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	Wind Power Project by Markdata Green Energy (EKIESLCDM.January-15-01)	
UNFCCC reference number of the project activity	UN 10382[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	30/10/2019	
Monitoring period number	01	
Duration of this monitoring period	15/06/2017 to 30/06/2019 (including first and last day)	
Monitoring report number for this monitoring period	Not Applicable	
Project participants	Markdata Green Energy Pvt. Ltd.	
Host Party	India	
Applied methodologies and standardized baselines	Methodology: - ACM0002/ Version 17.0, EB 89, "Grid connected electricity generation from renewable sources" Standardized Baseline: Not Applicable	
Sectoral scopes	Sectoral Scope 1: 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 tCO2e	99,688 tCO2e
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	144,869 tCO2e	

[1] https://cdm.unfccc.int/Projects/DB/Applus1497437593.14/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 wind energy source. Markdata Green Energy Pvt. Ltd.[2] and Siddhayu Ayurvedic Research Foundation Pvt. Ltd[3]. are the investors of the project activity. The project activity involves installations of 21 wind turbines of varying capacity at Madhya Pradesh and Rajasthan. The total capacity of the proposed project activity is 41.2 MW. The commissioning of the project activity is already completed and details are mentioned in section B1 of this MR. The project will replace anthropogenic emissions of greenhouse gases (GHG's) estimated to be approximately 70,881 tCO2e per year, thereon displaces 72,550 MWh/year amount of electricity from the generation-mix of power plants connected to the NEWNE regional grid (Now a part of synchronised single Indian Grid), which is mainly dominated by thermal/fossil fuel based power plant.

The power generated from the project activity is sold to the State Electricity Board. The details of the WTGs of the project activity is as below: -

S. N.	Project Promoters' Name	Capacity in MW	Usage	Location (State)
1	Markdata Green Energy Pvt. Ltd.	2 x 1.50 MW	Sale to EB	Madhya Pradesh
2	Markdata Green Energy Pvt. Ltd.	2 x 2.10 MW		Rajasthan
3	Siddhayu Ayurvedic Research Foundation Pvt. Ltd.[4]	1 x 2.00 MW		Madhya Pradesh
4	Markdata Green Energy Pvt. Ltd.	16 x 2.00 MW		Madhya Pradesh

The total GHG emission reduction in this monitoring period 15/06/2017 to 30/06/2019 (inclusive of both days) is 99,688 tCO_{2e}.

No major breakdowns occurred during the current monitoring period apart from the scheduled maintenance shutdowns.

A.2. Location of project activity

Country: India
State: Madhya Pradesh and Rajasthan

The location of the WTGs has been tabulated below: -

S. No.	Project Promoters' Name	Capacity in MW	Location (State)	Make	Site	District
1	Markdata Green Energy Pvt. Ltd.	2 x 1.50 MW	Madhya Pradesh	Suzlon	Mahuriya	Agar
2	Markdata Green Energy Pvt. Ltd.	2 x 2.10 MW	Rajasthan	Suzlon	Bhesada	Jaisalmer

[2] Formerly known as Markdata Advertising Private Limited hence all Purchase Orders are on this name only.
[3] The WTG was owned by Siddhayayu Ayurvedic Research Foundation Pvt Ltd. But as an internal procedure, ownership has been transferred to Markdata Green Energy Pvt. Ltd
[4] The WTG was owned by Siddhayayu Ayurvedic Research Foundation Pvt Ltd. But as an internal procedure, ownership has been transferred to Markdata Green Energy Pvt. Ltd

3	Siddhayu Ayurvedic Research Foundation Pvt. Ltd.[5]	1 x 2.00 MW	Madhya Pradesh	Inox	Nipaniya	Mandsaur
4	Markdata Green Energy Pvt. Ltd.	16 x 2.00 MW	Madhya Pradesh	Inox	Nipaniya	Mandsaur

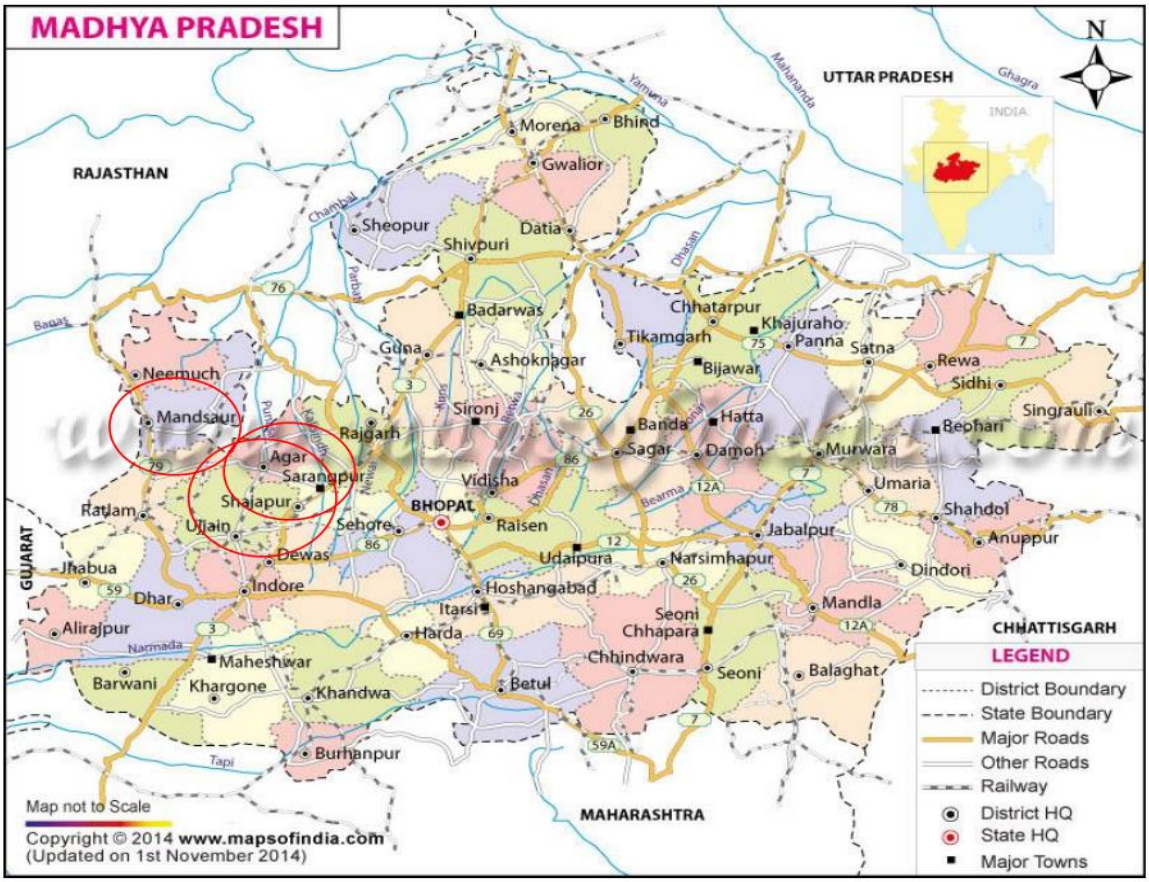
The geographical location of the WTGs has been tabulated below: -

