



20 MW_{AC} (22 MW_{DC}) SKCIL SOLAR POWER PLANT PROJECT



Document Prepared by MITCON Consultancy & Engineering Services
Limited

Project Title	20 MW _{AC} (22 MW _{DC}) SKCIL Solar Power Plant Project
Version	03.2
Report ID	MP-4th-1854
Date of Issue	28-August-2023
Project ID	1854
Monitoring Period	01-September-2021 to 30-September-2022 (inclusive of both days)
Prepared By	MITCON Consultancy & Engineering Services Limited
Contact	1st floor, Kubera Chambers, Shivajinagar, Pune, Maharashtra 411 005 Email id- dhawal.marghade@mitconindia.com Contact No - 86057 28840

CONTENTS

1	PROJECT DETAILS.....	3
1.1	Summary Description of the Implementation Status of the Project	3
1.2	Sectoral Scope and Project Type	4
1.3	Project Proponent	5
1.4	Other Entities Involved in the Project	5
1.5	Project Start Date	6
1.6	Project Crediting Period	6
1.7	Project Location	6
1.8	Title and Reference of Methodology	7
1.9	Participation under other GHG Programs	7
1.10	Other Forms of Credit and Supply Chain (Scope 3) Emissions	8
1.11	Sustainable Development Contributions	8
2	SAFEGUARDS	11
2.1	No Net Harm	11
2.2	Local Stakeholder Consultation	11
2.3	AFOLU-Specific Safeguards	12
3	IMPLEMENTATION STATUS	12
3.1	Implementation Status of the Project Activity	12
3.2	Deviations	15
3.3	Grouped Projects	16
4	DATA AND PARAMETERS.....	16
4.1	Data and Parameters Available at Validation	16
4.2	Data and Parameters Monitored.....	17
4.3	Monitoring Plan.....	19
5	QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS	22
5.1	Baseline Emissions	22
5.2	Project Emissions	23
5.3	Leakage.....	24
5.4	Net GHG Emission Reductions and Removals.....	24
	APPENDIX 1<CALIBRATION RECORDS>.....	26

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 energy source for captive use/open access (third party consumer)¹. Shri Keshav Cements & Infra Ltd is the promoter of the project activity.

The project activity involves the installation of 20MW_{AC} solar power project in Karnataka. The project has replaced anthropogenic emissions of greenhouse gases (GHG's) estimated to be approximately 33,707 tCO₂e per year, thereon displacing 35,575 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. Total estimated GHG emission reductions for the chosen 10-year renewable crediting period will be 337,070 tonnes of tCO₂e.

The details of the project are mentioned in the table:

Project Investor's Name	Commissioning Date	Capacity	Location (Village / State)
Shri Keshav Cements & Infra Ltd.	31-March-2018	20MW _{AC}	Village: Bisarhalli, District: Koppal, Karnataka, India

In this process, there is no consumption of any fossil fuel and hence the project does not lead to any greenhouse gas emissions. Thus, electricity would be generated through sustainable means without causing any negative impact on the environment.

The current monitoring period is from 01-September-2021 to 30-September-2022 and this the fourth monitoring period. The total GHG emission reductions or removals generated in this monitoring period are 37,091 tCO₂e

Audit Type	Period	Program	VVB Name	Number of years
Validation/ Verification	(01-April-2018 to 30-	Verified Carbon Standard	Earthood Services Private Limited	06 months

¹ Sale to third party consumer has been started from this monitoring period.

