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# 15 MW GRID CONNECTED RENEWABLE ENERGY WIND TURBINE PROJECT IN KARNATAKA



Document Prepared By EKI Energy Services Limited

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<b>Prepared By</b>	Neetu Yadav EKI Energy Services Limited
<b>Contact</b>	EnKing Embassy, Office No. 201, Plot 48, Scheme 78, Part 2 Vijay Nagar, Near brilliant Convention Centre, Indore- 452010 Madhya Pradesh, India

Website: [www.enkingint.org](http://www.enkingint.org)

Email ID: [neetu@enkingint.org](mailto:neetu@enkingint.org)

T: +91 731 42 89 086, M: +91 9589899647

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# 1 PROJECT DETAILS

## 1.1 Summary Description of the Implementation Status of the 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 harnesses the wind resource for electricity generation and displaces 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 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 (now Indian grid).

The purpose of this document is to report the emission reductions generated from the 15 MW wind power project during the period 01/01/2013 to 31/03/2016.

S.No.	Activity	Date completed
1	Date of Purchase Orders for the wind machines	Started : 28/05/2004 Completed: 22/08/2005
2	Date of WEG Commissioning Certificates (also Project Start date)	30/09/2004, 1/09/2005, 31/03/2006
4	Date of Power Purchase Agreements for the wind machines	27/02/2006, 04/04/2006, 14/06/2006.

## 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 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. Also the project is not a grouped project.

### 1.3 Project Proponent

<b>Organization name</b>	Mineral Enterprises Limited
<b>Contact person</b>	Mr. Basant Poddar
<b>Title</b>	Managing Director
<b>Address</b>	Khanija Bhavan, West Wing, 3 <sup>rd</sup> Floor , No. 49, Race Course Road, Bangalore, Karnataka, India, Pin-500001
<b>Telephone</b>	+91 08042459797
<b>Email</b>	minent@mel.org.in

### 1.4 Other Entities Involved in the Project

<b>Organization name</b>	EKI Energy Services Limited
<b>Role in the Project</b>	Project Consultant
<b>Contact person</b>	Barun Sharma
<b>Title</b>	DGM
<b>Address</b>	Office No 201, Plot No 48, Scheme 78, Vijay Nagar Part- II, Indore 452010, India
<b>Telephone</b>	9015615247
<b>Email</b>	<a href="mailto:barun@enkingint.org">barun@enkingint.org</a>

### 1.5 Project Start Date

The project Start date is 30/09/2004 which is the first commissioning date of Unit 1-5.

### 1.6 Project Crediting Period

Thus project activity VCS crediting period is from 01/04/2006 to 31/03/2016 (10 Years crediting period with one time renewable as per registered PD & validation report)<sup>1</sup>.

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<sup>1</sup> Though VCS PD mentioned the start date of crediting period as 28/03/2006 which was as per VCS 2007.1 guidelines, the earliest project crediting period start date shall be 28th March 2006 for non-AFOLU projects.

