



**Verified Carbon
Standard**

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



INFINITE
SOLUTIONS

Document Prepared by (Infinite Solutions)

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The main purpose of this project activity is to generate a clean form of electricity through renewable solar energy source for captive use. 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 tCO_{2e} 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 tones of CO_{2e}.

The details of the project are mentioned in the table:

Project Investors' Name	Commissioning Date	Capacity	Location (Village/State)
Shri Keshav Cements & Infra Ltd.	31-Mar-2018	20 MW _{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 monitoring period is from 01-Oct-2019 to 31-Aug-2021. The total GHG emission reductions or removals generated in this monitoring period are 67,540 tCO_{2e}

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 19.0¹

¹ <https://cdm.unfccc.int/UserManagement/FileStorage/58IAGB7SZUDE02VN6LYM30K41HFPRO>

The project is not a grouped project activity.

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	0831-2484412
Email	info@keshav.com

1.4 Other Entities Involved in the Project

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

Organization name	MITCON Consultancy & Engineering Services Ltd.
Role in the Project	Project Consultant
Contact person	Mr. Dhawal Marghade
Title	Chief Consultant
Address	1 st Floor, Kubera Chambers, Shivajinagar, Pune - 411005
Telephone	+91-20-25533121
Email	dhawal.marghade@mitconindia.com

1.5 Project Start Date

Project Start Date: 31-Mar-2018

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

1.6 Project Crediting Period

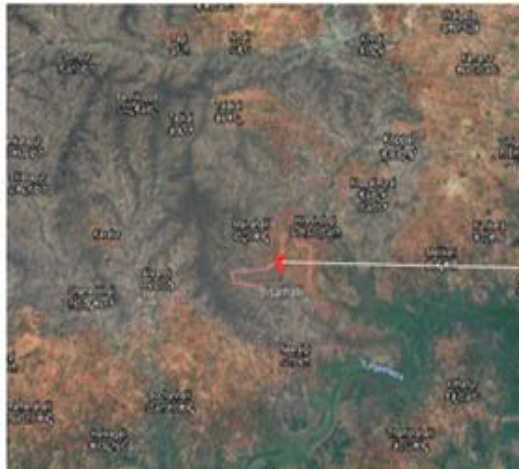
The project activity adopts renewable crediting period of 10 years (from 01-April-2018 to 31-Mar-2028).

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.



1.8 Title and Reference of Methodology

Title: Grid-connected electricity generation from renewable sources

Reference: ACM0002: - Version 19.0²

² <https://cdm.unfccc.int/UserManagement/FileStorage/58IAGB7SZUDEO2VN6LYM30K41HFPRQ>

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)³

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).

1.10 Other Forms of Credit

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

1.11 Sustainable Development

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

³ <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v7.0.pdf>

- 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.

2 SAFEGUARDS

2.1 No Net Harm

There were no harm identified from the project and hence no mitigations measures are applicable.

2.2 Local Stakeholder Consultation

The project has already been registered under VCS mechanism. The Local stakeholder consultation process was conducted during the validation stage. Hence it is not applicable.

There were no negative comments received during the meeting and stakeholders appreciated proactive efforts taken by the project proponent towards reducing emissions.

For ongoing communication, the PP has also placed a grievance register onsite where in the stakeholder can put down his/her complaint, and the same if found genuine will be addressed immediately.

However, there is no negative feedback has been reported within this monitoring period.

2.3 AFOLU-Specific Safeguards

Not Applicable.

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:

SI. 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:

Module Supplier	Module Type	Quantity
HT- SAAE.	HT72-156P – 320 Wp (Polycrystalline)	29,600
	HT72-156P – 325 Wp (Polycrystalline)	38,680

The Project activity is a new facility (Greenfield) and the electricity generated by the Project is utilized for captive consumption at SKCIL Bagalkote & Mudhol Plants 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.

The project has been replacing anthropogenic emissions of greenhouse gases (GHG's) estimated to be approximately 33,707 tCO_{2e} per year, thereon displacing 35,575 MWh/year amount of electricity from the Grid.

Solar Power Project Technology Details

This implemented solar power project is based on Poly Crystalline Silicon Photo Voltaic technology. Sunlight with the help of PV modules 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 Inverters into the A.C. power of certain voltage and current level. At this stage current and voltage level can be stepped up with the help of transformers which then is injected into the grid through distribution licensee substation.

