Monitoring report form
(Version 03.1)

Monitoring report

Title of the project activity	Vaayu India Wind Power Project in Tamilnadu
Reference number of the project activity	4930
Version number of the monitoring report	02
Completion date of the monitoring report	28/03/2013
Registration date of the project activity	19/07/2011
Monitoring period number and duration of this monitoring period	Second, 18/02/2012-11/12/2012(Inclusive of first and last day)
Project participant(s)	Vaayu (India) Power Corporation Private Limited
Host Party(ies)	Govt. of India (Host)
Sectoral scope(s) and applied methodology(ies)	Energy industries (renewable/ non-renewable sources) **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: • Tool to calculate the emission factor for an electricity system – Version 02 • Tool for the demonstration and assessment of additionality – Version 5.2
Estimated amount of GHG emission reductions or net anthropogenic GHG removals by sinks for this monitoring period in the registered PDD	Average value of CER/ year (or 365 days) as per PDD are 103,612 tCO_2. Current monitoring period (18/02/2012-11/12/2012) covers period of 298 days, hence ex-ante estimated of CER's as per the PDD are 84593 tCO_2.
Actual GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period	98269 tCO_2 (Actual GHG emission reductions under 2nd Monitoring period, Duration: 18/02/2012-11/12/2012 (Inclusive of first and last day))

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

(a) >> Purpose of the project activity and the measures taken for GHG emission reductions or net anthropogenic GHG removals by sinks;

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, which is estimated to be approximately 103,612 tCO2e per year, 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/ will be predominantly based on fossil fuels. Whereas the electricity generation from operation of Wind Energy Convertors (WEC's) is emission free.

(b) Brief description of the installed technology and equipments;

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. Enercon (India) Ltd (EIL) is the turbine supplier and is the operations and maintenance contractor.

(c) Relevant dates for the project activity (e.g. construction, commissioning, continued operation periods, etc.);

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 commissioning dates of all the WTGs installed in the project activity have been provided in the table below:

S. No.	WEG S.C. NO	No. & Capacity	Commissioning Date (dd/mm/yyyy)
1	3376	4 X 800 kW	29/9/2010
		5 X 800 kW	2/3/2011
		2 X 800 kW	11/3/2011
2	3461	1 X 800 kW	28/12/2010
3	3462	1 X 800 kW	28/12/2010
4	3463	1 X 800 kW	28/12/2010
5	3464	1 X 800 kW	28/12/2010
6	3465	1 X 800 kW	28/12/2010
7	3466	1 X 800 kW	28/12/2010
8	3467	1 X 800 kW	28/12/2010
9	3470	2X 800 kW	31/12/2010
10	3500	1 X 800 kW	18/3/2011
11	3501	1 X 800 kW	18/3/2011
12	3502	1 X 800 kW	18/3/2011
13	3503	1 X 800 kW	18/3/2011
14	3504	1 X 800 kW	18/3/2011

15	3505	1 X 800 kW	18/3/2011
16	3506	1 X 800 kW	18/3/2011
17	3507	1 X 800 kW	18/3/2011
18	3508	1 X 800 kW	18/3/2011
19	3509	2X 800 kW	18/3/2011
20	3510	1 X 800 kW	18/3/2011
21	3511	1 X 800 kW	18/3/2011
22	3512	1 X 800 kW	18/3/2011
23	3513	1 X 800 kW	18/3/2011
24	3514	1 X 800 kW	18/3/2011
25	3515	1 X 800 kW	18/3/2011
26	3516	1 X 800 kW	18/3/2011
27	3517	1 X 800 kW	18/3/2011
28	3518	1 X 800 kW	18/3/2011
29	3519	1 X 800 kW	18/3/2011
30	3528	1 X 800 kW	22/3/2011
31	3768	1 X 800 kW	1/7/2011
32	3769	1 X 800 kW	1/7/2011
33	3770	1 X 800 kW	1/7/2011
34	3771	1 X 800 kW	1/7/2011
35	3772	1 X 800 kW	1/7/2011
36	3773	1 X 800 kW	1/7/2011
37	3774	1 X 800 kW	1/7/2011
38	3775	1 X 800 kW	1/7/2011
39	3776	1 X 800 kW	1/7/2011
40	3777	1 X 800 kW	1/7/2011
41	3778	1 X 800 kW	1/7/2011
42	3779	1 X 800 kW	1/7/2011
43	3780	1 X 800 kW	1/7/2011
44	3781	1 X 800 kW	1/7/2011
45	3782	1 X 800 kW	1/7/2011
46	3783	1 X 800 kW	1/7/2011
47	3784	1 X 800 kW	1/7/2011
48	3785	1 X 800 kW	1/7/2011
49	3789	1 X 800 kW	11/7/2011
50	3790	1 X 800 kW	11/7/2011
51	3791	1 X 800 kW	11/7/2011

