



Monitoring report form for CDM project activity
(Version 07.0)

MONITORING REPORT

Title of the project activity	Solar Power Project by Fortum FinnSurya Energy Pvt Ltd	
UNFCCC reference number of the project activity	10404 ¹	
Version number of the PDD applicable to this monitoring report	03	
Version number of this monitoring report	01	
Completion date of this monitoring report	11/06/2019	
Monitoring period number	01	
Duration of this monitoring period	06/11/2017 to 01/04/2019 (inclusive of both days)	
Monitoring report number for this monitoring period	NA	
Project participants	Fortum FinnSurya Energy Private Limited	
Host Party	India	
Applied methodologies and standardized baselines	ACM0002: Grid-connected electricity generation from renewable sources Version 17.0	
Sectoral scopes	01 - Energy industries (renewable / non-renewable sources)	
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013
	0	248,805 tCO ₂ e
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	276,167 tCO ₂ e	

¹ <https://cdm.unfccc.int/Projects/DB/Applus1506003752.87/view>

SECTION A. Description of project activity

A.1. General description of project activity

The main purpose of this project activity is to generate clean form of electricity through renewable solar energy source. Fortum FinnSurya Energy Private Limited is the promoter of the project activity. The project activity has an installed capacity of 100 MW (AC) or (125 MWp) solar power project at Thirumani, Tumkur, Karnataka.

The annual average of estimated electricity generation and estimated emission reduction over 7 years of crediting period will be 181,417 MWh/year and 177,371 tCO₂e per year. The project replaces anthropogenic emissions of greenhouse gases (GHG's) by displacing equivalent amount of electricity from the generation-mix of power plants connected to the Indian grid, which is mainly dominated by thermal/fossil fuel based power plant.

The details of the project and the state of installation are mentioned in the table:

Project Participants Name	Capacity in MW (AC)	Connection with Grid	State
Fortum FinnSurya Energy Pvt. Ltd.	100 MW	Indian Grid	Karnataka

Sectoral Scope: 01 : Grid-connected electricity generation from renewable sources ACM0002-Version 17.0

Project Type: (i) : Renewable energy projects

Tools referred with above methodology are:

Tool to calculate the emission factor for an electricity system¹ - Version 05.0 (EB 87, Annex 09)

Scenario existing prior to the implementation of project activity:

The scenario existing prior to the implementation of the project activity, is electricity delivered to the grid by the project activity that would have otherwise been generated by the operation of grid connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

Baseline Scenario:

As per the applicable methodology, a Greenfield power plant is defined as "a new renewable energy power plant that is constructed and operated at a site where no renewable energy power plant was operated prior to the implementation of the project activity".

As the project activity falls under the definition of a Greenfield power plant, the baseline scenario as per paragraph 24 of Section 5.2.1 of applied methodology is the following: "If the project activity is the installation of a Greenfield power plant, the baseline scenario is electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations described in the "Tool to calculate the emission factor for an electricity system".