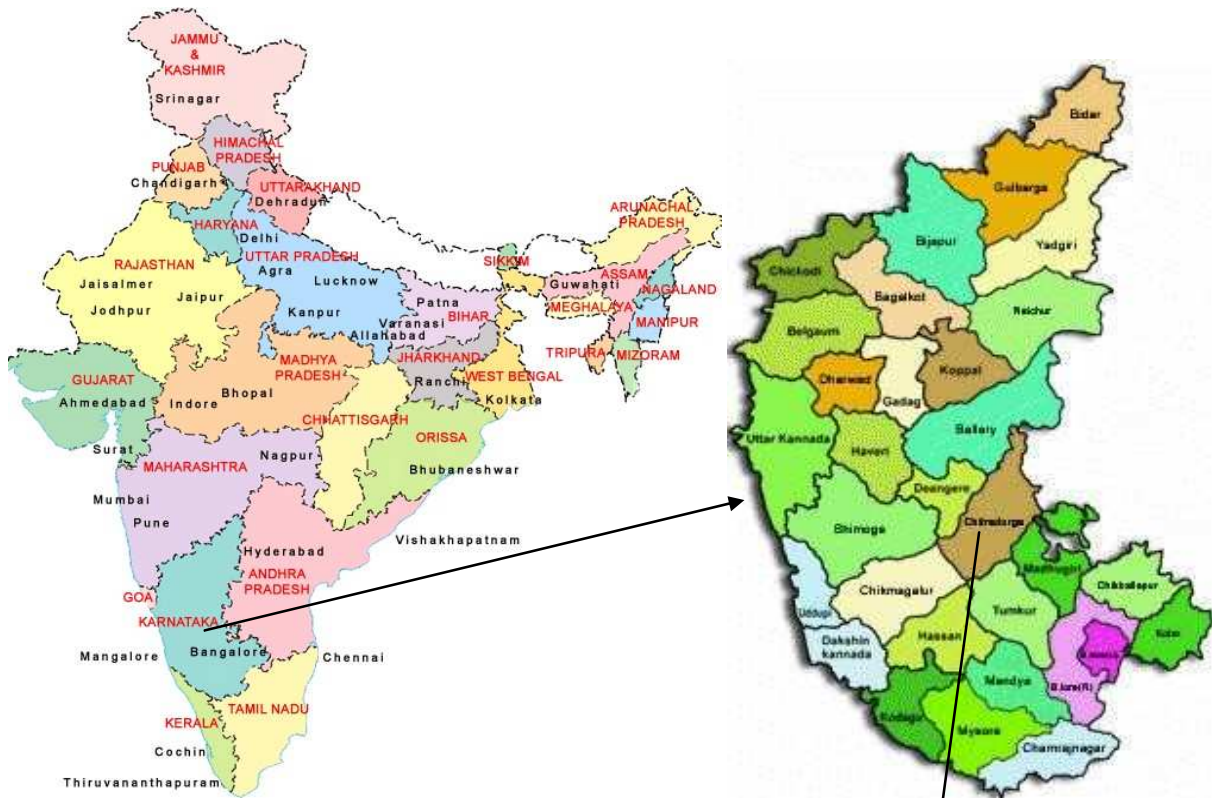
## 1.7 Project Location

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.

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In actual VCS verification is started from 01/04/2006 onwards. The first VCS verification has been completed for period from 01/04/2006 to 31/12/2009. Also First verification report clearly mentioned that project have fixed crediting period with start date of crediting period as 01/04/2006. (Please refer first VCS verification report dated 28/03/2011 by VVB TÜV NORD CERT GmbH.) Thus project activity VCS crediting period is from 01/04/2006 to 31/03/2016 (10 Years fixed period).



### Locations of the Wind turbines

Sl. NO	Capacity (kW)	Date of Comm.	HTS C Number /R R no.	Village	Taluka	Latitude	Longitude
1	600kW	30/09/2004	VVS 28	Elladekere	Vanivilasagar	N13° 51' 21"	E76° 29' 33"
2	600kW	30/09/2004	VVS28	Elladekere	Vanivilasagar	N13° 51' 21"	E76° 29' 33"
3	600kW	30/09/2004	VVS28	Elladekere	Vanivilasagar	N13° 51' 21"	E76° 29' 33"