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.

Module Make/Capacity: HT-SAAE	HT72-156P – 320 Wp	HT72-156P – 325 Wp
Maximum Power (P_{max})	320 Wp	325 Wp
Voltage at Maximum Power (V_{mpp})	37 V	37.3 V
Current at Maximum Power (I_{mpp})	8.66 A	8.73 A
Open Circuit Voltage (V_{oc})	45.8 V	46 V
Short Circuit Current (I_{sc})	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 - 0.9lag, adjustable
AC Overvoltage Surge Protection	Yes
Max. Efficiency	98.7 %

Transformers - 5000 kVA 33/4 x 0.380KV 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.

Lifetime of the project activity

The lifetime of the project activity is 25 years.

3.2 Deviations

2.3.1 Methodology Deviations

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

2.3.2 Project Description Deviations

There has been no project description deviation applied during validation & previous verifications as well as in the current monitoring period for the project activity.

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 01-Jun-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 01-Jun-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 01-Jun-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)
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: $EG_{PJ,y} = EG_{Export} - EG_{Import}$ 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 11/33/11 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 & Standby meters.

	Export readings of Main, Check & Standby 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 ⁴ frequency: 5 years
Value monitored	71,295 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. 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

⁴ Energy Meter Calibration details has been provided under Appendix 1.

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 proposed for captive consumption 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.

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.

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.

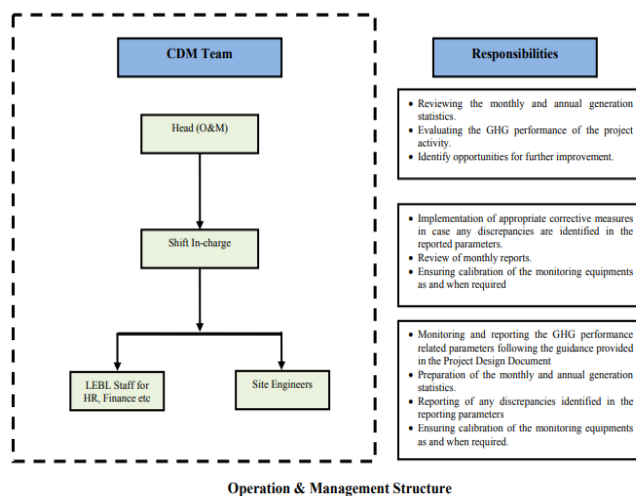
Responsibilities of Shift In-charge:

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.

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 & Standby meters. Export & Import readings of Main, Check & Standby 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. In the unlikely event that the check meter fails, a Standby meter will be used.

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. In order to ensure, that the O&M team is deft at handling technical snags on top of the turbine, the necessity of ensuring that they are capable of climbing the tower with absolute ease and comfort has been established. 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)

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-Oct-2019 to 31-Aug-2021	71,295	0.9475	67,540 (Rounded Down)

5.2 Project Emissions

The project activity involves in harnessing solar power. So, the emissions from the project are zero.

5.3 Leakage

No leakage emissions have been considered and hence the leakage emission is zero.

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 tCO₂/year

BE_y = Baseline emission in tCO₂/year

PE_y = Project emissions in tCO₂/year

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)
2019 (01-Oct-2019 to 31-Dec-2019)	7,919	0	0	7,919
2020 (01-Jan-2020 to 31-Dec-2020)	34,671	0	0	34,671
2021 (01-Jan-2021 to 31-Aug-2021)	24,950	0	0	24,950
Total	67,540	0	0	67,540

It is to be noted that as per the estimated emission reduction to be achieved from the project activity for the current monitoring period is 64,736 tCO₂e, whereas actual emission reductions achieved are 67,540 tCO₂e, which is approximately 4.33% higher than the estimated emission reductions. The generation of electricity depends upon the number of annual days of sunshine availability and many other climatic conditions, and not within the control of the project participant.

APPENDIX 1: <CALIBRATION RECORDS>

Metering point at 110/33/11 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
Date of Calibration	16-March-2018	16-March-2018
Due date of Calibration	15-March-2023	15-March-2023