



Monitoring report form for CDM project activity
(Version 06.0)

MONITORING REPORT

Title of the project activity	Vaayu India Wind Power Project in Tamilnadu	
UNFCCC reference number of the project activity	4930	
Version number of the PDD applicable to this monitoring report	Version 06, dated 28/12/2015	
Version number of this monitoring report	01	
Completion date of this monitoring report	25/01/2018	
Monitoring period number	6 th Monitoring Period.	
Duration of this monitoring period	12/02/2016 to 02/01/2018 (both days inclusive)	
Monitoring report number for this monitoring report	NA	
Project participants	Vaayu (India) Power Corporation Private Limited ¹ ACT Commodities B.V. First Climate Markets A.G.	
Host Party	India	
Sectoral scopes	Sectoral scope 1: Energy Industries (Renewable - /non-renewable sources).	
Applied methodologies and standardized baselines	"Consolidated baseline methodology for grid-connected electricity generation from renewable sources" Reference: Approved consolidated baseline methodology ACM0002 (Version 12.1.0, EB 58)	
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	134,139 tCO ₂
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	191,043 tCO ₂	

¹ PP would like to clarify that 19 WTGs of the bundle had undergone name change from "Vaayu (India) Power Corporation Pvt. Ltd." to "Vaayu renewable energy Godavari Pvt. Ltd." w.e.f March 2016. Thus, there is no change in project design or capacity but JMRs & invoices for those machines are generated with the new names. Please ref to the section B.1. for the details of the name transferred machines.

SECTION A. Description of project activity

A.1. General description of project activity

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The purpose of the project activity is to utilize renewable wind energy for generation of electricity. The project activity replaces anthropogenic emissions of greenhouse gases (GHG's) into the atmosphere by displacing the equivalent amount of electricity generation through the operation of existing fuel mix in the grid comprising mainly fossil fuel based power plants and future capacity expansions connected to the grid. In the absence of the project activity the equivalent amount of electricity would have been generated from the connected/ new power plants in the Southern grid, which are predominantly based on fossil fuels. Whereas the electricity generation from operation of Wind Energy Convertors (WEC's) is emission, free.

The project activity involves supply, erection, commissioning and operation of 63 machines of rated capacity 800 kW each. The machines are Enercon E-53 make. The WECs under the project activity were commissioned between 29/09/2010 and 11/07/2011. The expected operational lifetime of the project is for 20 years.

The total emission reductions achieved under this monitoring period from 12/02/2016 to 02/01/2018 (including first and last day) are 134,139 tCO₂.

A.2. Location of project activity

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(a) Host Party (ies);

India

(b) Region/ State/ Province, etc.;

Tamilnadu State in India

(c) City/ Town/ Community, etc.;

Vagaikulam, Kuruchikulam, Ettankulam, Kalakudi, Muthammalpuram, Ukkirankottai villages in Tirunelveli district State of Tamilnadu.

(d) Physical/ Geographical location

The project area extends between latitude 8° 52' 12.368" and 8° 56' 6.770" North and longitude 77° 35' 0.824" and 77° 37' 9.822" East. Tirunelveli railway station is about 25 kms away from the site. Nearest airport is at Tuticorin about 70 kms from the site. The details of the geo-coordinates of individual machines have been given below:

S No.	Location Number	Village	Latitude	Longitude
1	7	KURUCHIKULAM	8° 53' 26.985" N	77° 35' 43.461" E
2	8	KURUCHIKULAM	8° 53' 18.435" N	77° 35' 51.873" E
3	146	VAGAIKULAM	8° 55' 58.299" N	77° 37' 54.634" E
4	147	KALAKUDI	8° 56' 23.880" N	77° 37' 48.373" E
5	149	VAGAIKULAM	8° 55' 38.340" N	77° 37' 38.952" E

S No.	Location Number	Village	Latitude	Longitude
6	150	VAGAIKULAM	8° 55' 37.857" N	77° 37' 24.555" E
7	151	VAGAIKULAM	8° 55' 47.538" N	77° 37' 26.390" E
8	153	VAGAIKULAM	8° 55' 37.857" N	77° 37' 24.555" E
9	154	VAGAIKULAM	8° 56' 37.357" N	77° 37' 19.517" E
10	155	VAGAIKULAM	8° 56' 19.107" N	77° 37' 15.101" E
11	156	VAGAIKULAM	8° 55' 55.775" N	77° 37' 11.630" E
12	157	VAGAIKULAM	8° 55' 42.415" N	77° 37' 10.193" E
13	158	VAGAIKULAM	8° 55' 48.057" N	77° 36' 59.013" E
14	159	MUTHAMMALPURAM	8° 56' 33.966" N	77° 37' 6.832" E
15	160	MUTHAMMALPURAM	8° 56' 28.029" N	77° 36' 55.438" E
16	163	VAGAIKULAM	8° 56' 11.019" N	77° 36' 36.636" E
17	165	UKKIRANKOTTAI	8° 56' 12.215" N	77° 36' 19.240" E
18	167	KALAKUDI	8° 55' 8.373" N	77° 36' 58.664" E
19	179	VAGAIKULAM	8° 56' 45.130" N	77° 37' 33.509" E
20	180	VAGAIKULAM	8° 56' 6.770" N	77° 37' 11.676" E
21	181	VAGAIKULAM	8° 56' 3.605" N	77° 36' 54.544" E
22	V48	KURUCHIKULAM	8° 53' 6.300" N	77° 35' 0.824" E
23	V49	KURUCHIKULAM	8° 52' 57.577" N	77° 35' 10.805" E
24	V51	KURUCHIKULAM	8° 52' 40.412" N	77° 35' 9.180" E
25	V58	KURUCHIKULAM	8° 53' 30.146" N	77° 35' 9.922" E
26	V59	KURUCHIKULAM	8° 53' 22.443" N	77° 35' 13.695" E
27	V60	KURUCHIKULAM	8° 53' 10.091" N	77° 35' 16.977" E
28	V63	KURUCHIKULAM	8° 52' 34.838" N	77° 35' 29.519" E
29	V72	KURUCHIKULAM	8° 53' 12.156" N	77° 35' 33.445" E
30	V73	KURUCHIKULAM	8° 53' 2.788" N	77° 35' 33.248" E
31	V74	KURUCHIKULAM	8° 52' 53.993" N	77° 35' 34.953" E
32	V90	KALAKUDI	8° 52' 44.966" N	77° 36' 14.566" E
33	V94	KALAKUDI	8° 52' 22.001" N	77° 36' 14.274" E
34	V100	KALAKUDI	8° 52' 58.118" N	77° 36' 31.636" E
35	V101	KALAKUDI	8° 52' 48.402" N	77° 36' 30.161" E
36	V104	KALAKUDI	8° 52' 20.945" N	77° 36' 35.036" E
37	V105	KALAKUDI	8° 52' 12.502" N	77° 36' 32.883" E
38	V106	KALAKUDI	8° 52' 2.346" N	77° 36' 33.826" E
39	V107	KALAKUDI	8° 53' 21.734" N	77° 36' 59.574" E
40	V108	KALAKUDI	8° 53' 8.659" N	77° 36' 45.416" E
41	V109	KALAKUDI	8° 53' 0.568" N	77° 36' 44.148" E
42	V110	KALAKUDI	8° 52' 51.507" N	77° 36' 46.537" E
43	V114	ETTANKULAM	8° 52' 12.368" N	77° 36' 51.919" E
44	V116	KALAKUDI	8° 53' 12.200" N	77° 37' 22.992" E
45	V119	KALAKUDI	8° 53' 5.291" N	77° 37' 1.747" E
46	V120	KALAKUDI	8° 52' 54.106" N	77° 37' 5.527" E
47	V123	VAGAIKULAM	8° 54' 1.042" N	77° 37' 7.115" E
48	V125	KALAKUDI	8° 53' 20.931" N	77° 37' 25.769" E
49	V127	KALAKUDI	8° 53' 32.234" N	77° 37' 9.822" E
50	V129	KALAKUDI	8° 53' 21.809" N	77° 37' 11.906" E
51	V130	KALAKUDI	8° 53' 2.610" N	77° 37' 22.073" E
52	V132	KALAKUDI	8° 52' 47.738" N	77° 37' 22.916" E
53	V134	VAGAIKULAM	8° 54' 1.377" N	77° 37' 24.029" E
54	V137	KALAKUDI	8° 53' 52.241" N	77° 37' 23.375" E
55	V139	KALAKUDI	8° 53' 44.058" N	77° 37' 25.901" E