4	600kW	28/10/2004	VVS28	Elladekere	Vanivilas sagar	N13° 51' 21"	E76° 29'33"
5	600kW	28/10/2004	VVS 28	Elladekere	Vanivilas sagar	N13° 51'21"	E76° 29'33"
6	800kW	17/09/2005	MMCL 05	Mathighatta &Berebahal li	Holalkere	N14° 05'22"	E76° 20'35"
7	800kW	17/09/2005	MMCL 05	Mathighatta &Berebahal li	Holalkere	N14° 05'22"	E76° 20'35"
8	800kW	17/09/2005	MMCL 05	Mathighatta &Berebahal li	Holalkere	N14° 05' 22"	E76° 20'35"
9	800kW	31/03/2006	ELP39	Kitthadalhai ll	Hiriyur	N13° 56'46"	E76° 25'10"
10	800kW	31/03/2006	ELP39	Kitthadalhai ll	Hiriyur	N13° 56' 46"	E76° 25'10"
11	800kW	31/03/2006	ELP39	Kitthadalhai ll	Hiriyur	N13° 56'46"	E76° 25'10"
12	800kW	31/03/2006	ELP39	Kitthadalhai ll	Hiriyur	N13° 56' 46"	E76° 25'10"
13	800kW	31/03/2006	ELP39	Kitthadalhai ll	Hiriyur	N13° 56'46"	E76° 25'10"
14	800kW	31/03/2006	ELP39	Kitthadalhai ll	Hiriyur	N13° 56' 46"	E76° 25'10"
15	800kW	31/03/2006	ELP39	Kitthadalhai ll	Hiriyur	N13° 56'46"	E76° 25'10"
16	800kW	31/03/2006	ELP20	Kitthadalhai ll	Hiriyur	N13° 59' 42"	E76° 24'08"
17	800kW	31/03/2006	ELP20	Kitthadalhai ll	Hiriyur	N13° 59'42"	E76° 24'08"
18	800kW	31/03/2006	ELP20	Kitthadalhai ll	Hiriyur	N13° 59' 42"	E76° 24'08"
19	800kW	31/03/2006	ELP20	Kitthadalhai ll	Hiriyur	N13° 59'42"	E76° 24'08"
20	800kW	31/03/2006	ELP20	Kitthadalhai ll	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

## 1.9 Participation under other GHG Programs

The project activity has not been registered and is not seeking registration at moment under any other GHG programs. The project also proponent has provided undertaking that it will not claim any GHG credits under any GHG program other than that under VERRA during the current monitoring period..

## 1.10 Other Forms of Credit

Emission Trading Programs and Other Binding Limits:

Net GHG emission reductions or removals generated by the Project will not be used for compliance with an emissions trading program or to meet binding limits on GHG emissions in any Emission Trading program or other binding limits.

Other Forms of Environmental Credit:

Not applicable, as the project is not registered in any other GHG mechanism other than VCS. Also, the project activity is not availing any REC benefits and the same can be confirmed from publically available link of REC generators.

Web-link: [https://www.recregistryindia.nic.in/index.php/general/publics/registered\\_regens](https://www.recregistryindia.nic.in/index.php/general/publics/registered_regens)

## 1.11 Sustainable Development

The project assists in enhancing sustainable development in India as detailed in the following aspects:

**Social well being:** The VCS project activity leads to alleviation of poverty by generating additional employment opportunities for the local people of the project area both during the construction phase and the entire lifetime of the project. This leads to removal of social disparities and therefore, the project is contributing to provision of basic amenities to people leading to improvement in quality of life of people.

**Economic well being:** The VCS project activity required additional investment to be made to set up the wind turbines, and infrastructure like approach roads, substations, etc.

**Environmental well being:** The project uses natural resource, wind, to generate clean and green power. Thus, the impact of the project activity on the state of Karnataka is that it reduces Karnataka's dependency on fossil fuels due to use of wind as fuel source. There is no degradation of resources used for the project. Wind power is a bio-diversity and environmental friendly mode of power generation with no negative impact on human health and leads to reduction of pollution in general as compared to the alternative sources of power such as fossil fuel.

**Technological well being:** The project activity utilises environmentally safe and sound wind power technology that is comparable to best practices across the world.

Thus, the project assists in the sustainable development of the country, and the state of Karnataka by reducing its dependency on fossil fuels, reducing local air pollution, providing emission free clean electricity and employment to rural youth both during the construction phase and the entire lifetime of the project.

## 2 SAFEGUARDS

### 2.1 No Net Harm

Renewable energy projects are not mandated in India by any enforced law or other regulatory framework. However, for guidance on voluntary wind energy based electricity generation, there are policies introduced/incentives declared by the state governments. These policies have been considered for the project activity and are available at <http://www.windpowerindia.com/govtinc.html> .