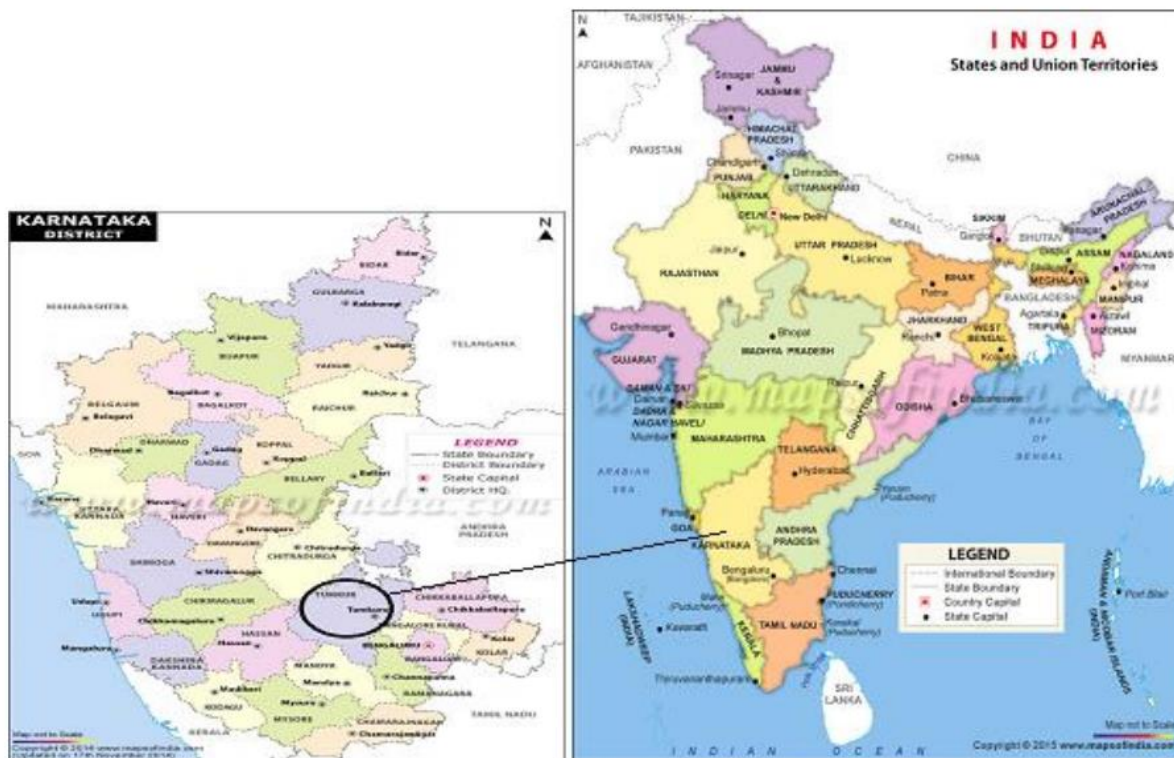
Hence, pre-project scenario and baseline scenario are the same.

During the current monitoring period 276,167 tCO₂e emission reduction have been achieved.

A.2. Location of project activity

The project activity is located in Village Thirumani, Tehsil Pavagada and district Tumkur in the state of Karnataka, India.

Project Investor	Location	Latitude (N)	Longitude (E)	Date of Commissioning
Fortum FinnSurya Energy Pvt. Ltd.	Plot B-30	14° 5' 19.6296"	77° 17' 28.3812"	B-30: 05/12/2017
	Plot B-31			B-31: 02/12/2017



The Location of the Project activity as visible in Google Maps is shown below:



A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India	Fortum FinnSurya Energy Private Limited.	No

A.4. References to applied methodologies and standardized baselines

Title : Grid-connected electricity generation from renewable source.²

Reference : The project activity meets the eligibility criteria of large scale project as it is more than 15MW.

Methodology : ACM0002: Grid-connected electricity generation from renewable sources- Version 17.0³

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

Category : Approved Consolidated Methodology (ACM0002)

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

- Tool to calculate the emission factor for an electricity system⁴ - Version 05.0 (EB 87, Annex 09)
- Tool for the demonstration and assessment of additionality⁵- Version 07.0.0 (EB 70, Annex 08)

² <http://cdm.unfccc.int/methodologies/PAmethodologies/approved>

³ <http://cdm.unfccc.int/methodologies/DB/8W400U6E7LFHHYH2C4JR1RJWWO4PVN>

⁴ <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v5.0.pdf>

⁵ <http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf>

A.5. Crediting period type and duration

Type of crediting period	Renewable
Crediting period from	06 Nov 17 - 05 Nov 24 (Renewable)
Length of the Crediting Period	7 Years
Monitoring period from	06/11/2017 to 01/04/2019 (both days included)
Length of the Monitoring Period	512