S No.	Location Number	Village	Latitude	Longitude
56	V141	KALAKUDI	8° 53' 30.641" N	77° 37' 23.385" E
57	V145	KALAKUDI	8° 53' 4.624" N	77° 37' 36.251" E
58	V147	KALAKUDI	8° 52' 56.356" N	77° 37' 32.431" E
59	V164	KALAKUDI	8° 53' 28.505" N	77° 36' 44.968" E
60	V165	KALAKUDI	8° 52' 32.752" N	77° 36' 25.961" E
61	V166	KALAKUDI	8° 53' 36.953" N	77° 36' 41.757" E
62	V167	KALAKUDI	8° 52' 30.367" N	77° 37' 13.700" E
63	W23	VAGAIKULAM	8° 55' 29.524" N	77° 37' 39.052" E

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)	Vaayu (India) Power Corporation Private Limited (Private entity)	No
Netherlands	ACT Commodities B.V. (Private entity)	No
Germany	First Climate Markets A.G. (Private entity)	No

A.4. Reference to applied methodologies and standardized baselines

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Title: "Consolidated baseline methodology for grid-connected electricity generation from renewable sources"

Reference: Approved consolidated baseline methodology ACM0002 (Version 12.1.0, EB 58)

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

- Tool to calculate the emission factor for an electricity system – Version 02
- Tool for the demonstration and assessment of additionality – Version 5.2

Further information with regards to the methodology/ tools can be obtained at <http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html>

A.5. Crediting period type and duration

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The length of the Crediting period of the project activity as per registered PDD is 10 years (Fixed). The crediting period start date is 19/07/2011 and length of crediting period is 10 years (from 19/07/2011 to 18/07/2021).

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

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The project activity involves 63-wind energy converters (WECs) of Enercon make (800 kW E- 53) with internal electrical lines connecting the project activity with local evacuation facility. The WECs generate 3-phase power at 400 V, which is stepped up to 33 kV. The project activity can operate in the frequency range of 47.5–51.5 Hz and in the voltage range of 400 V \pm 12.5%. The average life time of the WEC is around 20 years as per the industry standards. The salient features of the state-of-art-technology are:

Parameter	Details
Turbine model	E – 53
Rated Power	800 kW
Rated diameter	52.9 m
Hub height	75 m
Turbine type	Gearless horizontal axis wind turbine with variable rotor speed
Power regulation	Independent pitch system for each blade
Cut in wind speed	2.5 m/s
Rated wind speed	12 m/s
Cut out wind speed	28 - 34 m/s
Extreme wind speed	59.5 m/s
Rated rotational speed	32 rpm
Operating range rot. Speed	12 - 29 rpm
Orientation	Upwind
No. of blades	3
Blade material	Fibre glass Epoxy reinforced with integral lightning protection
Gear box type	Gearless
Generator type	Synchronous generator
Braking	Aerodynamic
Output voltage	400 V
Yaw system	Active yawing with 4 electric yaw drives with brake motor and friction bearing
Tower	74 m Concrete

The WECs under the project activity were commissioned between 29/09/2010 and 11/07/2011. The commissioning date for all the machines included in the project activity is given in the table below:

S. No.	WEG HTSC No	No. & Capacity (kW)	Commissioning Date
1	3376	4 X 800	29/09/2010
		5 X 800	02/03/2011
		2 X 800	11/03/2011
2	3461	1 X 800	28/12/2010
3	3462	1 X 800	28/12/2010
4	3463	1 X 800	28/12/2010
5	3464	1 X 800	28/12/2010
6	3465	1 X 800	28/12/2010
7	3466	1 X 800	28/12/2010
8	3467	1 X 800	28/12/2010
9	3470	2 X 800	31/12/2010
10	3500	1 X 800	18/03/2011