Wind power is one of the cleanest sources of renewable energy, with no associated emissions and waste products. In India, as per the provisions under the EIA Notification of 1994, wind power projects do not require an Environmental Impact Assessment.

The project activity does not involve any major construction activity. It primarily requires the installation of wind turbine generators.

The report on “Developmental Impacts and Sustainable Governance Aspects of Renewable Energy Projects” prepared by MNRE dated September 2013. This report clearly mentioned that wind power project activity operations do not result in direct air pollution, noise pollution. Please refer below web link for the same<sup>2</sup>.

Thus there are no any significant impacts due to implementation of project activity on air, water, soil quality and ambience are envisaged due to the project activity

### 2.2 Local Stakeholder Consultation

As a part of continual improvement process, feedback from the associated stakeholders is vital, therefore a dedicated Visitor register cum grievance register has been placed at the project site which is accessible to stakeholders to provide their feedback on the project. It is appropriate publicly accessible location at which local stakeholders can provide their feedback on the project. This location is also conducive to continuous and regular checks for stakeholder comments

Stakeholder meetings are organized on regular intervals in order to identify the major challenges around the area, stakeholders are invited well in advance through printed invitation, calls, meeting and a notice is placed around the local common areas. Various CSR activities around site are carried out with proper stakeholder requirements meeting. The stakeholders are also requested to share their experiences and grievances on continuous basis. Registers is used to records the grievances and feedback.

During the current monitoring period, following complaints were registered in the grievance register which were resolved by the Project proponent .

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<sup>2</sup> <https://smartnet.niua.org/sites/default/files/resources/report-on-developmental-impacts-of-RE.pdf>

Sl. No	Date of Complaint	Site	Topic	Date of Resolution	Remark from PP
1	25/04/2013	Chitradurga	Street lights not working	28/04/2013	Street lights have been changed
2	20/08/2015	Karnataka	Request to repair RO at the primary school	24/08/2015	RO purifier was repaired

### 2.3 AFOLU-Specific Safeguards

Not applicable to this as this is not an AFOLU project activity.

## 3 IMPLEMENTATION STATUS

### 3.1 Implementation Status of the Project Activity

The project proponent has Enercon make gearless technology, which features a synchronous generator suitable for variable speed options. This enables power generation at very low speeds, which has the potential to improve power generation from any particular site, and therefore improve the potential of wind power in the country. Thus, in addition to being technologically superior, it also is resource efficient. The project employs 600 kW (E-40) and 800 kW (E-48) turbines of Enercon make for power generation. .

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

Turbine model	Enercon E 40	Enercon E-448
Rated power	600	800
Rotor diameter	48m	48m
Hub height	74.85 m	56.85 m
Turbine Type	Gearless horizontal axis wind turbine with variable rotor speed	Gearless horizontal axis wind turbine with variable rotor speed
Power regulation	Independent electromechanical pitch system for each blade.	Independent electromechanical pitch system for each blade.
Design lifetime	20years	20years
Cutin windspeed	2.5 m/s	2.0 m/s
Rated wind speed	12 m/s	14 m/s
Extreme Wind Speed	59.5 m/s	59.5 m/s

Rated rotational speed	31.5 rpm	31.5 rpm
Operating range rot. speed	16.0 - 31.5 rpm	16.0 - 31.5 rpm
Orientation	Upwind	Upwind
No of Blades	3	3
Blade Material	Glass Fibre reinforced Epoxy	Glass Fibre reinforced Epoxy
Gear box type	Gear less	Gear less
Generator type	Synchronous generator	Synchronous generator
Braking	Aerodynamic	Aerodynamic
Output Voltage	400 V	400 V
Yaw System	Active yawing with 4 electric yaw drives with brake motor and friction bearing	Active yawing with 4 electric yaw drives with brake motor and friction bearing
Tower	74 m concrete	56 m concrete

Phases	Capacity	WEGs Number of Machines	List of Major Equipments
Phase-1	3MW	600 kW* 5	<ul style="list-style-type: none"> <li>• Wind energy converters – Enercon India Make 600kw,400v, Synchronous generators – 5 Nos</li> <li>• Transformers of : 700KVA, 400V/33Kv.1.225/1010A-2nos</li> <li>• CTPT combined for 33kv metering with electronic tri-vector meter 2units.</li> <li>• 33KVOH line with rabbit conductors.</li> </ul>

