



Monitoring report form
(Version 05.1)

Complete this form in accordance with the Attachment "Instructions for filling out the monitoring report form" at the end of this form.

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 monitoring report	04	
Completion date of the monitoring report	19/10/2016	
Monitoring period number and duration of this monitoring period	Monitoring Period Number: 05 Duration: From 16/06/2015 to 11/02/2016 (Both days inclusive)	
Project participant(s)	Vaayu (India) Power Corporation Private Limited	
Host Party	India	
Sectoral scope(s)	Sectoral scope 1: Energy Industries (Renewable - /non-renewable sources).	
Selected methodology(ies)	"Consolidated baseline methodology for grid-connected electricity generation from renewable sources" Reference: Approved consolidated baseline methodology ACM0002 (Version 12.1.0, EB 58)	
Selected standardized baseline(s)	NA	
Estimated amount of GHG emission reductions or net GHG removals by sinks for this monitoring period in the registered PDD	68,412	
Total amount of GHG emission reductions or net GHG removals by sinks achieved in this monitoring period	GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards
	0	40,029

SECTION A. Description of project activity

A.1. Purpose and 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 16/06/2015 to 11/02/2016 (including first and last day) are 40,029 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

S No.	Location Number	Village	Latitude	Longitude
5	149	VAGAIKULAM	8° 55' 38.340" N	77° 37' 38.952" E
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

S No.	Location Number	Village	Latitude	Longitude
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
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 participant(s)

Party involved (host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate whether the Party involved wishes to be considered as project participant (yes/no)
India (host)	Vaayu (India) Power Corporation Private Limited (Private entity)	No

A.4. Reference of applied methodology and standardized baseline

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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 of project activity

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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).

A.6. Contact information of responsible persons/entities

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Mr. Yogesh Mehra

Director

Vaayu (India) Power Corporation Private Limited

Vaayu (India) Power Corporation Private Limited is the project participant in this project. Detailed contact information are mentioned in Appendix-1.

SECTION B. Implementation of project activity

B.1. Description of implemented registered 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 generates 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

Parameter	Details
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
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

S. No.	WEG HTSC No	No. & Capacity (kW)	Commissioning Date
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

B.2. Post-registration changes

B.2.1. Temporary deviations from registered monitoring plan, applied methodology or applied standardized baseline

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Not applicable

B.2.2. Corrections

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Not applicable

B.2.3. Changes to start date of crediting period

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Not applicable

B.2.4. Inclusion of a monitoring plan to the registered PDD that was not included at registration

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Not applicable

B.2.5. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

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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 2016¹.

B.2.6. Changes to project design of registered project activity

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Not applicable

B.2.7. Types of changes specific to afforestation or reforestation project activity

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Not applicable

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:

¹ <http://cdm.unfccc.int/PRCCContainer/DB/prcp730011487/view>

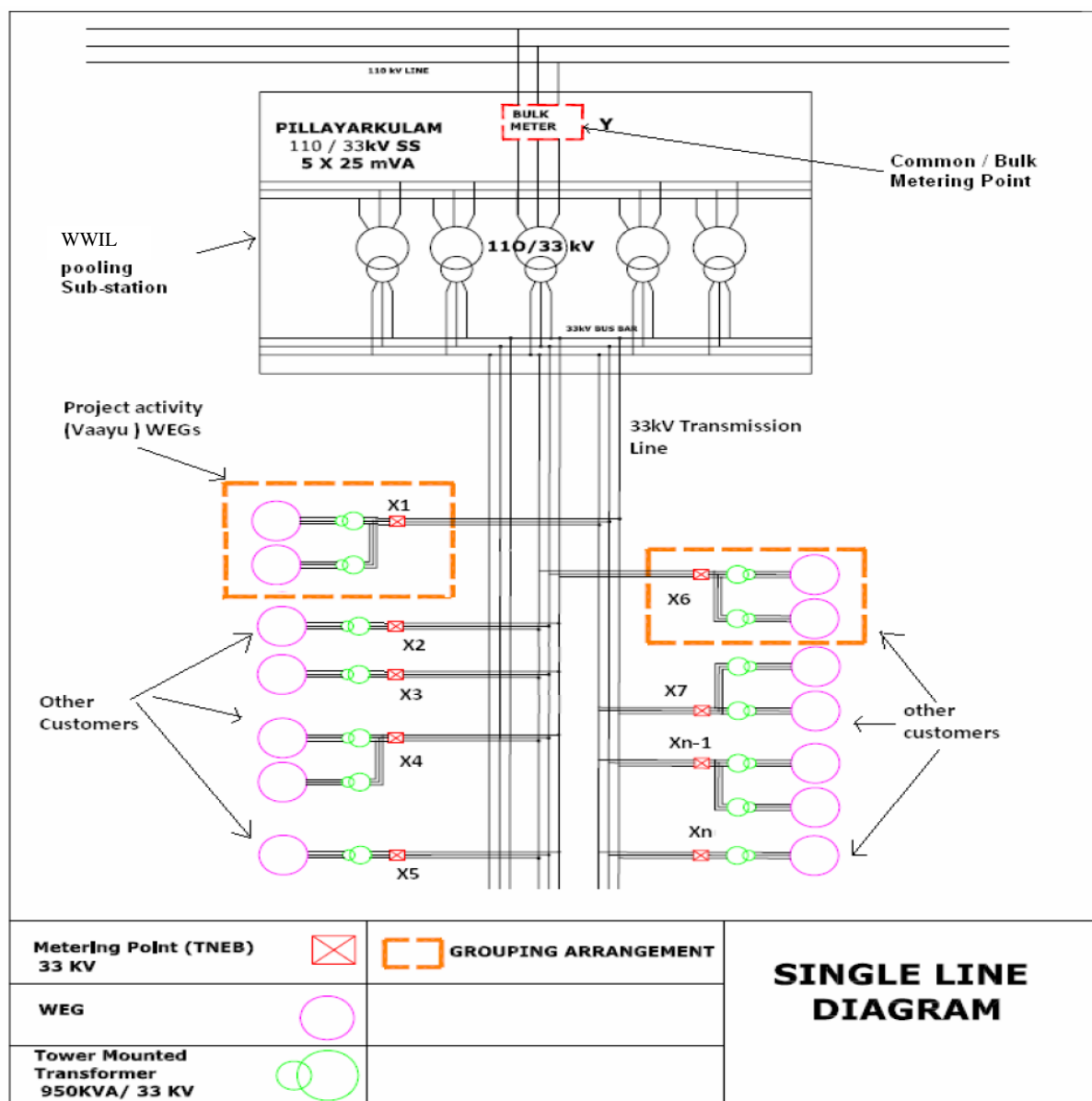
- Electricity generation from the project activity; and
- Operating margin emission factor and build margin emission factor of the grid, where ex post determination of grid emission factor has been chosen

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 below picture:-



From the above line diagram 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 made 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:

$$Z = ((X_1 + X_2 + X_3 + X_4 + \dots + X_n) - Y) / (X_1 + X_2 + X_3 + X_4 + \dots + X_n) \times 100\%$$

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+.....X_n) = 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. X₁, X₂, X₃,...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:-

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

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.