	September-2018) (inclusive of both days)			
Verification	(01-October-2018 to 30-September-2019) (inclusive of both days)	Verified Carbon Standard	LGAI Technological Center S.A.	01 year
Verification	(01-October-2019 to 31-August-2021) (inclusive of both days)	Verified Carbon Standard	TÜV SÜD South Asia Pvt Ltd	01 year 11 months
Verification	(01-September-2021 to 30-September-2022) (inclusive of both days)	Verified Carbon Standard	VKU Certification Pvt. Ltd.	01 year 01 month
Total	(01-April-2018 to 30-September-2022) (inclusive of both days)	Verified Carbon Standard	-	04 years 06 months

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

Methodology: ACM0002: Grid-connected electricity generation from renewable sources - Version 19.0²

1.3 Project Proponent

Organization name	Shri Keshav Cements & Infra Ltd.
Contact person	Mr. Venkatesh Katwa
Title	Director
Address	Jyoti Towers, 215/2, Karbhar Street, Nazar Camp, Vadgaon, Belgaum - 590005
Telephone	+91 - 831 - 2484412
Email	info@keshav.com

1.4 Other Entities Involved in the Project

Organization name	MITCON Consultancy & Engineering Services Ltd.
Role in the Project	Project Consultant
Contact person	Mr. Dhawal Marghade
Title	Assistant Vice President
Address	1st Floor, Kubera Chambers, Shivajinagar, Pune - 411005
Telephone	+91 20 66289 120
Email	dhawal.marghade@mitconindia.com

Organization name	Infinite Solutions
Role in the Project	Project Consultant
Contact person	Mr. Jimmy Sah
Title	Head – Sustainability

² <https://cdm.unfccc.int/UserManagement/FileStorage/58IAGB7SZUDE02VN6LYM30K41HFPRO>

Address	214-215, Milinda Manor, Opp.Next Treasure Island Mall ,2 RNT Marg, Indore, MP – 452001
Telephone	+91-9644130430
Email	jimmy@infisolutions.org

1.5 Project Start Date

Project Start Date: 31-March-2018

The project start date is the date on which the solar project was commissioned.

1.6 Project Crediting Period

Type of Crediting Period: Renewable crediting period of 10 years

Crediting Period: 01-April-2018 to 31-March-2028

Start date of crediting period: 01-April-2018

Length of the crediting period: 10 years to 0 months

Current monitoring period: 01-September-2021 to 30-September-2022 (inclusive of both days)

Monitoring Period Number: 04

Crediting Period Number: 01

1.7 Project Location

The 20MW_{AC} solar PV Plant site is located near Village: Bisarhalli, District: Koppal, Karnataka, India.

The site is well connected by the National Highway (NH 67).

The site lies around the coordinates - 15° 15' 03.96" N, 76° 02' 57.40" E and at an altitude of approximately 536 m, above mean sea level.



Figure 1: Satellite image showing project location

1.8 Title and Reference of Methodology

Title: Grid-connected electricity generation from renewable sources

Reference: ACM0002: - Version 19.0³

Methodology Type I: Energy industries (renewable/non-renewable sources)

Tools referred with the above methodology and applicable for project activity are:

Tool to calculate the emission factor for an electricity system - Version 07.0 (EB 100, Annex 04)⁴

Methodological Tool- Tool for the demonstration and assessment of additionality - Version 09.0 (EB 101, Annex 11)

1.9 Participation under other GHG Programs

The project has not been applied under the CDM mechanism and also has not participated under any other GHG program other than Voluntary Carbon Standard (VCS).

³ <https://cdm.unfccc.int/UserManagement/FileStorage/58IAGB7SZUDE02VN6LYM30K41HFPRO>

⁴ <https://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-07-v7.0.pdf>

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

Emissions Trading Programs and Other Binding Limits

Net GHG emission reductions or removals generated by the Project has not been 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 a solar power project and does not involve any supply chain involved in the project such as manufacturers, wholesalers, distributors and retailers So, no indirect upstream and downstream GHG emissions are not involved in the project activity. Thus, the scope 3 emissions are not applicable in this project activity.

1.11 Sustainable Development Contributions

Contribution to sustainable development:

Ministry of Environment, Forests and Climate Change has stipulated economic, social, environmental, 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 helps in generating employment opportunities during the construction and operation phases. The project activity leads 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 also help to reduce the demand supply gap in the state. The project activity is generating power using zero-emissions solar-based power generation which helps to reduce GHG emissions and specific pollutants like SO_x, NO_x, and SPM associated with the conventional thermal power generation facilities.
- **Technological well-being:** The successful operation of project activity lead to the promotion of solar based power generation and would encourage other entrepreneurs to participate in similar projects.
- **Environmental well-being:** Solar being a renewable source of energy, it reduces the dependence on fossil fuels and conserves natural resources which are on the verge of depletion. Due to its zero emission, the Project activity also helps in avoiding a significant amount of GHG emissions.

