



**Monitoring report form for CDM project activity**  
(Version 06.0)

**MONITORING REPORT**

<b>Title of the project activity</b>	5 MW Solar PV Power Project at NTPC Faridabad	
<b>UNFCCC reference number of the project activity</b>	9964	
<b>Version number of the PDD applicable to this monitoring report</b>	03	
<b>Version number of this monitoring report</b>	1.0	
<b>Completion date of this monitoring report</b>	26/09/2017	
<b>Monitoring period number</b>	01	
<b>Duration of this monitoring period</b>	01/06/2014 – 31/08/2017 (both dates are included)	
<b>Monitoring report number for this monitoring report</b>	01	
<b>Project participants</b>	M/s. NTPC Limited	
<b>Host Party</b>	India	
<b>Sectoral scopes</b>	Sectoral scope 1 : Energy industries (renewable - / non-renewable sources)	
<b>Applied methodologies and standardized baselines</b>	Applied Methodology: AMS-I.D. ver. 17 – “Grid connected renewable electricity generation”  Standardized baselines: N/A	
<b>Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period</b>	<b>Amount achieved before 1 January 2013</b>	<b>Amount achieved from 1 January 2013</b>
	Nil	15,547 tCO <sub>2</sub> e
<b>Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD</b>	22,572 <sup>1</sup> tCO <sub>2</sub> e	

<sup>1</sup> Note: The current monitoring period is from 01/06/2014 to 31/08/2017 (i.e. 1188 days) hence estimated amount of GHG emission reduction for the current monitoring period in the registered PDD has been extrapolated for 1188 days i.e. = (6,844 tCO<sub>2</sub>e/365 days) x 1188 days = 22,572 tCO<sub>2</sub>e. Detailed calculation has been provided in work sheet "Annual Avg ERReg,PDD" of ER sheet.

## SECTION A. Description of project activity

### A.1. General description of project activity

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The 5 MW Solar Photo Voltaic project developed by NTPC Limited is a green field activity. The project activity involves installation of 5 MW Solar Photo Voltaic plant at NTPC-Faridabad to generate electricity from solar energy by utilizing the solar radiation potential available. The net generated power is supplied to GRIDCO via NEWNE grid which is a part of national grid. The development of registered project activity has resulted into reduction of Green House Gas (GHG) emissions produced by the northern regional grid of India, which is mainly dominated by fossil fuel based power plants.

The power plant comprises of Solar PV modules, junction boxes / combiner boxes, Power Conditioning Unit (PCU), module mounting structure, switch yard, evacuation facility etc. The PV module is made from high efficiency crystalline silicon solar cells. Modules generate direct current (DC) which is converted to alternating current (AC) by inverter hardware. The net generated power is supplied to GRIDCO via NEWNE grid which is a part of national grid.

The commissioning and synchronization of the Solar PV plant has commissioned on 31/03/2014. The project activity has registered with UNFCCC on 23/05/2014 with renewable crediting period. The duration of the crediting period is from 01/06/2014 to 31/05/2021, which is the current period. The duration of the monitoring period considered under this monitoring report is 01/06/2014 to 31/08/2017, which is the first monitoring period of first crediting period for the project.

During the current monitoring period, the project has achieved emissions reduction of 15,547 tCO<sub>2</sub>e.

### A.2. Location of project activity

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The project activity is located as follows:

Host Part(ies) : India  
 State : Haryana  
 District : Faridabad  
 Village : Jajru

The site is at the Jajru village, between National Highway-2 & Delhi-Agra railway line and is in possession of NTPC Faridabad. The site is approximately 14 km from NTPC Faridabad Gas Power Station. The project lies between Latitudes 28° 17' 8.3" N and Longitudes 77° 19' 4.1" E.

The location of project activity is shown in following figures:



### 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 (Host)	M/s. NTPC Limited (Public Entity)	No

### A.4. Reference to applied methodologies and standardized baselines

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Renewable electricity generation for a grid in accordance with approved small scale methodology AMS I.D.