Project Investors' Name	UID	Latitude (N)	Longitude (E)	Village	Date of Commissioning
Markdata Green Energy Pvt. Ltd.	M69	23°45'40.8"	76°08'28.32"	Karwakhedi	27/05/2014
	M84	23°44'28.32"	76°06'58.38"	Ladwan	23/06/2014
	RSA 114	26°43' 41.93"	71°27'12.51"	Madasar	30/09/2014
	RSA 115	26°44'0.6"	71°26'58.43"		
Siddhayu Ayurvedic Research Foundation Pvt. Ltd.	NPY-22	24°11'03.8544"	75°38'03.0210"	Dongarkhedi	31/03/2015
Markdata Green Energy Pvt. Ltd.	NPY_P-01	24°15'54.2664"	75°25'50.0576"	Nipaniya	20/01/2016
	NPY_P-03	24°15'30.7440"	75°27'13.8528"		
	NPY_P-13	24°15'29.5992"	75°25'11.7434"		
	NPY_P-14	24°15'29.4048"	75°26'08.5929"		
	NPY_P-15	24°15'39.5676"	75°24'53.3340"		
	NPY_P-16	24°15'59.5404"	75°25'13.5797"		
	NPY_P-20	24°16'58.7712"	75°25'16.5414"		
	NPY_P3-01	24°12'01.5012"	75°33'20.5711"		25/03/2016
	NPY_P3-42	24°09'08.5716"	75°37'20.8866"		
	NPY_P3-177	24°06'51.0120"	75°38'21.7528"		27/03/2016
	NPY_P3- 178	24°06'25.1424"	75°38'42.1692"		
	NPY-P3-170	24°08'35.0808"	75°40'09.7003"		19/03/2016
	NPY-P3- 171	24°08'27.2508"	75°37'27.2767"		
	NPY-P3-172	24°08'10.3128"	75°37'26.8402"		
	NPY-P12	24°15'01.2996"	75°25'50.2339"		

[5] The WTG was owned by Siddhayayu Ayurvedic Research Foundation Pvt Ltd. But as an internal procedure, ownership has been transferred to Markdata Green Energy Pvt. Ltd

	NPY-P61	24°14'17.0952"	75°27'36.4982"		

The location of the WTGS has been depicted in the map below: -



The location of the project activity as visible on google map is shown below.

1. The project location for WTG ID M-69

2. The project location for WTG ID M-84

3. The project location for WTG ID- RSA 114

4. The project location for WTG ID- RSA 115

5. The project location for WTG ID- NPY-22

6. The project location for 16*2 MW project activity at Nipaniya site by Markdata Green Energy Pvt. Ltd.

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)	Markdata Green Energy Pvt. Ltd. (Private Entity)	No

A.4. References to applied methodologies and standardized baselines

Title: Consolidated baseline and monitoring methodology for "Grid-connected electricity generation from renewable sources"

References: Approved consolidated baseline methodology ACM0002"Grid-connected electricity generation from renewable sources" (Version 17.0, EB 89)[6]

ACM0002 draws upon the following tools which have been used in the PDD:

- Tool to calculate the emission factor for an electricity system – Version 5.0.0, EB 87 Annex 98[7]
- Tool for the demonstration and assessment of additionality – Version 7, EB 70 Annex 89[8]

[6] https://cdm.unfccc.int/methodologies/DB/8W400U6E7LFHHYH2C4JR1RJWWO4PVN

[7] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v5.0.pdf

[8] 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	15 Jun 17 - 14 Jun 24 (Renewable)
Length of the Crediting Period	7 Years
Monitoring period from	15/06/2017 to 30/06/2019 (both days included)
Length of the Monitoring Period	746 days

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

The technology employed, converts wind energy to electrical energy. In wind power generation, energy of wind is converted into mechanical energy and subsequently into electrical energy. The technology is an environment friendly technology since there are no GHG emissions associated with the electricity generation. There is no transfer of technology involved in the project activity.

The project activity comprises a total of 21 WTG's (out of which 4 WTGs are of Suzlon Energy Limited and 17 WTGs are of Inox Wind Limited). The commissioning details of the project activity are mentioned below:

Project Investor 's Name	UID	Date of Commissioning
Markdata Green Energy Pvt. Ltd.	M69	27/05/2014
	M84	23/06/2014
	RSA 114	30/09/2014
	RSA 115	
Siddhayu Ayurvedic Research Foundation Pvt. Ltd.	NPY-22	31/03/2015
Markdata Green Energy Pvt. Ltd.	NPY_P-01	20/01/2016
	NPY_P-03	
	NPY_P-13	
	NPY_P-14	
	NPY_P-15	
	NPY_P-16	
	NPY_P-20	
	NPY_P3- 01	25/03/2016
	NPY_P3- 42	
	NPY_P3- 177	27/03/2016
	NPY_P3- 178	
	NPY-P3-170	19/03/2016
	NPY-P3- 171	
	NPY-P3-172	
	NPY-P12	
	NPY-P61	

The design lifetime of all the WTG's is 25 years.

