# 15 MW Grid Connected Renewable Energy Wind Turbine Project in Karnataka

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| **Project Title** | 15 MW Grid Connected Renewable Energy Wind Turbine Project In Karnataka |
| **Version** | 2.0 |
| **Report ID** | 1.0 |
| **Date of Issue** | 25-February-2013 |
| **Project ID** | VCSR316 |
| **Project Database ID** | VCSPD 619.X |
| **Monitoring Period** | 01-January-2010 to 31-December-2012 |
| **Prepared By** | Mineral Enterprises Ltd. |
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# 1 PROJECT DETAILS

## 1.1 Summary Description of Project

The project involves generation of 15 MW of electricity from installation of Wind Electric Generators (WEGs) across the Chitradurga wind Corridor of Chitradurga district in the state of Karnataka. The project will harness the wind resource for electricity generation and will displace the electricity generated from the grid which comprises mainly the thermal generated energy mix resources, The project is a group of project owned by a single owner M/s Mineral Enterprises Limited, Bangalore, in the wind regime of Chitradurga corridor, involving 20 WEGs of 600 and 800KW rated machines. The generated electricity shall be fed into the regional grid through the locally available evacuation facility provided by the state utility, Karnataka Power Transmission Company Limited (KPTCL) to the Southern Grid.

The purpose of this document is to report the emission reductions generated from the 15 MW wind power project during the period 01/01/2010 to 31/12/2012.

## 1.2 Sectoral Scope and Project Type

The Project Activity is a small scale Project, under the Category 1: Energy Industries (renewable / non renewable sources) as per list of sectoral scopes. As per Appendix B of Indicative simplified modalities and procedures for small-scale CDM project activities (Version 13, EB 36), the project qualifies as a small-scale CDM project.

Therefore, the proposed project activity can be defined under Type I: Renewable Energy Projects Category ID: Grid connected renewable electricity generation. The project has a total installed capacity of 15 MW, which is the qualifying ceiling for small scale CDM project. Having qualified as a small scale CDM project, it becomes eligible to utilize simplified modalities and procedures for small scale CDM (SSC) projects.

## 1.3 Project Proponent

| | |
|---|---|
| Organization: | Mineral Enterprises Ltd |
| Street/P.O.Box: | Khanija Bhavan, West Wing, 3rd Floor , No. 49, Race Course Road |
| City: | Bangalore |
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| Represented by: | Mr. Basant Poddar |
| Title: | Managing Director |
| Salutation: | Mr. |
| Last name: | Poddar |
| Middle name: | |
| First name: | Basant |

### 1.4 Other Entities Involved in the Project

No other project participant involved in this project activity. Hence, not applicable.

### 1.5 Project Start Date

Units 1-5 comprising 5 Nos. of 600kW turbine capacity each - 30/09/2004

Units 6-8 comprising 3 Nos. of 800kW turbine capacity each - 17/09/2005

Units 9-20 comprising 12 Nos. of 800kW turbine capacity each - 31/03/2006

### 1.6 Project Crediting Period

Crediting period for the project activity is from 01/04/2006 to 31/03/2016(10years) with one-time renewable.

### 1.7 Project Location

The Project activity is located in the Jogimatti Wind Zone at Chitradurga District in Karnataka, India. Chitradurga is approximately 200 km from Bangalore, the capital of Karnataka. It is located on the Bangalore–Mumbai highway, encompassing the sites of Vani Vilas Sagar, Gim2 (West), Gim2 (Central) and MMCL. Specifically, they are located as detailed below in Hiriyur and Hosadurga talukas of Chitradurga district in Karnataka. The nearest railway station is at Chitradurga.

The project is spread over the talukas of Chitradurga wind corridor namely VVS, HD Pura and Kittadhall in the state of Karnataka. The longitude & latitude has been furnished is also furnished below.