Table 1: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	7.2	7.2.1 Renewable energy share in the total final energy consumption	Implemented activities to increase	About 39,146 MWh renewable electricity has been utilized for captive consumption/open access during the reported period that helps to increase the renewable energy share in the energy mix during this Monitoring period.	A total of 161,027 MWh (15,738+34,848+71,295+39,146) renewable electricity has been utilized for captive consumption/open access by the project activity since commissioning.
2)	8.5	Number of people employed	Implemented activities to decrease the unemployment rate	Total- 01 peoples employed during this monitoring period.	The project has created about 04 permanent jobs since commissioning. (01 employed during the current monitoring period while 03 employed till date)

5 https://registry.terra.org/mymodule/ProjectDoc/Project_ViewFile.asp?FileID=28212&IDKEY=s903q4isafkasifu90amnmasdfkaidflnmdf9348r09dmfasdf338904348

6 https://registry.terra.org/mymodule/ProjectDoc/Project_ViewFile.asp?FileID=54139&IDKEY=j8723kjnf7kjandsasImdv09887vaksmrmnwqkjoiuafnfufuq0n74657681

7 https://registry.terra.org/mymodule/ProjectDoc/Project_ViewFile.asp?FileID=56768&IDKEY=98723kjnf7kjandsasImdv09887vaksmrmnwqkjoiuafnfufuq0778283072

2 SAFEGUARDS

2.1 No Net Harm

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

The report on “Developmental Impacts and Sustainable Governance Aspects of Renewable Energy Projects” prepared by MNRE dated September 2013. This report clearly mentioned that solar project activity operations do not result in direct air pollution, noise pollution. Please refer below web link for the same⁸.

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 stakeholders of the project activity were invited to attend the stakeholder meeting. Personal invitations were also sent to the prominent members of the regions in the vicinity along with public display of invitation letters. A stakeholder meeting was held on 31-October-2018 involving the local stakeholders at the project site. 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.

No negative comments received. 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 for ongoing communication to the local stakeholders and transparently kept the notice mentioning the grievance register and box at the project site.

⁸ [Draft report on use of non-conventional energy resources for Simhastha 2016 \(niua.org\)](#)

2.3 AFOLU-Specific Safeguards

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

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The project activity involves the installation of the Solar Power Project. The total installed capacity of the project is 20 MW. The project is promoted by Details of the installation of project in respective state are as follows:

Table 1: Details of the installation of project

Sr. No	Name of PP	Project Site	Location (State)	Project Capacity (MW _{AC})	Commissioned Capacity (MW _{AC})
1	Shri Keshav Cements & Infra Ltd.	Village: Bisarhalli District: Koppal, Karnataka, India	Karnataka	20	20

The project activity aims to harness solar energy through the installation of PV. The solar PV power plant have solar PV modules, inverters, transformers and other protection system and supporting component as under:

Table 2: Solar PV module details

Module Supplier	Module Type	Quantity	Capacity MW _{DC}	Capacity MW _{AC}
HT- SAAE.	HT72-156P - 320 Wp (Polycrystalline)	29,600	9.4	8.6
	HT72-156P - 325 Wp (Polycrystalline)	38,680	12.6	11.4
Total		68,280	22	20

The solar PV modules are cleaned with the help of water and during the time of power shutdown UPS is used. Hence, there is no involvement of any fossil source.

In the Project activity the electricity generated by the Project is utilized for captive consumption at SKCIL Bagalkote & Mudhol Plants and for 3rd party open access⁹ in Karnataka. The Project is therefore displacing an equivalent amount of electricity that 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.