(d) Total GHG emission reductions or net anthropogenic GHG removals by sinks achieved in this monitoring period.

The total emission reductions achieved under this monitoring period (18/02/2012-11/12/2012) are **98269 tCO_2**.

A.2. Location of project activity

(a) >> Host Party(ies);
India

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

(c) City/Town/Community, etc.;
Vagaikulam, Kuruchikulam, Ettankulam, Kalakudi, Muthammalpuram, Ukkirankottai villages in Tirunelveli district State of Tamilnadu.

(d) Physical/ Geographical location.

Table-1:

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
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
	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 if the Party involved wishes to be considered as project participant (Yes/No)
Government of India (Host)	Vaayu (India) Power Corporation Private Limited	No

A.4. Reference of applied methodology

>> **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:

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

A.5. Crediting period of project activity

>> 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 registered project activity

>> 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 400V, 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 ± 12.5%. The average life time of the WEC is around 20 years as per the industry standards. The other salient features of the state-of-art-technology are:

Turbine model	Enercon 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 expected operational lifetime of the project is for 20 years.

B.2. Post registration changes

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

>> Not applicable.

B.2.2. Corrections

>> Not applicable.

B.2.3. Permanent changes from registered monitoring plan or applied methodology

>> Not applicable.

B.2.4. Changes to project design of registered project activity

>> Not applicable.

B.2.5. Changes to start date of crediting period

>> Not applicable.

B.2.6. Types of changes specific to afforestation or reforestation project activity

>> Not applicable.

SECTION C. Description of monitoring system

>> 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.

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

This approved monitoring methodology requires monitoring of the following:

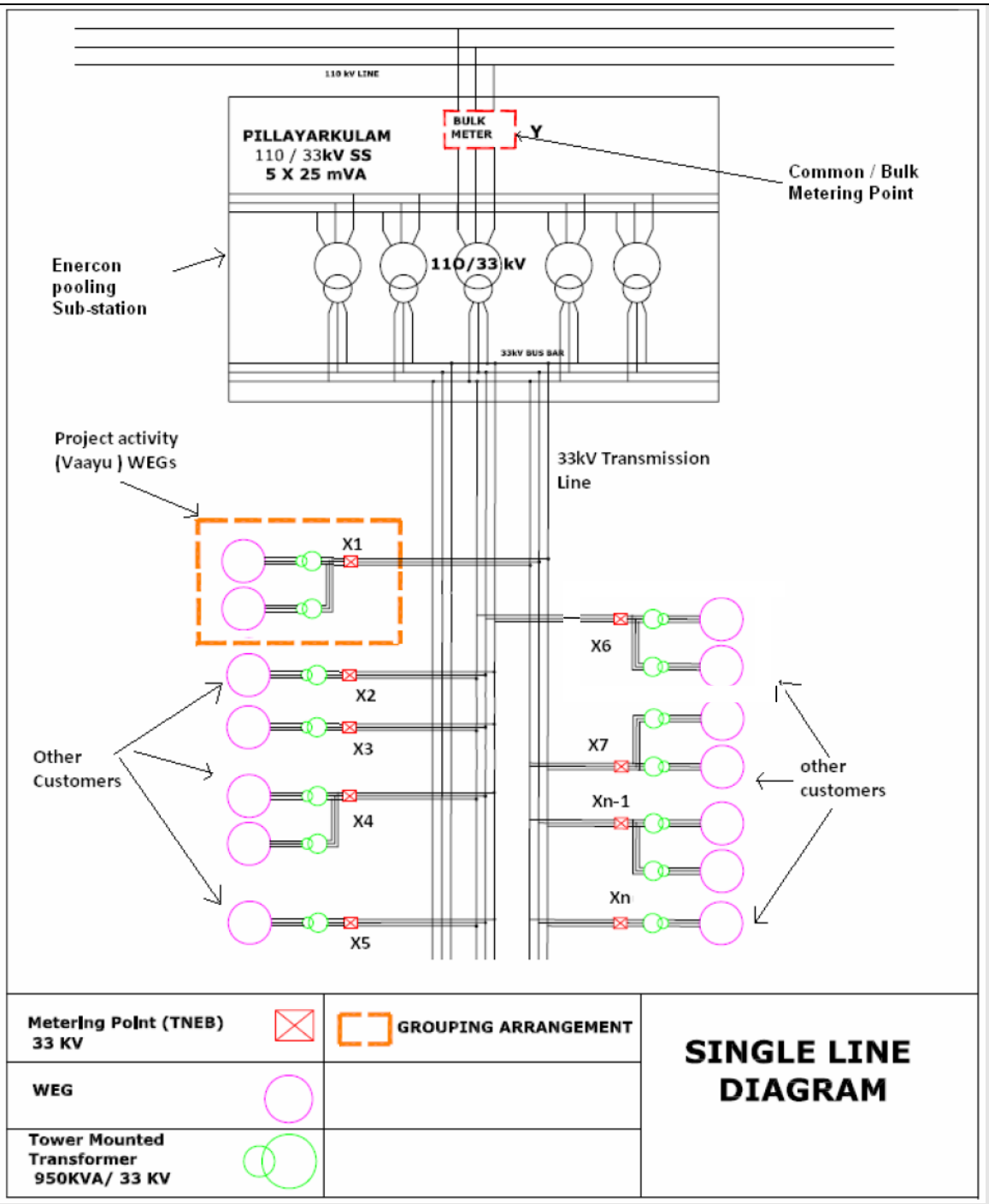
- Electricity generation from the project activity; and
- Operating margin emission factor and build margin emission factor of the grid, where *ex post* determination of grid emission factor has been chosen

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 Enercon and managed by the PP. The operational and maintenance contract for the project is with Enercon. Enercon is an ISO 9001:2000 certified Quality Management system from Germanischer Lloyd. Enercon 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 33kV 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 Enercon pooling sub-station at Pillayarkulam at bulk metering point at 110 kV. There is one main and one check meter at the Enercon substation. Since the main and check meters (bulk meter) at 110 kV metering point at the ENERCON 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 ENERCON substation, the state utility apply Line loss to the meter reading recorded

at the 33 KV.
The total % of Line loss from WEGs (33kV metering point) to Enercon substation (110kV 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)*

Xn = Net Export (Export – Import) Reading (Xi) 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,…Xn 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 33kV & 110kV metering point) is calculated as follows:-
Line Loss (TE) = Percentage Line Loss * Net Export recorded at 33kV metering point of project activity

$$\mathbf{TE = Z \times (EGExport,y - EGImport,y)}$$

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

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

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 Export (EGexport)
2. Electricity Import (EGimport)
3. Line Loss (TE) between 33 kV metering point and 110 kV metering point at Enercon substation
4. Net Generation to the Grid [EGexport-EGimport-TE]

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 each year. Enercon 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 Enercon'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 Enercon Training Academy provides need-based training to meet the training requirements of Enercon 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 will be taken from the monthly joint meter readings noted from the dedicated meters connecting 63 turbines of the project activity. The PP will make clusters of WECs at the project site for the purpose of metering. Each cluster will have one main meter. Summation of meter reading for all the clusters (connecting 63 machines) will 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 Enercon Substation Pillyarkulam.at 110kV. The machines of the project activtity 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 (Enercon personals and personals of TNEB) for every last month. At the conclusion of each meter reading an appointed representative of TNEB and Enercon sign a document indicating the number of Kilowatt-hours (kWh) indicated by the meter.