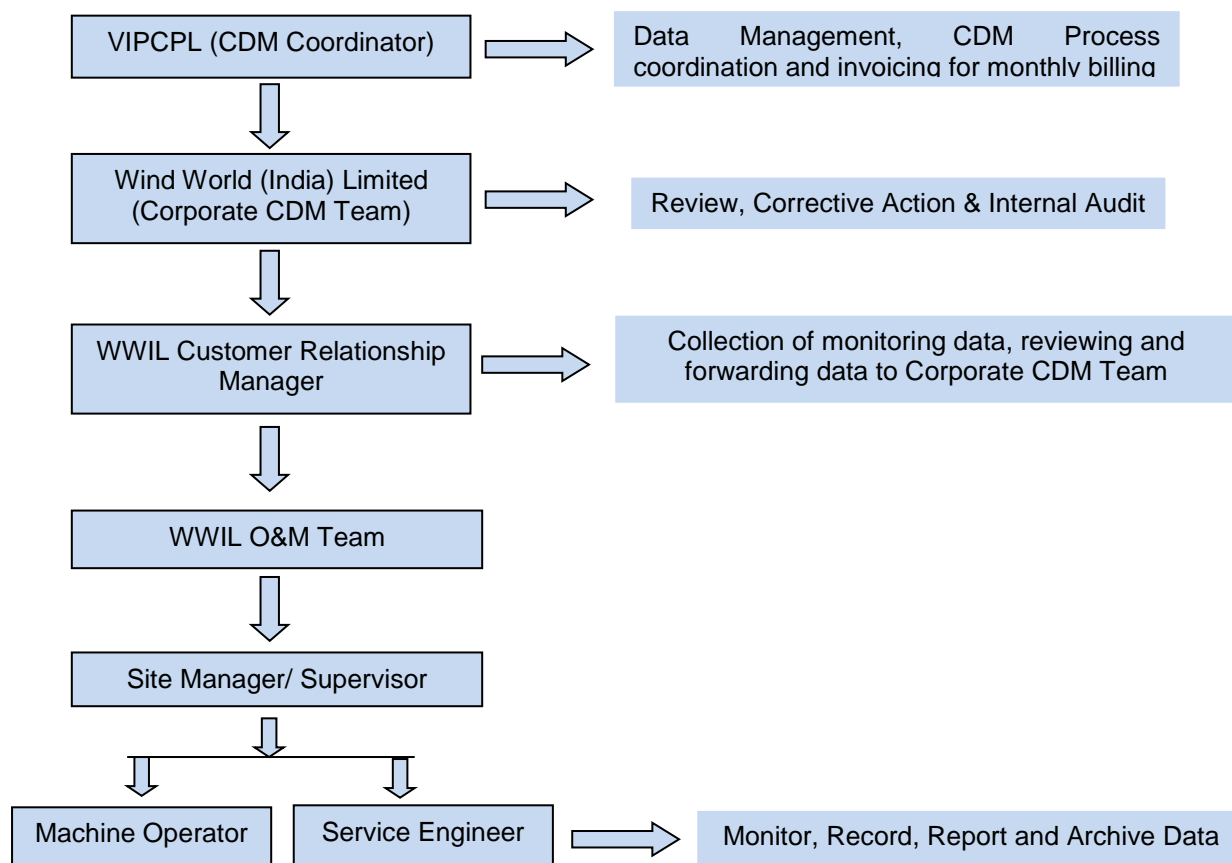
Meter Readings: The monthly meter reading is taken jointly by the parties (WWIL personals and personals of TNEB) for every month. At the conclusion of each meter reading an appointed representative of TNEB and WWIL sign a document indicating the number of Kilowatt-hours (kWh) indicated by the meter.

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 for measuring export and import by project activity are provided below:

SI No	WEG HTSC No	No. & Capacity (kW)	Meter No.	Make	Accuracy Class	Latest Calibration Date	Due Date
1	3376	4 X 800	HT2121081	Wallabey	0.2s	26/08/2013	25/08/2018
		5 X 800					
		2 X 800					
2	3461	1 X 800	HT2110167	Wallabey	0.2s	02/11/2012	01/11/2017
3	3462	1 X 800	HT2110162	Wallabey	0.2s	02/11/2012	01/11/2017
4	3463	1 X 800	HT2110156	Wallabey	0.2s	02/11/2012	01/11/2017
5	3464	1 X 800	HT2110161	Wallabey	0.2s	02/11/2012	01/11/2017
6	3465	1 X 800	HT2110151	Wallabey	0.2s	02/11/2012	01/11/2017
7	3466	1 X 800	HT2110149	Wallabey	0.2s	02/11/2012	01/11/2017
8	3467	1 X 800	HT2110153	Wallabey	0.2s	02/11/2012	01/11/2017
9	3470	2X 800	HT2121079	Wallabey	0.2s	30/07/2013	29/07/2018
10	3500	1 X 800	HT2110146	Wallabey	0.2s	02/11/2012	01/11/2017
11	3501	1 X 800	HT2110143	Wallabey	0.2s	02/11/2012	01/11/2017

