commissioned and the location details were tentative, therefore there is slight change in final location of the commissioned project.
- The technical specification of the equipment's (PV module type and its capacity) used for actual installation on site is different from the details provided in the registered VCS PD and the same has been updated in section 3.1 of the VCS MR.
- As per the registered VCS PD "Fortum Solar Plus Private Limited" was the project proponent of the project activity. However, the name of "Fortum Solar Plus Private Limited" has been changed to "SPRNG Solar Plus Private Limited" on 14-June-2022. SPRNG Solar Plus Private Limited (Formerly known as "Fortum Solar Plus Private Limited") is responsible for overall management of current 250 MW project activity, but as per the declaration submitted to VERRA, all the Carbon Credits rights were transferred from "SPRNG Solar Plus Private Limited" (Formerly known as "Fortum Solar Plus Private Limited") to "Fortum India Private Limited".

Limited” during last verification (1st Monitoring Period) and therefore “Fortum India Private Limited” is acting as the project proponent for the said project activity.

The registry of the project activity was also transferred from previous account holder “EKI Energy Services Limited” (Account ID-1851) to “Fortum India Private Limited” (Account ID-4660) and now the sole responsibility of communication and issuance lies with Fortum India Private Limited. and therefore “Fortum India Private Limited” is acting as the project proponent for the said project activity.

- Infinite Environmental Solutions LLP (Infinite Solutions) is now name as the other entity involved for the project activity replacing EKI Energy Services Limited for the role of project consultant.

3.3 Grouped Projects

Not Applicable, as the project activity is not a Grouped Project.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	EF _{grid,OM,y}
Data unit	tCO _{2e} /MWh
Description	Operating Margin CO ₂ emission factor in year y
Source of data	Calculated from CEA database, Version 14.0, December -2018
Value applied	0.9610
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 ¹⁷ ” as 3-year generation weighted average using data for the years 2015-2016, 2016-2017 & 2017-2018. The data are obtained from “CO ₂ Baseline Database for Indian Power Sector” version 14 ¹⁸ , published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of Data	For the calculation of the Baseline Emissions.
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	EF _{grid,BM,y}
Data unit	tCO ₂ /MWh

¹⁷ <https://cdm.unfccc.int/UserManagement/FileStorage/TJUNP2WBS15MZGYXRD07HEOQ83ILF6>

¹⁸ https://cea.nic.in/wp-content/uploads/baseline/2020/07/user_guide_ver14.pdf

Description	Build Margin CO ₂ emission factor in year y
Source of data	Calculated from CEA database, Version 14.0, December -2018
Value applied	0.8644
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 ¹⁹ ” as per the latest data available for the most recent year 2018. The data is obtained from “CO ₂ Baseline Database for Indian Power Sector” version 14 ²⁰ , published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of Data	For the calculation of Baseline Emissions.
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	EF _{grid,CM,y}
Data unit	tCO ₂ /MWh
Description	Combined Margin CO ₂ emission factor in year y
Source of data	Calculated from CEA database, Version 14.0, December -2018
Value applied	0.9368
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% Calculated as per “Tool to calculate the emission factor for an electricity system, version 07.0.0²¹”. The data is obtained from “CO₂ Baseline Database for Indian Power Sector” Version 14, December 2018²², published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of Data	For the calculation of Baseline Emissions.
Comments	This parameter is fixed ex-ante for the entire crediting period.

¹⁹ <https://cdm.unfccc.int/UserManagement/FileStorage/TJUNP2WBS15MZGYXRD07HEOQ83ILF6>

²⁰ https://cea.nic.in/wp-content/uploads/baseline/2020/07/user_guide_ver14.pdf

²¹ <https://cdm.unfccc.int/UserManagement/FileStorage/TJUNP2WBS15MZGYXRD07HEOQ83ILF6>

