Monitoring report form for CDM project activity

(Version 06.0)

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

MONITORING REPORT		
Title of the project activity	Jbel Sendouq-Khalladi ("Khalladi") Wind Farm Project in Morocco	
UNFCCC reference number of the project activity	9047	
Version number of the PDD applicable to this monitoring report	3.4	
Version number of this monitoring report	1	
Completion date of this monitoring report	02/04/2019	
Monitoring period number	01	
Duration of this monitoring period	01/05/2014 – 05/06/2018	
Monitoring report number for this monitoring report	01	
Project participants	ACWA POWER KHALLADI S.A.	
Host Party	Morocco	
Sectoral scopes	1: Energy industries (renewable - / non-renewable sources)	
Applied methodologies and standardized baselines	ACM0002(Version 12.3.0): Consolidated baseline and monitoring methodology for grid- connected electricity from renewable source	
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	35,354 tCO2
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	73,754 tCO2[1]	

[1] As the 1st WTG commissioned on 12/12/2017, The ex-ante GHG emission reductions has been calculated for the period from 12/12/2017 to 05/06/2018.

SECTION A. Description of project activity

A.1. General description of project activity

>>
The objective of the project, the Jbel Sendouq-Khalladi ("Khalladi") Wind Farm Project in Morocco, is to generate electricity using state-of-the-art wind power generation technology.

The project is located in the Tangier-Tetouan Region, Fahs Anjra Province, Morocco. 40 wind turbines with a nominal unit capacity of 3 MW are installed, providing a total capacity of 120 MW.

In the 1st monitoring period of the project from 01/05/2014 to 05/06/2018 (both days included), project has achieved total 35,354 tCO_2 emission reductions.

Relevant project dates are as follows:

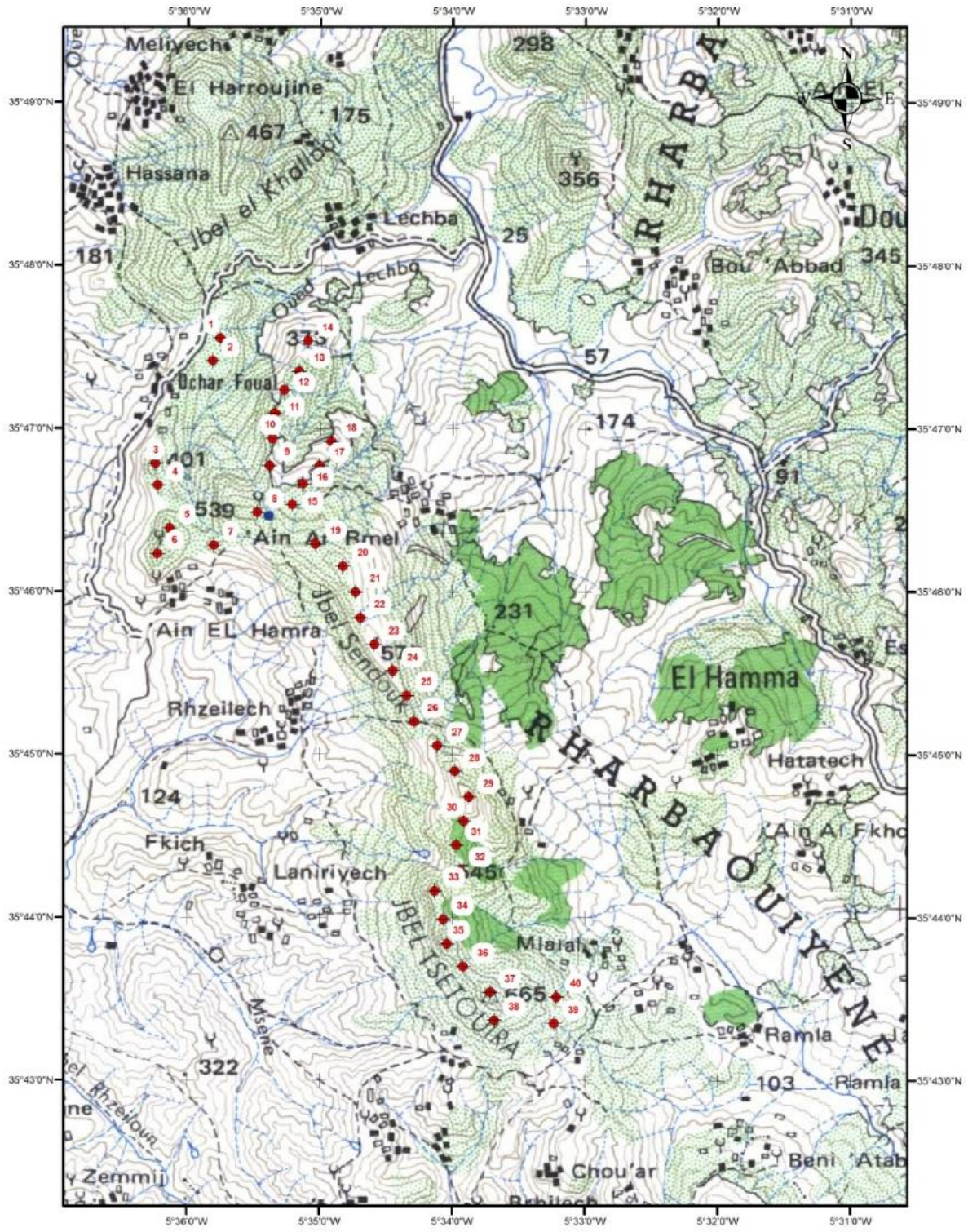
Construction start date:	16/07/2016
Construction end date:	30/06/2018
Commissioning of 1st turbine:	12/12/2017