Type I : Renewable energy project

Sectoral Scope : 01, Energy Industries

Category I.D : Grid connected renewable electricity generation, version 17<sup>2</sup>.

Reference : Reference has been taken from the list of the small-scale CDM project activity categories contained in Appendix B of the simplified M&P for small-scale CDM project activities.

<sup>2</sup> <http://cdm.unfccc.int/methodologies/DB/RSCTZ8SKT4F7N1CFDXCSA7BDQ7FU1X/view.html>

Tool reference: "Tool to calculate the emission factor for an electricity system".

**Standardized baseline:** Not applicable.

#### **A.5. Crediting period type and duration**

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Crediting Period : Renewable crediting period (3\*7 years).

Start date of the 1<sup>st</sup> Crediting Period : 01/06/2014

End date of the 1<sup>st</sup> Crediting Period : 31/05/2021

Duration of the Current Monitoring Period : 01/06/2014 – 31/08/2017

### **SECTION B. Implementation of project activity**

#### **B.1. Description of implemented project activity**

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The registered project activity commissioning and synchronization became operational on 31/03/2014. Before the start date of crediting period, the registered project activity became completely operational.

During current monitoring period, actual operations were normal i.e. no breakdown of operational activity.

No such events or situations occurred during the monitoring period which might have impacted the applicability of methodology. There are no issues needs to be addressed.

The project was registered with UNFCCC on 23/05/2014 with renewal crediting period.

#### **Main plant Equipment and System**

- Solar Photovoltaic modules
- Power conditioning units / Solar Inverter
- Control equipments
- Data Acquisition system (DAS) with event log
- Supervisory control & Data Acquisition (SCADA) System
- Total 04 Inverter Transformers of 1.25 MVA, 33/0.350/0.350 KV (Three Winding) of EMCO make (minimum 98% efficiency)
- 33 KV transmission line
- Switchgear equipments and 220 KV / 33 KV 7.5 MVA transformer (minimum 98% efficiency)
- Three energy meters (main, check and standby) of class 0.2 S accuracy suitable for ABT (Availability Based Tariff) requirement on 33 KV outgoing feeder to monitor net energy generated

#### **Schematic Diagram of the Project Activity:**

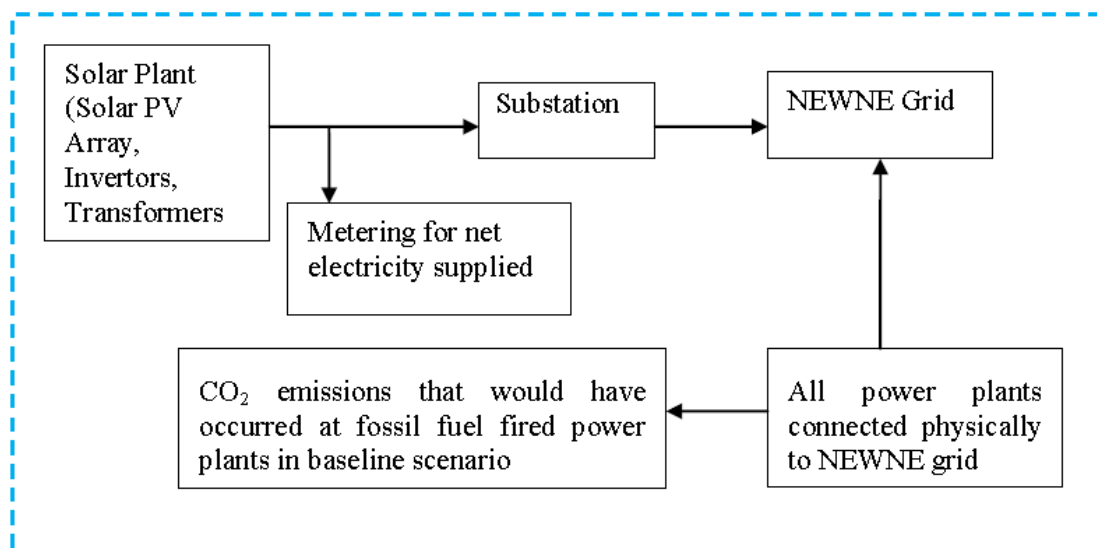


Fig: Project Boundary

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

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This section left blank intentionally as not applicable.