²² https://cea.nic.in/wp-content/uploads/baseline/2020/07/user_guide_ver14.pdf

4.2 Data and Parameters Monitored

Data / Parameter	EG _{facility,y}
Data unit	MWh
Description	Quantity of net electricity generation supplied by the project (Solar) plant/unit to the grid in year y
Source of data	JMR
Description of measurement methods and procedures to be applied	The value of net electricity generation supplied to the grid as per the Joint Meter Reading Report forms the basis for calculation of the emission reductions, which can be cross checked from the invoice raised. Net electricity supplied to grid will be calculated as the difference of the measured values of “export” and “import” of electricity through the dedicated SEB energy meter installed at the delivery point. Monthly meter readings are taken from the main and check meter installed at metering point and certified by the representatives of SEB Officials and the representatives of the project proponent. Monitoring: Bidirectional Tri vector meter will be used Data type: Measured Type of meter: Static type meter (Main & Check). Both are Bidirectional meters. Class of meter: 0.2s. Calibration frequency: Once in five years²³. More details about energy meter provided in appendix 1.
Frequency of monitoring/recording	Continuous monitoring, hourly measurement and at least monthly recording.
Value monitored	600,047
Monitoring equipment	Special Energy Meters (SEMs) of 0.2s accuracy class
QA/QC procedures to be applied	Energy meters will be calibrated once every five years and faulty meters will be duly replaced immediately. This data may be cross checked with the Monthly Generation Reports
Purpose of the data	The Data/Parameter is required to calculation of baseline emission.

²³ As per the registered VCS PD version 02 dated 19-December-2019, the calibration frequency for energy meters is once in 5 years, which is also in line with Article 7 para 7.1.1 of the Power Purchase Agreement and para 1 (b) under section 18 of Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006, “All interface meters shall be tested at least once in five years.”

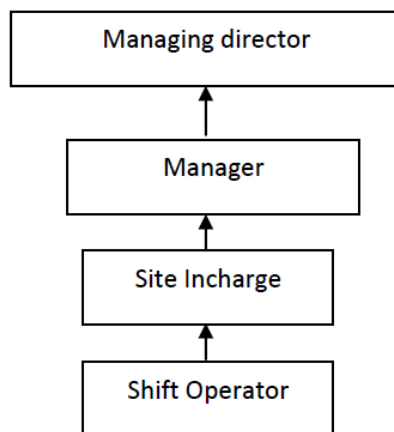
Calculation method	N/A
Comments	The data would be archived electronically and maintained for the entire crediting period plus two years.

4.3 Monitoring Plan

“SPRNG Solar Plus Private Limited” (Formerly known as “Fortum Solar Plus Private Limited”) is responsible for overall management of current 250 MW project activity. RWE Solar India Private Limited (Formerly Belectric Photovoltaic India Private Limited) is contracted/appointed by SPRNG Solar Plus Private Limited (formerly known as “Fortum Solar Plus Private Limited”) for daily operation and maintenance of the project.

The project has the following operational & management structure in order to monitor emission reduction. The organization structure for the power plant has a manager as the in-charge for the entire power plant operations and maintenance and directly reports to the Managing director. He is assisted by the site in charge. The day-to-day operation like planning the routine maintenance, safety and environmental control was placed under the care of the Site manager. The organizational structure and responsibilities on project operation, monitoring, data recording and ER calculation has been mentioned below:

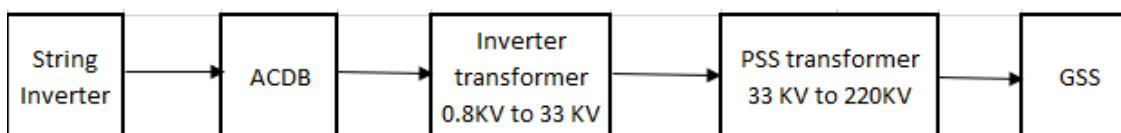
Organizational Structure:



Designation	Responsibilities
Managing director	- Held complete control over monitoring aspects pertaining to the project. - Reviewed Monitoring report. - Training of the staff performed. - Emission reduction calculation has been maintained.
Manager	- Entire power plant operation & maintenance - Periodic checking of recorded & stored data. - Emission reduction calculation & Monitoring report preparation.