Technical details for WT 2000 DF, 2000 KW Machine

Particulars	Details
Make	Inox
Rated power	2000 kW
Cut-in wind speed	3 m/s
Cut-out wind speed	20 m/s
Rated wind speed	11.5 m/s
Hub height	80 m
Diameter	93 m
Swept area	6,785 m2
Design Lifetime	25 years

Technical details for S82, 1500 KW Machine

Particulars	Details
Make	Suzlon
Rated power	1500kW
Cut-in wind speed	4 m/s
Cut-out wind speed	20 m/s
Rated wind speed	14 m/s
Hub height	78.5 m
Diameter	82 m
Swept area	5281.01 m^2
Design Lifetime	25 years

Technical details for S88, 2100 KW Machine

Particulars	Details
Make	Suzlon
Rated power	2100kW
Cut-in wind speed	4 m/s
Cut-out wind speed	25 m/s
Rated wind speed	14 m/s
Hub height	80 m
Diameter	88 m
Swept area	6082 m^2
Design Lifetime	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

The monitoring plan is as per the registered PDD. No temporary deviations from registered monitoring plan or applied methodology is applied standardized baseline have been applied during this monitoring period.

B.2.2. Corrections

The monitoring plan is as per registered PDD. No corrections have been applied during this monitoring period, neither to any previous monitoring period.

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

As visible on the UN page, there has been no change to the start date of the crediting period of the project activity which is from 15/06/2017 to 14/06/2024[9].

B.2.4. Inclusion of monitoring plan

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

The registered monitoring plan and applied methodology are as per the registered PDD only. No permanent Changes have been made subsequently.

B.2.6. Changes to project design

The project design is as per the registered PDD only. No permanent Changes have been made subsequently.

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

Not Applicable as the project activity is not an afforestation or reforestation project 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 a grid-connected wind power project being implemented in Madhya Pradesh and Rajasthan 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.

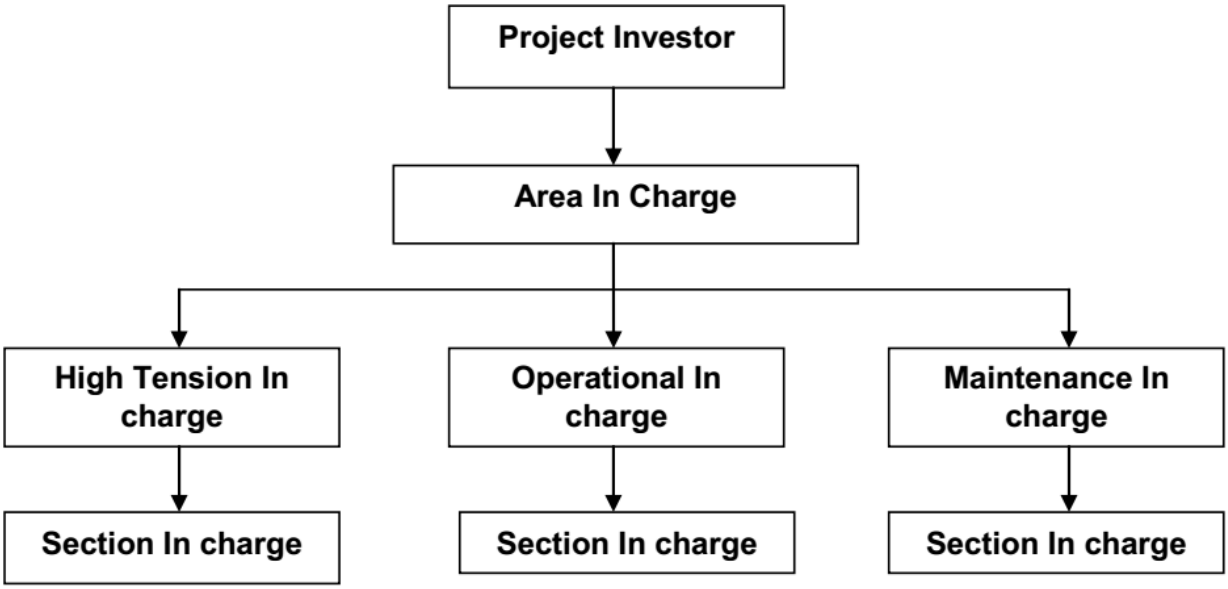
Monitoring Plan for Wind Power Project in Madhya Pradesh

Organisational Structure for data recording and monitoring

A detailed description of metering measurements methods procedures to be applied to the project activity favouring Madhya Pradesh-site.

The organizational hierarchy of Project Investor & Project management entity is as follows:

[9] https://cdm.unfccc.int/Projects/DB/Applus1497437593.14/view



Monitoring Plan:

QA/QC Procedures:
The main and backup meter installed at connected substations for monitoring of the project activity are electronic tri-vector energy meters of 0.2 accuracy class. Each meter is jointly inspected and sealed on behalf of project investor and MPPKVVCL, in the presence of its authorised representatives. All main and backup meter are calibrated once in 5 years by MPPKVVCL or its representatives.

Description of calibration
The controller used for the WTGs is an SCS Controller is a micro-processor based intelligent controller which has been specially designed for control of wind turbines. It uses a Woodward Multifunction Relay that has three current inputs from CT and three direct voltage inputs (690 Volts). The analog values of current / voltage is converted into digital signal internally using A/D Converters at very high sampling rate. A software program reads these values and displays instantaneous parameters such as voltage, current, power factor, kVAh, kVArh and kWh. These instantaneous values are then time integrated and displayed / stored. Woodward relay is having no display and needs special protocol to view energy readings as this relay is communicating digital signal through special communication protocol. Moreover, turbine cannot run without this relay hence it cannot be removed for calibration, hence, it is not possible to calibrate.