**B.2.2. Corrections**

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

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This section left blank intentionally as not applicable.

**B.2.4. Inclusion of monitoring plan**

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This section left blank intentionally as 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 applied standards or tools**

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**B.2.6. Changes to project design**

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## SECTION C. Description of monitoring system

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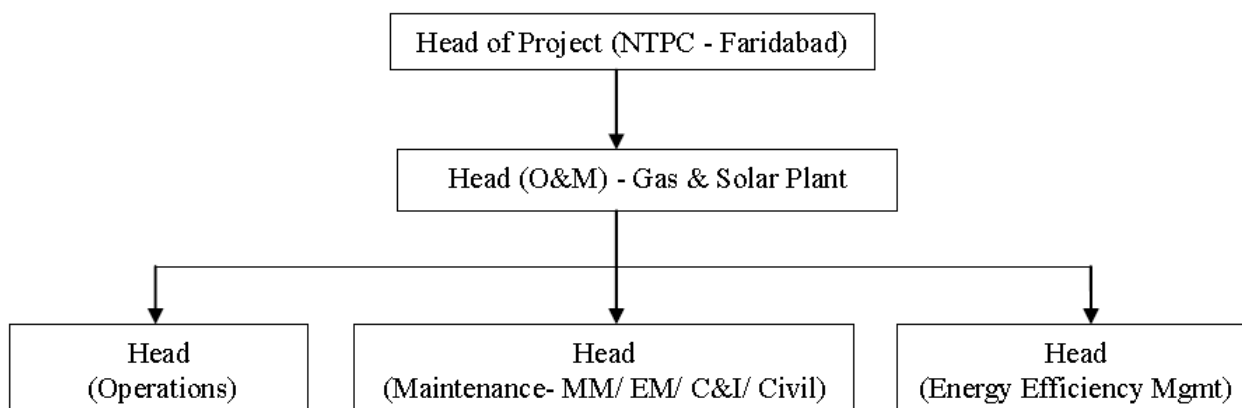
### 1. Name and reference of approved monitoring methodology

The monitoring plan of the project activity is formulated as per approved methodology AMS I.D version 17. As per the methodology, net electricity supplied to the grid is to be monitored.

**BOT process:** The solar plant supplied and installed by M/s Eversun Energy Private Limited, Bangalore, India. The registered activity operated and managed by supplier for the first year under coordination of NTPC representative. Documentation practice has been followed to ensure the reliability and availability of data for all the activities as required by the identification of site, logistics, finance, construction, commissioning and operation of the solar plant. NTPC is responsible for operation and maintenance of project activity from the second year until end of crediting period.

### 2. Organizational structure, roles and responsibilities of personnel:

The organisation structure for the solar power plant envisages a head for operations and maintenance of solar power plant with reporting structure as given below:



#### Responsibilities

The monitoring parameter required to be monitored is net energy generated from project activity. The organization structure for the solar power plant envisages a head of O&M, which is common for Gas & solar power plant; he has complete control over monitoring aspects of the Solar Power Plant. He directly report to the Head of Project. The Head of O&M assisted by operation, energy efficiency management and maintenance personnel and have overall responsibility of monitoring of power generation and consolidating daily weekly, monthly and yearly and archiving the same. The day-to-day operation control performed by the operation engineer who has monitor solar power generation continuously. Energy efficiency management engineer responsible for archiving and reporting of energy generated as measured by online special energy meter.

