



Monitoring report form for CDM project activity
(Version 07.0)

Complete this form in accordance with the instructions attached at the end of this form.

MONITORING REPORT

Title of the project activity	Cam Lam VN Solar Power Plant	
UNFCCC reference number of the project activity	10535	
Version number of the PDD applicable to this monitoring report	Version 3.2	
Version number of this monitoring report	Version 1.0	
Completion date of this monitoring report	12/03/2020	
Monitoring period number	1 st monitoring period	
Duration of this monitoring period	25/11/2019 – 29/02/2020	
Monitoring report number for this monitoring period	Not Applicable	
Project participants	- Hanwha Energy Corporation - Cam Lam Solar Joint Stock Company	
Host Party	Viet Nam	
Applied methodologies and standardized baselines	ACM0002 Version 19.0 Grid-connected electricity generation from renewable sources	
Sectoral scopes	Sectoral Scope 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
	-	16,733
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	17,620 tCO ₂ e	

SECTION A. Description of project activity

A.1. General description of project activity

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The Cam Lam VN Solar Power Plant is necessary to supplement the power supply, as the demand for electricity will gradually increase due to continuous development country wise and at province level. The power contributes to reduce environmental pollution by providing clean energy sources in line with the general sustainable development trend of the world. The project uses polycrystalline photovoltaic cells without any backup generators and generates 100% clean energy to be fed into the national grid.

The Cam Lam VN Solar Power Plant is installation of a new power plant at the site and is not a capacity addition or retrofit or replacement of any other existing plant. So the current baseline scenario is the energy that is being fed into the national grid through other power plants and the project scenario is a clean Greenfield power plant that generates energy and supply it to the national grid. This energy helps to reduce the energy deficit of the country by supplying the electricity through the grid.

The commercial date of this project is 25/06/2019 and the amount of generation is around 78,885 MWh of electricity on average.

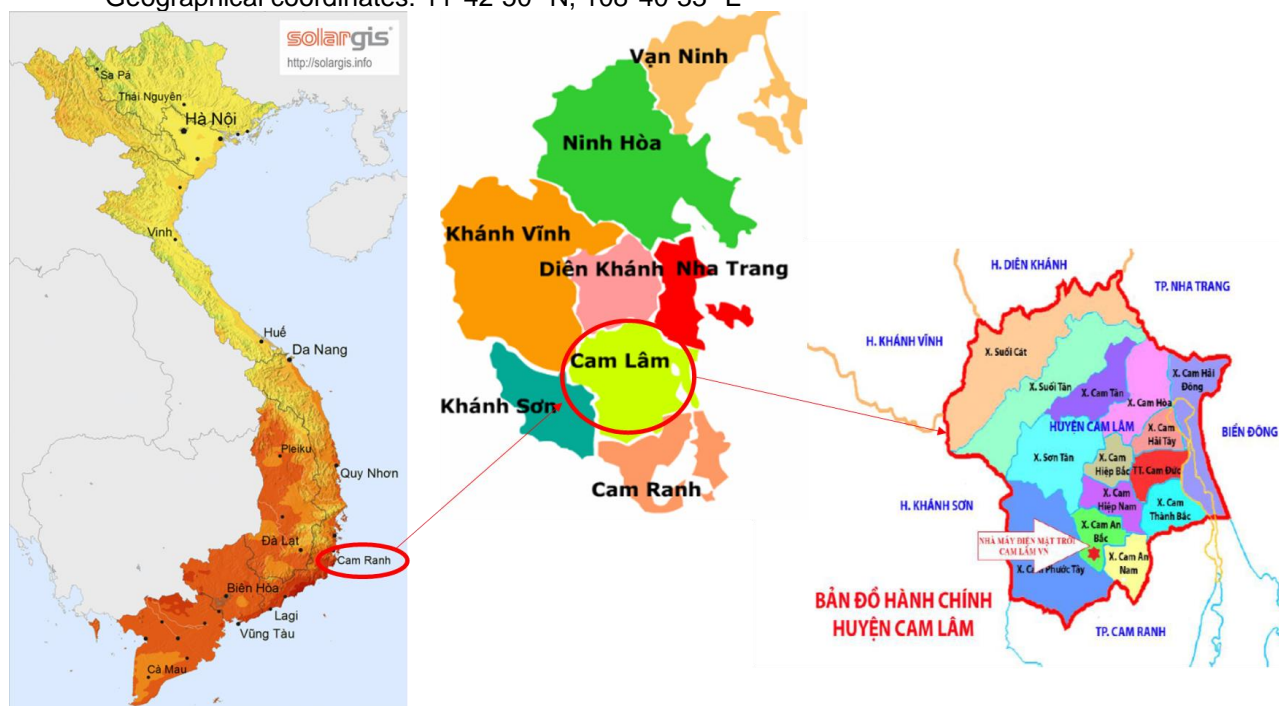
The most significant improvement the project is making the generation of electricity itself that can reduce the load shedding and the energy crisis to some extent and provide electricity to the local population. The entire solar park in the long run would play a critical role in attempting to bridge the supply demand gap that the country is facing at the moment.