QA/QC Procedure: All the meters are calibrated/ tested once each year as per the PPA. 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 33kV 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 Enercon pooling sub-station; 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.

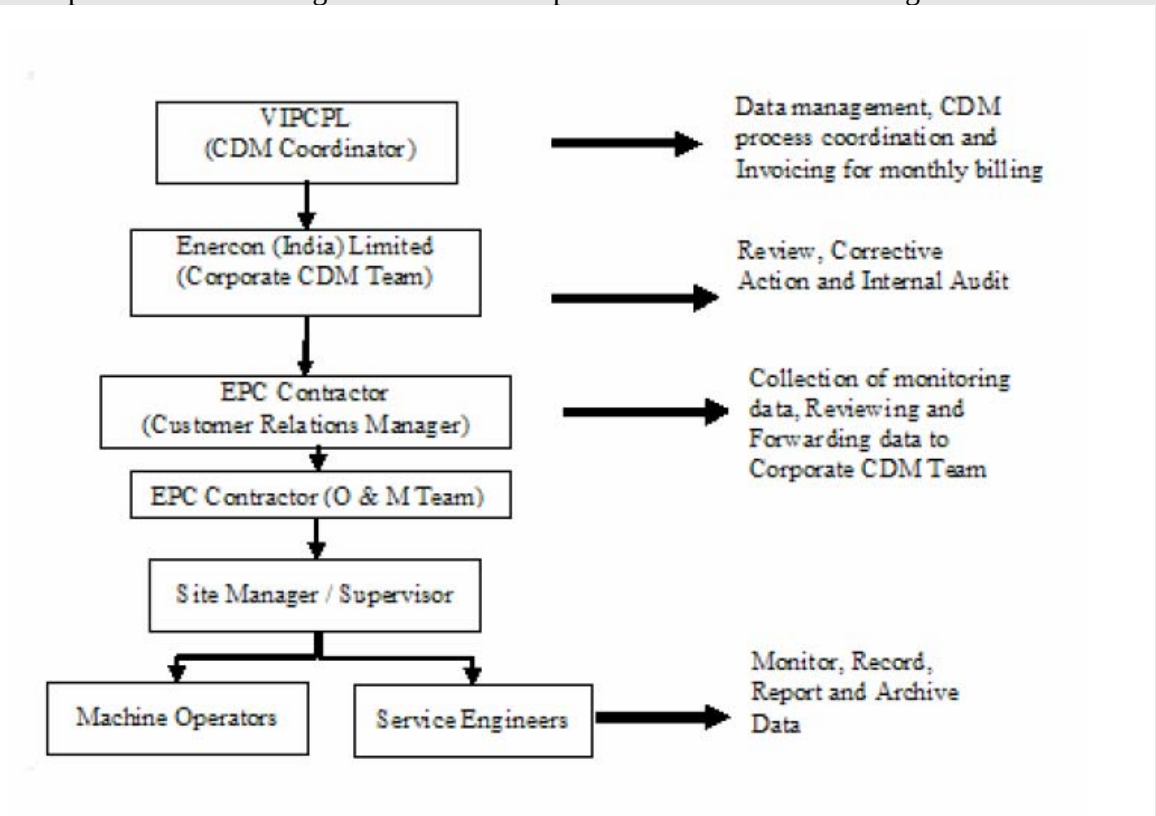
In case the date of registration or start date of the crediting period of the project does not match with the date of joint meter report, the apportioning for net electricity exported to the grid for first month will be done based upon the meter reading of the controller meter (also known as Local Control System (LCS) meter) located in the WEC tower and thereafter the readings from main meter will be referred.

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

All the main meters and check meters are calibrated once each year and 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 project proponent is Vaayu (India) Power Corporation Private Limited will be keeping and monitoring the data for electricity generation and calibration reports post project implementation. Enercon (India) Limited will be the O&M contractor who will be having the responsibility of activities such as maintaining electricity generation records, calibration records and maintenance of the Wind Energy Generators.