Designation	Responsibility
Head of project	<ul style="list-style-type: none"> <li>Holds complete control over monitoring aspects pertaining to the project</li> <li>Review of Monitoring report</li> </ul>
Head (O&M )	<ul style="list-style-type: none"> <li>Oversees the collection, recording and storage of data</li> <li>Entire power plant operation &amp; maintenance for both Gas &amp; Solar Power Plant</li> </ul>

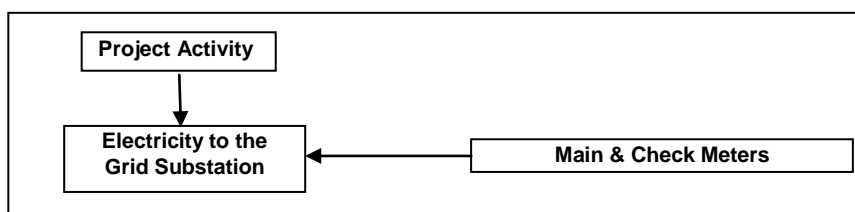
Head of Maintenance (MM/ EM/ C&I/ Civil)	<ul style="list-style-type: none"> <li>• Maintenance of all equipments</li> <li>• Coordination with operation &amp; other maintenance groups</li> <li>• Training of the staff</li> </ul>
Head of Operation	<ul style="list-style-type: none"> <li>• Day to day operation</li> <li>• Coordination with maintenance groups</li> <li>• Training of the staff</li> </ul>
Head of Energy and Efficiency Monitoring group	<ul style="list-style-type: none"> <li>• Data collection and storage</li> <li>• Archiving and reporting of net energy generated as measured by online special energy meter</li> <li>• Monitoring of power generation and measurement of power generated in 15 minutes blocks</li> <li>• Periodic checking of recorded &amp; stored data</li> <li>• Responsible for carrying out periodical testing and calibration of equipments and meters.</li> <li>• Emission reduction calculation &amp; Monitoring report preparation</li> </ul>

### 3. Data Measurement:

Main and check meter are installed as per the specification stipulated in the PPA. The accuracy class of energy meter is 0.2s. There are continuous monitoring of power generated, 15 minute block wise measurement and reading are recorded daily and data of net energy generated are reported weekly to SLDC / RLDC. The electricity supplied to the grid is measured continuously using main meter and check meter installed at 33 KV outgoing feeder. In case of failure of main meter, reading of check meter for the corresponding period shall be considered for energy accounting. If both the main and check meter(s) fail to record or if any of the PT fuses is blown out, energy shall be computed based on standby meters.

No such emergency procedures were required during current monitoring period. No elaboration needed as this refers to emergency procedures only.

### Line diagram showing monitoring points:



### 4. Data collection and archiving:

The meter readings from main and check meters are collected under the supervision of Energy and Efficiency Monitoring Group. The net electricity supplied data would be recorded and stored in electronic form. The records are checked periodically by the Head (O&M). The period of the storage of the monitored data will be 2 years after the end of crediting period or till the last issuance of CERs for this project activity whichever occurs later.

### 5. QA/QC procedures:

Refer section D.2 of MR for respective parameter.

**6. Emission reduction calculation:** Energy Meters reading are considered for calculating emission reduction.

**7. Emergency preparedness:** The project activity is 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.

**8. Personnel training:** In order to ensure a proper functioning of the project activity and a properly monitoring of emission reductions, the staff has been trained. The personnel are trained in equipment operation, data recording, reports writing, operation and maintenance and emergency procedures in compliance with the monitoring plan. The Head of the Maintenance & Head of Operation is responsible for training of their staff in association with Employee Development Centre (EDC).