SECTION B. Implementation of project activity**B.1. Description of implemented project activity**

Technical detail of the equipment	Pavagada 1 (plot 30)	Pavagada 2 (Plot 31)
No of Modules	543510	112.5 Wp:- 88000, 115 Wp:-370260, 117.5 Wp:- 85360
Make	First Solar	First Solar
Capacity	115 Wp	112.5Wp, 115Wp,117.5Wp
No of inverters	50	50
Make	TMEIC	TMEIC
Capacity	1000 kVA	1000 kVA
No. of transformers	13 (IDT) +2 (PT)	13 (IDT) +2 (PT)
Life	25 years	25 years

B.2. Post-registration changes**B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents**

There is no request for deviation applied during this monitoring period.

B.2.2. Corrections

There have not been any corrections to project information or parameters fixed at validation during the current monitoring period.

B.2.3. Changes to the start date of the crediting period

There is no change in the start date of the crediting period, considering the monitoring plan has been implemented.

B.2.4. Inclusion of monitoring plan

There has not been any change in the monitoring plan during the current monitoring period.

B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

Not Applicable

B.2.6. Changes to project design

There has not been any change in the PDD during the current monitoring period

B.2.7. Changes specific to afforestation or reforestation project activity

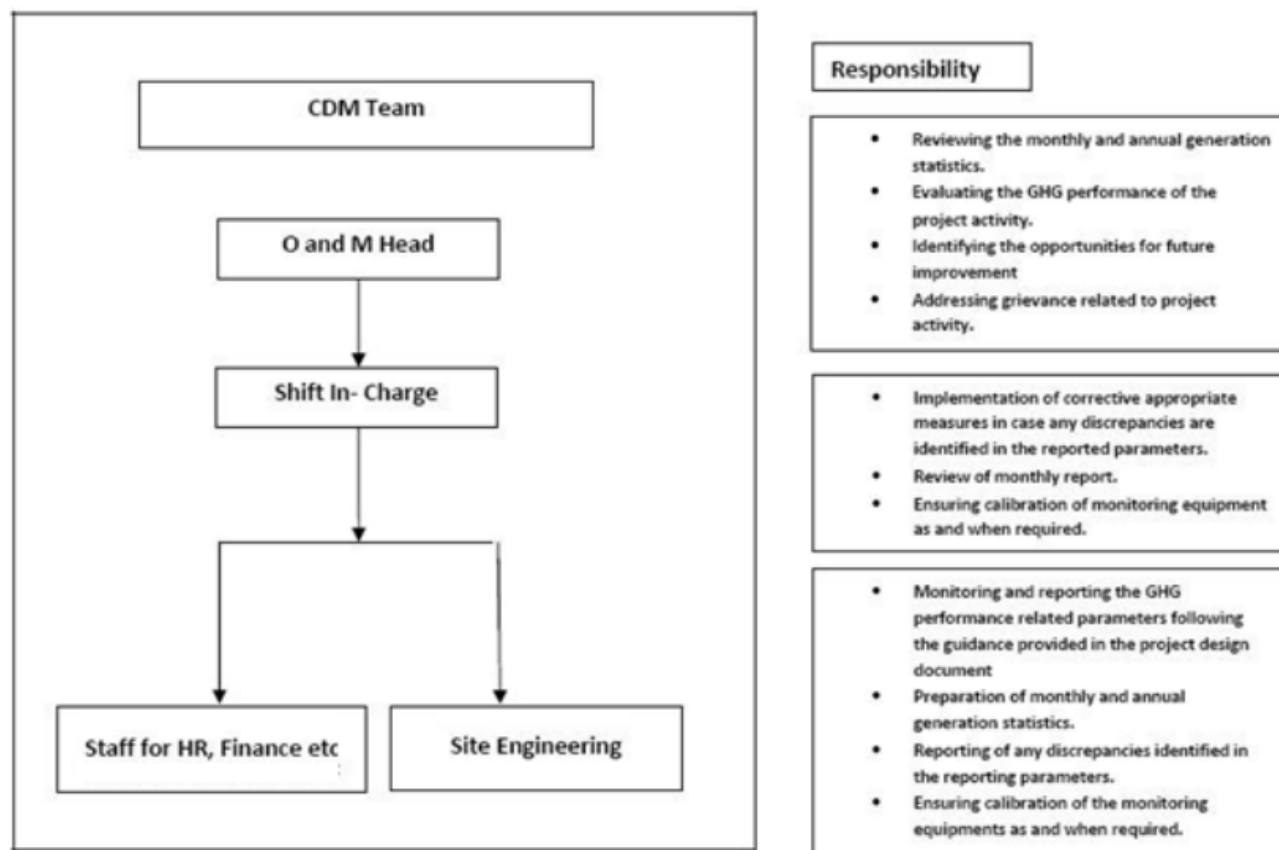
This project activity is not an afforestation or reforestation activity.