Phase-2	2.4MW	800 kW * 3 Nos	<ul style="list-style-type: none"> <li>• Wind energy converters – Enercon India Make 600kw,400v, Synchronous generators</li> <li>• 900 KVA,Transformers 400v/33kv 2nos.</li> <li>• CT 33KV</li> <li>• PT 33KV/110V</li> <li>• Trivector meter 2nos</li> <li>• Group Controlled SF<sub>6</sub> Circuit breakers 36kv.</li> <li>• 33KV oh line 550mtrs with ACSR coyote conductor</li> </ul>
Phase-3.1	5.6MW	800 kW * 7Nos	<ul style="list-style-type: none"> <li>• Wind energy converters- Enercon India make 800kw,400v, Synchronous generators</li> <li>• 950 KVA, Transformers 400v/33kv 2Nos</li> <li>• CT 33KV</li> <li>• PT33KV/110V</li> <li>• Trivector meters 2nos</li> <li>• VCB breakers 36kv.</li> <li>• 33KV Intra form line 2200 mtrs with ACSR Conductor</li> </ul>
Phase-3.2	4MW	800 kW * 5Nos	<ul style="list-style-type: none"> <li>• Wind energy converters- Enercon India make 800kw,400v, Synchronous generators</li> <li>• 950 KVA, Transformers 400v/33kv 2Nos</li> <li>• CT 33KV</li> <li>• PT33KV/110V</li> <li>• Trivector meters 2nos</li> <li>• VCB breakers 36kv.</li> <li>• 33KV Intra form line 2200 mtrs with ACSR conductor</li> </ul>

Details of the commissioning dates are provided in the section 1.1 of this monitoring report. Further, during this monitoring period, all WTGs under the project are operating normally, and no events happened, which may impact the GHG emission reductions or removals and monitoring.

During this monitoring period, no project proponents changed.

## 3.2 Deviations

### 3.3.1 Methodology Deviations

No methodology deviation is applied during the monitoring period.

### 3.2.2 Project Description Deviations

For two WTGs with HTSC no. VVS -28 commissioned on 28/10/2004, in last MR mentioned as VVS -26, however in Commissioning Certificates mentioned as VVS -28, therefore in the current monitoring report it is mentioned as VVS -28 in line with commissioning certificate.

The deviation does not impact the applicability, baseline, additionality and emission reduction of the project activity.

### 3.3 Grouped Projects

The project is not a grouped project - thus this is not applicable.

## 4 DATA AND PARAMETERS

### 4.1 Data and Parameters Available at Validation

<b>Data / Parameter</b>	<b>EF<sub>OM,y</sub></b>
<b>Data unit</b>	tCO2/MWh
<b>Description</b>	Operating Margin emission factor for Southern Regional Grid (now Indian Grid)
<b>Source of data</b>	Calculated as per data available <sup>3</sup>
<b>Value applied</b>	0.9981 tCO2/MWh
<b>Justification of choice of data or description of measurement methods and procedures applied</b>	Calculated as an average 3 years vintage data and option of ex-ante calculation based on Simple OM Method. Computed once during PDD finalization.
<b>Purpose of Data</b>	To calculate the emission reductions achieved from the Project Activity.
<b>Comments</b>	-

<b>Data / Parameter</b>	<b>EF<sub>BM,y</sub></b>
<b>Data unit</b>	tCO2/MWh
<b>Description</b>	Build Margin emission factor for Southern Regional Grid (now Indian Grid).