## SECTION D. Data and parameters

### D.1. Data and parameters fixed ex ante

Data/parameter	$EF_{grid,OM,y}$
Unit	tCO <sub>2</sub> /MWh
Description	Simple Operating Margin of the NEWNE Grid
Source of data	CO2 Baseline Database for the Indian Power Sector Version 07.0, Dated January 2012 (Combined Margin Emission Factor for Northern Regional Grid) published by Central Electric Authority (CEA), India
Value(s) applied)	0.9842
Choice of data or measurement methods and procedures	3 year average data calculated from CEA Database for Northern, Eastern, Western and north-eastern grids in India specifically meant for use in CDM project activities CEA calculated emission factor by collecting information on fuel consumed, net energy generated and, GCV and measuring oxidation factor and emission factor.
Purpose of data	For calculation of emission factor
Additional comments	This database is an official publication of government of India for the purpose of CDM baseline. It is based on most recent data available to CEA and hence considered for authentic. As the calculation for baseline has been done ex-ante, its value will remain fixed for the entire crediting period.

Data/parameter	$EF_{grid,BM,y}$
Unit	tCO <sub>2</sub> /MWh
Description	Build Margin of the NEWNE Grid
Source of data	CO2 Baseline Database for the Indian Power Sector Version 07.0, Dated January 2012 (Combined Margin Emission Factor for Northern Regional Grid) published by Central Electric Authority (CEA), India
Value(s) applied)	0.8587
Choice of data or measurement methods and procedures	3 year average data calculated from CEA Database for Northern, Eastern, Western and north-eastern grids in India specifically meant for use in CDM project activities CEA calculated emission factor by collecting information on fuel consumed, net energy generated and, GCV and measuring oxidation factor and emission factor.
Purpose of data	For calculation of emission factor
Additional comments	This database is an official publication of government of India for the purpose of CDM baseline. It is based on most recent data available to CEA and hence considered for authentic. As the calculation for baseline has been done ex-ante, its value will remain fixed for the entire crediting period.

Data/parameter	$EF_{grid,CO_2,y}$
Unit	tCO <sub>2</sub> /MWh
Description	Emission factor of the NEWNE Grid



Source of data	CO2 Baseline Database for the Indian Power Sector Version 07.0, Dated January 2012 (Combined Margin Emission Factor for Northern Regional Grid) published by Central Electric Authority (CEA), India
Value(s) applied)	0.9528
Choice of data or measurement methods and procedures	Calculated as the weighted average of the Operating margin and Build margin with ratio of 0.75 and 0.25 as per tool for calculation of emission factor for electrical system. The OM and BM data is publicly available provided by CEA and is conservative and transparent.
Purpose of data	For calculation of emission factor
Additional comments	This database is an official publication of government of India for the purpose of CDM baseline. It is based on most recent data available to CEA and hence considered for authentic. As the calculation for baseline has been done ex-ante, its value will remain fixed for the entire crediting period.

## D.2. Data and parameters monitored

Data/parameter	EG <sub>BLy</sub>		
Unit	MWh/y		
Description	Quantity of net electricity supplied to the grid by power plant in year y		
Measured/calculated/default	Measured		
Source of data	Joint Energy meter reading reports (NTPC and GRIDCO will jointly read the metering system on the first day of every month and thus the joint Energy meter reading reports will be prepared).		
Value(s) of monitored parameter	Monitored Period	EG <sub>BLy</sub>	
		kWh	MWh
	Jun-14	581,981.00	581.981
	Jul-14	569,058.00	569.058
	Aug-14	500,091.00	500.091
	Sep-14	609,389.00	609.389
	Oct-14	544,497.00	544.497
	Nov-14	387,237.00	387.237
	Dec-14	426,159.00	426.159
	Jan-15	394,011.00	394.011
	Feb-15	510,402.00	510.402
	Mar-15	671,043.00	671.043
	Apr-15	638,839.00	638.839
	May-15	682,224.00	682.224
	Jun-15	592,291.00	592.291