S. No.	WEG HTSC No	No. & Capacity (kW)	Commissioning Date
11	3501	1 X 800	18/03/2011
12	3502	1 X 800	18/03/2011
13	3503	1 X 800	18/03/2011
14	3504	1 X 800	18/03/2011
15	3505	1 X 800	18/03/2011
16	3506	1 X 800	18/03/2011
17	3507	1 X 800	18/03/2011
18	3508	1 X 800	18/03/2011
19	3509	2X 800	18/03/2011
20	3510	1 X 800	18/03/2011
21	3511	1 X 800	18/03/2011
22	3512	1 X 800	18/03/2011
23	3513	1 X 800	18/03/2011
24	3514	1 X 800	18/03/2011
25	3515	1 X 800	18/03/2011
26	3516	1 X 800	18/03/2011
27	3517	1 X 800	18/03/2011
28	3518	1 X 800	18/03/2011
29	3519	1 X 800	18/03/2011
30	3528	1 X 800	22/03/2011
31	3768	1 X 800	01/07/2011
32	3769	1 X 800	01/07/2011
33	3770	1 X 800	01/07/2011
34	3771	1 X 800	01/07/2011
35	3772	1 X 800	01/07/2011
36	3773	1 X 800	01/07/2011
37	3774	1 X 800	01/07/2011
38	3775	1 X 800	01/07/2011
39	3776	1 X 800	01/07/2011
40	3777	1 X 800	01/07/2011
41	3778	1 X 800	01/07/2011
42	3779	1 X 800	01/07/2011
43	3780	1 X 800	01/07/2011
44	3781	1 X 800	01/07/2011
45	3782	1 X 800	01/07/2011
46	3783	1 X 800	01/07/2011
47	3784	1 X 800	01/07/2011
48	3785	1 X 800	01/07/2011
49	3789	1 X 800	11/07/2011
50	3790	1 X 800	11/07/2011
51	3791	1 X 800	11/07/2011

PP would like to clarify that the above 19 WTGs (highlighted in grey) had undergone name change from “Vaayu (India) Power Corporation Pvt. Ltd.” to “Vaayu renewable energy Godavari Pvt. Ltd.” w.e.f. March 2016. Thus, JMRs & invoices for these machines are generated with the new name.

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

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Not applicable.

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

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Not applicable.

B.2.4. Inclusion of monitoring plan

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Not applicable.

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

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PP has requested for a permanent change in Monitoring plan as the frequency of energy meter calibration prescribed under registered monitoring plan has not been practiced by state utility. The scope of meter calibration is solely controlled and under the purview of state utility of Tamil Nadu and as per prevailing practice it does not adhere to the prescribed frequency of once in a year. Therefore, as per provision of CEA regulations 2006 issued by the Central Electricity Authority, Ministry of Power, Government of India Notification No. 502/70/CEA/DP&D dated 17/03/2006/19/ and also as per the provision of section 4 paragraphs (iv) and (v) of the Power Purchase Agreement, PP has requested for a permanent change in the calibration frequency from annual to 'once in a five year'. This request was approved by UNFCCC on 08 Jun 2016².

B.2.6. Changes to project design

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Not applicable.

² <http://cdm.unfccc.int/PRCCContainer/DB/prcp730011487/view>

SECTION C. Description of monitoring system

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Approved monitoring methodology ACM0002 Version 12.1.0, "Consolidated baseline monitoring methodology for grid-connected electricity generation from renewable sources", by CDM - Meth Panel is proposed to be used to monitor the emission reductions.

Wind World (India) Limited (WWIL) (formerly Enercon (India) Limited) is O&M contractor for the project activity. WWIL is responsible for the maintaining all the monitoring data on behalf of VIPCPL in respect of the project activity. WWIL has implemented the management structure for managing the monitored data.

This approved monitoring methodology requires monitoring of the following:

- Electricity generation from the project activity; and
- Operating margin emission factor and build margin emission factor of the grid, where ex post determination of grid emission factor has been chosen

Since the baseline methodology is based on ex ante determination of the baseline, the monitoring of operating margin emission factor and build margin emission factor is not required. Further, wind based electricity generation is not associated with any kind of leakages. Hence, the sole parameter for monitoring is the electricity generated by the project and supplied to the grid.

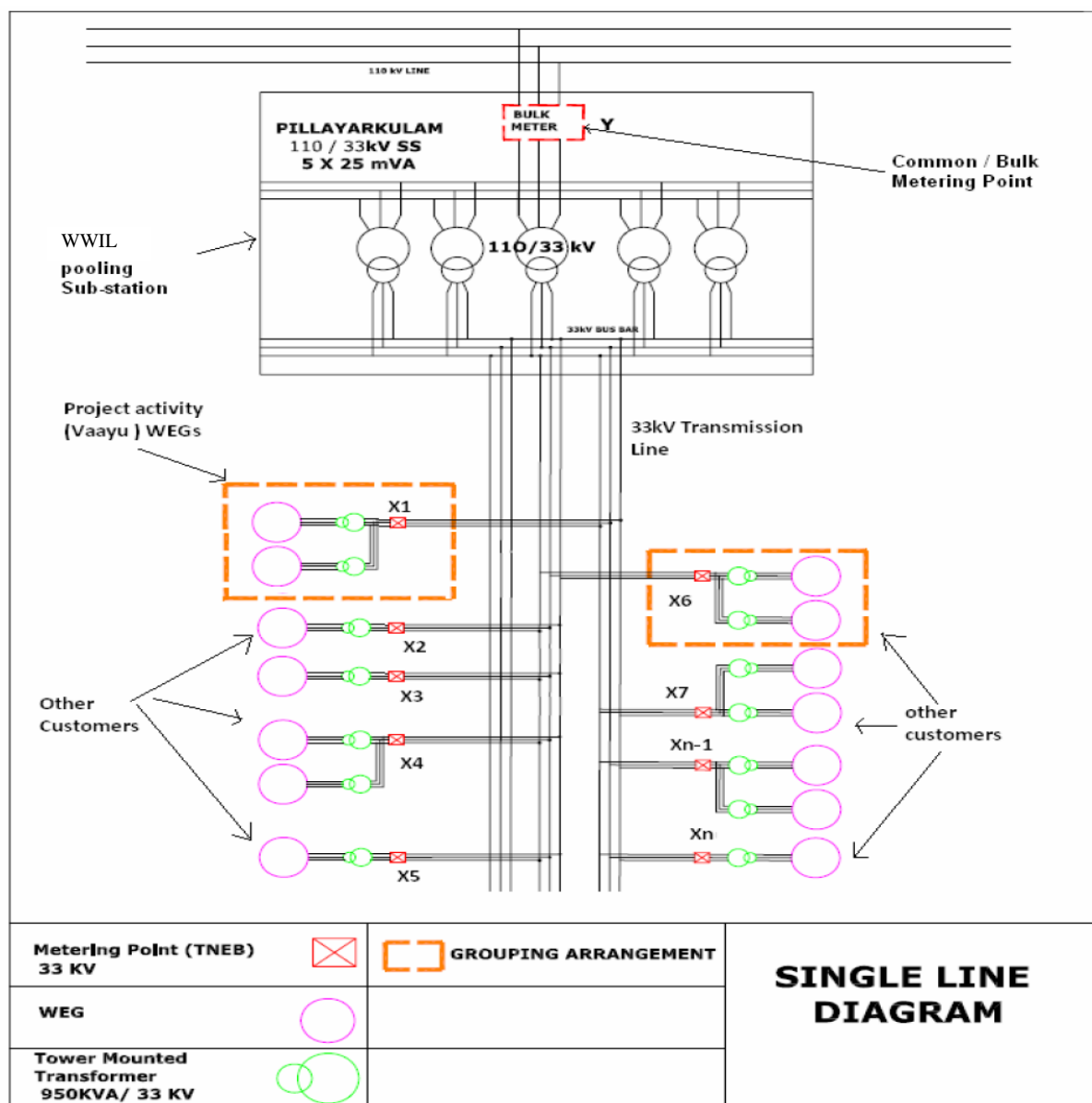
The Project is operated by WWIL and managed by the PP. The operational and maintenance contract for the project is with WWIL. WWIL is an ISO 9001:2008 certified Quality Management system. WWIL follows the documentation practices to ensure the reliability and availability of the data for all the activities as required from the identification of the site, wind resource assessment, logistics, finance, construction, commissioning and operation of the wind power project.