Data Management and Data Archiving:
Copies of the break-up sheet, invoices raised to Discom and sales receipts are retained and archived for the entire crediting period plus two years by the project investor.

Procedures for Data Adjustments/Uncertainties:
Data uncertainty in the project activity monitoring could occur under the following circumstances:

1. During the monthly joint meter reading at connected substations, the reading of the main meter and backup meter are cross checked to ensure that the meters are working within the permissible limit. If during the cross checking the reading is found to be outside the permissible limit of accuracy, then calibration is done to identify the meter with the error and the faulty meter is replaced immediately. The meter reading for that month is to be taken from the correct meter.
2. During the monthly joint meter reading at the connected substations, if the display defect is in the main meter then in that case the backup meter reading are considered for the purpose of preparation of the break-up sheet and billing purpose. Defective main meter will be replaced immediately.

3. During the monthly joint meter reading at the connected substation, if the display defect is in the check meter than in that case the main meter reading are considered for the purpose of preparation of the break-up sheet and billing purpose. Defective check meter will be replaced immediately.
4. If during the calibration of the meters at the connected substations, the main meter is found to be outside the permissible limit of accuracy and if the main meter reading have been used to prepare the break-up sheet, then the identified error would be applied to all the measured value since the date of last calibration. Further the main meter would be replaced immediate.
5. If during the calibration of the meters the connected substations, the check meter is found to be outside the permissible limit of accuracy and if the check meter reading have been used to prepare the break-up sheet, then the identified error would be applied to all the measured value since the date of last calibration. Further the check meter would be replaced immediate.

Procedure for data apportioning:
There is a common metering facility at the 132 kV substation at Agar, wherein WTGs of other project promoters are also connected along with WTGs covered under this project activity. Therefore, net electricity supplied to substation by all the WTGs connected to the feeder has to be apportioned between all promoters on the basis of electricity generation of individual WTG at the controller, so as to account for contribution of individual promoters of WTGs. Apportioning of the net electricity supplied to NEWNE grid by all the WTGs connected to the feeder between all promoters is done by the technology supplier. The various WTGs in the site are connected to feeders by which the power is exported to nearest substation. The summation of all the WTG meter reading at the controller of each WTG gives the gross amount of electricity generated in the windfarm (EGy, gross). The power generated by individual WTGs is recorded at the central monitoring system (CMS). The summation of power generated at the controller of WTGs owned by the project participant gives the amount of power exported by the project activity to the substation. The main billing meter at substation records total export (EGy exp), and total import (EGy imp) by all the connected WTGs in the windfarm. Apportioning of net electricity generation from each WTG located at Madhya Pradesh is determined is as follows: The apportioning of the electricity is the responsibility of the State Utility. The sample apportioning procedure adopted for any given WTG for any given month is given below:

Generation Ratio at metering point (132 kV level GSS): The generation ratio is the ratio of electricity generated by installed WTG of PP to the total generation by all the connected WTGs to the applicable metering point.

$$G_{R,\text{ metering point}} = EG_{\text{Controller, WTG}} / EG_{\text{Controller, metering point}} \quad \text{(a)}$$

Where,
$G_{R,\text{ metering point}}$: Generation Ratio at metering point
$EG_{\text{Controller, WTG}}$: Electricity generated by installed WTG of PP connected to the applicable metering point
$EG_{\text{Controller, metering point}}$: Total generation by all the connected WTGs to the applicable metering point

Calculation of net electricity exported at applicable metering point:
The Main and Check meters at the applicable metering point measure a number of parameters including export and import for all the connected WTGs.
The import, kWh by the WTG at the metering point is calculated in the following manner:

$$EG_{\text{Import, metering point}} = G_{R,\text{ metering point}} \times EG_{\text{Total Import, metering point}} \quad \text{(b)}$$

Where,
$EG_{\text{Import, metering point}}$: Import, kWh by the WTG at the metering point
$G_{R,\text{ metering point}}$: Generation Ratio at metering point
$EG_{\text{Total Import, metering point}}$: Total Import, kWh by all the WTGs at the metering point

The export, kWh by the WTG at the metering point is calculated in the following manner:

$$EG_{Export,\ metering\ point} = G_{R,\ metering\ point} \times EG_{Total\ Export,\ metering\ point} \quad (c)$$

Where,
$EG_{Export,\ metering\ point}$: Export, kWh by the WTG at the metering point
$G_{R,\ metering\ point}$: Generation Ratio at metering point
$EG_{Total\ Export,\ metering\ point}$: Total Export, kWh by all the WTGs at the metering point

The net electricity exported by the WTG at the 132 kV/220 kV level metering point is calculated by subtracting equation (b) from (c).

Thus, the net electricity exported at 33 kV/220 kV level metering point:

$$= EG_{Export,\ metering\ point} - EG_{Import,\ metering\ point} \quad (d)$$

Transmission Loss Calculation:
The total transmission loss occurred during export of the electricity between the 33/220 kV level pooling station & 132 kV level common delivery point is calculated as the difference between total aggregated reading of export for all metering points at 33/220 kV level and the total reading of export for same metering points recorded at the 132 kV level. Similarly transmission loss occurred during import of the electricity is also calculated.

The PP/WTG wise transmission loss during export & import is calculated by multiplying the values of arrived transmission loss for export & import for wind farm with the Generation Ratio at common delivery point.

Generation Ratio at common delivery point:
It is the ratio of electricity generated by installed WTG to the total generation by all the connected WTGs/ or connected metering points under common delivery point.

$$G_{R,\ Common\ Delivery\ Point} = EG_{Controller,\ WTG} / EG_{Controller,\ Common\ Delivery\ Point} \quad (e)$$

Where,
$G_{R,\ Common\ Delivery\ Point}$: EG Controller, Common Delivery Point
$EG_{Controller,\ WTG}$: Electricity generated by installed WTG
$EG_{Controller,\ Common\ Delivery\ Point}$: Total generation by all the connected WTGs/ or connected metering points under common delivery point

Calculation of net electricity delivered to the Grid:
The values of transmission loss during export & import for the given WTG are subtracted from $EG_{Export,\ metering\ point}$ & $EG_{Import,\ metering\ point}$ respectively to get the values of export and import respectively for the given month.