SI No	WEG HTSC No	No. & Capacity (kW)	Meter No.	Make	Accuracy Class	Latest Calibration Date	Due Date
12	3502	1 X 800	HT2110152	Wallabey	0.2s	02/11/2012	01/11/2017
13	3503	1 X 800	HT2110166	Wallabey	0.2s	02/11/2012	01/11/2017
14	3504	1 X 800	HT2110148	Wallabey	0.2s	02/11/2012	01/11/2017
15	3505	1 X 800	HT2110154	Wallabey	0.2s	02/11/2012	01/11/2017
16	3506	1 X 800	HT2110168	Wallabey	0.2s	02/11/2012	01/11/2017
17	3507	1 X 800	HT2110144	Wallabey	0.2s	02/11/2012	01/11/2017
18	3508	1 X 800	HT2110163	Wallabey	0.2s	03/11/2012	02/11/2017
19	3509	2X 800	HT02121080	Wallabey	0.2s	30/07/2013	29/07/2018
20	3510	1 X 800	HT2110165	Wallabey	0.2s	03/11/2012	02/11/2017
21	3511	1 X 800	HT2110158	Wallabey	0.2s	03/11/2012	02/11/2017
22	3512	1 X 800	HT2110157	Wallabey	0.2s	03/11/2012	02/11/2017
23	3513	1 X 800	HT2110147	Wallabey	0.2s	02/11/2012	01/11/2017
24	3514	1 X 800	HT2110150	Wallabey	0.2s	02/11/2012	01/11/2017
25	3515	1 X 800	HT2110159	Wallabey	0.2s	02/11/2012	01/11/2017
26	3516	1 X 800	HT2110164	Wallabey	0.2s	02/11/2012	01/11/2017
27	3517	1 X 800	HT2110142	Wallabey	0.2s	02/11/2012	01/11/2017
28	3518	1 X 800	HT2110160	Wallabey	0.2s	02/11/2012	01/11/2017
29	3519	1 X 800	HT2110145	Wallabey	0.2s	02/11/2012	01/11/2017
30	3528	1 X 800	HT2110155	Wallabey	0.2s	02/11/2012	01/11/2017
31	3768	1 X 800	HT2110195	Wallabey	0.2s	02/11/2012	01/11/2017
32	3769	1 X 800	HT2110220	Wallabey	0.2s	03/11/2012	02/11/2017
33	3770	1 X 800	HT2110196	Wallabey	0.2s	03/11/2012	02/11/2017
34	3771	1 X 800	HT2110215	Wallabey	0.2s	02/11/2012	01/11/2017
35	3772	1 X 800	HT2110219	Wallabey	0.2s	03/11/2012	02/11/2017
36	3773	1 X 800	HT2110216	Wallabey	0.2s	03/11/2012	02/11/2017
37	3774	1 X 800	HT2110169	Wallabey	0.2s	03/11/2012	02/11/2017
38	3775	1 X 800	HT2110191	Wallabey	0.2s	03/11/2012	02/11/2017
39	3776	1 X 800	HT2110218	Wallabey	0.2s	03/11/2012	02/11/2017
40	3777	1 X 800	HT2110226	Wallabey	0.2s	03/11/2012	02/11/2017
41	3778	1 X 800	HT2110198	Wallabey	0.2s	03/11/2012	02/11/2017
42	3779	1 X 800	HT2110223	Wallabey	0.2s	03/11/2012	02/11/2017
43	3780	1 X 800	HT2110218	Wallabey	0.2s	03/11/2012	02/11/2017
44	3781	1 X 800	HT2110229	Wallabey	0.2s	03/11/2012	02/11/2017
45	3782	1 X 800	HT2110206	Wallabey	0.2s	03/11/2012	02/11/2017
46	3783	1 X 800	HT2110211	Wallabey	0.2s	03/11/2012	02/11/2017

SI No	WEG HTSC No	No. & Capacity (kW)	Meter No.	Make	Accuracy Class	Latest Calibration Date	Due Date
47	3784	1 X 800	HT2110192	Wallabey	0.2s	03/11/2012	02/11/2017
48	3785	1 X 800	HT2110203	Wallabey	0.2s	03/11/2012	02/11/2017
49	3789	1 X 800	HT2110225	Wallabey	0.2s	03/11/2012	02/11/2017
50	3790	1 X 800	HT2110228	Wallabey	0.2s	03/11/2012	02/11/2017
51	3791	1 X 800	HT2110224	Wallabey	0.2s	03/11/2012	02/11/2017

Substation Meter Details:

Meter Name	Serial Number	Make	Accuracy Class	Recent 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 or at renewal of crediting period**

