

MONITORING REPORT FORM (CDM-MR) *
Version 01 - in effect as of: 28/09/2010

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* as contained within the document entitled "Guidelines for completing the monitoring report form (CDM-MR)" (EB 54 meeting report, annex 34).

MONITORING REPORT

Version number 6.0, Date: 07/07/2012
Title: Vaayu India Wind Power Project in Tamilnadu
Project Reference No: 4930

Monitoring Period – First monitoring period

FROM 19/07/2011 TO 17/02/2012 (including first and last day)

SECTION A. General description of the project activity

A.1. Brief description of the project activity: >>

>>

1. Purpose of the project activity and the measures taken to reduce greenhouse gas emissions;

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.

2. 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.

3. 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 project activity was registered as CDM project on 19/07/2011. The first monitoring period is from 19/07/2011 to 17/02/2012.

4. Total emission reductions achieved in this monitoring period.

The total emission reductions achieved under this monitoring period (19/07/2011 to 17/02/2012) is **27128 tCO₂**.

A.2. Project Participants

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| Name of Party involved ((host) indicates a host Party) | Private and/or public entity(ies) project participants (*) (as applicable) | Kindly indicate if the Party involved wishes to be considered as project participant (Yes/No) |
|---|--|--|
| India (Host) | Vaayu (India) Power Corporation Private Limited | No |

A.3. Location of the project activity:

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The project is spread across Vagaikulam, Kuruchikulam, Ettankulam, Kalakudi, Muthammalpuram, Ukkirankottai villages in Tirunelveli district in Indian State of Tamilnadu.

| 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.4. Technical description of the project

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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 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 \pm 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 |

A.5. Title, reference and version of the baseline and monitoring methodology applied to the project activity:

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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

A.6. Registration date of the project activity:

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19/07/2011

A.7. Crediting period of the project activity and related information (start date and choice of crediting period):

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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.8. Name of responsible person(s)/entity(ies):

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Contact Information of Vaayu (India) Power Corporation Private Limited is given in the table below:

| | |
|------------------|--|
| Organization: | Vaayu (India) Power Corporation Private Limited |
| Street/P.O.Box: | Plot No. 33, Daman Patalia Road |
| Building: | |
| City: | Bhimpore |
| State/Region: | Daman (UT) |
| Postfix/ZIP: | 396210 |
| Country: | India |
| Telephone: | +91-260-2220624, 2220628 |
| FAX: | +91-260-2221508 |
| E-Mail: | Yogesh.mehra@enerconindia.net |
| URL: | |
| Represented by: | |
| Title: | Managing Director |
| Salutation: | Mr. |
| Last Name: | Mehra |
| Middle Name: | |
| First Name: | Yogesh |
| Department: | Corporate |
| Mobile: | +91-98200 40301 |
| Direct FAX: | +91-260-2221508 |
| Direct tel: | +91-22-22-6702 2832 extn. 7111 |
| Personal E-Mail: | Yogesh.mehra@enerconindia.net |

SECTION B. Implementation of the project activity**B.1. Implementation status of the project activity**

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The commissioning date for all the WECs included in the project activity is given 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 |

There have not been any special events comprising of major overhauls and downtime of project activity during the said monitoring period; thus there has not been any change in the operation of project activity during the monitoring period.

There have not been any events or situations that occurred during the monitoring period, which may impact the applicability of the methodology.

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|---|
| B.2. Revision of the monitoring plan |
|---|

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Not Applicable

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|---|
| B.3. Request for deviation applied to this monitoring period |
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Not Applicable

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|--|
| B.4. Notification or request of approval of changes |
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Not Applicable

SECTION C. Description of the 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.