Calculation of Net Electricity Supplied to the grid by project activity:

Single Line diagram of Metering arrangement for project activity is shown in this section below.

From the line diagram (please refer below) it is clear that the machines of the project activity and other project developers at the wind farm have individual metering points at 33 kV at the project site. Further PP has make clusters of WEGs at the project site for the purpose of metering. Each cluster has a main meter. The WTGs of the project activity are connected to individual dedicated cluster meters. From the above layout it is clear that the clusters meters (dedicated meters/ individual meters) of project activity and other customers are connected to the WWIL pooling sub-station at Pillayarkulam at bulk metering point at 110 kV. There is one main and one check meter at the WWIL substation. Since the main and check meters (bulk meter) at 110 kV metering point at the WWIL pooling substation is connected to the machines of the project activity and the machines commissioned by the other project developers, therefore in order to determine the net electricity supplied to the grid at 110 kV at the WWIL substation, the state utility apply line loss to the meter reading recorded at the 33 kV.

The total % of Line loss from WEGs (33 kV metering point) to WWIL substation (110 kV metering point) is calculated by the state utility. Net Electricity supplied to the grid by project activity is calculated by applying Line loss to the meter readings taken at 33 kV metering point of the project activity.



The procedure for calculation of the percentage Line loss is set-out below:

$$Z = ((X1+X2+X3+X4+.....Xn) - Y) / (X1+X2+X3+X4+.....Xn) \times 100\%$$

Where,

Z = Percentage Line loss incurred in Line between the meters located at 33 kV metering point (including the machines of the project activity and other project developers) and the meters located at 110kV metering point (bulk meter: main and check) at high voltage side of receiving sub-station. Refer above picture for schematic of the flow diagram.

(X1+X2+X3+X4+.....Xn) = Summation of meter readings (Export- Import) at 33 kV metering points for all the project developers connected to receiving substation (including the machines of the project activity and other project developers)

X_n = Net Export (Export – Import) Reading (X_i) noted at energy meter installed at 33kV metering point where i vary from 1 to n which represents the meters connected to project activity and other project developers. $X_1, X_2, X_3, \dots, X_n$ are the meters that are installed at 33kV metering point (including the machines of the project activity and other project developers) and further connected to the receiving substation at 110 kV by internally connected lines. Refer above picture for schematic of the flow diagram.

Y = Net Export (Export-Import) Reading at bulk meter installed at high voltage side of transformer of the receiving sub-station at 110 kV connecting machines of the project activity and other project developers. Refer above picture for schematic of the flow diagram.

Therefore Line Loss for the project activity (between 33 kV & 110 kV metering point) is calculated as follows:-

Line Loss (T_E) = Percentage Line Loss * Net Export recorded at 33 kV metering point of project activity

$$T_E = Z \times (EG_{\text{Export},y} - EG_{\text{Import},y})$$

Therefore Net Energy Supplied to Grid (or net generation) after adjustment of Line loss is calculated as below:-

$$EG_{P,J,y} = EG_{\text{Export},y} - EG_{\text{Import},y} - T_E$$

The monthly statement showing the Energy Generated by the project activity as provided and duly signed by TNEB/Tirunelveli Electricity Distribution Circle, Tirunelveli) contains the following data:-

1. Electricity exported by project activity to grid recorded at 33 kV metering points (Cluster meter) ($EG_{\text{export},y}$)
2. Electricity imported by project activity to grid recorded at 33kV metering point (Cluster meter) (EG_{import})
3. Line Loss (T_E) between the metering point at 33 kV metering points of project activity and the metering point at 110 kV at the ENERCON pooling substation
4. Net Electricity Exported to the grid by the project ($EG_{\text{export}} - EG_{\text{import}} - T_E$)

The Electricity Export, Electricity Import, Line Loss and net electricity supplied (Net Generation) to the grid, can be cross checked from the invoices raised on the state utility for supply of net electricity supplied to the grid.

The accuracy of monitoring parameter is ensured by adhering to the calibration and testing of the metering equipment once in five years. WWIL provides the daily generation report to the Project proponent. The project proponent also maintains the records of daily generation report and joint meter report.

Training and maintenance:

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 WECs, it is extremely essential, that the engineers and technicians understand the machines and keep them in good health. In order to ensure, that WWIL's service staff 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. The WWIL Training Academy provides need-based training to meet the training requirements of WWIL projects. The training is contemporary, which results in imparting focused knowledge leading to value addition to the attitude and skills of all trainees. This ultimately leads to creativity in problem solving.