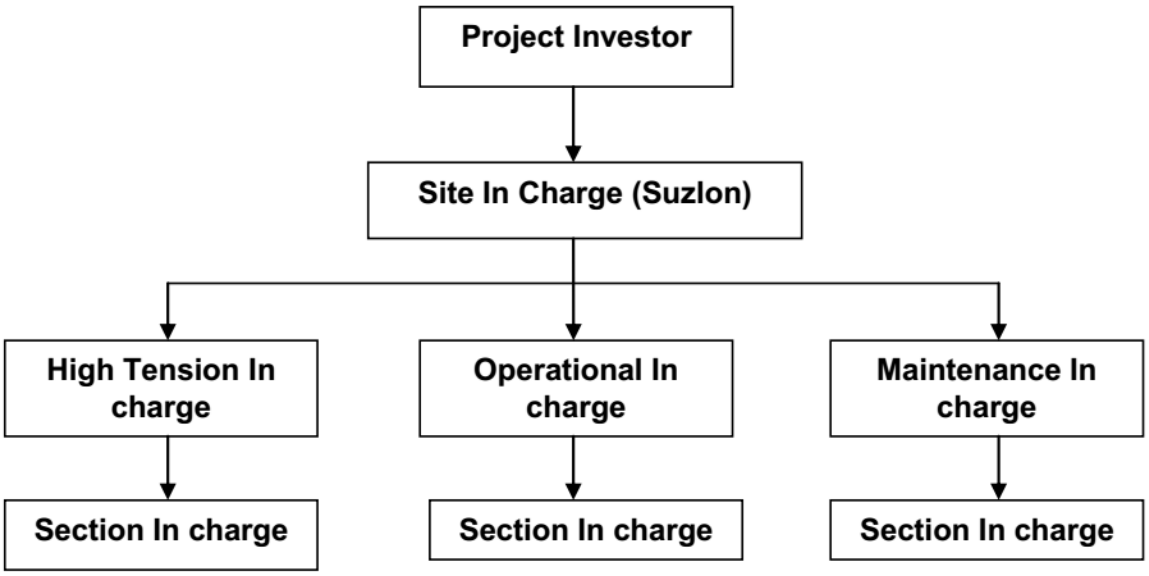
The net electricity delivered to the Grid by the given WTG for the given month (net export kWh) is then obtained by subtracting import from export.
Thus,

Net Electricity = Export – Import **(f)**

These apportioned values viz., import, export and net export kWh can be referred from the Monthly Break up of net export units report.
It is to be noted that the procedure of apportioning is under purview of state electricity board and PP do not have any control on it. Thus PP got the monthly value of net electricity supplied to grid and same parameter is mentioned as monitoring parameter. Also the accuracy class of meters and meter calibration frequency is also under purview of state electricity board.

Monitoring Plan for Rajasthan

Roles & Responsibility Structure: The monitoring plan is developed in accordance with the modalities and procedures for CDM project activities and is proposed for wind power project being implemented in Rajasthan, India. The monitoring plan has been 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 equipments for this project activity. The team comprises of the following members:



PP has assigned the responsibility of operation and maintenance of WTGs to Suzlon Wind Ltd. The Plant In-charge and Shift In-Charge are deployed by Suzlon Wind Ltd.

Monitoring Requirements

The monitoring plan includes monitoring of energy parameters such as net energy export to the regional grid. Emission reductions resulted from the project activity has been calculated based on the net energy exported to the grid. Sales records are used and kept for checking the consistency of the recorded data.

Project participant calibrates the meter at-least once in 5 year. For the WTGs in project activity, the monthly reading is taken from the meter at substation by state utility and representative of PP. This reading gives the net electricity exported to the grid by all WTGs connected to the substation.

The WTGs of other owners are also connected to the substation. The apportioning is not under the control of PP and generation report forms the basis of emission reductions calculations.

The baseline emission factor is fixed ex-ante for all the years of the crediting period using the official data published by the Central Electricity Authority for the NEWNE grid and hence is not included in the monitoring procedures.

QA/QC procedures:

The energy meters at the NEWNE Grid are maintained and owned by RVPNL/ JdVVNL. Invoice raised by the project participant to the power purchaser against net power export to the grid can be used for cross checking the measured data. The main and check meters will be of accuracy class 0.2S. Each meter is jointly inspected and sealed on behalf of project investor and respective State

Electricity Board, in the presence of its authorised representatives and shall be calibrated at least once in five years.

Description of calibration of WTG Controller
The controller used for the WTGs which is an SCS Controller is a micro-processor based intelligent controller which has been specially designed for control of wind turbines. It uses a Woodward Multi-function Relay that has three current inputs from CT and three direct voltage inputs (690 Volts). The analog values of current/ voltage is converted into digital signal internally using A/D Converters at very high sampling rate. A software program reads these values and displays instantaneous parameters such as voltage, current, power factor, kVAh, kVArh and kWh. These instantaneous values are then time integrated and displayed / stored. Woodward relay is having no display and needs special protocol to view energy readings as this relay is communicating digital signal through special communication protocol. Moreover, turbine cannot run without this relay hence it cannot be removed for calibration, hence, it is not possible to calibrate.

Data Management and Data Archiving:
Copies of the break-up sheet, invoices raised on Discom and sales receipts will be retained and archived for the entire crediting period plus two years by the project participant.