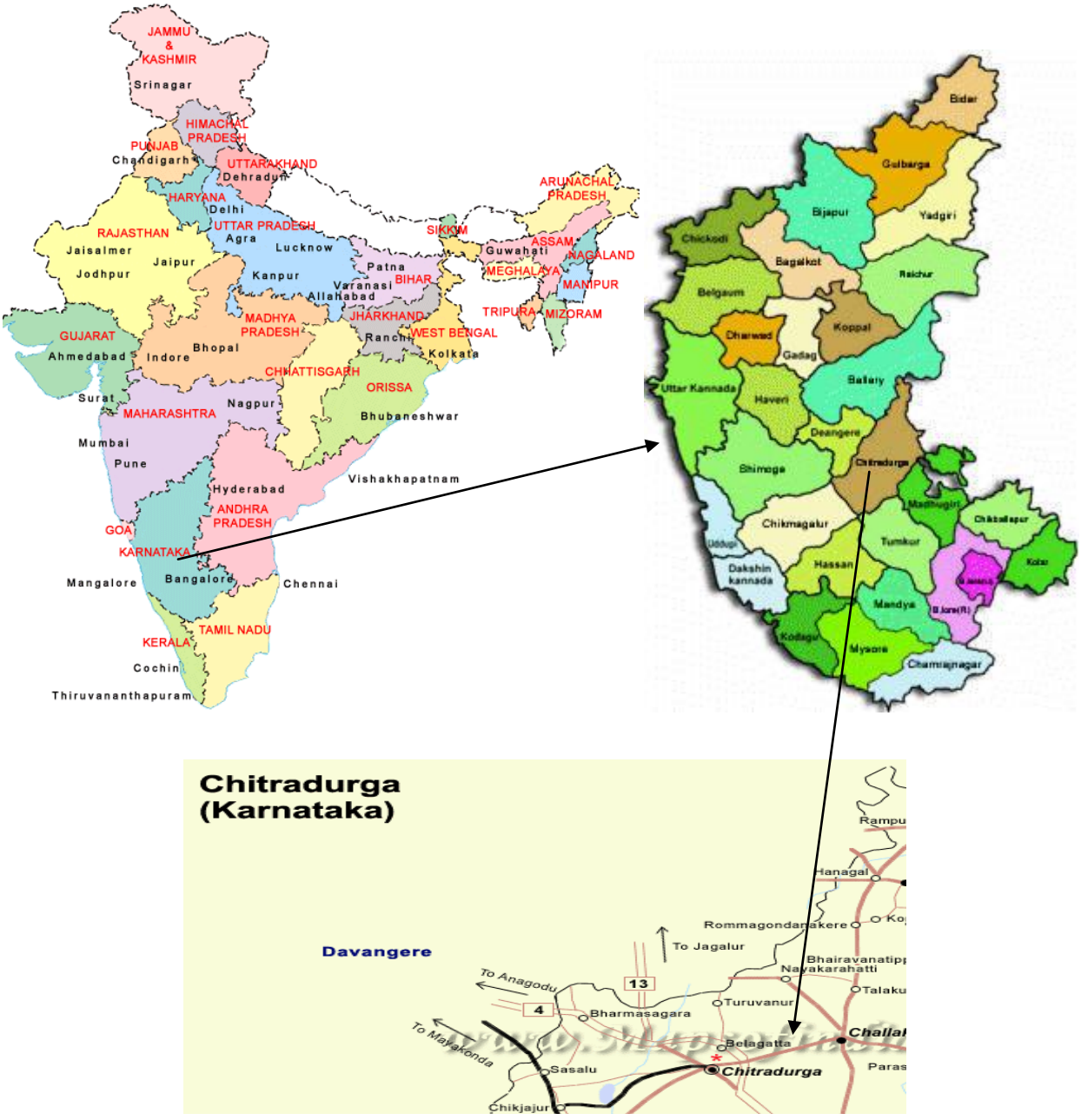

**Table 1.7: Locations of the Wind turbines**

| Sl. NO | Capacity (kW) of each wind turbine | Date of Comm. | HTS C Number /R R no. | Village | Taluka | Latitude | Longitude |
|---|---|---|---|---|---|---|---|
| 1 | 600kW | 30.09.2004 | VVS26 | Elladekere | Vanivilas sagar | N13° 51' 21" | E76° 29' 33" |
| 2 | 600kW | 30.09.2004 | VVS26 | Elladekere | Vanivilas sagar | N13° 51' 21" | E76° 29'33" |
| 3 | 600kW | 30.09.2004 | VVS26 VVS26 | Elladekere | Vanivilas sagar | N13° 51'21" | E76° 29'33" |
| 4 | 600kW | 30.09.2004 | VVS26 | Elladekere | Vanivilas sagar | N13° 51' 21" | E76° 29'33" |
| 5 | 600kW | 30.09.2004 | VVS26 | Elladekere | Vanivilas sagar | N13° 51'21" | E76° 29'33" |
| 6 | 800kW | 17.09.2005 | MMCL 05 | Mathighatta &Berebahalli | Holalkere | N14° 05'22" | E76° 20'35" |
| 7 | 800kW | 17.09.2005 | MMCL 05 | Mathighatta &Berebahalli | Holalkere | N14° 05'22" | E76° 20'35" |
| 8 | 800kW | 17.09.2005 | MMCL 05 | Mathighatta &Berebahalli | Holalkere | N14° 05' 22" | E76° 20'35" |
| 9 | 800kW | 31.03.2006 | ELP39 | Kitthadalhaill | Hiriyur | N13° 56'46" | E76° 25'10" |
| 10 | 800kW | 31.03.2006 | ELP39 | Kitthadalhaill | Hiriyur | N13° 56' 46" | E76° 25'10" |
| 11 | 800kW | 31.03.2006 | ELP39 | Kitthadalhaill | Hiriyur | N13° 56'46" | E76° 25'10" |
| 12 | 800kW | 31.03.2006 | ELP39 | Kitthadalhaill | Hiriyur | N13° 56' 46" | E76° 25'10" |