A.2. Location of project activity

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Khanh Hoa is a coastal province in the south of Vietnam, some of its territory extend farthest to the South China Sea.

- Host Country: Viet Nam
- Region/State/Province etc.: Khanh Hoa Province
- Town/City/community etc.: Cam Nghia Ward, Cam Ranh City
- Geographical coordinates: 11°42'50"N, 108°40'33"E



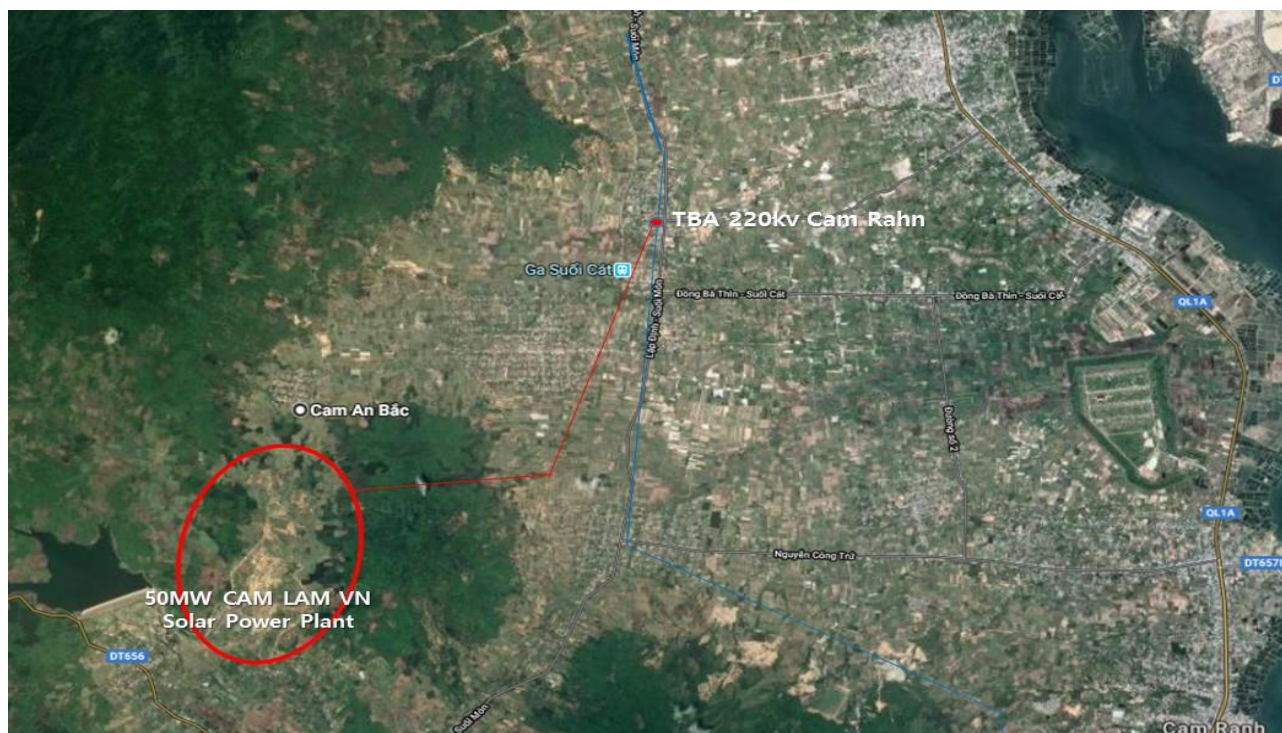


Figure 1 Location of Cam Lam VN Solar Power Project

A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Viet Nam	Cam Lam Solar Joint Stock Company	No
Viet Nam	Hanwha Energy Corporation (Private entity)	No

A.4. References to applied methodologies and standardized baselines

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The approved baseline and monitoring methodology selected for to the proposed project activity is:
ACM0002: Large-scale Consolidated Methodology: Grid-connected electricity generation from renewable sources, Version 19.0.

The tool accompanies the methodology and is referred-to in the methodology, for the purpose of calculations, is as follows.