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:

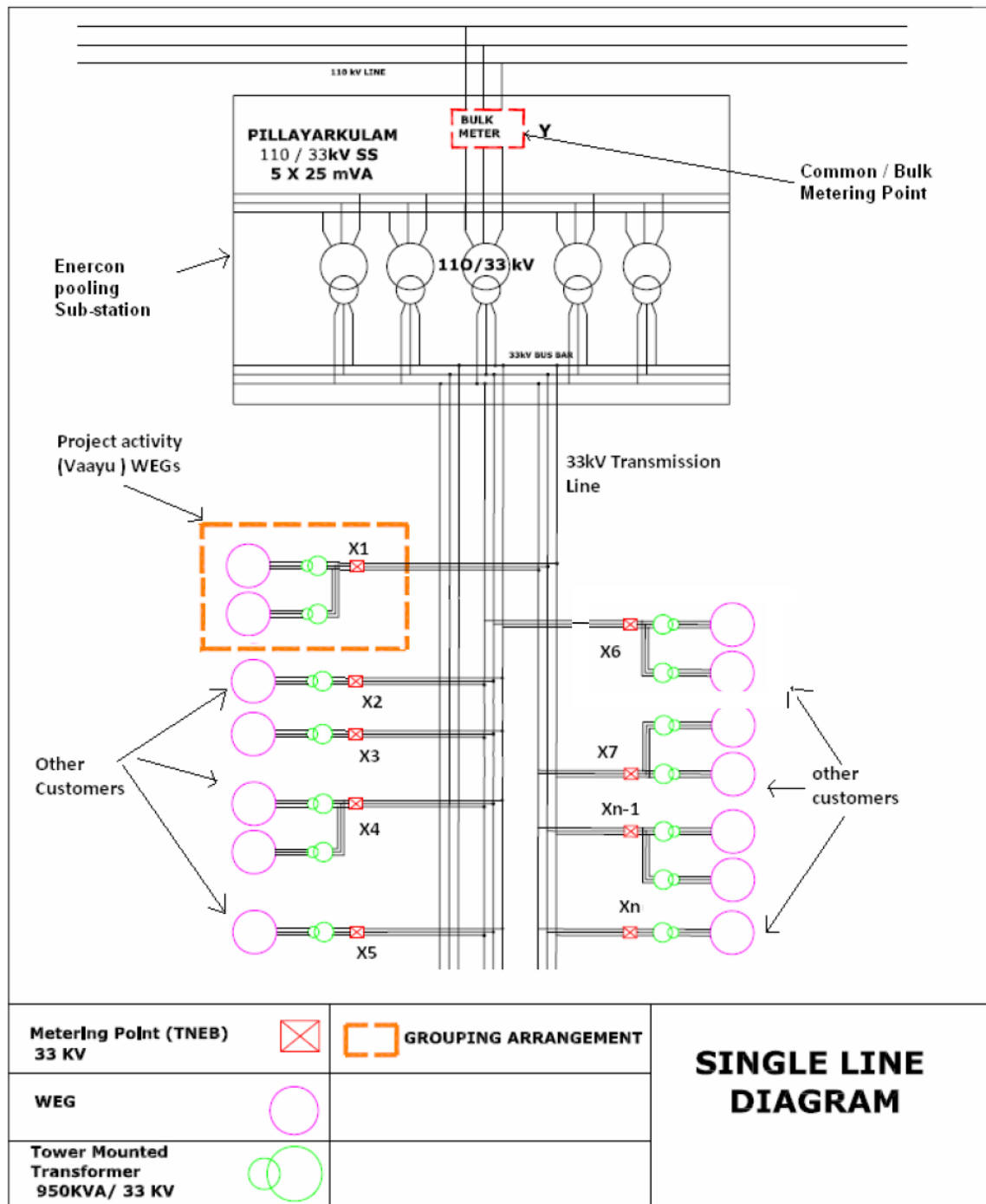
- Electricity generation from the project activity; and
- Operating margin emission factor and build margin emission factor of the grid, where *ex post* determination of grid emission factor has been chosen

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)

Xi = 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

$$\mathbf{TE = Z \times (EG_{Export,y} - EG_{Import,y})}$$

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 (EG_{export})
2. Electricity Import (EG_{import})
3. Line Loss (TE) between 33 kV metering point and 110 kV metering point at Enercon substation
4. Net Generation to the Grid [EG_{export}-EG_{import}-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 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 (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.