| 13 | 800kW | 31.03.2006 | ELP39 | Kitthadalhaill | Hiriyur | N13° 56'46" | E76° 25'10" |
| 14 | 800kW | 31.03.2006 | ELP39 | Kitthadalhaill | Hiriyur | N13° 56' 46" | E76° 25'10" |
| 15 | 800kW | 31.03.2006 | ELP39 | Kitthadalhaill | Hiriyur | N13° 56'46" | E76° 25'10" |
| 16 | 800kW | 31.03.2006 | ELP20 | Kitthadalhaill | Hiriyur | N13° 59' 42" | E76° 24'08" |
| 17 | 800kW | 31.03.2006 | ELP20 | Kitthadalhaill | Hiriyur | N13° 59'42" | E76° 24'08" |
| 18 | 800kW | 31.03.2006 | ELP20 | Kitthadalhaill | Hiriyur | N13° 59' 42" | E76° 24'08" |
| 19 | 800kW | 31.03.2006 | ELP20 | Kitthadalhaill | Hiriyur | N13° 59'42" | E76° 24'08" |
| 20 | 800kW | 31.03.2006 | ELP20 | Kitthadalhaill | Hiriyur | N13° 59' 42" | E76° 24'08" |

### 1.8 Title and Reference of Methodology

Type : Type - I: Renewable Energy Project.

Category I.D : Grid Connected Renewable Electricity Generation

Reference : Version 13, EB 36

## 2 IMPLEMENTATION STATUS

### 2.1 Implementation Status of the Project Activity

The project was implemented in three different phases with the first phase of five turbines of 600kW capacity each commissioned in 30/09/2004, the second phase of 3 turbines of 800kW capacity each commissioned on 17/09/2005 and the final third phase of 12 turbines of 800kW commissioned on 31/03/2006. All the turbines have been in operation continuously since commissioning including the present monitoring period.