Quality Control System:

Metering and Monitoring Plan details: The general conditions set out for metering, recording, meter readings, meter inspections, Test & Checking and communication shall be applicable as per the PPA (Power purchase agreement) with the State electricity board except or otherwise explicitly mentioned in the PDD.

Metering: The electricity supplied to the grid metered from main meters that are connected to the 63 turbines of the project activity. The electricity export and import for the project activity are taken from the monthly joint meter readings noted from the dedicated meters connecting 63 turbines of the project activity. The PP has made clusters of WECs at the project site for the purpose of metering. Each cluster has one main meter. Summation of meter reading for all the clusters (connecting 63 machines) provide net electricity generated by the project activity after adjustment of transmission loss. In addition to the cluster meters there is one main & check meter at high voltage side of WWIL Substation Pillyarkulam.at 110kV. The machines of the project activity and other project developers are connected to 110 kV metering point.

Metering Equipment: Metering equipment is electronic trivector meter of 0.2s accuracy class.

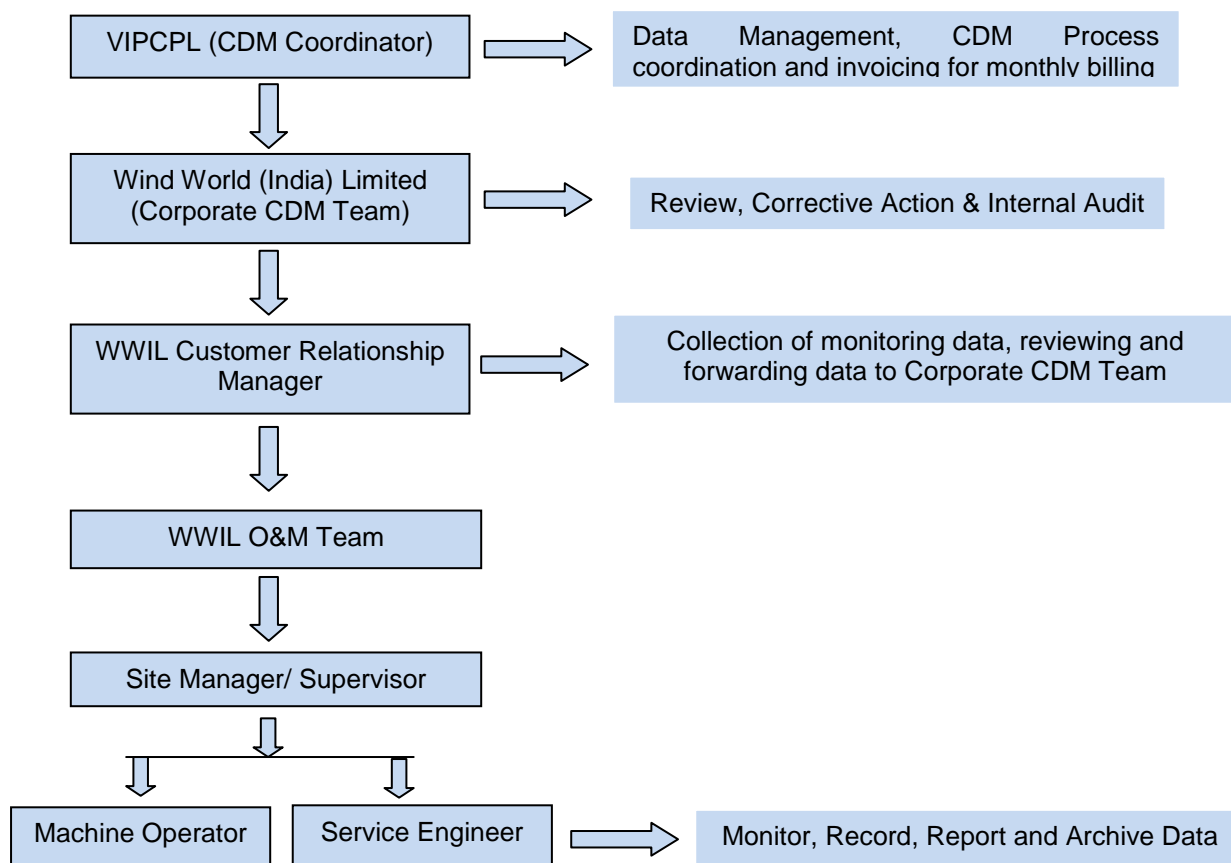
Meter Readings: The monthly meter reading is taken jointly by the parties (WWIL personals and personals of TNEB) for every month. At the conclusion of each meter reading an appointed representative of TNEB and WWIL sign a document indicating the number of Kilowatt-hours (kWh) indicated by the meter.

QA/QC Procedure: All the meters are calibrated/ tested once in five years. LCS meters do not require calibration as the energy readings of electricity generated at the LCS meter is cross verified by the energy calculated by inverting system installed in the WECs. In case there is any mismatch in the energy values recorded by the LCS meter and the energy values calculated by the inverting system; the machine will stop working and generate the error report. Further, the net electricity supplied to the grid that is used for calculation of emission reductions can be cross checked from the invoices raised by the PP on the state utility. Therefore, there is no data uncertainty. The calibration is done by the officials of the state utility. Copy of calibration/testing certificate will be kept as record by the PP and will be presented to the DoE during verification exercise.

Main and Check meter: In case the main meter(s) at 33 kV metering point (cluster meter) is found to operate outside the permissible limits, the main meter will be either replaced or calibrated immediately and for the period during which meter was faulty the LCS controller reading will be referred to calculate electricity exported by WEGs. At 110kV metering point at WWIL pooling substation; in case the main meter(s) is found to operate outside the permissible limits, the main meter will be either replaced or calibrated immediately. Whenever a main meter goes defective, the consumption recorded by the Check meter will be referred.

PP is monitoring the data sent by the O&M contractor and the data for electricity generated by the project activity have been kept as records for the period of 10+2 years i.e. 2 years beyond the term of crediting period. WWIL is O&M contractor and responsible for data recording.

The operational and management structure implemented for data monitoring is as follows:



Metering system details:

The details of meters installed at the site are provided below. It is to be noted that the earlier meters were replaced with new version of DLMS meters by authority during the period Jun-Nov 2017. The information on meter replacement along with other details are provided in the table below. This meter replacement activity falls within this current monitoring period and replacements were done within the validity period of the meter testing due dates. Thus, there is no delay experienced in the calibration frequency during this current monitoring period.