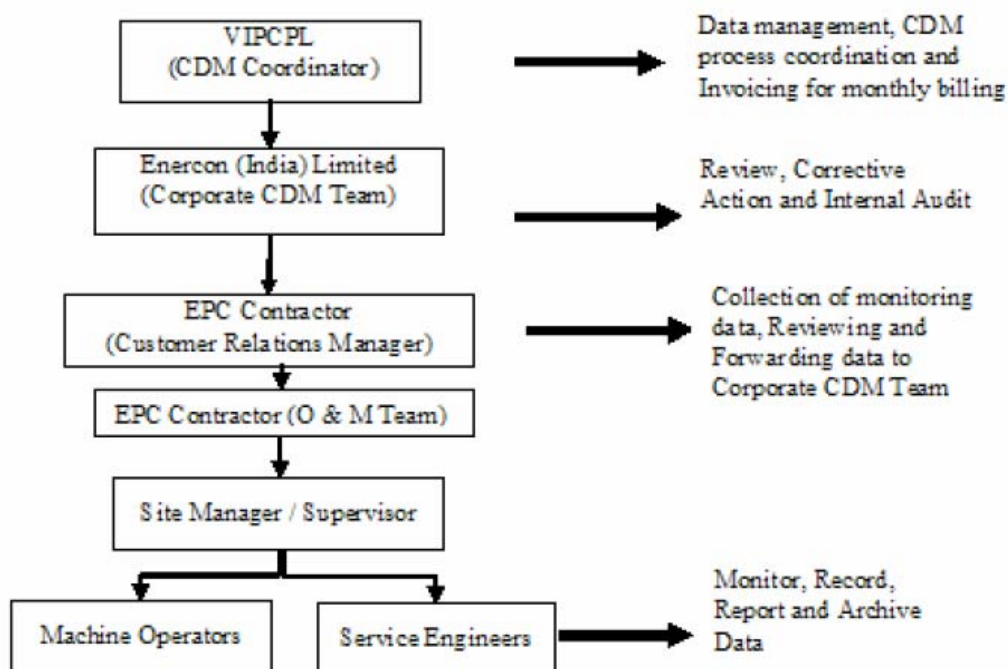
PP will be monitoring the data sent by the O&M contractor and the data for electricity generated by the project activity will be kept as records for the period of 10+2 years i.e. 2 years beyond the term of crediting period. Enercon is O&M contractor and will be responsible for data recording.

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 | Accur acy Class | Calibration Date (dd/mm/yyyy) | Validity date of Calibration |
|--------|--------------------------|-------------------|-----------|--------------|-----------------------|-------------------------------------|------------------------------------|
| 1 | 3376 | 4 X 800 kW | TNU04909 | Premier | 0.2s | 11/3/2011 | 10/3/2012 |
| | | 5 X 800 kW | | | | | |
| | | 2 X 800 kW | | | | | |
| 2 | 3461 | 1 X 800 kW | HT2110167 | Wallabe y | 0.2s | 9/5/2011 | 8/5/2012 |
| 3 | 3462 | 1 X 800 kW | HT2110162 | Wallabe y | 0.2s | 9/5/2011 | 8/5/2012 |
| 4 | 3463 | 1 X 800 kW | HT2110156 | Wallabe y | 0.2s | 9/5/2011 | 8/5/2012 |
| 5 | 3464 | 1 X 800 kW | HT2110161 | Wallabe y | 0.2s | 9/5/2011 | 8/5/2012 |
| 6 | 3465 | 1 X 800 kW | HT2110151 | Wallabe y | 0.2s | 10/5/2011 | 9/5/2012 |
| 7 | 3466 | 1 X 800 kW | HT2110149 | Wallabe y | 0.2s | 10/5/2011 | 9/5/2012 |
| 8 | 3467 | 1 X 800 kW | HT2110153 | Wallabe y | 0.2s | 10/5/2011 | 9/5/2012 |
| 9 | 3470 | 2X 800 kW | TN901101 | Premi er | 0.2s | 31/12/2010 & 8/11/2011 | 7/11/2012 |
| 10 | 3500 | 1 X 800 kW | HT2110146 | Wallabe y | 0.2s | 9/5/2011 | 8/5/2012 |
| 11 | 3501 | 1 X 800 kW | HT2110143 | Wallabe y | 0.2s | 9/5/2011 | 8/5/2012 |
| 12 | 3502 | 1 X 800 kW | HT2110152 | Wallabe y | 0.2s | 10/5/2011 | 9/5/2012 |
| 13 | 3503 | 1 X 800 kW | HT2110166 | Wallabe y | 0.2s | 9/5/2011 | 8/5/2012 |
| 14 | 3504 | 1 X 800 kW | HT2110148 | Wallabe y | 0.2s | 10/5/2011 | 9/5/2012 |
| 15 | 3505 | 1 X 800 kW | HT2110154 | Wallabe y | 0.2s | 10/5/2011 | 9/5/2012 |
| 16 | 3506 | 1 X 800 kW | HT2110168 | Wallabe y | 0.2s | 10/5/2011 | 9/5/2012 |
| 17 | 3507 | 1 X 800 kW | HT2110144 | Wallabe y | 0.2s | 10/5/2011 | 9/5/2012 |
| 18 | 3508 | 1 X 800 kW | HT2110163 | Wallabe y | 0.2s | 10/5/2011 | 9/5/2012 |
| 19 | 3509 | 2X 800 kW | TNB04626 | Premier | 0.2s | 18/3/2011 | 17/3/2012 |
| 20 | 3510 | 1 X 800 kW | HT2110165 | Wallabe y | 0.2s | 9/5/2011 | 8/5/2012 |
| 21 | 3511 | 1 X 800 kW | HT2110158 | Wallabe y | 0.2s | 9/5/2011 | 8/5/2012 |
| 22 | 3512 | 1 X 800 kW | HT2110157 | Wallabe y | 0.2s | 9/5/2011 | 8/5/2012 |
| 23 | 3513 | 1 X 800 kW | HT2110147 | Wallabe y | 0.2s | 10/5/2011 | 9/5/2012 |
| 24 | 3514 | 1 X 800 kW | HT2110150 | Wallabe | 0.2s | 10/5/2011 | 9/5/2012 |