The Technical details of the project activity are provided in the following table:

| Phases | Capacity | WEGs Number of Machines | List of Major Equipments |
|---|---|---|---|
| Phase-1 | 3MW | 600 kW* 5 | • Wind energy converters – Enercon India Make 600kw,400v, Synchronous generators – 5 Nos<br>• Transformers of : 700KVA, 400V/33Kv.1.225/1010A-2nos<br>• CTPT combined for 33kv metering with electronic tri-vector meter 2units.<br>• 33KVOH line with rabbit conductors. |
| Phase-2 | 2.4MW | 800 kW * 3 Nos | • Wind energy converters – Enercon India Make 600kw,400v, Synchronous generators<br>• 900 KVA,Transformers 400v/33kv 2nos.<br>• CT 33KV<br>• PT 33KV/110V<br>• Trivector meter 2nos<br>• Group Controlled $SF_6$ Circuit breakers 36kv.<br>• 33KV oh line 550mtrs with ACSR coyote |

| Phases | Capacity | WEGs Number of Machines | List of Major Equipments |
|---|---|---|---|
| | | | conductor |
| Phase-3.1 | 5.6MW | 800 kW * 7Nos | • Wind energy converters- Enercon India make 800kw,400v, Synchronous generators<br>• 950 KVA, Transformers 400v/33kv 2Nos<br>• CT 33KV<br>• PT33KV/110V<br>• Trivector meters 2nos<br>• VCB breakers 36kv.<br>• 33KV Intra form line 2200 mtrs with ACSR Conductor |
| Phase-3.2 | 4MW | 800 kW * 5Nos | • Wind energy converters- Enercon India make 800kw,400v, Synchronous generators<br>• 950 KVA, Transformers 400v/33kv 2Nos<br>• CT 33KV<br>• PT33KV/110V<br>• Trivector meters 2nos<br>• VCB breakers 36kv.<br>• 33KV Intra form line 2200 mtrs with ACSR conductor |

## 2.2 Project Description Deviations

There is no deviation in monitoring plan which is described in the project description. Hence, this is not applicable.

## 2.3 Grouped Project

The project involves development and operation of 20 Wind Energy Generators with aggregate installed capacity of 15MW. However, the project activity is a single entity based project activity and not a grouped project activity. Hence, not applicable.

# 3 DATA AND PARAMETERS

## 3.1 Data and Parameters Available at Validation

| | |
|---|---|
| **Data / Parameter:** | **$EF_{OM,y}$** |
| **Unit:** | tCO2/MWh |
| **Description:** | Operating Margin emission factor for Southern Regional Grid |
| **Source of data:** | Calculated as per data available |
| **Value(s) applied:** | 0.9981 tCO2/MWh |
| **Choice of data or Measurement methods and procedures:** | Calculated as an average 3 years vintage data and option of *ex-ante* calculation based on Simple OM Method. Computed once during PDD finalization. |
| **Purpose of data:** | To calculate the emission reductions achieved from the Project Activity |

| | |
|---|---|
| **Data / Parameter:** | **$EF_{BM,y}$** |
| **Unit:** | tCO2/MWh |
| **Description:** | Build Margin emission factor for Southern Regional Grid |
| **Source of data:** | Calculated as per data available |
| **Value(s) applied:** | 0.7133 tCO2/MWh |
| **Choice of data or Measurement methods and procedures:** | Calculated for the most recent data and option of *ex-ante* calculation based on "20% of total generation approach". Computed once during PDD finalization (ex-ante). |
| **Purpose of data:** | To calculate the emission reductions achieved from the Project Activity |

| | |
|---|---|
| **Data / Parameter:** | **$EF_{y}$** |
| **Unit:** | tCO2/MWh |
| **Description:** | Combined Margin CO2 emission factor for Southern Regional Grid |
| **Source of data:** | Estimated figure based on 75% of OM and 25% of BM values, referred from obtained above |
| **Value(s) applied:** | 0.9269 tCO2/MWh |
| **Choice of data or Measurement methods and procedures** | Calculated ex-ante based on 75% of OM and 25% of BM values approach". Computed once during |

| | |
|---|---|
| | PDD finalization (ex-ante). |
| **Purpose of data:** | To calculate the emission reductions achieved from the Project Activity |