<sup>3</sup> [http://www.cea.nic.in/planning/c%20and%20e/user\\_guide\\_ver4.pdf](http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver4.pdf)

<b>Source of data</b>	Calculated as per data available <sup>4</sup>
<b>Value applied</b>	0.7133 tCO <sub>2</sub> /MWh
<b>Justification of choice of data or description of measurement methods and procedures applied</b>	Calculated for the most recent data and option of <i>ex-ante</i> calculation based on "20% of total generation approach". Computed once during PDD finalization (ex-ante).
<b>Purpose of Data</b>	To calculate the emission reductions achieved from the Project Activity
<b>Comments</b>	-

<b>Data / Parameter</b>	EF <sub>y</sub>
<b>Data unit</b>	tCO <sub>2</sub> /MWh
<b>Description</b>	Combined Margin CO <sub>2</sub> emission factor for SouthernRegional Grid (now Indian Grid)
<b>Source of data</b>	Estimated figure based on 75% of OM and 25% of BM values, referred from obtained above
<b>Value applied</b>	0.9269 tCO <sub>2</sub> /MWh
<b>Justification of choice of data or description of measurement methods and procedures applied</b>	Calculated ex-ante based on 75% of OM and 25% of BM values approach". Computed once during PDD finalization (ex-ante).
<b>Purpose of Data</b>	To calculate the emission reductions achieved from the Project Activity
<b>Comments</b>	-

## 4.2 Data and Parameters Monitored

<b>Data / Parameter</b>	EG <sub>y</sub>
<b>Data unit</b>	kWh
<b>Description</b>	Net Electricity supplied to the grid by the WEGs
<b>Source of data</b>	B-Form from BESCO providing the monthly electricity generated from the project activity and exported to Southern grid(now Indian Grid).
<b>Description of measurement methods</b>	Net electricity supplied to grid will be calculated based on the

<sup>4</sup> [http://www.cea.nic.in/planning/c%20and%20e/user\\_guide\\_ver4.pdf](http://www.cea.nic.in/planning/c%20and%20e/user_guide_ver4.pdf)

<p><b>and procedures to be applied</b></p>	<p>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 BESCO officials.</p> <p>BESCO will calculate the transmission loss. The net electricity supplied to grid is calculated based on the formula</p> <p>Net electricity supplied to grid = export-115% of import transmission loss</p> <p>All the details are provided in the B-Forms in the respective months.</p> <p>The maximum error is applied to find the electricity for the months the calibration validity is not there.</p>
<p><b>Frequency of monitoring/recording</b></p>	<p>Continuous monitoring and Monthly recording</p>
<p><b>Value monitored</b></p>	<p>85,245,901.69 KWh (85,245.902 MWh)</p>
<p><b>Monitoring equipment</b></p>	<p>Trivector meters</p>
<p><b>QA/QC procedures to be applied</b></p>	<p>The net energy exported value shall be cross checked with the monthly invoice raised to BESCO by Mineral Enterprise Limited. Calibration of the energy meters being used will be carried out annually as per the standard practice.</p> <p>All the B-Forms and invoice certificates shall be archived for the entire crediting period plus two years.</p> <p>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.</p> <p>Complete metering details and calibration has been provided in Appendix 1 of MR.</p>
<p><b>Purpose of the data</b></p>	<p>Calculation of baseline emissions</p>
<p><b>Calculation method</b></p>	<p>Net electricity exported to grid = electricity supplied to grid – 115% of electricity drawn from grid – transmission loss</p>
<p><b>Comments</b></p>	<p>The accuracy class of the metering equipment shall be 0.2% (both main and check meters) as also mentioned in the Power Purchase</p>

### 4.3 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 BESCO 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), Horakeredevapur 66/11KV substation (from Phase 2) and Hiriur 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 BESCO.

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. 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 BESCO. 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 BESCO. 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.  $\pm 0.2\%$ . 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	Substraion 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 Substation
Phase-2	2.4	400V	14.21	33KV	66KV	12.5MVA	H>D Pura
Phase 3.1 GIM2 (Central)	5.6	400V		33KV	66KV	2*40MVA	220KV SRSSub stn
Phase 3.2 GIM2 (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 BESCO 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.

Pls. see the Appendix 1 for calibration details.