| | | | | | | | |
|----|------|------------|-----------|--------------|------|-----------|-----------|
| | | | | y | | | |
| 25 | 3515 | 1 X 800 kW | HT2110159 | Wallabe y | 0.2s | 9/5/2011 | 8/5/2012 |
| 26 | 3516 | 1 X 800 kW | HT2110164 | Wallabe y | 0.2s | 9/5/2011 | 8/5/2012 |
| 27 | 3517 | 1 X 800 kW | HT2110142 | Wallabe y | 0.2s | 9/5/2011 | 8/5/2012 |
| 28 | 3518 | 1 X 800 kW | HT2110160 | Wallabe y | 0.2s | 9/5/2011 | 8/5/2012 |
| 29 | 3519 | 1 X 800 kW | HT2110145 | Wallabe y | 0.2s | 9/5/2011 | 8/5/2012 |
| 30 | 3528 | 1 X 800 kW | HT2110155 | Wallabe y | 0.2s | 9/5/2011 | 8/5/2012 |
| 31 | 3768 | 1 X 800 kW | HT2110195 | Wallabe y | 0.2s | 1/7/2011 | 30/6/2012 |
| 32 | 3769 | 1 X 800 kW | HT2110220 | Wallabe y | 0.2s | 1/7/2011 | 30/6/2012 |
| 33 | 3770 | 1 X 800 kW | HT2110196 | Wallabe y | 0.2s | 1/7/2011 | 30/6/2012 |
| 34 | 3771 | 1 X 800 kW | HT2110215 | Wallabe y | 0.2s | 1/7/2011 | 30/6/2012 |
| 35 | 3772 | 1 X 800 kW | HT2110219 | Wallabe y | 0.2s | 1/7/2011 | 30/6/2012 |
| 36 | 3773 | 1 X 800 kW | HT2110216 | Wallabe y | 0.2s | 1/7/2011 | 30/6/2012 |
| 37 | 3774 | 1 X 800 kW | HT2110169 | Wallabe y | 0.2s | 1/7/2011 | 30/6/2012 |
| 38 | 3775 | 1 X 800 kW | HT2110191 | Wallabe y | 0.2s | 1/7/2011 | 30/6/2012 |
| 39 | 3776 | 1 X 800 kW | HT2110214 | Wallabe y | 0.2s | 1/7/2011 | 30/6/2012 |
| 40 | 3777 | 1 X 800 kW | HT2110226 | Wallabe y | 0.2s | 1/7/2011 | 30/6/2012 |
| 41 | 3778 | 1 X 800 kW | HT2110198 | Wallabe y | 0.2s | 1/7/2011 | 30/6/2012 |
| 42 | 3779 | 1 X 800 kW | HT2110223 | Wallabe y | 0.2s | 1/7/2011 | 30/6/2012 |
| 43 | 3780 | 1 X 800 kW | HT2110218 | Wallabe y | 0.2s | 1/7/2011 | 30/6/2012 |
| 44 | 3781 | 1 X 800 kW | HT2110229 | Wallabe y | 0.2s | 1/7/2011 | 30/6/2012 |
| 45 | 3782 | 1 X 800 kW | HT2110206 | Wallabe y | 0.2s | 1/7/2011 | 30/6/2012 |
| 46 | 3783 | 1 X 800 kW | HT2110211 | Wallabe y | 0.2s | 1/7/2011 | 30/6/2012 |
| 47 | 3784 | 1 X 800 kW | HT2110192 | Wallabe y | 0.2s | 1/7/2011 | 30/6/2012 |
| 48 | 3785 | 1 X 800 kW | HT2110203 | Wallabe y | 0.2s | 1/7/2011 | 30/6/2012 |
| 49 | 3789 | 1 X 800 kW | HT2110225 | Wallabe y | 0.2s | 11/7/2011 | 10/7/2012 |