Solar Power Project Technology Details

This implemented solar power project is based on Poly Crystalline Silicon Photo Voltaic technology. Sunlight with the help of 68,280 PV modules of capacity 320Wp (29,600 Nos.) and 325Wp (38,680 Nos.) is converted into D.C. power which has been combined to get the desired level of current and voltage. Now this D.C. output is converted with the help of 16 Nos. of Inverters installed in 4 control rooms (4 X 4 = 16) of 1,250 kW capacity each into the A.C. power of certain voltage and current level. At this stage current and voltage level can be stepped up at 33kV level with the help of 4 nos. of transformers each having capacity of 5,000 kVA which then is injected into the Indian grid through 110/33kV Betagera substation which is located at a distance of 3.8 km from the project site. Two meters are located at the substation (Main & Check) which are used for the measurement of energy generation.

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.

Table 3: Technical specifications of solar power project

Angle of tilt (Seasonal tilt adjustable)	April to October 5 Deg. November to March 25 Deg.	
Electrical Characteristics		
Module Make/Capacity: HT-SAAE	HT72-156P – 320 Wp	HT72-156P – 325 Wp
Maximum Power (Pmax)	320 Wp	325 Wp
Voltage at Maximum Power (Vmpp)	37 V	37.3 V

⁹ Sale to third party consumer has been started from this monitoring period.

Current at Maximum Power (Impp)	8.66 A	8.73 A
Open Circuit Voltage (Voc)	45.8 V	46 V
Short Circuit Current (Isc)	9.2 A	9.3 A
Panel Efficiency	16.5 %	16.7 %
Power Tolerance (Positive)	+ 1.5 %	+ 1.5 %
Inverter Make / Capacity: TBEA TC1250 KS		
Model	TBEA	
Rated Capacity	1250kW	
No. of Inverters	16 Nos.	
Max. DC Input Power	1417 KW	
Max. DC Input Voltage	1000 V	
MPPT Voltage Range	520 – 820 V	
Max. DC Current	2725A	
Number of DC Inputs	20	
Max. PV Current per Input	200 A	
Earthing Fault Detection	Yes	
DC Overvoltage Surge Protection	Yes	
External Power Supply	380 V /3P4L	
Output (AC)		
Rated AC Output Power	1250 kW	
Number of AC Outputs	2	
Rated AC Voltage	340V	
Rated Output Current per AC output	1061 A	
Max. AC Output Current	1167 A	
Grid Frequency Range	49.5 – 50.2 Hz	
Total Harmonic Distortion of Grid Current THDi	< 3 %	
Power Factor	0.9 lead - 0.9 lag, adjustable	
AC Overvoltage Surge Protection	Yes	
Max. Efficiency	98.7 %	
Transformers – 5000 kVA 33/4 x 0.380 KV 3 Phase Transformer		
Capacity	5000 kVA	
Quantity	04	

The project activity has been in operation continuously since its commissioning. There have been no emergencies happened to the monitoring system. There are no events or situation that occurred during the monitoring period which may impact the applicability of the methodology. There is no major shutdown observed during the current monitoring period in the project activity.

Table 4: Monthly breakdown details

Month-YYYY	Breakdown Hours	Reason
Nov-2021	32	DC Cable Fault
Dec-2021	10	Power Cable Fault
Mar-2022	21	Line trip
May-2022	1	Line trip
Jun-2022	13	Line trip
Jul-2022	10	110 kV line trip Contactor coil failed
Aug-2022	11	Line trip
Total	98 Hours	

3.2 Deviations

3.2.1 Methodology Deviations

There has been no methodology deviation applied during this monitoring period of the project activity.

3.2.2 Project Description Deviations

Project deviation applicable:

Deviation - 1

In the registered PD, formula used in the calculation net electricity supplied to the grid was not mentioned correctly, hence the same is corrected in line with the Joint Meter Reading (B-Form). This correction is considered as project deviation in the current monitoring period.