SECTION C. Description of monitoring system

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

The authority and responsibility for registration, monitoring, measurement, reporting and reviewing of the data rests with the project participant. 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:



Data Measurement

The export and import energy is measured continuously using above mentioned Main and Check meters located at the pooling station and substation. Readings of meters are taken on monthly basis by authorized officer of SEB in the presence of PP or representative of PP. Based on the

Meter Reading Statement, the apportioned value of export and import is provided to Fortum FinnSurya Energy Pvt. Ltd, and invoices are be raised. These invoices are used for cross checking the meter readings taken for the respective project activity.

The monitoring practise, metering arrangement, calibration frequency interval in under control of state electricity board and PP do not have any control on it.

In case of billing cycle and monitoring period cycle does not match, then daily generation data is used to determine net electricity export for particular period.

Data collection and archiving

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

Emergency preparedness

The project activity will not result in any unidentified activity that can result in substantial emissions from the project activity. No need for emergency preparedness in data monitoring is visualized.

Personnel training

In order to ensure a proper functioning of the project activity and a properly monitoring of emission reductions, the staff (CDM team) has 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.

The schematic diagram of the project are illustrated below:

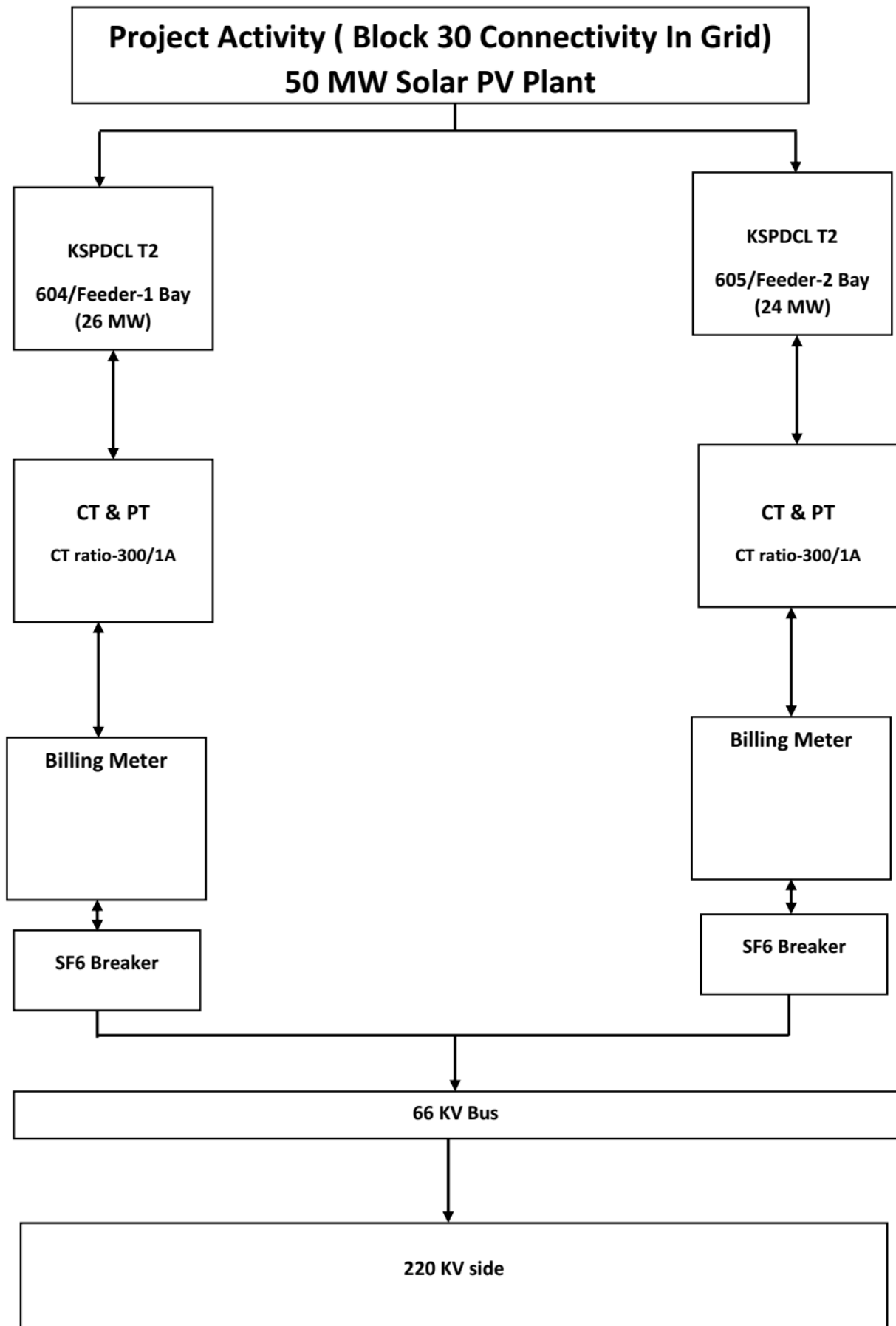


Figure 1. B-30 Connectivity in Grid

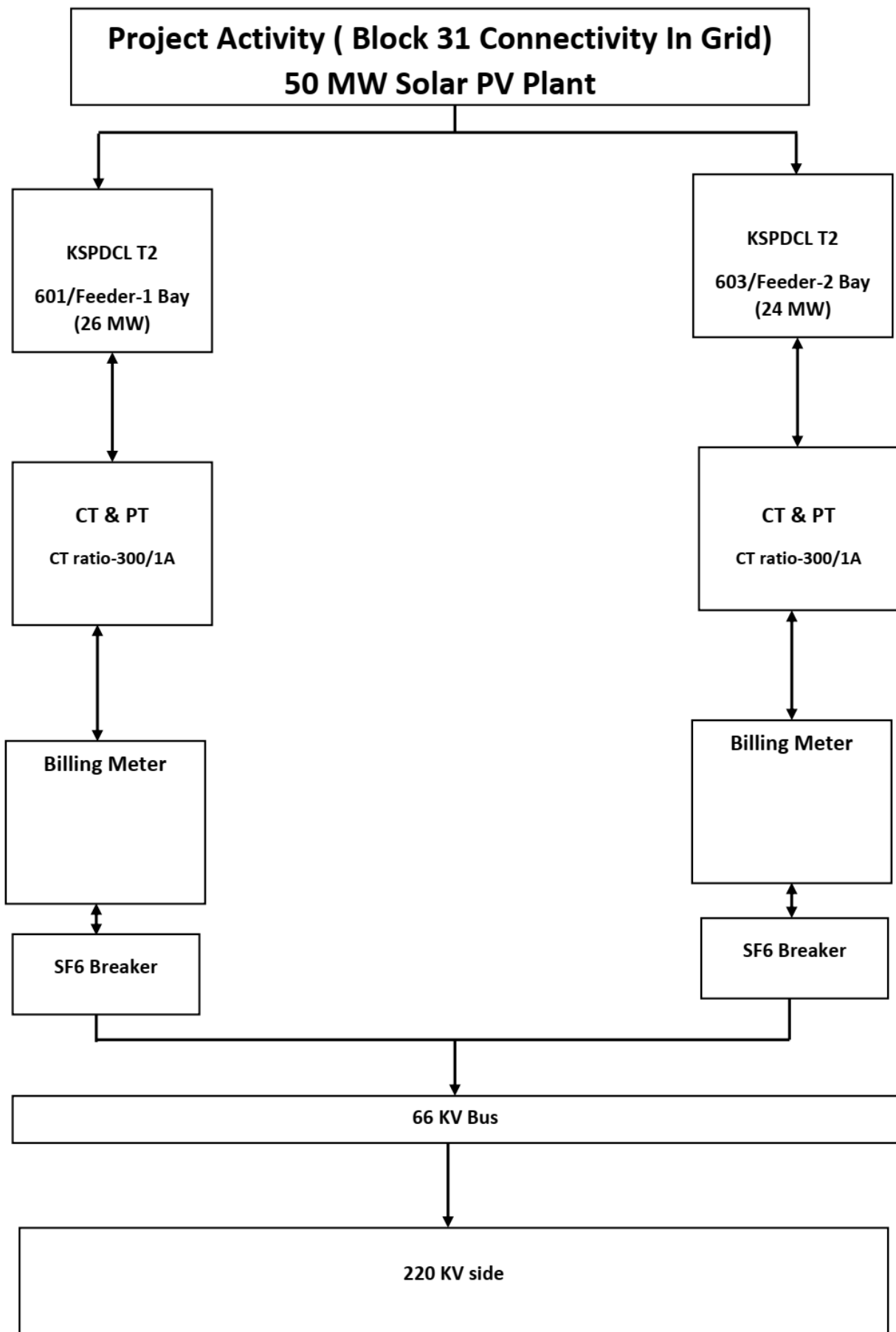


Figure 2. B-31 Connectivity in Grid

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

Data/Parameter	EF_{grid,OM,y}
Unit	tCO ₂ /MWh
Description	Operating Margin CO ₂ emission factor in year y
Source of data	Calculated from CEA database, Version 11, April 2016 ⁶
Value(s) applied	0.9941
Choice of data or measurement methods and procedures	Calculated as per “Tool to calculate the emission factor for an electricity system, version 05” as 3-year generation weighted average using data for the years 2012-13, 2013-14, & 2014-15. The data are obtained from “CO ₂ Baseline Database for Indian Power Sector” version 11, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of data/parameter	For the calculation of the Baseline Emission
Additional comments	This parameter is fixed ex-ante for the entire crediting period

Data/Parameter	EF_{grid,BM,y}
Unit	tCO ₂ /MWh
Description	Build Margin CO ₂ emission factor in year y
Source of data	Calculated from CEA database, Version 11, April 2016 ⁷
Value(s) applied	0.9285
Choice of data or measurement methods and procedures	Calculated as per “Tool to calculate the emission factor for an electricity system, version 05” as 3-year generation weighted average using data for the years 2012-13, 2013-14, & 2014-15. The data are obtained from “CO ₂ Baseline Database for Indian Power Sector” version 11, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of data/parameter	For the calculation of the Baseline Emission
Additional comments	This parameter is fixed ex-ante for the entire crediting period

Data/Parameter	EF_{grid,CM,y}
Unit	tCO ₂ /MWh
Description	Combined Margin CO ₂ emission factor in year y
Source of data	Calculated from CEA database, Version 11, April 2016 ⁸
Value(s) applied	0.9777
Choice of data or measurement methods and procedures	<p>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%</p>
Purpose of data/parameter	For the calculation of the Baseline Emission
Additional comments	This parameter is fixed ex-ante for the entire crediting period.