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:

S. No.	WEG HT. S.C. NO	No. & Capacity	Meter No.	Make	Accuracy Class	Past Calibration Date (dd/mm/yyyy)	Latest Calibration Date (dd/mm/yyyy)	Validity date of Calibration
1	3376	4 X 800 kW 5 X 800 kW 2 X 800 kW	TNU04909	Premier	0.5s	11/3/2011	02/11/2012	01/11/2013
2	3461	1 X 800 kW	HT2110167	Wallabey	0.2s	9/5/2011	02/11/2012	01/11/2013
3	3462	1 X 800 kW	HT2110162	Wallabey	0.2s	9/5/2011	02/11/2012	01/11/2013
4	3463	1 X 800 kW	HT2110156	Wallabey	0.2s	9/5/2011	02/11/2012	01/11/2013
5	3464	1 X 800 kW	HT2110161	Wallabey	0.2s	9/5/2011	02/11/2012	01/11/2013
6	3465	1 X 800 kW	HT2110151	Wallabey	0.2s	10/5/2011	02/11/2012	01/11/2013
7	3466	1 X 800 kW	HT2110149	Wallabey	0.2s	10/5/2011	02/11/2012	01/11/2013
8	3467	1 X 800 kW	HT2110153	Wallabey	0.2s	10/5/2011	02/11/2012	01/11/2013
9	3470	2X 800 kW	TN901101	Premier	0.5s	8/11/2011	02/11/2012	01/11/2013
10	3500	1 X 800 kW	HT2110146	Wallabey	0.2s	9/5/2011	02/11/2012	01/11/2013
11	3501	1 X 800 kW	HT2110143	Wallabey	0.2s	9/5/2011	02/11/2012	01/11/2013
12	3502	1 X 800 kW	HT2110152	Wallabey	0.2s	10/5/2011	02/11/2012	01/11/2013
13	3503	1 X 800 kW	HT2110166	Wallabey	0.2s	9/5/2011	02/11/2012	01/11/2013
14	3504	1 X 800 kW	HT2110148	Wallabey	0.2s	10/5/2011	02/11/2012	01/11/2013
15	3505	1 X 800 kW	HT2110154	Wallabey	0.2s	10/5/2011	02/11/2012	01/11/2013
16	3506	1 X 800 kW	HT2110168	Wallabey	0.2s	10/5/2011	02/11/2012	01/11/2013
17	3507	1 X 800 kW	HT2110144	Wallabey	0.2s	10/5/2011	02/11/2012	01/11/2013
18	3508	1 X 800 kW	HT2110163	Wallabey	0.2s	10/5/2011	03/11/2012	02/11/2013
19	3509	2X 800 kW	TNB04626	Premier	0.5s	18/3/2011	03/11/2012	02/11/2013
20	3510	1 X 800 kW	HT2110165	Wallabey	0.2s	9/5/2011	03/11/2012	02/11/2013
21	3511	1 X 800 kW	HT2110158	Wallabey	0.2s	9/5/2011	03/11/2012	02/11/2013