| | | | | | | | |
|----|------|------------|-----------|----------|------|-----------|-----------|
| 50 | 3790 | 1 X 800 kW | HT2110228 | Wallabey | 0.2s | 11/7/2011 | 10/7/2012 |
| 51 | 3791 | 1 X 800 kW | HT2110224 | Wallabey | 0.2s | 11/7/2011 | 10/7/2012 |

Enercon substation Meter Details:

| Meter Name | Serial Number | Make | Accuracy Class | Previous Calibration Date ¹ | Recent Calibration Date | Validity date of Calibration |
|-------------|---------------|----------|----------------|--|-------------------------|------------------------------|
| Main Meter | HT1100044 | Wallabey | 0.2 s | 27/09/2010 | 9/11/2011 | 8/11/2012 |
| Check Meter | HT1100045 | Wallabey | 0.2 s | 27/09/2010 | 12/11/2011 | 11/11/2012 |

¹ Meters at Substation meant for allocating transmission losses were calibrated in Nov-2011 while previous calibration was conducted in Sep-2010. Thus there was delay of 3-months. Hence a 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 Sep, Oct & Nov-2010.

SECTION D. Data and parameters

D.1. Data and parameters determined at registration and not monitored during the monitoring period, including default values and factors

(Copy this table for each data and parameter. To report multiple values, a table may be used)

| | |
|--|---|
| Data / Parameter: | $EF_{grid,OM,y}$ |
| Data unit: | tCO ₂ e/MWh |
| Description: | Operating Margin Emission Factor of Southern Regional Electricity Grid |
| Source of data used: | <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) : | 0.98756 |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Baseline Emissions |
| Additional comment: | The value is calculated on ex-ante basis and it will remain same throughout the crediting period. |

| | |
|--|---|
| Data / Parameter: | $EF_{grid,BM,y}$ |
| Data unit: | tCO ₂ e/MWh |
| Description: | Build Margin Emission Factor of Southern Regional Electricity Grid |
| Source of data used: | <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) : | 0.81792 |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Baseline Emissions |
| Additional comment: | The value is calculated on ex-ante basis and it will remain same throughout the crediting period. |

| | |
|--|---|
| Data / Parameter: | $EF_{grid,CM,y}$ |
| Data unit: | tCO ₂ e/MWh |
| Description: | Combined Margin Emission Factor of Southern Regional Electricity Grid |
| Source of data used: | <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) : | 0.94515 |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Baseline Emissions |

| | |
|---------------------|---|
| calculations) | |
| 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 | |
|---|---|
| <i>(Copy this table for each data and parameter. To report multiple values, a table may be used)</i> | |
| Data / Parameter: | EG_{PJ,y} |
| Data 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: | 28706.684 |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Baseline |
| Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity) | Refer section C for an illustration of the provisions for measurement methods and Monitoring equipment. |
| 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 applied: | 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. |

| | |
|--|---|
| Data / Parameter: | EG_{Export,y} |
| Data 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)/ (Tirunelveli Electricity Distribution Circle, Tirunelveli). |
| Value(s) of monitored parameter: | 29834.934 |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Baseline |

| | |
|---|--|
| Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity) | 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 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 applied: | 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. |