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	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	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	“CO2 Baseline Database for Indian Power Sector”, version 5 published by the Central Electricity Authority, Ministry of Power, Government of India. The “CO2 Baseline Database for Indian Power Sector” is available at www.cea.nic.in
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	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	42,352.274
Monitoring equipment	Refer section C for an illustration of the provisions for measurement methods.
Measuring/reading/recording frequency:	This is calculated parameter based on parameters which are measured continuously. Frequency of recording data: Monthly 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.
Calculation method (if applicable):	$EG_{PJ,y} = EG_{Export,y} - EG_{Import,y} - T_E$
QA/QC procedures:	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 annually and records are available with PP. Refer section C for an illustration of the provisions for QA/QC procedures.
Purpose of data:	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	43,883.632
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 annually and records are available with PP. Refer section C for an illustration of the provisions for QA/QC procedures.
Purpose of data:	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	267.708
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 annually and records are available with PP. Refer section C for an illustration of the provisions for QA/QC procedures.
Purpose of data:	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	1,263.650
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 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. Refer section C for an illustration of the provisions for QA/QC procedures.
Purpose of data:	To calculate emission reduction.
Additional comments:	The data will be archived for crediting period + 2 years.

D.3. Implementation of sampling plan

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Not Applicable for this project activity.

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

>>

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.

Duration ²	EG _{Export,y} (MWh)	EG _{Import,y} (MWh)	T _E (MWh)	EG _{PJ,y} (MWh)
From 16/06/2015 to 14/07/2015	14468.176	11.202	231.987	14224.987
From 14/07/2015 to 12/08/2015	13348.116	5.154	389.756	12953.206
From 12/08/2015 to 14/09/2015	7853.976	19.992	257.232	7576.752
From 14/09/2015 to 12/10/2015	5457.840	40.212	208.712	5208.916
From 12/10/2015 to 12/11/2015	675.042	58.332	75.364	541.346
From 12/11/2015 to 12/12/2015	473.232	58.086	34.641	380.505
From 12/12/2015 to 11/01/2016	785.286	43.632	26.357	715.297
From 11/01/2016 to 11/02/2016	821.964	31.098	39.601	751.265
Total	43883.632	267.708	1263.650	42352.274

Baseline Emission (BE_y) = (43,883.632 - 267.708 - 1,263.650) MWh * 0.94515 tCO₂/MWh
= 42,352.274 MWh * 0.94515 tCO₂/MWh
= 40,029 tCO₂ (after rounding down)

E.2. Calculation of project emissions or actual net GHG removals by sinks

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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

>>

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

$$L_y = 0$$

² There will be no double accounting of emission reduction despite of end date of previous month is the start date of consequent month. The reason for the same is that meter reading is taken at a particular time of the day (i.e. 12:00 noon). For example generation for the period 16/06/2015 to 11/02/2016 would denote reading till that time of 11/02/2016. These dates are also reflected in the Joint Meter Reading prepared by State Utility based on which ER calculation is done. Hence, it is clear that there would not be any double accounting of emission reduction and apportioning is done.

E.4. Summary of calculation of emission reductions or net GHG removals by sinks

Item	Baseline emissions or baseline net GHG removals by sinks (t CO ₂ e)	Project emissions or actual net GHG removals by sinks (t CO ₂ e)	Leakage (tCO ₂ e)	GHG emission reductions or net GHG removals by sinks (t CO ₂ e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
Total	40,029	0	0	0	40,029	40,029

E.5. Comparison of actual emission reductions or net GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO ₂ e)	68,412	40,029

E.6. Remarks on difference from estimated value in registered PDD

>>

The actual emission reduction achieved is 41.49% less than the estimated figure as per registered PDD. This is due to lower electricity generation (actual 43,883.632 MWh compared to estimated 72,382.49 MWh in registered PDD considering the same duration of operation) 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.

Appendix 1. Contact information of project participants and responsible persons/entities

Project participant and/or responsible person/ entity	<input checked="" type="checkbox"/> Project participant <input checked="" type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
Organization name	Vaayu (India) Power Corporation Private Limited
Street/P.O. Box	Plot No. 33, Daman Patalia Road
Building	
City	Bhimpore
State/region	Daman (UT)
Postcode	396210
Country	India
Telephone	+91-260-2220624, 2220628
Fax	+91-260-2221508
E-mail	yogesh.mehra@windworldindia.com
Website	
Contact person	
Title	Director
Salutation	Mr.
Last name	Mehra
Middle name	
First name	Yogesh
Department	Corporate
Mobile	+91-98200 40301
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Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
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 (EB70, 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	28 May 2010	EB 54, Annex 34. Initial adoption.
Decision Class: Regulatory Document Type: Form Business Function: Issuance Keywords: monitoring report		