⁶ http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver11.pdf

⁷ http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver11.pdf

⁸ http://cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver11.pdf

D.2. Data and parameters monitored

Data/Parameter	EG _{PJ, y}
Unit	MWh/y
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year y in MWh
Measured/calculated/default	Measured
Source of data	Monthly joint meter reading reports (100MW)
Value(s) of monitored parameter	282,466.80
Monitoring equipment	Please refer Appendix I for Energy meter details
Measuring/reading/recording frequency	<p>Data Type: Measured Monitoring equipment: Energy Meters are used for monitoring Recording Frequency: Continuous monitoring and Monthly recording from Energy Meters Archiving Policy: Paper & Electronic Calibration frequency: At least once in 5 years</p> <p>The electricity generation from project activity is metered at 220/66 KV Pooling substation. All the plants (including the project activity solar plant and other solar project developers solar plant) are connected to a common metering point at 400/220 KV substation. The metering point at both substations consists of both main & check meters (ABT Meters). The meters located at 400/220 KV substation are considered for billing purpose. The transmission losses between 220/66 KV Pooling substation and 400/220 KV substation will be apportioned to each solar project developers in proportion to their generation. The difference of final apportioned value of export and import of the project activity is used for calculation of net electricity supplied to the grid by the project activity and same value will be considered for ER calculations. The final value of export and import and net electricity for individual solar project developer will be provided by state Utility board in the form of JMR sheets. The process of apportioning, metering/feeder arrangement, meter calibration interval is under state Utility and PP do not have any control on it.</p>
Calculation method (if applicable)	NA
QA/QC procedures	<p>The meters is approved, tested & sealed by the State Utility. The meters are in the custody of State Utility. The frequency of calibration is once in 5 years.⁹</p> <p>The monthly electricity supplied/exported by the project activity in the JMR report is cross checked with the monthly invoices of sale. The meters are located at the LT side of 220/66 KV and 400/220 KV substation having accuracy class of 0.2s</p> <p>In the absence or delay in the meter calibration appropriate Guidelines will be applied appropriately to confirm the conservativeness of metering. The project activity actual monitoring plan will be fixed after commissioning of project activity.</p>
Purpose of data/parameter	Calculation of baseline emissions
Additional comments	Data will be archived in paper & electronic form for two years after the end of crediting period or of the last issuance of CERs for this project activity, whichever occurs later.

⁹ http://www.aegcl.co.in/Metering_Regulations_Of_CEA_17_03_2006.pdf

D.3. Implementation of sampling plan

No sampling is required.

SECTION E. Calculation of emission reductions or net anthropogenic removals**E.1. Calculation of baseline emissions or baseline net removals**

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

$$ER_Y = BE_Y - PE_Y$$

Where,

ER_Y = Emission Reduction in tCO₂/year

BE_Y = Baseline emission in tCO₂/year

PE_Y = Project emissions in tCO₂/year

Baseline Emission: -

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.

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

Where,

$EG_{PJ,y}$ = Total quantity of net electricity delivered to the INDIAN grid (now NEWNE Grid)

$EF_{grid,CM,y}$ = Baseline emission factor

$$= 0.9777 \text{ tCO}_2/\text{MWh}$$

$$BE_y = 282466.80 * 0.9777$$

$$= 276,167 \text{ tCO}_2/\text{year}$$

E.2. Calculation of project emissions or actual net removals

As the project activity is solar powered renewable energy project, project emissions are zero.

$$\begin{aligned} ER_y &= BE_y - PE_y \\ &= 276,167 - 0 \\ &= 276,167 \text{ tCO}_2\text{e} \end{aligned}$$

E.3. Calculation of leakage emissions

No leakage has been considered for the project activity.