### *3.2* Data and Parameters Monitored

| | |
|---|---|
| Data Unit / Parameter: | EGy |
| Data unit: | kWh |
| Description: | Net Electricity supplied to the grid by the WEGs |
| Source of data: | B-Form from BESCOM providing the monthly electricity generated from the project activity and exported to Southern grid. |
| Description of measurement methods and procedures to be applied: | Net electricity supplied to grid will be calculated based on the measured values of “export” and “import” on the main meter, along with the deduction of transmission losses where joint reading is taken by project proponent representative and BESCOM officials.<br>BESCOM will calculate the transmission loss.<br>The net electricity supplied to grid is calculated based on the formula<br>Net electricity supplied to grid = export-115% of import-transmission loss<br>All the details are provided in the B-Forms in the respective months.<br>The maximum error is applied to find the electricity for the months the calibration validity is not there. |
| Frequency of monitoring/recording: | Continuous monitoring and Monthly recording |
| Value monitored: | 95058018kWh |
| Monitoring equipment: | Trivector meters |
| QA/QC procedures to be applied: | The net energy exported value shall be cross checked with the monthly invoice raised to BESCOM by Mineral Enterprise Limited. Calibration of the energy meters being used will be carried out annually as per the standard practice |

| | |
|---|---|
| | All the B-Forms and invoice certificates shall be archived for the entire crediting period plus two years.<br>All these activities shall be carried out by trained personnel of Enercon Wind Technology that is an ISO 9001 certified company. Thus, all QA / QC procedures applicable shall be followed. The data records shall also be maintained as specified in the quality standard. |
| Calculation method: | Net electricity exported to grid = electricity supplied to grid – 115% of electricity drawn from grid – transmission loss |
| Any comment: | The accuracy class of the metering equipment shall be 0.2% (both main and check meters) as also mentioned in the Power Purchase Agreement. |

### 3.3 Description of the Monitoring Plan

The main objective of having a monitoring system is to have a constant check on the emission reductions. Energy delivered by the project is recorded in the Main Meter, which is considered as relevant data to monitor and keep a constant check on the emissions reductions achieved by the project.

Project proponent in co-ordination with BESCOM or its representative Energy Distribution Companies, meter the delivered energy. The project activity is supplying electricity at 33 kV through double circuit overhead transmission (suspension type) conductors to Method 66/11KV substation (from Phase 1), Horakeredevarapura 66/11KV substation (from Phase 2) and Hiriyur 220/66/11KV substation (Phase 3.1) and Phase 3.2

The general conditions set out for metering, recording, meter readings, meter inspections, Test & Checking and communication shall be as per the PPA (power purchase agreement) with BESCOM.

The project activity generates about 15MW equivalent of clean electricity, with efficient utilization of the available wind energy, with Enercon turbines. The project activity displaces energy (largely from fossil fuel based sources), and also delays any planned expansion of the grid generations by its equivalent size, which contributes to sustainable development and

conservation through use of wind, a renewable resource. A total of 96,273,587 kWh of green energy is fed to the Southern grid during the period Jan. 2010 – Dec. 2012. The project is promoted by Mineral Enterprises Limited, a company engaged in the mining industry in India, with at least 5 mines in the state of Karnataka, of which one is located in the same district as the project, i.e. Chitradurga. The project began in May 2004 with the issue of the purchase order by the project promoter and implementation was completed by March, 2006 when the last WEG was installed.

The project activity of MEL is solely owned by them through subleasing argument from M/s Enercon, who maintains the wind energy sites, as the wind turbines haven been manufactured by Ms Enercon using the technology of which the details have already been covered.

Methods of data transfer and archiving policy:
The meters used for recording the electricity generation will be of integrator type. The electricity generated will be recorded on a daily basis. The data will be captured and stored electronically, wherever possible. As a separate measure, the same data will be entered in the log book on change of every shift. The monitoring data shall also be archived by Enercon (India) Limited as a backup arrangement for the entire crediting period plus two years. Measuring instruments of all the parameters covered under the monitoring plan which are required to be monitored regularly will be calibrated as per maintenance schedule.