| | |
|---|--|
| Data / Parameter: | EG_{Import,y} |
| Data 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)/ (Tirunelveli Electricity Distribution Circle, Tirunelveli). |
| Value(s) of monitored parameter: | 218.31 |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Baseline |
| Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity) | 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 applied: | 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. |
|--|---|

| | |
|---|--|
| Data / Parameter: | T_E |
| Data 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: | 763.933 |
| Indicate what the data are used for (Baseline/ Project/ Leakage emission calculations) | Baseline |
| Monitoring equipment (type, accuracy class, serial number, calibration frequency, date of last calibration, validity) | Refer section C for an illustration of the provisions for measurement/calculation 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): | $T_E = Z \times (EG_{Export,y} - EG_{Import,y})$ 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 applied: | 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. |

SECTION E. Emission reductions calculation

E.1. Baseline emissions calculation

>>

The baseline emissions are to be calculated as follows:

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

Where:

BE_y = Baseline emissions in year y (tCO₂/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)

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

$$= 29834.934 - 218.31 - 763.933$$

$$= 28706.684$$

$EF_{grid, CM, y}$ = Combined margin CO₂ 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” (tCO₂/MWh)

Baseline Emission for the period (19/07/2011²² to 17/02/2012)

$$= 28706.684 \text{ (MWh)} * 0.94515 \text{ (tCO}_2\text{/MWh)}$$

$$= \mathbf{27128 \text{ tCO}_2}$$

E.2. Project emissions calculation

>>

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

E.3. Leakage calculation

>>

No leakage is considered from the project activity as per approved methodology ACM0002 (Version 12.1.0).

E.4. Emission reductions calculation / table

>>

The total emission reductions achieved during the monitoring period is calculated as:

$$ER_y = BE_y - PE_y - LE_y$$

Where,

ER_y are emission reductions in year y, tCO₂e

BE_y are baseline emissions in year y, tCO₂e

PE_y are project emissions in year y, tCO₂e

LE_y are leakage in year y, tCO₂e

Emission reductions are equal to baseline emissions as emissions due to project and leakage are zero.

Total baseline emissions: **27128 tCO₂**

Total project emissions: Zero

Total leakage: Zero

²² The billing cycle for the month of July-2011 starts from 18th July whereas the project was registered with Unfccc on 19th July 2011. Thus as a conservative estimate to calculate emission reductions, the gross generation of day (18th July 2011) has been deducted from **EG PJ, y** of complete billing cycle.

Thus Emission reductions for project activity is

$$ER_y = BE_y = 27128 \text{ tCO}_2$$

Total Emission Reductions for the monitoring period are **27128 tCO₂**.

| Month | Baseline Emissions, BE _y (tCO ₂ e) | Project Emissions, PE _y (tCO ₂ e) | Leakage Emissions, LE _y (tCO ₂ e) | Emission Reductions, ER _y (tCO ₂ e) |
|--------------|--|---|---|---|
| Aug-11 | 6050 | 0 | 0 | 6050 |
| Sep-11 | 8578 | 0 | 0 | 8578 |
| Oct-11 | 6980 | 0 | 0 | 6980 |
| Nov-11 | 735 | 0 | 0 | 735 |
| Dec-11 | 2008 | 0 | 0 | 2008 |
| Jan-12 | 1495 | 0 | 0 | 1495 |
| Feb-12 | 1282 | 0 | 0 | 1282 |
| Total | 27128 | 0 | 0 | 27128 |

E.5. Comparison of actual emission reductions with estimates in the CDM-PDD

>>

| Item | Values applied in ex-ante calculation of the registered CDM-PDD | Actual values reached during the monitoring period |
|---|---|--|
| Emission reductions (tCO₂e) | 103,612 for each year, the monitoring period contains 7 months hence estimated CER's as per the PDD are 60,748 (approx) | 27128 |

The CERs for the said monitoring period are 55.34 % lower than CERs as estimated in the PDD.

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

>>

The CER's for the said monitoring period are 55.34 % lower than as estimated in the PDD.

History of the document

| Version | Date | Nature of revision |
|--|--------------------------------|--------------------|
| 01 | EB 54, Annex 34 28 May 2010 | Initial adoption. |
| Decision Class: Regulatory Document Type: Guideline, Form Business Function: Issuance | | |