Date of Installation*	WEC Capacity in kw	HTSC No	Names	Old Meter SL. No	New meter make	New Meter SL. no	Meter Version
28-11-2017	11*800	3376	Vaayu renewable energy Godavari P Ltd	HT02121081	EDMI	HT2170647	DLMS
30-10-2017	1*800	3461	Vaayu (India) Power Corporation PVT LTD	HT2110167	EDMI	HT2170448	DLMS
30-10-2017	1*800	3462	Vaayu renewable energy Godavari P Ltd	HT2110162	EDMI	HT2170444	DLMS
30-10-2017	1*800	3463	Vaayu (India) Power Corporation PVT LTD	HT2110156	EDMI	HT2170445	DLMS
30-10-2017	1*800	3464	Vaayu (India) Power Corporation PVT LTD	HT2110161	EDMI	HT2170451	DLMS
16-06-2017	1*800	3465	Vaayu (India) Power Corporation PVT LTD	HT2110151	EDMI	HT2170232	DLMS
16-06-2017	1*800	3466	Vaayu (India) Power Corporation	HT2110149	EDMI	HT2170232	DLMS

CDM-MR-FORM

			PVT LTD				
16-06-2017	1*800	3467	Vaayu (India) Power Corporation PVT LTD	HT2110153	EDMI	HT2170230	DLMS
30-10-2017	2*800	3470	Vaayu (India) Power Corporation PVT LTD	HT02121079	EDMI	HT2170453	DLMS
31-10-2017	1*800	3500	Vaayu renewable energy Godavari P Ltd	HT2110146	EDMI	HT2170454	DLMS
31-10-2017	1*800	3501	Vaayu renewable energy Godavari P Ltd	HT2110143	EDMI	HT2170459	DLMS
15-07-2017	1*800	3502	Vaayu renewable energy Godavari P Ltd	HT2110152	EDMI	HT2170391	DLMS
15-07-2017	1*800	3503	Vaayu renewable energy Godavari P Ltd	HT2110166	EDMI	HT2170392	DLMS
15-07-2017	1*800	3504	Vaayu renewable energy Godavari P Ltd	HT2110148	EDMI	HT2170396	DLMS
15-07-2017	1*800	3505	Vaayu renewable energy Godavari P Ltd	HT2110154	EDMI	HT2170394	DLMS
15-07-2017	1*800	3506	Vaayu renewable energy Godavari P Ltd	HT21106168	EDMI	HT2170395	DLMS
15-07-2017	1*800	3507	Vaayu (India) Power Corporation PVT LTD	HT02130189	EDMI	HT2170389	DLMS
16-06-2017	1*800	3508	Vaayu (India) Power Corporation PVT LTD	HT2110163	EDMI	HT2170228	DLMS
16-06-2017	2*800	3509	Vaayu (India) Power Corporation PVT LTD	HT02121080	EDMI	HT2170236	DLMS
16-06-2017	1*800	3510	Vaayu (India) Power Corporation PVT LTD	HT2110165	EDMI	HT2170227	DLMS
16-06-2017	1*800	3511	Vaayu (India) Power Corporation PVT LTD	HT2110158	EDMI	HT2170226	DLMS
31-10-2017	1*800	3512	Vaayu (India) Power Corporation PVT LTD	HT2110157	EDMI	HT2170462	DLMS
16-06-2017	1*800	3513	Vaayu (India) Power Corporation PVT LTD	HT2110147	EDMI	HT2170225	DLMS
16-06-2017	1*800	3514	Vaayu (India) Power Corporation PVT LTD	HT2110150	EDMI	HT2170229	DLMS
30-10-2017	1*800	3515	Vaayu (India) Power Corporation PVT LTD	HT2110159	EDMI	HT2170449	DLMS
30-10-2017	1*800	3516	Vaayu (India) Power Corporation PVT LTD	HT2110164	EDMI	HT2170446	DLMS
31-10-2017	1*800	3517	Vaayu (India) Power Corporation PVT LTD	HT2110142	EDMI	HT2170456	DLMS
31-10-2017	1*800	3518	Vaayu (India) Power Corporation PVT LTD	HT2110160	EDMI	HT2170463	DLMS
31-10-2017	1*800	3519	Vaayu (India) Power Corporation PVT LTD	HT2110145	EDMI	HT2170457	DLMS
31-10-2017	1*800	3528	Vaayu (India) Power Corporation PVT LTD	HT2110155	EDMI	HT2170460	DLMS
15-07-2017	1*800	3768	Vaayu (India) Power Corporation PVT LTD	HT2110195	EDMI	HT2170398	DLMS
28-11-2017	1*800	3769	Vaayu (India) Power Corporation	HT2110220	EDMI	HT2170291	DLMS

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			PVT LTD				
28-11-2017	1*800	3770	Vaayu (India) Power Corporation PVT LTD	HT2110196	EDMI	HT2170619	DLMS
18-07-2017	1*800	3771	Vaayu (India) Power Corporation PVT LTD	HT2110215	EDMI	HT2170379	DLMS
28-11-2017	1*800	3772	Vaayu (India) Power Corporation PVT LTD	HT2110219	EDMI	HT2170639	DLMS
28-11-2017	1*800	3773	Vaayu (India) Power Corporation PVT LTD	HT2110216	EDMI	HT2170292	DLMS
28-11-2017	1*800	3774	Vaayu (India) Power Corporation PVT LTD	HT2110169	EDMI	HT2170295	DLMS
28-11-2017	1*800	3775	Vaayu (India) Power Corporation PVT LTD	HT2110191	EDMI	HT2170296	DLMS
28-11-2017	1*800	3776	Vaayu (India) Power Corporation PVT LTD	HT02120218	EDMI	HT2170638	DLMS
28-11-2017	1*800	3777	Vaayu (India) Power Corporation PVT LTD	HT2110226	EDMI	HT2170616	DLMS
28-11-2017	1*800	3778	Vaayu (India) Power Corporation PVT LTD	HT2110198	EDMI	HT2170293	DLMS
30-10-2017	1*800	3779	Vaayu (India) Power Corporation PVT LTD	HT2110223	EDMI	HT2170469	DLMS
30-10-2017	1*800	3780	Vaayu (India) Power Corporation PVT LTD	HT2110218	EDMI	HT2170465	DLMS
18-07-2017	1*800	3781	Vaayu (India) Power Corporation PVT LTD	HT2110224	EDMI	HT2170387	DLMS
18-07-2017	1*800	3782	Vaayu (India) Power Corporation PVT LTD	HT2110206	EDMI	HT2170429	DLMS
18-07-2017	1*800	3783	Vaayu (India) Power Corporation PVT LTD	HT2110211	EDMI	HT2170385	DLMS
18-07-2017	1*800	3784	Vaayu (India) Power Corporation PVT LTD	HT2110192	EDMI	HT2170386	DLMS
18-07-2017	1*800	3785	Vaayu (India) Power Corporation PVT LTD	HT2110203	EDMI	HT2170382	DLMS
28-11-2017	1*800	3789	Vaayu (India) Power Corporation PVT LTD	HT2110225	EDMI	HT2170290	DLMS
28-11-2017	1*800	3790	Vaayu (India) Power Corporation PVT LTD	HT2110224	EDMI	HT2170614	DLMS
28-11-2017	1*800	3791	Vaayu (India) Power Corporation PVT LTD	HT2110224	EDMI	HT2170297	DLMS