On the last day in the last week of every month, readings are taken from the Main meter at the MRS on the basis of which invoices are raised to the BESCOM. The annual emission reductions have been calculated based on these joint meter readings. A double check of the measurements can be done with the help of the sale receipts from the BESCOM.100% of the relevant data from the project is monitored i.e. all data related to the monthly electricity generation by the project is regularly observed and collected by the project proponent. The data archived will be archived for 2 years after the end of the crediting period.

The monitoring procedure, data transfer and archiving procedures is described in the paragraphs below:

The general conditions set out for metering, recording, meter readings, meter inspections, Test & Checking and communication are as per the PPA signed with BESCOM/ MESCOM/KERC/KPTCL, as the Enercon & MMCL ,are the contractors, who maintain the sites. However, the paragraphs below present the procedure adopted by them.

Metering procedure adopted by ENERCON/BESCOM - WEG type: E40 /E48 for 600 KW/800KW is as per PPA. In this case, every WEG has one meter (of 0.2% accuracy class) attached to the respective WEG(s) which in turn is connected to the feeders. The feeders are connected to 66 KV substations. The group meters are tri-vector meters of 0.2% class accuracy and are used at arriving the daily/monthly generation by WEG or group of WEGs as the case may be.

Metering procedure adopted by ENERCON:
All the WEGs managed by Enercon Ltd. are connected to the respective feeders which are connected at the substation. Every WEG is connected to the feeder with a tri-vector meter of 0.2%class accuracy. The reading of individual WEG meter is used for arriving at the monthly generation of the respective WEG.

Meter Test checking for all the WEGs
The meter is tested for accuracy annually with reference to a portable standard meter which is of an accuracy class of 0.2%. The portable standard meter is owned by the KPTCL at its own cost and tested and certified from an accepted laboratory standard meter in accordance with electricity standards. The meters are deemed to be working satisfactorily if the errors are within specifications i.e. ± 0.2 %. The consumption registered by the meter will hold well for the purpose of billing as long as the error in the main meter is within the permissible limits. In case meter is not calibrated once in a year the error shall be applicable to the energy generation as per EB 52 Annex 60.

Meter Readings:
The monthly meter reading will be taken during the last week of the month, and the last day of every month at the 33 kV end of the wind energy substation carrying the main meters (tri-vectors) of 0.2s class accuracy. These main meters also account for the import of electricity from the grid. Meter readings are taken jointly at the appointed date and the readings are written in the B-Form and the same will be signed by the representatives of KPTCL/ENERCON, and MEL, the power producer. In case the PP representative is not available, in such circumstances KPTCL shall provide the PP with a signed copy of the meter reading of the main metering system or backup metering system, as the case may be. Such meter readings shall be considered as accurate and final measurement of energy supplied by MEL to KPTCL for the purpose of payment for the generation period.

The lines from the Substation are further connected to 66kv receiving stations and is as furnished below which is connected to the respective grids, (for reference purpose only.) At the receiving end of the Substation, there are two tri-vector meters of 0.2% class accuracy, installed to check the transmission losses between the wind turbine plant Substation and Main receiving substations and can be used as a Check Meter in case of failure of Main Meters installed.. The total transmission losses are losses between the WEG meters and the meters installed at 33 kV end of the 33kv Substation.

| Phase | MW | Generation Voltage | Survey Nos | Stepped upto kv | Substration voltage Level | KVA of transformer | Connected to main receiving station and to grid |
|---|---|---|---|---|---|---|---|
| Phase-1 | 3.0 | 400V | 101.4.1 | 33KV | 66KV | 2*31.5MVA | Mathod Sub.stn |
| Phase-2 | 2.4 | 400V | 14.21 | 33KV | 66KV | 12.5MVA | H>D Pura |
| Phase 3.1 GIM 2 (Central) | 5.6 | 400V | | 33KV | 66KV | 2*40MVA | 220KV SRS Sub stn |
| Phase 3.2 GIM 2 (west) | 4.0 | 400V | 46 | 33KV | 66KV | 2*40MVA | 220KV SRS Sub stn |

QA/QC Measures in Monitoring:

The following points summarize the QA/QC procedures that are being followed at the site. The electricity generated is metered with the help of electronic meters located at the Receiving station:

There are two electronic meters located at both the MRS (1&2):

1) Main meter and

2) Check meter.