Training and maintenance requirements:

Training on the machine is an essential pre-requisite, to ensure necessary safety of man and machine. Further, in order to maximize the output from the WTGs, it is extremely essential, that the engineers and technicians understand the machines and keep them in good health. In order to ensure, that O&M team is deft at handling technical snags on top of the turbine, the necessity of ensuring that they are capable of climbing the tower with absolute ease and comfort has been established. Each and every site personnel is provided with proper training to meet the requirements of the Operations and maintenance. This ultimately leads to creativity in problem solving. The project activity will not result in any unidentified activity that can result in substantial emissions from the project activity. However, in case monitoring equipment's get failed or found faulty, they shall be replaced with calibrated meters as quickly as possible. In case main meter get failed or found faulty, the reading of check meter will be considered.

Apportioning Procedure: There is a common metering facility at the Akal substation wherein WTGs of other project promoters are also connected along with WTGs covered under this project activity. Therefore, net electricity supplied to substation by all the WTGs connected to the feeder has to be apportioned between all promoters on the basis of electricity generation of individual WTG at the controller, so as to account for contribution of individual promoters of WTGs. Apportioning of the net electricity supplied to NEWNE grid by all the WTGs connected to the feeder between all promoters is done by the technology supplier, Suzlon Energy Ltd. The various WTGs in the site are connected to feeders by which the power is exported to nearest substation. The summation of all the WTG meter reading at the controller of each WTG gives the gross amount of electricity generated in the windfarm (EGy, gross). The power generated by individual WTGs is recorded at the central monitoring system (CMS). The summation of power generated at the controller of WTGs owned by the project participant gives the amount of power exported by the project activity to the feeder (EGp generated). The main billing meter at substation records total export (EGy exp) and total import (EGy imp) by all the connected WTGs in the windfarm. The electricity export & import by WTGs of project activity is then calculated by using the following formulae as given below.

EGfacility,y = EGp export - EGp import

Where, Total Electricity exported by Project activity EGp export = (EGp generated /EGy gross)*(EGy exp) Total Electricity imported by Project activity EGp import = (EGp generated /EGy gross)*(EGy imp) EGp generated, Total electricity generated by the project activity. The electricity generated at each individual WTG is measured using an integrated electronic meter which

monitors the data. The total electricity generated is obtained by adding individual meter values from CMS controller. The data is also recorded and archived electronically by O&M service provider on a monthly basis. EGy gross, Total electricity generated by all the WTGs (including WTGs of other project promoters, if any) connected to the substation. It is measured using the CMS controller at each WTG which monitor the data. The total electricity generated is obtained by adding individual meter values. EGy exp, Total export by all WTGs (including WTGs of other project promoters) connected at the substation. The electricity exported to the substation is measured by electronic meters at the substation end. These readings are recorded every month by DISCOM representative and the joint meter reading is submitted to Suzlon Ltd. EGy imp, Total import by all WTGs connected to the sub-station. The electricity imported from the grid by all the machines connected to the sub-station is measured by electronic meters at the substation feeder. These readings are recorded every month by DISCOM representative and the joint meter reading is submitted to Suzlon Wind Ltd. There is a separate meter installed for the WTGs of PP. This meter is used for the cross checking of meter reading by the DISCOM on a random basis. This meter is not under the control of the PP. Based on the apportioned meter readings, PP raises invoice to the RDPPC. The Jodhpur DICOM provides the provisional captive adjustment of energy delivered by the wind farm project on a monthly basis which is the basis of the net electricity calculated for the emission reductions. The meter used for recording the electricity generation in each WTG is of integrator type. The meter is placed at the controller panel of each WTG. The electricity generated from WTG is recorded on daily basis, once in 24 Hrs. The data will be captured by officials of O&M contractor electronically and submitted to the project participant in the form of a daily as well as a monthly report. The actual data of electricity generation from the WTG can be electronically stored in the individual meters cumulatively. Continuous monitoring, hourly measurement and monthly recording of data is carried out.

Net electricity supplied to grid is calculated as the difference of the measured values of “export” and “import” on the Trivector meter at the delivery point (i.e. the connected substation), where monthly joint meter reading is taken and certified by the representatives of O&M contractor and RRVPNL. The electricity exported and imported is noted and recorded monthly from the main and backup meters. The main and backup meters records the electricity exported and imported by all wind Turbine generators (WTGs) connected to it. Apportioning of net electricity supplied to grid by each WTG or group of WTGs with respect to their owner, is done by O&M contractor and based on the individual meter readings recorded from the controller panel meter of each WTG and based on the meter reading recorded from the meters situated at the connected substations. A break-up sheet is prepared by O&M contractor which contains the quantity of electricity exported and imported from all the WTGs pertaining to the each project owners. The data reported in the breakup sheet would be based on the controller generation readings of all WTGs of the wind farm and the joint meter readings by O&M contractor and RRVPNL. The apportioning procedure for arriving at the net electricity supplied to the grid by WTG(s) pertaining to the each project owners (as indicated in the break-up sheet) is under the control of O&M contractor. Subsequently the break-up sheet is submitted to each project owners by O&M contractor. The break-up sheets are also submitted to the state authority which in turn sends a credit report to the individual PP. On receipt of the break-up sheet, the project owner raises the invoice/bill and submits to concern Discom for release of payments. Cross checking of the measured value, as indicated in the break-up sheet, is done with records of sales receipts.

The net electricity supplied by the project activity to the grid, as indicated in the break-up sheet prepared by O&M contractor, will be used to calculate actual GHG emission reductions by the proposed CDM project activity.

Above steps for apportioning of electricity amongst the individual investors are controlled and conducted by RVPNL and the Project participant has no role in the entire procedure of apportioning.

Procedure for data apportioning:
In the event when verification period dates and billing cycle of WTGs in the project activity, do not

coincide:

Each WTG is equipped with the integrated electronic meter i.e. controller, which shows reading & the same has been recorded manually daily in Manual Log Books / which are connected to Central Monitoring System (CMS, the system continuously monitors the generation from each WTG. A daily consolidated report of the generation data is generated in the form of 'Daily Performance Report' and recorded in electronic as well as printed form.)