**all the meters installed earlier had the due calibration dates in 2018, which were outside the monitoring period. Whereas meter replacements were held within Nov 2017, which is within the current monitoring period, hence no delay in scheduled calibration is realized.*

Substation Meter Details:

Meter Name	Serial Number	Make	Accuracy Class	Previous Calibration Date	Due Date
Main Meter	HT1100044	Wallabey	0.2s	07/12/2012	06/12/2017
Check Meter	HT1100045	Wallabey	0.2s	09/12/2012	08/12/2017

SECTION D. Data and parameters**D.1. Data and parameters fixed ex ante**

Data/Parameter	$EF_{grid,OM,y}$
Unit	tCO _{2e} /MWh
Description	Operating Margin Emission Factor of Southern Regional Electricity Grid
Source of data	<p>“CO2 Baseline Database for Indian Power Sector”, version 5 published by the Central Electricity Authority, Ministry of Power, Government of India.</p> <p>The “CO2 Baseline Database for Indian Power Sector” is available at www.cea.nic.in</p>
Value(s) applied	0.98756
Choice of data or measurement methods and procedures	Operating Margin Emission Factor has been calculated by the Central Electricity Authority using the simple OM approach in accordance with ACM0002.
Purpose of data/parameter	To calculate Baseline Emissions Factor
Additional comments	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

Data/parameter:	$EF_{grid,BM,y}$
Unit	tCO _{2e} /MWh
Description	Build Margin Emission Factor of Southern Regional Electricity Grid
Source of data	<p>“CO2 Baseline Database for Indian Power Sector”, version 5 published by the Central Electricity Authority, Ministry of Power, Government of India.</p> <p>The “CO2 Baseline Database for Indian Power Sector” is available at www.cea.nic.in</p>
Value(s) applied	0.81792
Choice of data or measurement methods and procedures	Build Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with ACM0002.
Purpose of data/parameter	To calculate Baseline Emissions Factor
Additional comments	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

Data/parameter:	EF_y or $EF_{grid,CM,y}$
Unit	tCO _{2e} /MWh

Description	Combined Margin Emission Factor of Southern Regional Electricity Grid
Source of data	<p>"CO2 Baseline Database for Indian Power Sector", version 5 published by the Central Electricity Authority, Ministry of Power, Government of India.</p> <p>The "CO2 Baseline Database for Indian Power Sector" is available at www.cea.nic.in</p>
Value(s) applied	0.94515
Choice of data or measurement methods and procedures	Combined Margin Emission Factor has been calculated by the Central Electricity Authority in accordance with CDM methodologies: ACM0002, and Tool to Calculate the emission Factor for an Electricity System.
Purpose of data/parameter	To calculate Baseline Emissions
Additional comments	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

D.2. Data and parameters monitored

Data/Parameter	$EG_{PJ,y}$
Unit	MWh (Mega-watt hour)
Description	Net Electricity Exported to the grid by the project
Measured/calculated/default	Calculated
Source of data	Monthly billing records which is given by Tamilnadu Electricity Board (TNEB)/ (Tirunelveli Electricity Distribution Circle, Tirunelveli)
Value(s) of monitored parameter	141,924.05
Monitoring equipment	Refer section C for an illustration of the provisions for measurement methods.
Measuring/reading/recording frequency	<p>This is calculated parameter based on parameters which are measured continuously.</p> <p>Frequency of recording data: Monthly</p> <p>Recording: The values of Net Electricity Exported to the grid by the project are sourced from monthly billing records given by Tamilnadu Electricity Board. This record provides data for particular location number of single/multiple WECs.</p>
Calculation method (if applicable)	$EG_{PJ,y} = EG_{Export,y} - EG_{Import,y} - T_E$
QA/QC procedures	<p>QA/QC procedure has been implemented by DISCOM/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. All the energy meters have been calibrated by state utility once in five years and records are available with PP.</p> <p>Please refer to the section C for details of the provisions for QA/QC procedures. Also, during the current monitoring period, there were replacements of meters by Authority. The details are provided under the section C.</p>
Purpose of data/parameter	To calculate emission reduction.
Additional comments	The data will be archived for crediting period + 2 years.

Data/parameter:	EG_{Export,y}
Unit	MWh (Mega-Watt hour)
Description	Electricity exported by project activity to grid recorded at 33kV metering points (Cluster meter)
Measured/calculated/default	Directly measured
Source of data	Monthly billing records which is given by Tamilnadu Electricity Board (TNEB)/ (Tirunelveli Electricity Distribution Circle, Tirunelveli).
Value(s) of monitored parameter	147,055.69
Monitoring equipment	Refer section C for an illustration of the provisions for measurement methods.
Measuring/reading/recording frequency	Measurement: Continuous Frequency of recording data: Monthly Recording: The values of Electricity exported by project activity to grid recorded at 33kV metering points are sourced from monthly billing records given by Tamilnadu Electricity Board. This record provides data for particular location number of single/multiple WECs.
Calculation method (if applicable)	Not Applicable
QA/QC procedures	Value of EG _{Export,y} has been crosschecked from invoice raised on TNEB or state electricity board. QA/QC procedure has been implemented by DISCOM/State utility (TNEB) pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. All the main meter installed at 33kV metering point at project site have been calibrated by state utility once in five years and records are available with PP. Please refer to the section C for details of the provisions for QA/QC procedures. Also during the current monitoring period, there were replacements of meters by Authority. The details are provided under the section C.
Purpose of data/parameter	To calculate emission reduction.
Additional comments	The data will be archived for crediting period + 2 years.