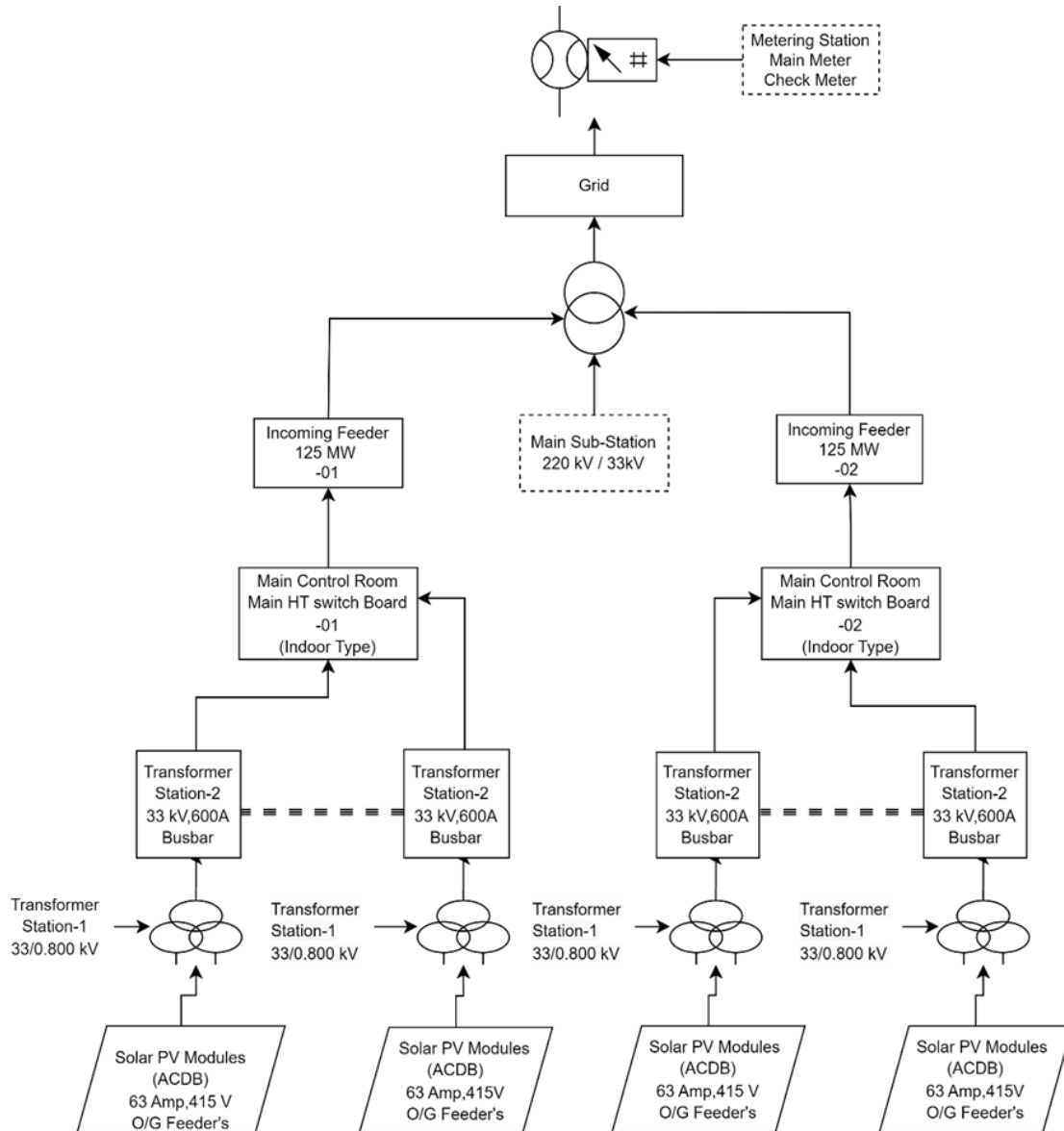
Site In-charge	- Day to day Operation - Storage of data - Data Recording
Shift operator	Data collection

The schematic diagram of the project is illustrated below:



The project activity involves the generation of electricity from renewable solar power by installation of 250 MW (AC) Solar Photovoltaic modules at Jaisalmer district, Rajasthan. The modules are of 2 types mono facial and bifacial. The power is initially generated at 800V by the string inverters, which are responsible for converting the solar energy into usable electrical power. To efficiently transmit the generated power, it is stepped up to a higher voltage of 33 kV using transformers installed in each of the inverters. In order to connect the power plant to the Bhensara substation, two feeders with a capacity of 125 MW have been laid. These feeders act as transmission lines, serving the purpose of transporting the power from the power plant to the pooling substation. The power is further stepped-up to 220 kV using the transformers installed in the pooling substation.

The power evacuation of the project activity is carried out by the Jodhpur Vidyut Vitaran Nigam Limited (JDVVNL) through 400/220 KV GSS (Grid Substation), which is the RVPNL Jaisalmer - II substation located in Bhensara, Jaisalmer, Rajasthan. The Grid Substation at Bhensara acts as a pivotal point where the power generated by the project is fed into the grid. This substation provides the necessary infrastructure, equipment, and monitoring capabilities to handle the high-voltage power coming from the project, ensuring efficient transmission.