E.4. Calculation of emission reductions or net anthropogenic removals

	Baseline GHG emissions or baseline net GHG removals (t CO ₂ e)	Project GHG emissions or actual net GHG removals (t CO ₂ e)	Leakage GHG emissions (t CO ₂ e)	GHG emission reductions or net anthropogenic GHG removals (t CO ₂ e)		
				Before 01/01/2013	From 01/01/2013	Total amount
Total	276,167	0	0	0	276,167	276,167

E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

Amount achieved during this monitoring period (t CO ₂ e)	Amount estimated ex ante for this monitoring period in the PDD (t CO ₂ e)
276,167	248,805

E.5.1. Explanation of calculation of “amount estimated ex ante for this monitoring period in the PDD”

Actual Emission reduction increased by 11%.

As per CDM registered PDD, 177,371 tCO₂e is the amount of CERs generated annually. Therefore, following unitary method, the amount of estimated ex ante for this monitoring period is identified. The total number of days in this monitoring period is 512.

$$= (177,371/365) * 512$$

$$= 248,805 \text{ tCO}_2\text{e}$$

E.6. Remarks on increase in achieved emission reductions

Actual emission reduction increased due to slight higher number of sunshine hours during monitoring period.

E.7. Remarks on scale of small-scale project activity

This project activity is large scale project activity.

Appendix 1. Meter Calibration Details

Calibration Date	Main Meter	Check Meter	Meter Make	Accuracy Class
31-01-2012	11071945	11071946	L&T	0.2s
04-01-2014	11071945	11071946	L&T	0.2s
08-04-2017	16197841	16198356	L&T	0.2s
09-04-2018	16197841	16198356	L&T	0.2s

The due date for the calibration of main and check meters are 08-04-2021.

Meter calibrations doesn't cover 04/01/2017 to 08/04/2017 of the current monitoring period, therefore error factor have been applied for complete month of Jan-2017 to Apr-2017 as an conservative approach.

Major Breakdown Details

Date	Internal outage (Subject to there is no Grid Outage in given time.)				Reason for Outage	Remarks/ Rectification
	Start Time	Restoration Time	Name of Equipment	Time Lost (B)		
28-Jul-16	10:30	20:50	Inverter 1 & 2	620 Minutes	PCU-1 tripped (10:30 am to full day) PCU-2 tripped (4:30 pm to end of generation time) due to isolation failure in inverter cable.	Rainy and cloudy
29-Jul-16	10:00	2:25 AM	Inverter 1 & 2	985 Minutes	PCU-1 tripped full day and PCU-2 tripped (10:00 am to Full day due to isolation failure in inverter cable.	Rainy and cloudy
30-Jul-16	6:40	18:30	Inverter 2	710 Minutes	PCU-2 Stopped due to Air circuit breaker problem	Rainy and cloudy
31-Jul-16	6:55	18:00	Inverter 2	655 Minutes	PCU-2 Stopped due to Air circuit breaker problem	Rainy and cloudy
23-Jul-17	6:50	18:30	Transmission Line joint kit	700 minutes	Plant trip due to earth fault in transmission line. After patrolling, we found end termination cable kit burst at point no3 (220 KV Transmission Line crossing)]	Rainy Day

Document information

Version	Date	Description
07.0	31 May 2019	Revision to: <ul style="list-style-type: none"> Ensure consistency with version 02.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); Add a section on remarks on the observance of the scale limit of small-scale project activity during the crediting period; Add "changes specific to afforestation or reforestation project activity" as a possible post-registration changes; Clarify the reporting of net anthropogenic GHG removals for A/R project activities between two commitment periods; Make editorial improvements.
06.0	7 June 2017	Revision to: <ul style="list-style-type: none"> Ensure consistency with version 01.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); Make editorial improvements.
05.1	4 May 2015	Editorial revision to correct version numbering.

<i>Version</i>	<i>Date</i>	<i>Description</i>
05.0	1 April 2015	Revisions to: <ul style="list-style-type: none"> • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: <ul style="list-style-type: none"> • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: monitoring report		