A.2. Location of project activity

>>
The project is located in Morocco, Tangier-Tetouan Region, Fahs Anjra Province. The project is located within three rural communes of Melloussa, Qsar Sghir and Khmis Anjra.

The project is located in the north of Morocco, approximately 50 Km east of the town of Tangier, in the south of the Qsar Sghir village, between cities of Tangier and Sebta.

The exact location of the project site and the 40 WTGs is depicted in the following figure:



GPS coordinates:

WTG label	WTG type	Possible Phases	Hub Height	UTM WSG84 Z30	
		1-2		Easting [m]	Northing [m]
V01	V90-3.0 MW	2	80	264743	3962336
V02	V90-3.0 MW	2	80	264770	3962144
V03	V90-3.0 MW	2	80	264884	3961681
V04	V90-3.0 MW	2	80	264868	3961495
V05	V90-3.0 MW	2	80	264766	3961322
V06	V90-3.0 MW	2	80	265746	3961780
V07	V90-3.0 MW	2	80	266113	3961792
V08	V90-3.0 MW	2	80	266118	3962032
V09	V90-3.0 MW	2	80	266095	3962251
V10	V90-3.0 MW	2	80	266108	3962480
V11	V90-3.0 MW	2	80	266760	3961670
V12	V90-3.0 MW	2	80	266065	3961409
V13	V90-3.0 MW	1	80	266650	3961426
V14	V90-3.0 MW	1	80	266810	3961159
V15	V90-3.0 MW	1	80	266964	3960955
V16	V90-3.0 MW	1	80	267031	3960723
V17	V90-3.0 MW	1	80	267089	3960502
V18	V90-3.0 MW	1	80	267180	3960280
V19	V90-3.0 MW	1	80	267273	3960113
V20	V90-3.0 MW	1	80	267438	3959923
V21	V90-3.0 MW	1	80	267527	3959738
V22	V90-3.0 MW	1	80	267596	3959507
V23	V90-3.0 MW	1	80	267658	3959291
V24	V90-3.0 MW	1	80	267815	3959122
V25	V90-3.0 MW	1	80	267933	3958945
V26	V90-3.0 MW	1	80	268083	3958779
V27	V90-3.0 MW	1	80	268154	3958594
V28	V90-3.0 MW	1	80	268251	3958418
V29	V90-3.0 MW	1	80	268196	3958132
V30	V90-3.0 MW	2	80	268588	3958013
V31	V90-3.0 MW	1	80	268058	3957977
V32	V90-3.0 MW	1	80	268130	3957789
V33	V90-3.0 MW	2	80	268143	3957598
V34	V90-3.0 MW	1	80	267817	3957434
V35	V90-3.0 MW	1	80	267898	3957184
V36	V90-3.0 MW	1	80	267906	3956991
V37	V90-3.0 MW	1	80	267951	3956787
V38	V90-3.0 MW	1	80	268116	3956551
V39	V90-3.0 MW	1	80	268289	3956393
V40	V90-3.0 MW	1	80	268514	3956179

A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
Morocco (host Party)	ACWA POWER KHALLADI S.A.	No

A.4. Reference to applied methodologies and standardized baselines

>>
ACM0002 (Version 12.3.0): Consolidated baseline and monitoring methodology for grid-connected electricity generation from renewable sources.