Single Line Diagram (simplified version)

Data Measurement:

The export and import energy are being measured continuously using above mentioned Main and Check meters located at 400/220 KV GSS, RVPNL Jaisalmer-II substation at Bhensara, Jaisalmer, Rajasthan. Readings of meters are taken on a monthly basis by an authorized officer of SEB (Jodhpur Vidyut Vitaran Nigam Limited, JDVVNL) in the presence of PP or a representative of PP. Based on the Meter Reading Statement to Fortum India Private limited, invoices are being raised. These invoices can be used for cross-checking the meter readings taken for the respective project activity. In case of the billing cycle and monitoring, period cycle does not match, then daily generation data will be used to determine net electricity export for a particular period.

Data collection and Data Archiving:

Readings from meters are collected in the presence of the plant in-charge. Export and Import data 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 would be 2 years after the end of crediting period or till the last issuance of VCUs for the project activity whichever occurs later.

QA/QC procedures:

The energy meters are maintained and owned by State Electricity Board (JDVNL). Neither the project proponent nor the site personnel have any control over it. The records are cross-checked with the records of sold electricity to Solar Energy Corporation of India (SECI). The meters are calibrated by a NABL certified third party agency appointed by state electricity board (JDVNL) at least once in five years.

The project activity uses high-precision monitoring meters of 0.2s accuracy class to monitor the electricity to the grid. The meters are calibrated and sealed as per the industry practices by the grid utility. Hence, high quality is ensured. At the project site, a robotic system is used to clean solar panels which runs on electricity and is a part of project. Hence, there are no project emissions related with solar panel cleaning. The power required by the robotic system is already included in the project's auxiliary consumption, which is a part of the project's electricity imports. Emission reductions are determined based on net power generation, which is calculated after subtracting import values from the energy exports.

Electricity sales receipts are used to test the consistency of the recorded data. A supervisory control and data acquisition (SCADA) system of ABB India is employed at site for overall monitoring of the project.

Internal Audit

PP has carried out the internal audit annually and whenever necessary to verify that the monitoring plan satisfies the VCS Standards, or the standards provided by other laws and regulations to be conformed to and abides by the procedures specified in the registered VCS PD.

Procedures for handling non-conformances with the validated monitoring plan

If any non-conformity is observed in the proposed monitoring plan, then the same shall be reported to the VCS board at the time of the VCS verification along with the corrective actions taken by the PP.

Emergency preparedness:

In case Main meter or Check meter is found to be outside the acceptable limits of accuracy or faulty or not functioning properly, it will be repaired, recalibrated or replaced as soon as possible. In the event that the Main meter will not be in service as a result of maintenance, repairs or testing, the Check meter will be used for readings. In case both the main and check meter are found to be outside the acceptable limits of accuracy or faulty or not functioning properly, both the meters will be calibrated immediately, and the error percentage found in the main meter

during its calibration will be applied to its metered energy data for the entire period since its last calibration to obtain the corrected value of net electricity exported to the grid.

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

- Data collected by Fortum India Private limited from energy meters installed at the plant end and recorded in the Daily Generation Report by SCADA system in place for overall monitoring of the project.
- Apportioning the net electricity exported to grid, as recorded in the Monthly Generation Record/Joint Meter Reading statement, based on the number of days in the monitoring period and the number of days for which the Monthly Generation Record/Joint Meter Reading report was taken. The net electricity exported to the grid would be calculated from:

Net electricity exported to the grid = $A/B \times C$

Where:

A= Number of days matching in billing period and monitoring period.

B= Total number of days of the billing period/month

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

Calculation of net electricity exported to the grid is done by both the approaches and conservative value among the two is used for calculation of emission reductions during that period.

Personnel training:

In order to ensure the proper functioning of the project activity and proper monitoring of emission reductions, the staff are trained. The Shift In-charge and Plant In-charge are trained in equipment operation, data recording, reports writing, operation and maintenance, and emergency procedures in compliance with the monitoring plan. The details of trainings provided during current monitoring period are mentioned under Appendix – 3 of the monitoring report.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

Baseline emissions for the project activity:

$$BE_y = EG_{\text{facility},y} * EF_{\text{grid,CM},y}$$

$EF_{grid,CM,y}$: 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 07.0²⁴” (tCO₂/MWh) (i.e., 0.9368 tCO₂/MWh).