**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).

## 5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

### 5.1 Baseline Emissions

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.

$$ER_y = BE_y - PE_y - L_y$$

Where

ER<sub>y</sub> = Emission reductions in a given year

BE<sub>y</sub> = Baseline emissions in a given year

PE<sub>y</sub> = Project emissions in a given year

Ly = Leakage in a given year

The baseline emissions are calculated as follows:

$$BE_y = EG_y \cdot EF_y$$

Where

EG<sub>y</sub> = Net electricity export to grid in a given year (GWh)

EF<sub>y</sub> is = Emission factor for a given year (tCO<sub>2</sub>/GWh)

Now,

$$EG_y = 85,245.902 \text{ MWh}$$

EF<sub>y</sub> = 0.9269 tCO<sub>2</sub>/MWh (calculated ex-ante as per the VCS PD and obtained from the official database published by the CEA, Version 4.0, October 2008)

Thus

$$BE_y = 85,245.902 \text{ MWh} * 0.9269 \text{ tCO}_2/\text{MWh}$$

$$= 79,013 \text{ tCO}_2 \text{ (Rounded down value)}$$

## 5.2 Project Emissions

The project emissions are considered zero.

## 5.3 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.

## 5.4 Net GHG Emission Reductions and Removals

Year	Baseline emissions or removals (tCO <sub>2</sub> e)	Project emissions or removals (tCO <sub>2</sub> e)	Leakage emissions (tCO <sub>2</sub> e)	Net GHG emission reductions or removals (tCO <sub>2</sub> e)
2013	26,522	0	0	26,522
2014	25,569	0	0	25,569

<b>2015</b>	<b>24,173</b>	<b>0</b>	<b>0</b>	<b>24,173</b>
<b>2016</b>	<b>2,749</b>	<b>0</b>	<b>0</b>	<b>2,749</b>
<b>Total</b>	<b>79,013</b>	<b>0</b>	<b>0</b>	<b>79,013</b>

Considering the annual average emission reductions as per the registered PDD which is 32,275 tCO<sub>2</sub>e per year, the number of days covered during the current monitoring period comes out to be 1,186 days, based upon which the estimated emission reductions attributed to this monitoring period comes out to be 104,871 tCO<sub>2</sub>e values whereas the actual emission reductions achieved during the current monitoring period is 79,013 .The actual VER is -32.73 % lower than the estimated VER. This variation is majorly due to the variations in wind flow pattern, grid availability and other parameters which are not in the control of PP. This is also affected due the application of error factor. The above variations is conservative.

# APPENDIX 1: METER DETAILS

## For MMCL -05

Meter Serial Number and Type	Make	Accuracy Class	Date of Calibration	Due Date of Calibration
0914844 (main meter)	L & T	0.2 s	13/03/2013	1.12/03/2014
			03/06/2013	02/06/2014
			03/06/2014	02/06/2015
			18/09/2014	17/09/2015
			22/05/2015	21/05/2016
			27/02/2015	26/02/2016
			18/02/2016	17/02/2017
13191134 <sup>5</sup> (Check meter)	L & T	0.2 s	13/03/2013	12/03/2014
			03/06/2013	02/06/2014
			03/06/2014	02/06/2015
			18/09/2014	17/09/2015
			22/05/2015	21/05/2016
			27/02/2015	26/02/2016
			18/02/2016	17/02/2017

## For ELP 20

S. No	Meter Number	Meter Make	Accuracy Class	Calibration dates	Due date
				15/05/2012	14/05/2013
1.	05389963 (main meter)	L & T	0.2s	24/12/2020	23/12/2021

<sup>5</sup> check meter has been has been changed from 05271164 to 13191134 on 02/12/2013

2.	05389964 (Check meter)	L & T	0.2s	15/05/2012 24/12/2020	14/05/2013 23/12/2021
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**For ELP 39**

Sr. no.	Meter Number	Meter Make	Accuracy Class	Calibration date		Due date	
1.	18068276 (main meter)	L & T	0.2s	15/05/2012 20/01/2021		14/05/2013 19/01/2022	
2.	18079752 (Check meter)	L & T	0.2s	15/05/2012 20/01/2021		14/05/2013 19/01/2022	