In the event when the individual verification period dates and billing cycle dates of the various WTGs in the project activity do not coincide, then the monitoring procedure is as below: -

X	Sum of generation during partial days of the month recorded at controller meter (kwh) source – Electronic / Manual Log Book
Y	Total generation during the month recorded at controller meter (kwh/month)
Z = X/ Y	Ratio
B	Net Energy export by the WTG as per RVPNL Monthly Report on Generation and Consumption
Z*B	Generation of partial days for calculating emission reduction (kwh)

$$EG_{BL,y} = EG_{controller} \text{ X Total } (EG_{export} - EG_{import}) \Big/ EG_{controller,\ total}$$

Where,
$EG_{BL,y}$ = Quantity of net electricity supplied to the grid from the projectactivity
Total (EG_{export} - EG_{import}) = Total net export value of all WTG's connected to feeder
$EG_{controller}$ = Controller generation at individual WTG
EG_{import} = Total import at feeder
EG_{export} = Total export at feeder
$EG_{controller,\ total}$ = Total controller generation of all WTG's connected on a feeder

QA & QC Procedures to be followed
Necessary check meters as required would be installed, to operate in standby mode or when the main meters are not working. All meters are calibrated at least once in five year. Records of calibration certificates will be maintained for verification. Hence, high quality is ensured with the above parameters.

Data Recording and Storage
For measuring the net energy exported by the project at the interconnection point, one set of Main meter and Check Meter has been provided by the project Participant. Representatives of both project participant and State Utility will be present to record the monthly meter readings. The state utility will prepare the credit report for the net energy exported to the grid and same will be used as a basic document for monitoring and verification of the net energy exported to the grid. Based on the monthly credit report, the PP shall raise an invoice to the utility. Utility will pay to the project participant based on this document.

The above document will be kept at safe storage for verification of emission reductions generated from the project activity. The period of data storage will be 2 years beyond crediting period.

Emergency preparedness
The project activity will not result in any unidentified activity that can result in substantial emissions from the project activity. However, in case monitoring equipments get failed or found faulty, they shall be replaced with calibrated meters as quickly as possible. In case main meter get failed or

found faulty, the reading of check meter will be considered.

Personnel training
In order to ensure a proper functioning of the project activity and a properly monitoring of emission reductions, the staff has been well trained. The Shift In-charge and Plant In-charge have been trained in equipment operation, data recording, operation and maintenance and emergency procedures in compliance with the monitoring plant.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

Data/Parameter	$EF_{grid,OM,y}$
Unit	tCO2/MWh
Description	Operating Margin CO2 emission factor in year y
Source of data	Calculated from CEA database, Version 10, December 2014[10]
Value(s) applied	0.9862
Choice of data or measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 05.0.0" as 3-year generation weighted average using data for the years 2011-2012, 2012-2013, & 2013-2014. The data are obtained from "CO2 Baseline Database for Indian Power Sector" version 10.0, Dec14, 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	tCO2/MWh
Description	Build Margin CO2 emission factor in year y
Source of data	Calculated from CEA database, Version 10, December 2014[11]
Value(s) applied	0.9495
Choice of data or measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 05.0.0" for the year 2013-2014. The data is obtained from "CO2 Baseline Database for Indian Power Sector" version 10.0, Dec 2014, 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	tCO2/MWh
Description	Combined Margin CO2 emission factor in year y
Source of data	Calculated from CEA database, Version 10, December 2014[12]
Value(s) applied	0.9770

[10] http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver10.pdf

[11] http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver10.pdf

[12] http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver10.pdf

Choice of data or measurement methods and procedures	Calculated as per "Tool to calculate the emission factor for an electricity system, version 05.0.0". The data is obtained from "CO2 Baseline Database for Indian Power Sector" version 10.0, Dec 2014, 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.

D.2. Data and parameters monitored

Data/Parameter	$EG_{,MP,y}$
Unit	MWh
Description	Quantity of net electricity supplied (MWh) to the grid as a result of the implementation of the CDM project activity in year *y* in Madhya Pradesh
Measured/calculated/ default	Measured
Source of data	Credit Report as per Monthly Generation Report
Value(s) of monitored parameter	88,989.82
Monitoring equipment	Energy Meters are used for monitoring
Measuring/reading/recording frequency	Data Type: Measured Monitoring equipment: Energy Meters are used for monitoring Recording Frequency: Continuous monitoring and Monthly recording from Energy Meters, Summarized Annually Archiving Policy: Paper & Electronic Calibration frequency: Once in five year
Calculation method (if applicable)	Electricity exported/imported to the grid is in kWh. However for the calculation purpose electricity exported is converted in MWh. The Net electricity supplied to the grid by the project activity will be calculated as a difference of electricity exported to the grid, electricity imported from the grid obtained from joint meter reading certificates/credit notes issued by MPPKVVNL as per below equation: $EG_{facility,y}=EG_{Export} - EG_{Import}$ The joint reading at metering point is carried out once in a month in presence of O&M officials and MPPKVVNL and the PP has no role in the apportioning and net energy calculations. Cross Checking: Quantity of net electricity supplied to the grid will be cross checked from the invoices raised by the project participant to the State Electricity Board.

QA/QC procedures	The energy meters used are trivector meters which are of accuracy class 0.2. The meters are monitored continuously & cumulative readings are taken at the end of the month by joint meter reading procedure. These are sealed by MPVVNL to avoid malfunctioning with meter readings. The officials frequently check the meters for tampering and malfunctioning with the meters. Meter is calibrated once in 5 years[13] by the authority in the presence of O&M Contractor / investors representatives and MPVVNL officials to ensure the working of meter within permissible limits. The calculation of net electricity supplied to grid is under purview of state electricity board and PP do not have control on it. The available parameter to PP is net electricity supplied to grid and same is mentioned as monitoring parameter.
Purpose of data/parameter	The Data/Parameter is required to calculate the baseline emission
Additional comments	Data will be archived electronically for a period of 2 years beyond the end of crediting period.