The formula used in the monitoring plan for calculating the net electricity supplied to the grid is based on the B-Form values provided by KPTCL is as follows: -

$$EGP_{J,y} = \text{Export (kWh)} - \text{Import (kWh)} - \text{Transmission losses (kWh)}$$

This is in line with the actual monitoring procedure followed on the project activity.

Deviation - 2

The project participant is selling electricity to third parties through open access market and captive use. During the registration process of the solar project activity under the Verified Carbon Standard (VCS), a wheeling and banking agreement was implemented to enable captive usage. The tariff rate considered during registration was INR 6.2/kWh, which resulted in an Internal Rate of Return (IRR) of 9.83%. This IRR value was then compared to a benchmark rate of 16.06%.

In the current monitoring period, the power plant is actively selling electricity to open access customers in accordance with the Power Purchase Agreement (PPA), which sets the tariff rate at INR 7/kWh. However, the IRR obtained with this open access tariff rate is 12.48%, still falling short of the established benchmark of 16.06%. Therefore, the project is classified as an additional undertaking.

This deviation does not impact the existing applicability conditions of the methodology, additionality or the appropriateness of the baseline scenario.

Deviation – 3

In the registered PD, section 4.3 (Monitoring Plan) contains information related to standby meter. However, there is no standby meter on site to measure the export or import readings. Measurement are continuously done with the help of Check and Main meters. Both Check and Main meters are under purview of KPTCL and PP do not have any control on it.

This deviation does not affect the applicability of the methodology, additionality, or the appropriateness of the baseline scenario. Hence, the assessment team finds that the project deviation is valid.

3.3 Grouped Projects

The project is not a grouped project activity.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	EF _{grid,CM,y}
Data unit	tCO ₂ /MWh
Description	Combined margin emission factor for Indian grid-connected power generation in year y calculated using the latest version of “Tool to calculate the emission factor for an electricity system”
Source of data	CO ₂ baseline database (Version 13.0) published by CEA on 2018

Value applied	0.9475
Justification of choice of data or description of measurement methods and procedures applied	This value is calculated using OM and BM values as per Version 7.0 of methodological tool to calculate the emission factor for an electricity system using the database of CEA.
Purpose of Data	For the calculation of Emission Factor of the grid
Comments	This parameter is fixed ex-ante for the entire crediting period

Data / Parameter	$EF_{grid,OM,y}$
Data unit	tCO ₂ /MWh
Description	Simple operating margin emission factor for Indian grid
Source of data	CO ₂ baseline database (Version 13.0) published by CEA on 2018
Value applied	0.9726
Justification of choice of data or description of measurement methods and procedures applied	This value is calculated by taking weighted average of Simple Operating Margin of recent three years for Indian grid as per the “Tool to calculate the emission factor for an electricity system”, version 07.0.0
Purpose of Data	For the calculation of Emission Factor of the grid
Comments	This parameter is fixed ex-ante for the entire crediting period

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO ₂ /MWh
Description	Simple build margin emission factor for Indian grid
Source of data	CO ₂ baseline database (Version 13.0) published by CEA on 2018
Value applied	0.8723
Justification of choice of data or description of measurement methods and procedures applied	This value is calculated by taking weighted average of simple build margin of recent three years for Indian grid as per the “Tool to calculate the emission factor for an electricity system “, version 07.0.0.
Purpose of Data	For the calculation of Emission Factor of the grid
Comments	This parameter is fixed ex-ante for the entire crediting period