The Tool for the Demonstration and Assessment of Additionality (version 06.1.0)
The Tool to Calculate the Emission Factor for an Electricity System (version 02.2.1)

As required by the approved methodology ACM0002 (Version 12.3.0), the project additionality will be
demonstrated using the latest version of the “Tool for the Demonstration and assessment of Additionality”.

A.5. Crediting period type and duration

>>
Start date of crediting period: 01/05/2014 to 30/04/2021
Duration of crediting period: 7 years (1st crediting period, renewable)

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

>>
The project has been completed on: 30/06/2018
Currently 40 out of 40 turbines have been installed and are commissioned.

The main technical characteristics of the project's turbines are summarized below:
– 40 no. of V90-3MW turbines;
– Hub height of 80 m;
– Rotor diameter of 90 m;
– Blade length of 44 m. Blades are made out of a glass fibre/carbon spar with glass fibre airfoil shells;
– Turbines benefit from the latest Supervisory Control and Data Acquisition (SCADA) system for modern wind power plants: VestasOnline® Business.

Relevant project dates are as follows:

Construction start date:	16/07/2016
Construction end date:	30/06/2018
Commissioning of 1st turbine:	12/12/2017

B.2. Post-registration changes

B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies or standardized baselines

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Not applicable

B.2.2. Corrections

>>

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 applied standards or tools

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Not applicable

B.2.6. Changes to project design

>>

Not applicable

SECTION C. Description of monitoring system

>>

a) The aim of the monitoring plan

Monitoring is a key procedure to verify the real and measurable emission reductions from the project activity. To guarantee the project's real, measurable and long-term GHG emission reductions, the monitoring plan is established.

b) Data to be monitored

One main parameter will be subject to an ex-post monitoring which is the net electricity supplied to the power grid.

The baseline emission factor is fixed on ex-ante calculation and thus doesn't need to be monitored every year as per the latest version of the "Tool to calculate the emission factor for an electricity system" (Version 2.2.1).

According to the baseline study, the key parameter of the emissions' reductions evaluation is the net electricity supplied to the grid by the wind farm. The recommended monitoring methodology is based on a specific and continuous measure of the net electricity supplied to the grid that will be derived from the following equation:

EG = E1+E2

Where:

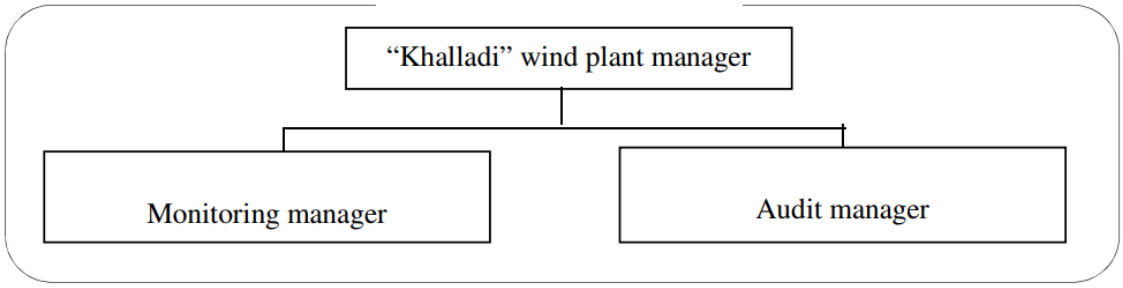
EG = Total net generated electricity exported to the grid
E1 = Net electricity supplied to the national grid through line 1
E2 = Net electricity supplied to the national grid through line 2

c) Monitoring management organization

The monitoring structure consists in a staff familiar with computers and data processing. Staff members are designated for data collection and management and monthly monitoring reports will be established.

The responsible entity for monitoring is the "Khalladi" wind plant manager.

The CDM monitoring team by the project participant is structured as follows:



The responsibilities of the CDM Monitoring team members are the following:

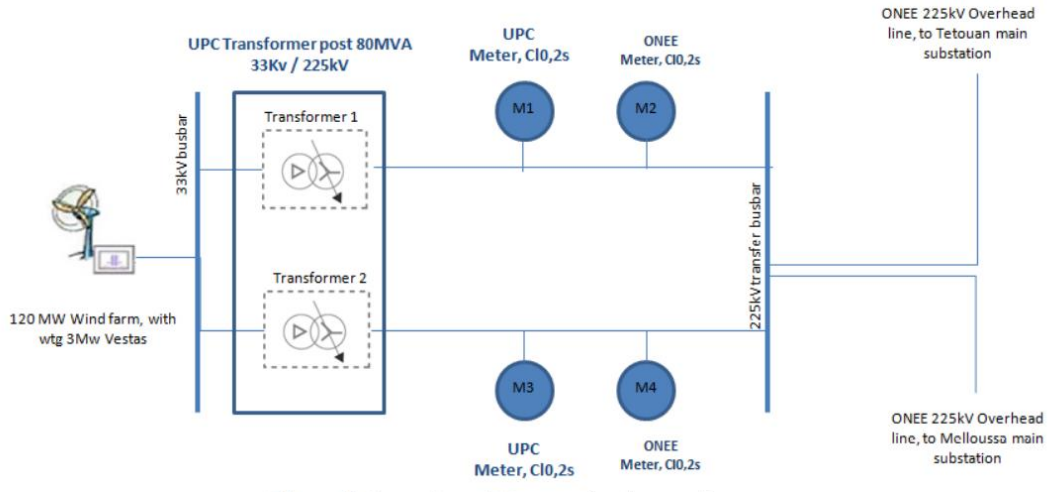
- Wind plant manager: manage the work of CDM Monitoring team and take charge of all relevant matters with the monitoring activity
- Monitoring manager: monitor, collect and archive the data according to the monitoring plan
- Audit manager: audit the work of Monitoring manager and execute the QC/QA (Quality Control/Quality Assurance) procedures according to the monitoring plan

d) Monitoring equipment, installation and calibration

"Khalladi" wind farm uses electrical transformers located at the turbines' base to boost the electricity generated at low voltage 690V to medium voltage of 33 kV. All transformers are linked by 33 kV underground lines to the two 33/225 kV step-up transformers located in the project substation. The energy produced is then transferred over two aerial 225 kV lines around 23 km to two ONE substations located in the west of Tetouan city and in Melloussa.

Two highly accurate bidirectional electricity meters for each step-up transformer are used: a main meter and a back-up meter will be installed at each of the 33/225 kV step up transformer allowing to monitor the net electricity supplied to the grid.

The accuracy of the above mentioned electric meters is 0.2s. The installation and metering will be in accordance with to the International Electro technical Commission (IEC) and ONEE standard. The following diagram shows the positions of the meters that will be used to monitor the electricity generated and the net electricity exported to the national grid. On each of the 225KV side of the two transformers on the Project site there are two main electricity PPmeters (M1 and M3, class 0.2s) and two additional ONEE meters are also placed on the two electricity lines (M2 and M4, class 0.2s).



The four electricity meters are bidirectional measuring the net electricity export to the national grid (gross electricity export to the grid minus the electricity imports for the use of the wind farm auxiliaries).

The electricity meters will be installed and sealed by the Office National d'Electricité et de l'Eau Potable (ONEE), which is the public utility that has the monopoly of the national electricity grid development and management. It will serve as the basis of the electricity supply and electricity imports accounting. The bidirectional ONEE electricity meters are regularly checked and calibrated by ONEE according to its official maintenance and calibration procedures. The electricity meters are property of ONEE. The meters shall undergo testing and calibration carried out by ONEE at least once a year.

The PPmeters may be inspected at any reasonable time by ONEE on the project participant's request. If, during any test, the accuracy of the meters fails to meet the standards specified by the International Electrotechnical Commission, ONEE shall repair or recalibrate the meters and if it is necessary to replace a meter.

If the error of the main meter is out of the permissible limits or if the main meter have malfunction, the data of the backup meter will be referenced. During this monitoring period, the main and check meters were working satisfactorily.

Meters will be jointly inspected, sealed or calibrated on behalf of the parties concerned and shall not be interfered with by either party (such removing, replacing, disassembling, sealing, seal-breaking, accident treatment and etc.), except in the presence of the other party or its accredited representatives.

	Meter 1	**Meter 2**	**Meter 3**	**Meter 4**
Number	02826265	02826266	02826267	02826268
Make	Schlumberger	Schlumberger	Schlumberger	Schlumberger
Model	SL7000	SL7000	SL7000	SL7000
Accuracy Class	0.2s	0.2s	0.2s	0.2s
Calibration Frequency	Annual	Annual	Annual	Annual
Calibration Date	25/11/17	25/11/17	25/11/17	25/11/17
Type	Main Meter	Check Meter	Main Meter	Check Meter

e) Data collection and management

The double meter readings of the net supplied electricity to the grid will be transmitted electronically to PP's monitoring computer and recorded every 24h. The daily meter readings data will be processed and stored electronically in a computer system with regular backup copy on a digital basis complemented by printed versions of the monthly electricity exports.