The check meter is used as back up for the meter reading in case of malfunctioning of the main meter.

Both the meters are calibrated periodically (but once in at least three years) by the BESCOM to ensure accuracy. All meters are of Accuracy class 0.2 %. The meter reading/testing/calibration procedures are in accordance & are highlighted in the respective

PPA, the details are furnished in the clause 6, in the documentation submitted to you before pre validation.

The meters are calibrated in the following dates during the current monitoring period:

| **Meter No.** | **MMCL05** | **ELP39** | **VVS28** | **ELP20** |
|---|---|---|---|---|
| **Date of commissioning** | 28.10..2005 | 31.03.2006 | 20.09.2004 | 31.03.2006 |
| **Calibration dates** | 03.09.2012<br><br><br><br>06.09.2011<br><br><br><br>07.09.2010<br><br><br><br>04.12.2009 | 15.05.2012<br>23.02.2012<br>15.11.2011<br>08.07.2011<br>21.04.2011<br>15.12.2010<br>10.08.2010<br>29.02.2010 | 08.06.2012<br>08.03.2012<br>19.12.2011<br>24.09.2011<br>23.06.2011<br>15.03.2011<br>09.12.2010<br>12.07.2010<br>26.04.2010 | 15.05.2012<br>18.02.2012<br>21.11.2011<br>29.07.2011<br>18.04.2011<br>11.01.2011<br>28.09.2010 |

Since all the meters are calibrated within the expiry of an annual validity period, no corrections (as per EB 52, Annex 60) are applied for calculation of net electricity supplied to the grid.

Monitoring roles and responsibilities:

The sole parameter for monitoring is the electricity supplied to the grid. The project proponent has entrusted the operations and maintenance of the project to Enercon India, since they themselves lack the technical expertise to do so. Enercon India, the technology supplier, is an ISO 9000 company and has elaborate procedures and well trained staff to carry out the various functions to ensure that the project delivers energy as planned and that the data is duly recorded and communicated to the Project Proponent on a regular basis.

The project activity will be looked after by the manager responsible for operation of the wind energy generating machines at the project site. Daily operations of the wind energy generating machines will be carried out by the staff responsible for the operation of the WEGs.

The meters used for recording the electricity generation will be of integrator type. The electricity generated will be recorded on a daily basis. The data will be captured and stored electronically, wherever possible. As a separate measure, the same data will be entered in the log book on change of every shift. The monitoring data shall also be archived by Enercon (India) Limited as a backup arrangement for the entire crediting period plus two years. Measuring instruments of all the parameters covered under the monitoring plan which are required to be monitored regularly will be calibrated as per maintenance schedule.

Monitoring Methodology:
The monitoring of VERs generated by the project follows the same principles that have been adopted for the monitoring of emission reductions under the Clean Development Mechanism. The project design document which has been registered for the project activity applies the following simplified monitoring methodology (hereafter referred to as AMS-I.D):

## 4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

The following formula is adopted for calculating emission reductions generated by the Project:.
The emission reductions for a given year are baseline emissions minus the project emissions and leakage.

ERy = BEy - PEy - Ly

Where

ERy = Emission reductions in a given year

BEy = Baseline emissions in a given year

PEy = Project emissions in a given year

Ly = Leakage in a given year

### 4.1 Baseline Emissions

The baseline emissions are calculated as follows:
$BE_y = EG_y \cdot EF_y$
Where

EGy = Net electricity export to grid in a given year (GWh)

EFy is = Emission factor for a given year (tCO2/GWh)

As mentioned in the PD, the project has considered the ex-ante emission factor for the combined margin of the southern regional grid and the details are furnished below:

$W_{OM}$= 0.75

$W_{BM}$= 0.25

Baseline emission Factor (EFBL) Or Combined margin is calculated as weighted average of simple Operating Margin and build Margin emission Factors. Therefore, EFBL = (0.75 X EFOM) + (0.25 X EFBM) = 0.9269 tCO2equivalent / MWh. The emission factor for simple operating margin (EFOM ) can be calculated as the average of ex ante data vintage on the basis of methodological tool (EB35, Annex-12) to calculate emission factor for an electricity system.