Data/parameter:	EG_{Import,y}
Unit	MWh (Mega-Watt hour)
Description	Electricity imported by project activity to grid recorded at 33kV metering points (Cluster meter)
Measured/calculated/default	Directly measured
Source of data	Monthly billing records which is given by Tamilnadu Electricity Board (TNEB)/ (Tirunelveli Electricity Distribution Circle, Tirunelveli).
Value(s) of monitored parameter	897.09

Monitoring equipment	Refer section C for an illustration of the provisions for measurement methods and Monitoring equipment.
Measuring/reading/recording frequency	Measurement: Continuous Frequency of recording data: Monthly Recording: The values of Electricity imported by project activity to grid recorded at 33 kV metering points are sourced from monthly billing records given by Tamilnadu Electricity Board. This record provides data for particular location number of single/multiple WECs.
Calculation method (if applicable)	Not Applicable
QA/QC procedures	Value of $EG_{Import,y}$ has been crosschecked from invoice raised on TNEB or state electricity board. QA/QC procedures have been implemented by DISCOM/State utility (TNEB) pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. All the main meter installed at 33kV metering point at project site have been calibrated by state utility once in five years and records are available with PP. Please refer to the section C for details of the provisions for QA/QC procedures. Also during the current monitoring period, there were replacements of meters by Authority. The details are provided under the section C.
Purpose of data/parameter	To calculate emission reduction.
Additional comments	The data will be archived for crediting period + 2 years.

Data/parameter:	T_E
Unit	MWh (Mega-Watt hour)
Description	Line loss between the metering point at 33 kV metering points of project activity and the metering point at 110 kV at the ENERCON pooling substation.
Measured/calculated/default	Calculated
Source of data	Monthly billing records which is given by Tamilnadu Electricity Board (TNEB)/ (Tirunelveli Electricity Distribution Circle, Tirunelveli).
Value(s) of monitored parameter	4,234.54
Monitoring equipment	Refer section C for an illustration of the provisions for measurement methods and Monitoring equipment.
Measuring/reading/recording frequency	Frequency of recording data: Monthly Recording: The values of Line loss between the metering point at 33 kV metering points of project activity and the metering point at 110 kV at the WWIL pooling substation are sourced from monthly billing records given by Tamilnadu Electricity Board. This record provides data for particular location number of single/multiple WECs.
Calculation method (if applicable)	$T_E = Z \times (EG_{Export,y} - EG_{Import,y})$ Where, Z = Percentage Line loss incurred in Line between the meters located at 33 kV metering point (including the machines of the project activity and other project developers) and the meters located at 110kV metering point (bulk meter: main and check) at high voltage side of receiving sub-

	station. Refer section C for detailed calculation procedure.
QA/QC procedures	Value of T_E has been cross checked from invoice raised on TNEB or state electricity board. QA/QC procedures have been implemented by Discom/State utility (TNEB) pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. Refer section C for an illustration of the provisions for QA/QC procedures.
Purpose of data/parameter	To calculate emission reduction.
Additional comments	The data will be archived for crediting period + 2 years.

D.3. Implementation of sampling plan

>>

Not Applicable for this project activity.

SECTION E. Calculation of emission reductions or net anthropogenic removals

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

>>

The baseline emissions are to be calculated as follows:

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

And

$$EG_{PJ,y} = EG_{Export,y} - EG_{Import,y} - T_E$$

Where

BE_y	=	Baseline emissions in year y (tCO ₂ /yr)
$EG_{PJ,y}$	=	Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the CDM project activity in year y (MWh/yr)
$EF_{grid,CM,y}$	=	Combined margin CO ₂ emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO ₂ /MWh)
$EG_{Export,y}$	=	Electricity exported by project activity to grid recorded at 33kV metering points (Cluster meter)
$EG_{Import,y}$	=	Electricity imported by project activity to grid recorded at 33kV metering points (Cluster meter)
T_E	=	Line loss between the metering point at 33 kV metering points of project activity and the metering point at 110 kV at the ENERCON pooling substation.

$$\begin{aligned}
 \text{Baseline Emission (BE}_y) &= (147,055.69 - 897.09 - 4,234.538) \text{ MWh} * 0.94515 \text{ tCO}_2/\text{MWh} \\
 &= 141,924.05 \text{ MWh} * 0.94515 \text{ tCO}_2/\text{MWh} \\
 &= \mathbf{134,139 \text{ tCO}_2 \text{ (after rounding down)}}
 \end{aligned}$$

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

>>

The project activity uses wind power to generate electricity and hence the emissions from the project activity have been taken as zero.

$$PE_y = 0$$

E.3. Calculation of leakage emissions

>>

No leakage has been considered from the project activity as per approved methodology ACM0002.

$$L_y = 0$$

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

	Baseline GHG emissions or baseline net GHG removals (t CO ₂ e)	Project GHG emissions or actual net GHG removals (t CO ₂ e)	Leakage GHG emissions (t CO ₂ e)	GHG emission reductions or net anthropogenic GHG removals (t CO ₂ e)		
				Before 01/01/2013	From 01/01/2013	Total amount
Total	134,139	0	0	0	134,139	134,139

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

Amount achieved during this monitoring period (t CO ₂ e)	Amount estimated ex ante (t CO ₂ e)
134,139	191,043

E.6. Remarks on increase in achieved emission reductions

>>

The actual emission reduction achieved is 29.79% less than the estimated figure as per registered PDD. This is due to lower electricity generation compared to estimated generation in registered PDD (for the equivalent period) during the monitoring period. Further, as the actual generation is less than the estimated generation mentioned in registered PDD, thus, further justification is not necessary.

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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"> • Ensure consistency with version 01.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN); • Make editorial improvements.
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: <ul style="list-style-type: none"> • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: <ul style="list-style-type: none"> • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: monitoring report		