An internal monitoring audit will be undertaken at the crediting period start up and routinely afterward as needed. Following the internal audit, the electronic data would be used in a spreadsheet procedure in order to calculate emissions reductions. The original data, the calculation procedures and the resulting emission reductions will be verified internally before the establishment of the monitoring report and the DOE verification

f) Training and monitoring procedures

The project participant will entrust the professional engineers and experts to train all the relative staff. The training contains CDM knowledge, operational regulations, quality control (QC) standard flow, data monitoring requirements and data management regulations etc.

The monitoring procedure will be defined in a monitoring manual that include, in particular: (i) staff organization with job descriptions, (ii) instructions for data transfer and record handling protocols, and (iii) calibration checking procedures for the measuring equipment. This manual will be updated

regularly according to the latest applicable EB monitoring recommendations and the recurrent corrective actions undertaken.

An internal audit procedure will ensure the quality control and will check the reliability and security of the monitoring. Following these audits, corrective actions will be decided, if necessary. In addition to periodic meetings, additional technical meetings among the technical team of the wind farm will be held, if necessary, in order to define the monitoring corrective actions to be carried out. Any corrective actions taken will be documented in case of equipment or system malfunction or breakdown.

Regular site audits will be made to ensure that monitoring and operational procedures are being observed in accordance with the monitoring plan.

All the data will be archived until two years after the end of the crediting period or the last issuance, whichever is later.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

(Copy this table for each data or parameter.)

Data/Parameter	**$FC_{i,m,y}$**
Unit	T
Description	Amount of fossil fuel type i consumed by power plant / unit m feeding the grid, in year y
Source of data	ONEE official data
Value(s) applied	See Annex 3 of the registered PDD
Choice of data or measurement methods and procedures	-
Purpose of data/parameter	Calculation of grid emission factor/Baseline emissions
Additional comments	-

Data/Parameter	**EGm,y**
Unit	MWh
Description	Net electricity generated by power plant/unit *m* in year *y*
Source of data	ONEE official data
Value(s) applied	See Annex 3 of the registered PDD
Choice of data or measurement methods and procedures	-
Purpose of data/parameter	Calculation of grid emission factor/Baseline emissions
Additional comments	-

Data/Parameter	**NCVi**
Unit	GJ/t
Description	Net calorific value (energy content) per mass or volume unit of fuel i
Source of data	Specific NCVs power plant values when available Official Statistical book Annuaire des Statistiques - 2007 2006 IPCC Guidelines for National Greenhouse Gas Inventories

Value(s) applied	See Annex 3 of the registered PDD
Choice of data or measurement methods and procedures	According to the Tool to Calculate the Emission Factor for an Electricity System (version 02.2.1), values provided by the fuel supplier of the power plants in invoices shall be used if data is collected from power plant operators. Otherwise the national average default value shall be used if values are reliable and documented in regional or national energy statistics / energy balances. If not, and only then, IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.2 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories shall be used.
Purpose of data/parameter	Calculation of grid emission factor/Baseline emissions
Additional comments	-

Data/Parameter	**$EF_{CO2,i}$**
Unit	tCO2/TJ
Description	Carbon emission factor per unit of energy of the fuel *i*
Source of data	2006 IPCC Guidelines for National Greenhouse Gas Inventories
Value(s) applied	See Annex 3 of the registered PDD
Choice of data or measurement methods and procedures	According to the Tool to Calculate the Emission Factor for an Electricity System (version 02.2.1), the national average default value shall be used if values are reliable and documented in regional or national energy statistics / energy balances. Otherwise IPCC default values at the lower limit of the uncertainty at a 95% confidence interval as provided in Table 1.4 of Chapter 1 of Vol. 2 (Energy) of the 2006 IPCC Guidelines on National GHG Inventories shall be used.
Purpose of data/parameter	Calculation of grid emission factor/Baseline emissions
Additional comments	-

D.2. Data and parameters monitored

(Copy this table for each data or parameter.)