22	3512	1 X 800 kW	HT2110157	Wallabey	0.2s	9/5/2011	03/11/2012	02/11/2013
23	3513	1 X 800 kW	HT2110147	Wallabey	0.2s	10/5/2011	02/11/2012	01/11/2013
24	3514	1 X 800 kW	HT2110150	Wallabey	0.2s	10/5/2011	02/11/2012	01/11/2013
25	3515	1 X 800 kW	HT2110159	Wallabey	0.2s	9/5/2011	02/11/2012	01/11/2013
26	3516	1 X 800 kW	HT2110164	Wallabey	0.2s	9/5/2011	02/11/2012	01/11/2013
27	3517	1 X 800 kW	HT2110142	Wallabey	0.2s	9/5/2011	02/11/2012	01/11/2013
28	3518	1 X 800 kW	HT2110160	Wallabey	0.2s	9/5/2011	02/11/2012	01/11/2013
29	3519	1 X 800 kW	HT2110145	Wallabey	0.2s	9/5/2011	02/11/2012	01/11/2013
30	3528	1 X 800 kW	HT2110155	Wallabey	0.2s	9/5/2011	02/11/2012	01/11/2013
31	3768	1 X 800 kW	HT2110195	Wallabey	0.2s	1/7/2011	02/11/2012	01/11/2013
32	3769	1 X 800 kW	HT2110220	Wallabey	0.2s	1/7/2011	03/11/2012	02/11/2013
33	3770	1 X 800 kW	HT2110196	Wallabey	0.2s	1/7/2011	03/11/2012	02/11/2013
34	3771	1 X 800 kW	HT2110215	Wallabey	0.2s	1/7/2011	02/11/2012	01/11/2013
35	3772	1 X 800 kW	HT2110219	Wallabey	0.2s	1/7/2011	03/11/2012	02/11/2013
36	3773	1 X 800 kW	HT2110216	Wallabey	0.2s	1/7/2011	03/11/2012	02/11/2013
37	3774	1 X 800 kW	HT2110169	Wallabey	0.2s	1/7/2011	03/11/2012	02/11/2013
38	3775	1 X 800 kW	HT2110191	Wallabey	0.2s	1/7/2011	03/11/2012	02/11/2013
39	3776	1 X 800 kW	HT2110218	Wallabey	0.2s	1/7/2011	03/11/2012	02/11/2013
40	3777	1 X 800 kW	HT2110226	Wallabey	0.2s	1/7/2011	03/11/2012	02/11/2013
41	3778	1 X 800 kW	HT2110198	Wallabey	0.2s	1/7/2011	03/11/2012	02/11/2013
42	3779	1 X 800 kW	HT2110223	Wallabey	0.2s	1/7/2011	03/11/2012	02/11/2013
43	3780	1 X 800 kW	HT2110218	Wallabey	0.2s	1/7/2011	03/11/2012	02/11/2013
44	3781	1 X 800 kW	HT2110229	Wallabey	0.2s	1/7/2011	03/11/2012	02/11/2013
45	3782	1 X 800 kW	HT2110206	Wallabey	0.2s	1/7/2011	03/11/2012	02/11/2013
46	3783	1 X 800 kW	HT2110211	Wallabey	0.2s	1/7/2011	03/11/2012	02/11/2013

47	3784	1 X 800 kW	HT2110192	Wallabey	0.2s	1/7/2011	03/11/2012	02/11/2013
48	3785	1 X 800 kW	HT2110203	Wallabey	0.2s	1/7/2011	03/11/2012	02/11/2013
49	3789	1 X 800 kW	HT2110225	Wallabey	0.2s	11/7/2011	03/11/2012	02/11/2013
50	3790	1 X 800 kW	HT2110228	Wallabey	0.2s	11/7/2011	03/11/2012	02/11/2013
51	3791	1 X 800 kW	HT2110224	Wallabey	0.2s	11/7/2011	03/11/2012	02/11/2013

Meters at machines/cluster of machines were calibrated in months of March, May and July-2011 mainly (except at machine 3470, where last calibration was done in November-2011). For the serial numbers as mentioned in above table, error factors for electricity import and export have been applied conservatively to cover the maximum period under error adjustment. For example from serial number 2 above table, past calibration was done in 09/05/2011 and recent calibration was done in 02/11/2012, so to cover maximum period; complete months of May-2012 (this month covers period from 17/04/2012 to 17/05/2012) to Nov-2012 (this month covers period from 11/10/2012 to 14/11/2012) were considered while applying correction factor.

Serial number from above table	Application of error factor for Stated months
2 to 8, 10 to 18, 20 to 30	May-2012 to November-2012
1 and 19	March-2012 to November-2012
31 to 51 (except 39)	July-2012 to November-2012

Meter change detail:

WEG HT. S.C. NO	Old meter no.	New meter no.	Meter Change date	Reason for meter change	Supporting document
3776	HT2110214	HT2110218	22/05/2012	No display of meter reading	Meter change report from Tamilnadu electricity Board

Enercon substation Meter Details:

Meter Name	Serial Number	Make	Accuracy Class	Previous Calibration Date	Recent Calibration Date	**Validity date of Calibration**
Main Meter	HT1100044	Wallabey	0.2 s	09/11/2011	07/12/2012	06/12/2013
Check Meter	HT1100045	Wallabey	0.2 s	12/11/2011	09/12/2012	08/12/2013

Meters at Substation meant for allocating transmission losses were calibrated in December-2012 lately while previous calibration was conducted in November-2011. Hence an error factor of 1.002

(i.e. for meters of accuracy class 0.2s, a conservative one) was applied on transmission losses for the months of November and December-2012 to cover the conservative period.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante or at renewal of crediting period

(Copy this table for each piece of data and parameter.)