4.2 Data and Parameters Monitored

Data / Parameter	$EG_{PJ,y}$
Data unit	MWh

Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y
Source of data	Monthly Energy Generation Report (Form –B) by Karnataka Power Transmission Corporation Ltd. (KPTCL) & Third-Party Invoices
Description of measurement methods and procedures to be applied	Electricity exported/imported to the grid is in kWh. However, for the calculation purpose electricity exported is converted in MWh. 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 joint meter reading certificates issued by KPTCL as per the below equation: $EG_{PJ,y} = EG_{Export} - EG_{Import} - \text{transmission losses}$ The calculation is done by KPTCL and the PP has no say in the calculation. The electricity exported to the grid by the project activity connected to the 110/33 KV Betagera sub-station is measured by electronic tri vector meters of accuracy class 0.2s. The electricity exported is measured continuously using Main, Check meters. Export readings of Main, Check meters are taken monthly by an authorized officer of KPTCL in the presence of PP or representative of PP.
Frequency of monitoring/recording	Data Type: Measured Monitoring equipment: Energy Meters are used for monitoring Recording Frequency: Continuous monitoring and Monthly recording from Energy Meters, Summarized Annually Archiving Policy: Paper & Electronic Calibration frequency: 5 years
Value monitored	39,146 MWh
Monitoring equipment	The two parameters, import and export to the grid, are measured at the same location near the connection to the grid, through a standard electricity metering instrument. The metering instruments are installed at the grid-connected point to measure the amount of electricity going from and to the grid. The readings of electricity are continuously measured by the metering instrument itself and monthly recorded.
QA/QC procedures to be applied	These data are directly used for the calculation of emission reductions. Measurement results of electricity supplied to the grid and that delivered from the grid to the project are cross-checked

	as per provisions in the Wheeling & Banking Agreement/Invoices for open access consumer. The meter(s) is calibrated once in 5 years in accordance with national standards and procedures.
Purpose of the data	The Data/Parameter is required to calculate the baseline emission.
Calculation method	N/A
Comments	Data is archived electronically for a period of 2 years beyond the end of crediting period.

4.3 Monitoring Plan

Aim of monitoring

The monitoring methodology specified in the methodology requires that the project-monitoring plan to consist of monitoring of quantity of net electricity supplied to the grid in the year y. In order to monitor the mitigation of GHG due to the project activity, the total energy exported needs to be measured. The net energy supplied to the grid by the project activity multiplied by the emission factor for the national grid would form the baseline for the project activity.

Since the baseline emission factor is based on an ex-ante determination, monitoring of this parameter is not required. The sole parameter for monitoring is the net electricity exported to the grid.

Monitoring roles and responsibilities

The operational and management structure implemented for data monitoring is as follows:

The monitoring plan is developed in accordance with the modalities and procedures for VCS project activities and is for captive consumption/open access solar power project being implemented in Karnataka state, India. The monitoring plan, which has been implemented by the project proponent describes the monitoring organization, parameters to be monitored, monitoring practices, quality assurance, quality control procedures, data storage, and archiving.

PP has also installed Supervisory control and data acquisition (SCADA) systems for internal monitoring, control, purpose.