Data/Parameter	$EG_{facility,y}$
Unit	MWh
Description	Quantity of net electricity generation supplied by the Project activity to the grid
Measured/calculated/ default	Measured and Calculated
Source of data	Electricity meters
Value(s) of monitored parameter	2017: 1,225.35 2018: 71,491.57

<table>
<tr><td>Monitoring equipment</td><td>Electricity meters
<table>
<tr><th></th><th>Meter 1</th><th>Meter 2</th><th>Meter 3</th><th>Meter 4</th></tr>
<tr><td>Type</td><td>Main Meter</td><td>Check Meter</td><td>Main Meter</td><td>Check Meter</td></tr>
<tr><td>Make</td><td>Schlumberger</td><td>Schlumberger</td><td>Schlumberger</td><td>Schlumberger</td></tr>
<tr><td>Model</td><td>SL7000</td><td>SL7000</td><td>SL7000</td><td>SL7000</td></tr>
<tr><td>Accuracy Class</td><td>0.2s</td><td>0.2s</td><td>0.2s</td><td>0.2s</td></tr>
<tr><td>Serial Number</td><td>02826265</td><td>02826266</td><td>02826267</td><td>02826268</td></tr>
<tr><td>Calibration Date</td><td>25/11/17</td><td>25/11/17</td><td>25/11/17</td><td>25/11/17</td></tr>
<tr><td>Calibration Frequency</td><td>Annual</td><td>Annual</td><td>Annual</td><td>Annual</td></tr>
<tr><td>Validity</td><td>One year</td><td>One year</td><td>One year</td><td>One year</td></tr>
</table></td></tr>
<tr><td>Measuring/reading/recording frequency</td><td>Data measured continuously basis and recorded on daily/monthly basis</td></tr>
<tr><td>Calculation method (if applicable)</td><td>-</td></tr>
<tr><td>QA/QC procedures</td><td>Net electricity supplied by the project activity to the grid. Double checked by the monthly accounting receipts established by ONEE. The authorized representatives of the Project Participant and ONEE have the right to propose testing inspection and calibration of meters. If the accuracy of meters does not meet the standards specified by the International Electro technical Commission (IEC), ONEE repairs or recalibrates the meters, and, if necessary replaces the meter. If the tests indicate that the meter has a degree of inaccuracy higher than 0.2s the electricity production of the Project activity is adjusted retroactively in compliance with an agreement set between ONEE and the Project participant.</td></tr>
<tr><td>Purpose of data/parameter</td><td>Calculation of Baseline emissions</td></tr>
<tr><td>Additional comments</td><td>-</td></tr>
</table>

D.3. Implementation of sampling plan

>>

Not applicable

SECTION E. Calculation of emission reductions or net anthropogenic removals

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

>>

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

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)
$EF_{grid,CM,y}$ = Combined margin CO2 emission factor for grid connected power generation in year y calculated using the "Tool to calculate the emission factor for an electricity system" (tCO_2/MWh).

$$EF_{grid,CM,y} = EF_{grid,OM,y} \times w_{OM} + EF_{grid,BM,y} \times w_{BM}$$

			Unit
$EF_{grid,CM,y}$	Combined Margin Grid Emission Factor Calculated under Annex 3 of the registered PDD.	0.48620	tCO2/MWh

Year 2018	Quantity of Electricity Generated (MWh)	Combined Margin Grid Emission Factor (tCO2/MWh)	Baseline emissions
		$EF_{grid,CM,y}$	BE_y (tCO2)
December (2017)	1,225	0.48620	596
January 2018	3,062	0.48620	1,489
February 2018	8,502	0.48620	4,134
March 2018	16,998	0.48620	8,264
April 2018	18,936	0.48620	9,207
May 2018	19,832	0.48620	9,642
June 2018	4,161	0.48620	2,023
Total		**0.48620**	**35,354**

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

>>
As per the registered PDD, project emissions are zero.

PEy = 0

E.3. Calculation of leakage emissions

>>
As per the registered PDD, project emissions are zero.

LEy = 0

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

	Baseline GHG emissions or baseline net GHG removals (t CO_2e)	Project GHG emissions or actual net GHG removals (t CO_2e)	Leakage GHG emissions (t CO_2e)	GHG emission reductions or net anthropogenic GHG removals (t CO_2e)		
				Before 01/01/2013	From 01/01/2013	Total amount
Total	35,354	0	0	0	**35,354**	**35,354**

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_2e)	Amount estimated ex ante (t CO_2e)

Amount achieved during this monitoring period (t CO_2e)	Amount estimated ex ante (t CO_2e)
35,354	**73,754**

E.6. Remarks on increase in achieved emission reductions

>>

Not applicable

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Document information

Version	*Date*	*Description*
06.0	7 June 2017	Revision to: • 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: • 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: • 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 *F-CDM-MR* to *CDM-MR-FORM*; • 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
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