Data / Parameter:	$EF_{grid,OM,y}$
Unit:	tCO2e/MWh
Description:	Operating 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):	0.98756
Purpose of data:	To calculate Baseline Emissions Factor
Additional comment:	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

Data / Parameter:	$EF_{qrid,BM,y}$
Unit:	tCO2e/MWh
Description:	Build 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):	0.81792
Purpose of data:	To calculate Baseline Emissions Factor
Additional comment:	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

Data / Parameter:	$EF_{grid,CM,y}$
Unit:	tCO2e/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 Calculated
Value(s) applied):	0.94515
Purpose of data:	To calculate Baseline Emissions
Additional comment:	The value is calculated on ex-ante basis and it will remain same throughout the crediting period.

D.2. Data and parameters monitored

(Copy this table for each piece of data and parameter.)

Data / Parameter:	$EG_{PJ,y}$
Unit:	MWh (Mega-watt hour)
Description:	Net electricity supplied 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:	103972.783
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 procedures 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 main meter and check 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 comment:	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	Measured
Source of data	Monthly billing records which is given by Tamilnadu Electricity Board (TNEB)/ (Tirnunelveli Electricity Distribution Circle, Tirunelveli).
Value(s) of monitored parameter	107872.096
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 procedures 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 comment	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	Measured
Source of data	Monthly billing records which is given by Tamilnadu Electricity Board (TNEB)/ (Tirnunelveli Electricity Distribution Circle, Tirunelveli).
Value(s) of monitored parameter	283.727
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 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 $EG_{Import,y}$ has been crosschecked from invoice raised on TNEB or state electricity board. QA/QC procedures 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 comment	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)/ (Tirnunelveli Electricity Distribution Circle, Tirunelveli).
Value(s) of monitored parameter	3615.585
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 ENERCON 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)	$\mathbf{T_E = Z \times (EG_{Export,y} - EG_{Import,y})}$ 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 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. Refer section C for an illustration of the provisions for QA/QC procedures.
Purpose of data	To calculate emission reduction.
Additional comment	The data will be archived for crediting period + 2 years.

D.3. Implementation of sampling plan

>> No sampling plan is followed by PP.

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:

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

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)

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

= 107872.096-283.727-3615.585

= 103972.783

$EF_{grid,CM,y}$ = 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)

Baseline Emission for the period (18/02/2012 to 11/12/2012)

= 103972.783 (MWh) * 0.94515 (tCO_2/MWh)

= **98269 tCO_2**

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

>> The project activity is a renewable energy project which generates electricity using wind power and hence does not result in project emissions.

E.3. Calculation of leakage

>> No leakage is considered from the project activity as per approved methodology ACM0002.

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

Item	Baseline emissions or baseline net GHG removals by sinks (t CO_2e)	Project emissions or actual net GHG removals by sinks (t CO_2e)	Leakage (t CO_2e)	Emission reductions or net anthropogenic GHG removals by sinks (t CO_2e)
Total	98269	0	0	98269

E.5. Comparison of actual emission reductions or net anthropogenic 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_2e)	84593	98269

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

>> The Emission Reduction (ER) value in the monitoring period is 16.16 % higher as compared to the value estimated in the registered PDD, which is due to exclusive consideration of peak wind season in the monitoring period.

E.7. Actual emission reductions or net anthropogenic GHG removals by sinks during the first commitment period and the period from 1 January 2013 onwards

Item	Actual values achieved up to 31 December 2012	Actual values achieved from 1 January 2013 onwards
Emission reductions or GHG removals by sinks (t CO_2e)	98269 (From 18/02/2012 to 11/12/2012)	Not Applicable

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Document information

Version	*Date*	*Description*
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 anthropogenic 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, performance monitoring