	Jul-15	576,954.00	576.954
	Aug-15	595,893.00	595.893
	Sep-15	709,587.00	709.587
	Oct-15	587,781.00	587.781
	Nov-15	397,562.00	397.562
	Dec-15	433,356.00	433.356
	Jan-16	385,122.00	385.122
	Feb-16	537,914.00	537.914
	Mar-16	710,157.00	710.157
	Apr-16	696,118.00	696.118
	May-16	676,205.00	676.205
	Jun-16	633,992.00	633.992
	Jul-16	494,237.00	494.237
	Aug-16	570,390.00	570.390
	Sep-16	633,943.00	633.943
	Oct-16	583,374.00	583.374
	Nov-16	443,708.00	443.708
	Dec-16	398,352.00	398.352
	Jan-17	457,778.00	457.778
	Feb-17	583,718.00	583.718
	Mar-17	714,021.00	714.021
	Apr-17	704,002.00	704.002
	May-17	627,079.95	627.080
	Jun-17	624,436.20	624.436
	Jul-17	599,325.90	599.326
	Aug-17	570,459.00	570.459
	<b>Total</b>	<b>16,219,980.05</b>	<b>16,219.000</b>
Monitoring equipment	ABT compliant Meters		
Measuring/reading/recording frequency	Monthly		
Calculation method (if applicable)	Measurement methods and procedures will be according to that detailed in the Power Purchase Agreement (PPA). A set of ABT (Availability Based Tariff) compliant Main meter, Check meter and Standby meter with 0.2s accuracy class as per CEA (Installation & operation of meters) regulations		

	<p>2006 (<a href="http://www.cea.nic.in/reports/regulation/meter_reg.pdf">http://www.cea.nic.in/reports/regulation/meter_reg.pdf</a>) / IEGC as applicable is installed at the common connection point at which all the solar modules are connected i.e. at the premises of generating station on the 33 KV outgoing feeder and meter reading will be considered for estimating emission reduction (Refer to Section B.7.3). Person responsible for measurement shall be Head of O&amp;M (Operation &amp; Maintenance), which is common for Gas &amp; solar plant.</p> <p>Net electricity supplied to the grid shall be cross checked with records for sold / purchased electricity (e.g. invoices / receipts)</p>
QA/QC procedures	<p>One set (Main &amp; Check) of class 0.2 S accuracy energy meters suitable for ABT requirement shall be provided for the 33 KV outgoing feeder. Another one no. of class 0.2 S accuracy standby energy meter suitable for ABT requirement shall be provided for the 33 KV outgoing feeder</p> <p>The main and check meters shall be checked jointly at the time of installation as per the CEA (Installation &amp; operation of meters) regulations 2006 (<a href="http://www.cea.nic.in/reports/regulation/meter_reg.pdf">http://www.cea.nic.in/reports/regulation/meter_reg.pdf</a>) as amended from time to time.</p> <p>Regular cross checking and analysis of meter readings and meter failure or discrepancies shall be reckoned as per CEA (Installation &amp; operation of meters) regulations 2006 as amended from time to time. If the main meter or check meter is found to be not working at the time of meter reading or at any other time, NTPC shall inform the SLDC (State Load Despatch Centre) / RLDC (Regional Load Despatch Centre) of the same (<a href="http://cercind.gov.in/Regulations/Signed-IEGC.pdf">http://cercind.gov.in/Regulations/Signed-IEGC.pdf</a>) .</p> <p>In case of failure of meters, energy accounting for the period shall be as per procedure laid down by CERC (<a href="http://cercind.gov.in/220206/IEGC_2005.pdf">http://cercind.gov.in/220206/IEGC_2005.pdf</a>) or as per the mutually agreed procedure. In case of absence of any such procedure, the following procedure shall be followed:</p> <p>In case of failure of main meter, reading of check meter for the corresponding period shall be considered for energy accounting. If both the main and check meter(s) fail to record or if any of the PT fuses is blown out, energy shall be computed based on standby meters.</p> <p><b>Testing and Calibration:</b> All meters shall be calibrated and tested as per procedure laid out in CEA (Installation &amp; operation of meters) regulations 2006. The meters shall be calibrated once in five years by NABL accredited agency in the presence of representative of NTPC and M/s GRIDCO as per procedure laid out in CEA (Installation &amp; operation of meters) regulations 2006.</p> <p>Quality assurance system elaborating the roles and responsibilities will be implemented once the project is registered to ensure consistency and accuracy of monitoring.</p>
Purpose of data/parameter	For calculation of baseline emission
Additional comments:	The data monitored and required for verification and issuance be kept and archived electronically for two years after the end of the crediting period or the last issuance of CERs, whichever occurs later

### D.3. Implementation of sampling plan

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This section left blank intentionally as not applicable.