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

BE_y : Baseline emissions in year y (tCO_{2e}/yr)

Here,

The monitoring period 01-April-2022 to 31-March-2023 (inclusive of both the days)

$EF_{grid,CM,y} = 0.9368 \text{ tCO}_2/\text{MWh}$

$EG_{facility,y} = 600,047 \text{ MWh}$

$BE_y = 600,047 * 0.9368 = 562,123 \text{ tCO}_2\text{e}$ (Rounded Down value)

5.2 Project Emissions

As per the approved consolidated Methodology ACM0002 (Version 19.0)²⁵ para 34: “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 CO_{2e}/yr)

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

At the project site, a robotic system is used to clean solar panels, which runs on electricity²⁶, there are no project emissions from fossil fuel consumption i.e. $PE_{FF,y} = 0$.

$PE_{GP,y}$ = Project emissions from the operation of dry, flash steam or binary geothermal 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 CO_{2e}/yr)”

²⁴ <https://cdm.unfccc.int/UserManagement/FileStorage/TJUNP2WBS15MZGYXRD07HEOQ83ILF6>

²⁵ <https://cdm.unfccc.int/UserManagement/FileStorage/58IAGB7SZUDE02VN6LYM30K41HFPRQ>

²⁶ The power required by the robotic system is included in the project's auxiliary consumption, which is included in the project's electricity imports. Emission reductions are determined based on net power generation which is calculated after subtracting import values from the energy exports. Hence there are no project emissions related to cleaning of solar panels.

For most renewable energy power generation project activities, $PE_y = 0$

The project activity involves in harnessing solar power, renewable source of energy. As per the applied methodology the project emissions are considered as Zero. Hence, $PE_y = 0$

5.3 Leakage

As per the approved consolidated Methodology ACM0002 (Version 19.0)²⁷ para 56 “No other leakage emissions are considered. The emissions potentially arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, transport etc.) are neglected.”

The project activity involves in harnessing solar power, renewable source of energy. As per the applied methodology the leakage emissions are considered as Zero. Hence, $LE_y = 0$

5.4 Net GHG Emission Reductions and Removals

As per the approved consolidated Methodology ACM0002 (Version 19.0)²⁸ para 57, emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y - LE_y$$

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

Baseline Emission (BE_y)

The baseline emissions are the product of electrical energy baseline $EG_{PJ, y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by an emission factor.

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

Where,

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

As project activity is the installation of a Greenfield power plant, hence $EG_{PJ, y} = EG_{facility, y}$

The notation of same parameters $EG_{PJ, y}$ can be $EG_{facility, y}$ as project activity is installation of a greenfield power plant.

²⁷ <https://cdm.unfccc.int/UserManagement/FileStorage/58IAGB7SZUDE02VN6LYM30K41HFPRQ>

²⁸ <https://cdm.unfccc.int/UserManagement/FileStorage/58IAGB7SZUDE02VN6LYM30K41HFPRQ>

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

Project Emission (PE_y)

As per para 34 of the applied methodology ACM0002 (Version-19.0)²⁹, no project emissions are considered in the project activity.

Hence, project emissions $PE_y = 0 \text{ tCO}_2\text{e}$

As per para 56 of the applied methodology ACM0002 (Version-19.0), no leakage emissions are considered in the project activity.

Hence, Leakage emissions $LE_y = \text{tCO}_2\text{e}$; Therefore, $ER_y = BE_y$

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)
01-April-2022 to 31-December-2022	422,776	0	0	422,776
01-January-2023 to 31-March-2023	139,347	0	0	139,347
Total	562,123	0	0	562,123

<u>Ex-ante emissions reductions/removals</u>	<u>Achieved emissions reductions/removals</u>	<u>Percent difference</u>	<u>Justification for the difference</u>
450,841	562,123	24.68%	The estimated PLF as per PDD is 22%, and the actual PLF achieved during monitoring period is 27.40%. The increase in the PLF is 24.54%, which is under the breaching value of Sensitivity i.e. 33.66% as per the registered PDD. The higher generation was observed due to more sunshine hours and irradiance which is not under the control of project participant. Hence, we are going forward.