Single Line Diagram

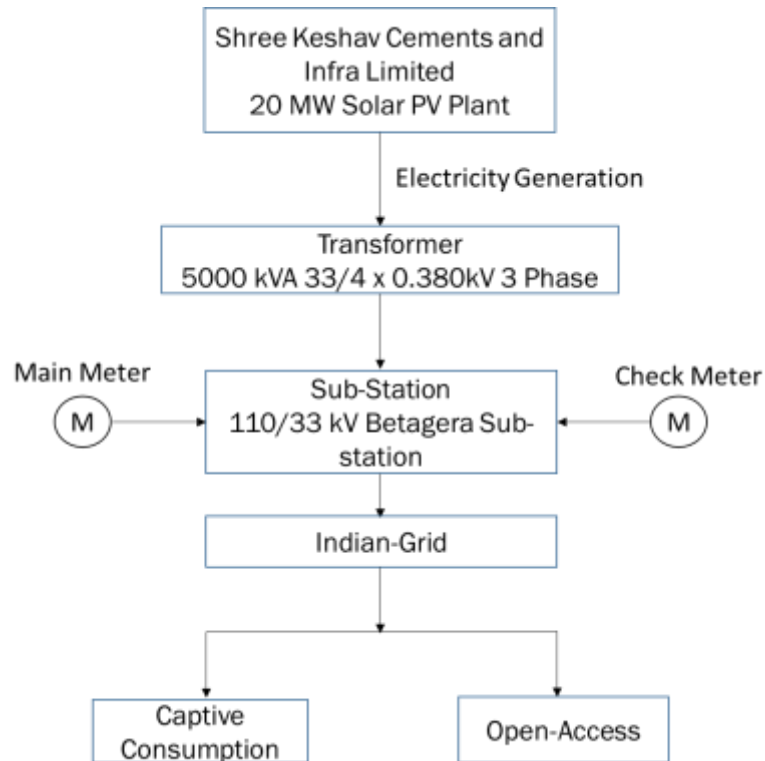


Figure 2: Single line diagram

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

Responsibilities of O & M Head: Overall functioning and maintenance of the project activity and overall responsibility of compliance with the VCS Monitoring Plan. The Operation & Maintenance is carried out on site by staff personnel.

Responsibilities of Plant In-charge: Responsibility for Maintains the data records, ensures completeness of data, and reliability of data. Regularly verifying the monthly energy generation date with energy sales receipt or installed meters reading for identification of any discrepancies in data collection and taking suitable action to rectify them.

Responsibilities of Shift In-charge:

Responsibility for day-to-day data collection and maintains day-to-day logbook for monitored data.

Responsibility for monthly and annual report generation and quality assurance of the data/reports and preliminary check of data for any discrepancies.

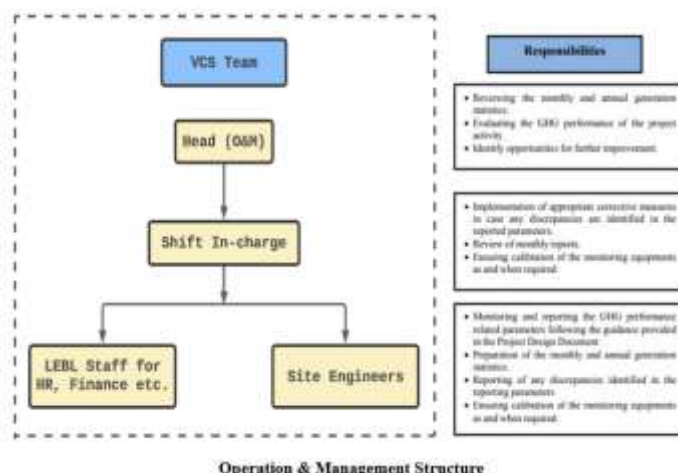


Figure 3: Organisation Structure for VCS project activity

QA/QC procedures: The energy meters at the feeders are maintained and owned by KPTCL. Neither the project proponent nor the site personnel have any control over it. The records have been cross-checked as per provisions in the Wheeling & Banking Agreement. The meters are calibrated by KPTCL at least once in five years.

Data Measurement: The export and import energy are measured continuously using above mentioned Main, Check meters. Export & Import readings of Main, Check meters are taken monthly by authorized officer of KPTCL in the presence of PP or representative of PP. The meter reading are taken jointly and signed by the representatives of the KPTCL and project investors. It is to be noted though PP or PP representative is available during meter reading, the calculations of net electricity supplied to the grid is completely under the purview of the KPTCL officer and PP does not have any control on it. Also, the accuracy class of meters and calibration frequency is under the purview of the KPTCL officer and PP does not have any control on it. PP got the B-form from where net electricity supplied to the grid is obtained and used for emission reduction calculations.

Data Archiving:

Monthly data is archived electronically and in paper form and stored for the entire crediting period and two years thereafter.

Emergency preparedness:

The project activity 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 event that the main meter, which is used to record the net electricity exported by the project, is found to be faulty it will be repaired or replaced and the data from the check meter will be used in its place.

Training and maintenance requirements:

Training on the machine is an essential pre-requisite, to ensure the necessary safety of man and machine. Further, to maximize the output from the solar plants, it is extremely essential, that the engineers and technicians understand the machines and keep them in good health. Each and every site personnel is provided with proper training to meet the requirements of the Operations and maintenance. This ultimately leads to creativity in problem-solving.