“TOOL07: Tool to calculate the emission factor for an electricity system”(Versions 7.0)

A.5. Crediting period type and duration

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The project activity applies a renewable crediting period. This monitoring period belongs to the first 7 years crediting period of the project. (25/11/2019 – 24/11/2026)

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

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The Cam Lam VN Solar Power Plant Project was designed as a greenfield single purpose solar photovoltaic power plant at the designated Project Site and is rated for a net power capacity of no more than 50 MW (DC)

It uses Solar PV modules which invert sunlight into DC thanks to photovoltaic effects. This energy will be inverted into AC with the same frequency of the grid's thanks to frequency inverters. This electricity energy will be reconciled to the grid by step up transformer and power transmission system.

The total capacity is 50 MWp installed with Si-Mono Solar PV Modules with a fixed tilt of 10° and the string of the modules is decided by the maximum operating voltage of the inverter and the temperature profile of the place. 28 modules is connected in one string and such strings put together and connected to an inverter.

The plant is in operation from 25/06/2019 and the estimated energy generation which fed into the Vietnam grid for Cam Lam VN Solar Power Plant Project is 78,885 MWh/year.

In the various parts of the project field as depicted in below table.

Summary of Equipment		
Installed capacity of the plant		50 MWp
Number of PV Modules	Sub-array #1 Q.PEAK DUO L-G5.3 390	390Wp
		76,160 PV Modules
		28 Modules in series
		2,720 strings in parallel
	Sub-array #2 Q.PEAK DUO L-G5.3 385	385Wp
		1,744 PV Modules
		28 Modules in series
		1,848 strings in parallel
PV Module technology		Mono-Si, 144 half cells
Array global power	Sub-array #1 Q.PEAK DUO L-G5.3 390	Nominal(STC) 29,702 kWp
		At operating cond. 26,958 kWp (50°C)
	Sub-array #2 Q.PEAK DUO L-G5.3 385	Nominal(STC) 19,921 kWp
		At operating cond. 18,072 kWp (50°C)
Tilt angle of PV modules		10°
Row to row		2 m
Total area		Module area 257,727 m²
		Cell area 225,070 m²
Number of inverter stations	Sub-array #1	10 cabinets typed 2500 kWac
	Sub-array #2	08 cabinets typed 2000 kWac
Maximum capacity of AC power 50MW (10h - 12h)		45 MWac
Annual electricity output with a probability of 50%		78,885 MWh/year (Expected)

Relevant implementation dates and events during operation are described in the table below.

Date	Milestone	Document
Nov 2017	Feasibility Study Conducted	Feasibility Study
9 Aug 2018	Environmental protection plan Approval	Environment Protection Department
1 Oct 2018	Implementation of EPC contract and construction start	EPC Contract

27 Nov 2018	Approval of investment policy and application for investment certification	
30 Nov 2018	Prior Consideration Form submitted to the host country DNA and UNFCCC	Submission of Prior Consideration Form
25 June 2019	Commercial operation	(VN)CV thoa thuan COD certification
21 Nov 2019	Registration	UNFCCC Homepage _Project Search
25 Nov 2019 – 29 Feb 2020	First monitoring period	

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

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Not Applicable

B.2.2. Corrections

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Not Applicable

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

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Not Applicable

B.2.4. Inclusion of monitoring plan

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Not Applicable

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

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Not Applicable

B.2.6. Changes to project design

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Not Applicable

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

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Not Applicable

SECTION C. Description of monitoring system

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The quantity of net electricity generation supplied by the project plant to the grid is reliably monitored through 1 main meter and 2 back up meter.

One multi-function main meter is installed and sealed by the Power Purchaser, which gathers the data for electricity generation and the reading from which is used to bill the purchaser for electricity. The main meter will also gather the data for electricity usage which is used for control room and operation of the plant. The main meter is installed between the inverter and the transformer. The details of the meters are as under:

The company installed two meters for its own reassurance of the meter readings of standard meters and to detect any potential fault between the transformer(T1) and grid. The details of meters are as follows:

Meter No.	Parameter	Description
Main	Metering Concept	Main meter for the billing
	Energy Meter Accuracy Class	0.2S
	Serial Number	19030328
	The main metering location: at the 110kV incoming of T1 transformer	
Back up1	Metering Concept	Back up meter for data management
	Energy Meter Accuracy Class	0.5S
	Serial Number	19030581
	The backup metering location at two 110kV outgoing lines to 220kV Cam Ranh substation.	
Back up2	Metering Concept	Back up meter for data management
	Energy Meter Accuracy Class	0.5S
	Serial Number	19030585
	The backup metering location at two 110kV outgoing lines to 220kV Cam Ranh substation.	