²⁹ <https://cdm.unfccc.int/UserManagement/FileStorage/58IAGB7SZUDE02VN6LYM30K41HFPRQ>

APPENDIX 1: METER DETAILS

The power generated by the project is evacuated through two feeders with a capacity of 125 MW each. The voltage is initially generated at 800V and stepped up to 33 kV using transformers. The power is then transmitted through two feeders, connecting the power plant to the Bhensara substation. The Jodhpur Vidyut Vitaran Nigam Limited (JDVVNL) is responsible for evacuating the power from the project and integrating it into the Indian grid system for distribution. Energy billing meter installed at the 400/220kV GSS (Grid Substation) located at Bhensara, Jaisalmer, Rajasthan.

The energy meters are calibrated once every five years. The calibration frequency is in line with the registered VCS PD version 02 dated 19-December-2019. The calibration process is also in line with Article 7 para 7.1.1 of the Power Purchase Agreement “For installation of Meters, Meter testing, Meter calibration and Meter reading and all matters incidental thereto, the SPD and SECI shall follow and be bound by the Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006; the Grid Code, as amended and revised time to time.” As per para 1 (b) under section 18 of Central Electricity Authority (Installation and Operation of Meters) Regulations, 2006, “All interface meters shall be tested at least once in five years.”

The details of energy meters along with calibration dates are mentioned below:

Meter	Sl. No.	Make	Model	Type	Class	Calibration Dates	Due date of calibration	Name of the entity
Main Meter	RJB99499	Secure	APEX 150	3phase 4wire	0.2s	01-March-2022	28-February-2027	Darsh Calibrations Private Limited
Check Meter	RJB99500	Secure	APEX 150	3phase 4wire	0.2s	01-March-2022	28-February-2027	Darsh Calibrations Private Limited
Standby Meter	RJB99501	Secure	APEX 150	3phase 4wire	0.2s	01-March-2022	28-February-2027	Darsh Calibrations Private Limited

APPENDIX 2: BREAKDOWN DETAILS

The plant was operational for 4301.68 hours out of a total of 8760 hours in the current monitoring period i.e. from 01-April-2022 to 31-March-2023. There are no such events during operation of the project activity that may impact the GHG emission reductions or removals in the monitoring period. There were few minor breakdowns occurred due to scheduled maintenance activities and some other reasons. However, the plant was not totally shut down during breakdown hours, only the affected parts were shut down. Total breakdown hours for the current monitoring period are 3537.41 hours. The details of the breakdown/downtime with description are mentioned below:

Month	Equipment	BD Duration (Hrs)	Description
Apr-2022	String, Inverter, TS- (15,16,17,18,19,20)	427.33	Module replacement, OG-1 is under breakdown due to Breaker contact overheated, Manual off for visual inspection of INV-16.2.12, MC4 burn, mccb tripped
May-2022	String, Inverter	265.08	low insulation resistance, Manual off for Replacement work of INV-17.4.3, Due to String cable Theft, MC4 open
Jun-2022	String, Inverter, TS-09	207.63	Manual off for Replacement work of INV-2.3.16, Low Insulation Resistance, TS Trip due to low oil level
Jul-2022	Inverter, IDT	786.35	Due to String cable Theft, mccb tripped due overcurrent, 33 KV OG-2 trip due to LBS issue in TS-8&9
Aug-2022	Inverter	926.24	Due to String cable Theft, mccb tripped due overcurrent, Low insulation resistance,
Sep-2022	NA	0.00	No Breakdowns occurred
Oct-2022	Inverter	118.63	Due to String cable Theft
Nov-2022	Inverter	8.82	SPD Failure & MCCB Fault
Dec-2022	IDT	2.13	IDT Tripped due to Grid voltage fluctuation
Jan-2023	Inverter, String	118.80	Due to String cable Theft, Low insulation resistance,
Feb-2023	String, IDT, HT Panel, SACU	672.08	OG-1 is under breakdown due to Breaker contact overheated, Load curtailed due to over heating in breaker

			contact, Tripped due to overcurrent earthfault, Due to String cable Theft
Mar-2023	Inverter	4.30	Tripped due to Ground fault, Due to String cable Theft

APPENDIX 3: TRAINING RECORDS

S. No.	Date	Training
1	27-March-2023	Environment Awareness, Heat Stroke/ Heat Stress
2	27-March-2023	Fault Review & Clear in relay
3	16-March-2023	Fire and Safety Training
4	09-March-2023	Training on Information Security Management System (ISMS)
5	09-March-2023	Grievance management, Awareness Training on 5S implementation
6	06-March-2023	Training on Workplace Risk Management
7	06-March-2023	Training on Industry lifesaving rules
8	03-March-2023	Training on Electrical Safety