**For VVS 28**

S. No	Meter Number	Meter Make	Accuracy Class	Calibration date		Due date	
1.	07022984 (main meter)	L & T	0.2s	08/06/2012 11/11/2019*		07/06/2013 10/11/2020	
2.	06675419 (Check meter)	L & T	0.2s	08/06/2012 11/11/2019*		07/06/2013 10/11/2020	

*\*delay in calibration*

For the monitoring period ,the calibration of meters was done only for MMCL 05 site and for the other location i.e ELP 39,ELP 20 and VVS 28 no calibration was done ,hence error factor has been applied for the same in the ER calculation as a conservative approach.

There is delay in calibration for location ELP 39 (May 2013- March 2016),ELP 20 (May 2013- March 2016) and VVS -28 (June 2013-March 2016) for complete monitoring period and result of delayed calibration is within permissible limit of accuracy class of 0.2%.Hence the error factor of 0.2% is applied.

However the last calibration (reference taken from last Monitoring report ) and the latest calibration dates are now hereby updated also the supporting for the same has been submitted to the assessment team .

## APPENDIX 2: BREAK-DOWN DETAILS

Generation Date	Customer name	State	Location Number	Breakdown remark	Breakdown Hours
12/06/13	Mineral Enterprises limited	Karnataka	ELP -39	CLS Generator Lubrication Stop	09:00
27/08/13	Mineral Enterprises limited	Karnataka	ELP -39	Mech Gear Oil Filter Choked Stop	17:00
05/05/14	Mineral Enterprises limited	Karnataka	ELP -39	CLS Generator Lubrication Stop	12:00
12/10/14	Mineral Enterprises limited	Karnataka	ELP -39	CLS Pitch Slew Ring Lubrication Stop	14:00
27/11/14	Mineral Enterprises limited	Karnataka	ELP -39	Pitch Resolver Encoder Stop	18:00
10/01/14	Mineral Enterprises limited	Karnataka	ELP -39	Rep Pitch Frequency Pitch2 Stop	10:00
16/03/14	Mineral Enterprises limited	Karnataka	ELP -39	CLS Generator Lubrication Stop	09:00
09/05/14	Mineral Enterprises limited	Karnataka	ELP -20	Mech Gear Oil Filter Choked Stop	17:00
22/11/14	Mineral Enterprises limited	Karnataka	ELP -20	Rep Pitch Freq Conv Pitch1 Stop	10:00
30/11/14	Mineral Enterprises limited	Karnataka	ELP -20	Forcefull Stoppage	06:00
28/12/14	Mineral Enterprises limited	Karnataka	ELP -20	Forcefull Stoppage	12:00
01/03/15	Mineral Enterprises limited	Karnataka	MMCL -05	Elec Saftey Chain Stop	10:00
06/06/15	Mineral Enterprises limited	Karnataka	MMCL -05	Elec Saftey Chain Stop	12:00

09/07/15	Mineral Enterprises limited	Karnataka	MMCL -05	INTL_Line Breakdown due to E/F	10:00
08/10/15	Mineral Enterprises limited	Karnataka	MMCL -05	INTL_Line Breakdown due to E/F	06:00
11/12/15	Mineral Enterprises limited	Karnataka	MMCL -05	INTL_Line Breakdown due to E/F	12:00
20/12/15	Mineral Enterprises limited	Karnataka	VVS-28	INTL_Line Breakdown due to E/F	10:00
10/01/16	Mineral Enterprises limited	Karnataka	VVS-28	CLS Generator Lubrication Stop	18:00
15/02/16	Mineral Enterprises limited	Karnataka	VVS-28	Mech Gear Oil Filter Choked Stop	10:00
17/02/16	Mineral Enterprises limited	Karnataka	VVS-28	Rep Pitch Freq Conv Pitch1 Stop	09:00
19/02/16	Mineral Enterprises limited	Karnataka	VVS-28	Forcefull Stoppage	17:00
25/03/16	Mineral Enterprises limited	Karnataka	VVS-28	Forcefull Stoppage	10:00