All meters are to be tested and appraised by the testing organization certified by the relevant authorities. The owner of the project has to carry out the periodic inspection and appraisal of the metering through a certified organization approved by ENVEPTC according to the following schedule and the owner incurs all expenses for this periodic inspection and appraisal.

- once a year for the power meters
- once every 5 years for the current and voltage transformer
- after the appraisal, the equipment will be lead sealed-off

Meter Selection, Installation and Meter Quality Control

“A1700 Alpha” from ELSTER is used for both main and backup meter. In accordance with the brochure¹ that the manufacturer provides, both total import and export kWh are measurable.

The measurement system is fully equipped with the functions according to Circular No.42/2015/TT-BCT of Ministry of Industry and Trade and relevant regulations and is in compliance with the requirements of the PPA and Metering Agreement.

The power connection diagrams of the project is as under:

¹ Brochure_A1700CT

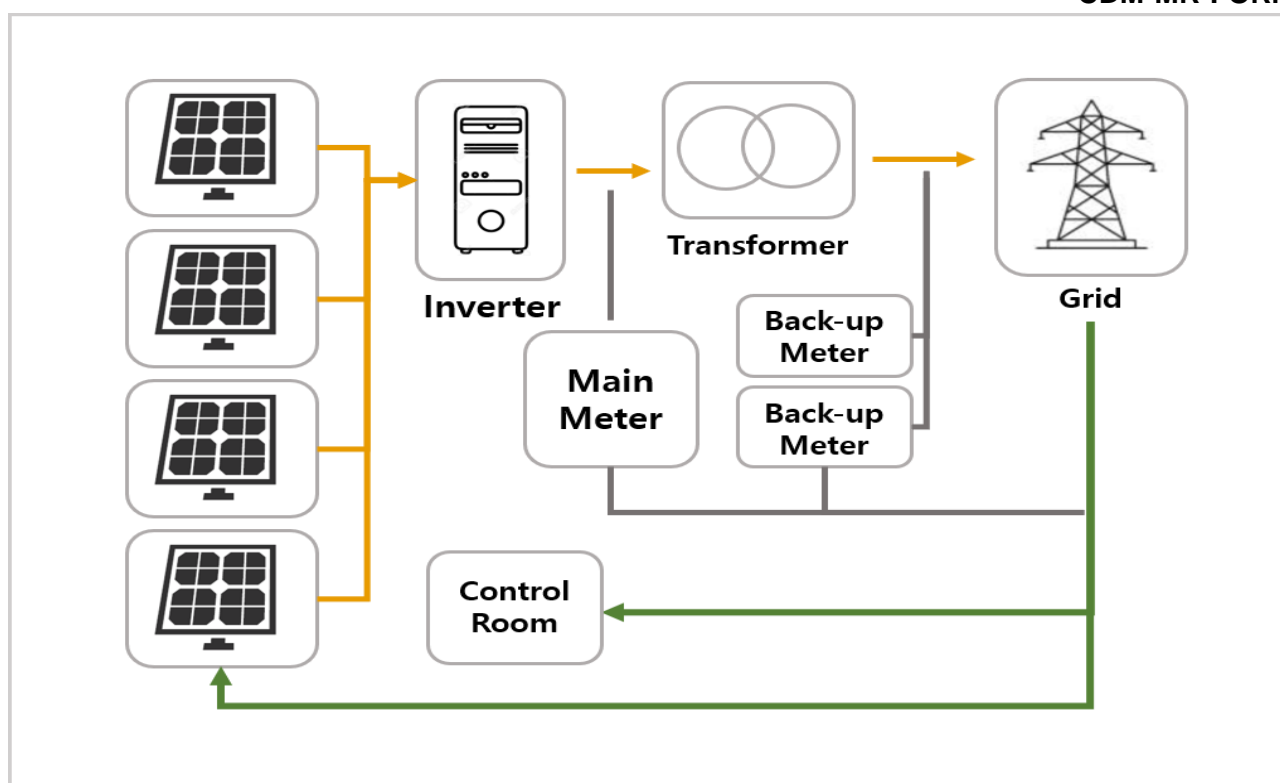


Figure 2 Monitoring diagram

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

Data / Parameter table 1.

Data/Parameter	EFgrid, OM,y
Unit	tCO ₂ /MWh
Description	Operating Margin CO ₂ emission factor in year y
Source of data	2017 Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment
Value(s) applied	0.8336
Choice of data or measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07.0" as 3-year generation weighted average using data for the years 2015~2017. The data are obtained 2017 Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment.
Purpose of data/parameter	For the calculation of baseline emission
Additional comments	-

Data / Parameter table 2.