Thus, weighted average data of simple operating margin has been calculated at the time of VCS PD validation and arrived as 0.9981 t CO2/MWh: The Build Margin (EFBM ) for the most recent year at the time of VCS PD validation for the project is 0.7133 tCO2/MWh.

Using the values of emission factors for OM and emission factor for BM, provided in the official database and the weights provided above the value of the emission factor for the combined margin has been determined to be 0.9269 tCO2equivalent / MWh. Thus the emission factor considered is 0.9269 tCO2e/MWh, Calculated by applying a weight of 75% to the Simple Operating Margin and 25% to the Build Margin for the Southern grid.

In order to determine GHG mitigation in a conservative manner, no transmission and distribution losses have been considered. In order to determine the emission in a baseline scenario, the emission factor is multiplied by the net power generated by the wind energy generators. The project emission in the proposed GHG emission reduction project activity has been taken as zero t CO2e/MWh, as wind is a zero GHG emitting renewable form of energy.

### 4.2 Project Emissions

The project emissions are considered zero.

### 4.3 Leakage

As specified in AMS I.D Version 13 project participants do not need to consider these emission sources as leakage in applying this methodology. Hence the leakage emissions are considered zero. Using the above formulas, the Emission reductions from the project are shown below.

Period Generation (MWh) Emission reductions Details of the generation from the project activity have been given in Annexure Details of monthly generation and emission reductions have been given in Annexure.

The project category applicable to the proposed project is AMS ID. Accordingly, the energy baseline being considered is as directed in paragraph 9 of the AMS.I.D/Version13 that states that the applicable baseline is the kWh produced by the renewable generating unit multiplied by an emission coefficient (measured in kg CO2e/kWh) calculated in a transparent and conservative manner as is explained above:

A combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) according to the procedures prescribed in the 'Tool to calculate the emission factor for an electricity system'.

OR

(b) The weighted average emissions (in kg CO2e/kWh) of the current generation mix. The data of the year in which project generation occurs must be used.

The methodology also states that the calculations must be based on data from an official source (where available) and made publicly available.

EFy = Baseline Emissions Factor in tCO2/MWh (calculated ex-ante as per the VCS PD and obtained from the official database published by the CEA, Version 4.0, October 2008)

EGy = 96,274 MWh

Thus, BEy = 96,274 MWh x 0.9269 tCO2/MWh

= 89,235 tCO2 (Calculated as per the VCS PD & rounded down).

### 4.4 Summary of GHG Emission Reductions and Removals

The energy exported by the project is recorded from main meter installed at the substation. The accuracy clause of both the meters is 0.2 %. As per validated PD the calibration of main & check meters needs to be done once in a year. The calibration is not in the purview of PP's hand. As

mentioned in the PD the calibration will be done by KPTCL depends on the availability of KPTCL staff.

The net electricity exported to grid in the reported monitoring period is 96,274 MWh. The emission reduction is calculated by multiplying the net electricity exported by grid emission factor which was fixed as 0.9269 $tCO_2$/MWh in the validated PD. The total emission reduction achieved in the reported mentoring period is 89,235 $tCO_2$ Energy data and emission reduction data for each month in the monitoring period is mentioned in the emission reduction excel sheet. The summary of Net electricity exported and emission reduction are mentioned below.

| **Year** | **Total net electricity Exported in MWh** | **Emission factor ($tCO_2$/ MWh)** | **Emission reduction ($tCO_2$)** |
|---|---|---|---|
| 2010 | 24,878 | 0.9269 | 23,059 |
| 2011 | 31,370 | 0.9269 | 29,077 |
| 2012 | 40,025 | 0.9269 | 37,099 |
| **Total** | **96,274** | | **89,235** |