Personnel training:

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

Data Adjustment in case of monitoring period different from 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 as follows:

$$D = (A/B) * C$$

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.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

As per description earlier under this document:

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

$EF_{grid, CM, y}$: 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” (tCO₂/MWh) (i.e., 0.9475 tCO₂/MWh).

$EG_{PJ,y}$: 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/yr)

BE_y : Baseline emissions in year y (tCO₂e/yr)

Table 5: Baseline Emission Details

Project Investors' Name	Monitoring Period	Total Generated Power (MWh)	Baseline Emission Factor (tCO ₂ /MWh)	Total Baseline Emission Reduction (tCO ₂)
Shri Keshav Cements & Infra Ltd.	01-September-2021 to 30-September-2022	39,146	0.9475	37,091 (Rounded down)

5.2 Project Emissions

As per ACM0002, version 19, 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:

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

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.)
- $PE_{GP,y}$ = 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.)
- PE_{BESS} = Project emissions from charging of a BESS using electricity from the grid or from fossil fuel electricity generators (t CO_{2e}/yr.)

The project activity involves the generation of electricity from the installation of solar projects. Hence, as per ACM0002, Version 19.0, there is no project emission for solar projects. Therefore, project emissions are zero.

Hence, $PE_y = 0$

5.3 Leakage

As per ACM0002, version 19, 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.

Since the emissions sources are small, it is neglected.

Hence, $LE_y = 0$

5.4 Net GHG Emission Reductions and Removals

As per the applied methodology, emission reductions are calculated as follows:

$$ER_y = BE_y - PE_y$$

Where,

ER_y = Emission Reduction in tCO_{2e}/year

BE_y = Baseline emission in tCO_{2e}/year

PE_y = Project emissions in tCO_{2e}/year

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})
<u>01-September-2021 to 31-December-2021</u>	10,728	0	0	10,728
<u>01-January-2022 to 30-September-2022</u>	26,363	0	0	26,363
Total	37,091	0	0	37,091

<u>Ex-ante emissions reductions /removals</u>	<u>Achieved emissions reductions /removals</u>	<u>Percent difference</u>	<u>Justification for the difference</u>
36,385	37,091	1.9%	This is due to the greater number of sunshine hours during the monitoring period and Present Monitoring period considered was Peak summer period. The generation of electricity depends upon many other climatic conditions, and the availability of sunlight is not within the control of the project participant. Thus, there is impact on emission reductions of the project. It is to be noted that PLF is completely governed by availability of sunshine hours, which is natural phenomenon and same is beyond the control of PP.

APPENDIX 1 <CALIBRATION RECORDS>

Table 6: Calibration Details

Metering point at 110/33 kV Betagera substation		
Meter Details	Main Meter	Check Meter
Meter Serial No	17166938	17137210
Meter Make	L & T	L & T
Accuracy Class	0.2s	0.2s
Calibration Frequency	Once in a 5 year	
Model of Meter	ER300P	
Date of Calibration	Last Calibration Date: 23-June-2020	
	Current Calibration Date: 29-September-2021	
	Due Date: 28-September-2026	

APPENDIX 2<SDG CONTRIBUTION>

Table 7: Details of SDG Contribution

Months	Total Net Generation (MWh)	Emission Factor (tCO ₂ /MWh)	Emission Reductions (tCO ₂)
	SDG7		SDG13
September 2021	2,699	0.9475	2,557
October 2021	3,046	0.9475	2,886
November 2021	2,366	0.9475	2,241
December 2021	3,211	0.9475	3,043
Vintage 2021	11,322	0.9475	10,728
January 2022	3,914	0.9475	3,709
February 2022	3,622	0.9475	3,431
March 2022	3,279	0.9475	3,107
April 2022	3,214	0.9475	3,045
May 2022	2,959	0.9475	2,804
June 2022	3,051	0.9475	2,891
July 2022	2,422	0.9475	2,295
August 2022	2,630	0.9475	2,492
September 2022	2,733	0.9475	2,589
Vintage 2022	27,824	0.9475	26,363
Total	39,146		37,091