Data/Parameter	EFgrid, BM,y
Unit	tCO ₂ /MWh
Description	Build Margin CO ₂ emission factor in year y
Source of data	2017 Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment
Value(s) applied	0.8961
Choice of data or measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07.0". The data are obtained 2017 Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment.

Purpose of data/parameter	For the calculation of baseline emission
Additional comments	-

Data / Parameter table 3.

Data / Parameter:	EFgrid, CM,y
Unit:	tCO2/MWh
Description:	Combined Margin CO2 emission factor in year y
Source of data:	2017 Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment
Value(s) applied:	0.8492
Choice of data or measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 07.0". The data are obtained 2017 Viet Nam Grid Emission Factor issued by Department of Climate Change, Ministry of Natural Resources and Environment.
Purpose of data	For the calculation of baseline emission
Additional comment	The value is outputted by merging with the weighting of the OM (wOM = 75%) and for the weighting of the BM (wBM =25%)

D.2. Data and parameters monitored

Data / Parameter table 1.

Data/Parameter	EGfacility, y			
Unit	MWh/year			
Description	Energy generated by the project activity and supplied to the national grid during the year (y)			
Measured/calculated/default	Measured			
Source of data	Standard metering measured by electricity meters (1 main meter and 2 back-up meters) of the net electricity supplied to the national grid			
	Meter	S/N	Calibration frequency(as per PPA)	
	Main	19030328	1 year	
	Back-up meter 1	19030581	1 year	
Value(s) of monitored parameter	Back-up meter 2	19030585	1 year	
	NO.	From	To	Net electricity supplied (MWh)
	1	25/11/2019	30/11/2019	785
	2	01/12/2019	31/12/2019	6,116
	3	01/01/2020	31/01/2020	6,759
	4	01/02/2020	29/02/2020	6,044
	Total			19,704
Monitoring equipment	The amount of electricity generation is measured and monitored by the electricity meters (1 main meter and 2 back-up meters) on a continuous basis and readings is taken every month for billing to the power purchaser. The data is also monitored by using SCADA system which is having a data storage that keeps track of the historical data. Archive of the data is available for last 3 years.			
Measuring/reading/recording frequency	Measuring Frequency: Continuous Recording Frequency: Monthly			
Calculation method (if applicable)	Not Applicable			
QA/QC procedures	All measurements should be conducted with calibrated measurement equipment according to the PPA.			
Purpose of data/parameter	Calculation of Certified Emission Reduction (CER) units			

Additional comments	-
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D.3. Implementation of sampling plan

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The data would not be collected through sampling. It would be available on ground and recorded as per the actual generation of electricity.

SECTION E. Calculation of emission reductions or net anthropogenic removals

E.1. Calculation of baseline emissions or baseline net removals

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Baseline emissions include only CO₂ emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing grid-connected power plants and the addition of new grid-connected power plants. The baseline emissions are calculated as follows:

NO.	From	To	Net electricity supplied (MWh)
1	25/11/2019	30/11/2019	785
2	01/12/2019	31/12/2019	6,116
3	01/01/2020	31/01/2020	6,759
4	01/02/2020	29/02/2020	6,044
Total			19,704

Calculation of BE_y

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

Where:

BE_y = Baseline emissions in year y (t CO₂/yr)

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

$EF_{grid,CM,y}$ = Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of "TOOL07: Tool to calculate the emission factor for an electricity system" (t CO₂/MWh)

Calculation of EG_{PJ,y}

Since the project activity consists in the installation of new grid-connected renewable power plant at site where no renewable power plant was operated prior to the implementation of the project activity.

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

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 CDM project activity in year y (MWh/yr)

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

Net electricity generation is calculated by deducting auto-consumption of the power plant from gross annual electricity production.

Total electricity generation = 19,704 MWh/yr
 BE = 19,704 MWh × 0.8492 tCO₂/MWh
 = 16,733 tCO₂

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

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The project emission has been taken to be 0, since the project activity is the installation of a new grid-connected renewable power plant.

$$PE_y = 0$$

E.3. Calculation of leakage emissions

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No leakage emissions are considered.

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	16,733	0	0	0	16,733	16,733

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)
16,733	17,620

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

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The amount estimated ex ante is calculated for 1 year, but the actual period is only for 96days.

E.6. Remarks on increase in achieved emission reductions

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When calculating the estimated ex ante data for monitoring period, it is slightly larger than the actual data. It's because during the crediting period, the actual radiation is less than design amount.

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

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Not applicable.

Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
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.
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.

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