Data/Parameter	$EG_{,RJ,y}$
Unit	MWh
Description	Quantity of net electricity supplied (MWh) to the grid as a result of the implementation of the CDM project activity in year *y* in Rajasthan
Measured/calculated/ default	Measured
Source of data	Joint Energy Meter Reading Report
Value(s) of monitored parameter	13,045.36
Monitoring equipment	Energy Meters are used for monitoring
Measuring/reading/recording frequency	Data Type: Measured Monitoring equipment: Energy Meters are used for monitoring Recording Frequency: Continuous monitoring and Monthly recording from Energy Meters, Summarized Annually Archiving Policy: Paper & Electronic Calibration frequency: once in five years Electricity exported/imported to the grid is in kWh. However for the calculation purpose electricity exported is converted in MWh.
Calculation method (if applicable)	The Net electricity supplied to the grid by the project activity is calculated as a difference of electricity exported to the grid, electricity imported from the grid obtained from joint meter reading certificates/credit notes issued by RRVPNL as per below equation: $EG_{facility,y} = EG_{Export} - EG_{Import}$ The joint reading at metering point is carried out once in a month in presence of O&M officials and RRVPNL and the PP has no role in the apportioning and net energy calculations. Cross Checking: Quantity of net electricity supplied to the grid has been cross checked from the invoices raised by the project participant to the State Electricity Board.

[13] http://www.aegcl.co.in/Metering_Regulations_Of_CEA_17_03_2006.pdf page 12

QA/QC procedures	The energy meters used are trivector meters which are of accuracy class 0.2. The meters are monitored continuously & cumulative readings are taken at the end of the month by joint meter reading procedure. These are sealed by RRVPNL to avoid malfunctioning with meter readings. The officials frequently check the meters for tampering and malfunctioning with the meters. Meter is calibrated once in 5 years[14] by the authority in the presence of O&M Contractor / investors representatives and RRVPNL officials to ensure the working of meter within permissible limits. In case of any failure in the main meter, the invoice is raised to RRVVNL based on the check meter readings. Also, the main meter will be replaced immediately with the calibrated back up meter.
Purpose of data/parameter	The Data/Parameter is required to calculate the baseline emission
Additional comments	Data will be archived electronically for a period of 2 years beyond the end of crediting period.

D.3. Implementation of sampling plan

Sampling is not required for the given project activity.

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

$$ER_y = BE_y - Pe_y - LE_y$$

Where,
ER_y = Emission Reduction in tCO_2/year
BE_y = Baseline emission in tCO_2/year
PE_y = Project emissions in tCO_2/year
LE_y = Leakage Emissions in tCO_2/year

Baseline Emission (BE_Y)
The baseline emissions are the product of electrical energy baseline $EG_{facility,y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by an emission factor.

$$BE_Y = EG_{facility,y} * EF_{grid,CM,y}$$

Where,
$EG_{facility,y}$ = Total quantity of net electricity delivered to the NEWNE grid (now Indian Grid)
$= EG_{,MP,y} + EG_{,RJ,y}$
= 88,989.82 + 13,045.36 = 102,035.18 MWh

$EF_{grid,CM,y}$= Baseline emission factor = 0.9770 tCO_2/MWh

Hence, BE_y = 102,035.18 * 0.9770
= 99,688 tCO2e (Rounded Down figure)

[14] http://www.aegcl.co.in/Metering_Regulations_Of_CEA_17_03_2006.pdf , page 12

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

For most renewable power generation projects activities PEy =0. As per applied methodology, only emission associated with the fossil fuel combustion, emission from operation of geo-thermal power plants due to release of non-condensable gases, emission from water reservoir of Hydro should be accounted for the project emission. Since the project activity is a wind power project, PEy = 0.

E.3. Calculation of leakage emissions

No Leakage emissions are considered. The main emission potentially giving rise to leakage in the context of electrical sector projects is emission arising due to activities arising such as power plant construction and upstream emission from fossil fuel use (e.g. extraction, processing, and transport). These emission sources are neglected, LEy = 0.

Emission reduction (ER_y): The project activity mainly reduces carbon dioxide through substitution of grid electricity generation with fossil fuel fired power plant by renewable electricity. The emission reduction ER_y by the project activity during a given year y is the difference between Baseline emission and Project emission & Leakage emission.

$ERy = BEy - PEy - LEy$

Where,
ER_y = Emission Reduction in tCO_2/year
BE_y = Baseline emission in tCO_2/year
PE_y = Project emissions in tCO_2/year
LE_y = Leakage Emissions in tCO_2/year

$PE_y = LE_y = 0$
Thus,
$ER_y = BE_y - PE_y – LE_y$

$ER_y = BE_y - 0 – 0$

$ER_y = BE_y$

Therefore,

$ER_y = BE_y =$ 99,688 tCO_{2e}

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	99,688	0	0	0	99,688	99,688

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 for this monitoring period in the PDD (t CO_2e)
144,869	99,688

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

As per the registered PDD of the project activity, the estimated amount of ex ante emission reduction for an year, that is, for 365 days is 70,881 tCO2e. The no. of days in current monitoring period from 15/06/2017 to 30/06/2019 comes out to be 746 days. Hence, by applying unitary method, the estimated amount of emission reductions for the current monitoring period determined ex antes can be calculated as below: -
= (70881 * 746) / 365
= 144,869 tCO2e
The amount of emission reductions estimated ex ante for this monitoring period (15/06/2017 to 30/06/2019) comes out to be 144,869 tCO2e.

E.6. Remarks on increase in achieved emission reductions

The estimated annual emission reductions in the registered PDD for the monitoring period are 144,869 tCO2e. The actual emission reductions are 99,688 tCO2e, which is less than the estimated emission reduction by 31.19%. The reason for this is low wind season during the monitoring period, which is beyond the control of the Project Proponent.

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

Not applicable as the project activity is a large-scale project activity.

- - - - -

Document information

Version	*Date*	*Description*
07.0	31 May 2019	Revision to: • 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: • 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).

Version	*Date*	*Description*
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