## SECTION E. Calculation of emission reductions or net anthropogenic removals

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

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The baseline emissions are the product of electrical energy baseline *E<sub>GBL</sub>*, y expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor.

$$BE_y = EG_{BL,y} * EF_{CO2, grid, y}$$

Where:

$BE_y$  : Baseline Emissions in year  $y$  (t CO<sub>2</sub>)

$EG_{BL, y}$  : Quantity of net electricity supplied to the grid as a result of the implementation of the CDM Project activity in year  $y$  (MWh)

$EF_{CO2, grid, y}$  : CO<sub>2</sub> emission factor of the grid in year  $y$  (t CO<sub>2</sub>/MWh)

$$BE_y = 16,219 \text{ MWh} \times 0.9586 \text{ t CO}_2/\text{MWh} = 15,547 \text{ t CO}_2$$

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

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As per paragraph 20 of methodology AMS I.D. Version 17, for most renewable energy project activities,  $PE_y = 0$ . However, for the following categories of project activities, project emissions have to be considered following the procedure described in the most recent version of ACM0002.

- Emissions related to the operation of geothermal power plants (e.g. non-condensable gases, electricity/fossil fuel consumption);
- Emissions from water reservoirs of hydro power plants.

As the project activity is a construction of a new solar power plant, there is no project emission.

$$PE_y = 0$$

Since the project activity is installation of solar power plant which does not consume any fossil fuel for its operation so as per para 21 of the methodology AMS I.D. Version 17, no project emission has been considered for the project activity. Hence, for this project activity, project emission remains zero.

## E.3. Calculation of leakage emissions

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There is no leakage involved as the energy generating equipment is not transferred from another activity. This is in line with paragraph 22 of methodology AMS I.D. Version 17.

$$LE_y = 0$$

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

	Baseline GHG emissions or baseline net GHG removals (t CO <sub>2</sub> e)	Project GHG emissions or actual net GHG removals (t CO <sub>2</sub> e)	Leakage GHG emissions (t CO <sub>2</sub> e)	GHG emission reductions or net anthropogenic GHG removals (t CO <sub>2</sub> e)		
				Before 01/01/2013	From 01/01/2013	Total amount
<b>Total</b>	15,547	0	0	0	15,547	15,547

## 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 <sub>2</sub> e)	Amount estimated ex ante (t CO <sub>2</sub> e)
15,547	22,572

## E.6. Remarks on increase in achieved emission reductions

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There is decrease of -31.12 % in the actual emission reductions achieved during the current monitoring period from that stated in the registered CDM-PDD because of breakdown and outage of the plant.

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**Document information**

<i>Version</i>	<i>Date</i>	<i>Description</i>
06.0	7 June 2017	Revision to: <ul style="list-style-type: none"> <li>• Ensure consistency with version 01.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN);</li> <li>• Make editorial improvements.</li> </ul>
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: <ul style="list-style-type: none"> <li>• Include provisions related to delayed submission of a monitoring plan;</li> <li>• Provisions related to the Host Party;</li> <li>• Remove reference to programme of activities;</li> <li>• Overall editorial improvement.</li> </ul>
04.0	25 June 2014	Revisions to: <ul style="list-style-type: none"> <li>• Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0));</li> <li>• Include provisions related to standardized baselines;</li> <li>• Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1;</li> <li>• Change the reference number from <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>;</li> <li>• Editorial improvement.</li> </ul>
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		