

B.7 Application of the monitoring methodology and description of the monitoring plan:	
B.7.1 Data and parameters monitored:	
Data / Parameter:	EGy
Data unit:	MWh (Mega-watt hour)
Description:	Net electricity supplied to the grid by the Project
Source of data to be used:	Electricity supplied to the grid as per Joint Meter Readings (Form B) taken at 33 kV metering point.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	Annual electricity supplied to the grid by the Project $= 22.8 \text{ MW (Capacity)} \times 26.5\% \text{ (PLF)} \times 8760 \text{ (hours) MWh}$ $= 52.928 \text{ MWh}$
Description of measurement methods and procedures to be applied:	<p>Monitoring: The procedures for metering and meter reading will be as per the provisions of the power purchase agreement except or otherwise explicitly stated in the monitoring plan in section B.7.2. Metering system for the project activity consists of one main and check meter at 33 kV metering location. Both meters are two-way tri-vector meters capable of recording import and export of electricity.</p> <p>In addition to this there are two main and check meters (bulk meters) at 110 kV metering point at the Enercon India Limited (herein after referred as “Enercon”) substation at Bannikoppa. The bulk meter is connected to the machines of the project activity and the machines commissioned by the other project developers. Therefore in order to determine the electricity supplied to the grid by the project activity at high voltage (110 kV) side of Enercon substation, the state utility (herein after referred to as “KPTCL/HESCOM”) applies the transmission loss between 110 kV metering points (two in number) and meter reading recorded at the 33 kV metering points for all the machines that are connected to 110 kV bulk meters at Enercon substation at Bannikoppa. The transmission loss calculated by the state utility is endorsed / confirmed jointly by the representatives of Enercon and the state utility. The transmission loss applied to the project activity by the state utility is reflected in the JMR (Form B) recorded at 33kV metering point. Refer Appendix 1 for location of metering points at 33kV and 110 kV.</p> <p>Frequency of recording data: Monthly</p> <p>Recording: The values of electricity supplied to the grid is sourced from JMR for 22.8 MW at 33 kV metering point.</p> <p>Responsibility: Joint responsibility of Enercon and state utility.</p> <p>Refer section B.7.2 and Annex – 4 for an illustration of the provisions for measurement methods.</p>
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by state utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. The values of electricity supplied to the grid mentioned in the JMR for 22.8 MW for the project at 33kV metering point can be cross checked with values mentioned in the invoice raised on the state utility. Refer Annex – 4 for an illustration of the provisions for QA/QC procedures
Any comment:	The data (electricity supplied to the grid) will be archived on electronic media as well as on paper. The archive will be kept for the period up to two years after the completion of the crediting period.

Data / Parameter:	EGexport
Data unit:	MWh (Mega-Watt hour)
Description:	Electricity Export recorded at meters (one main and one check) connecting 38 machines of the project activity.
Source of data to be used:	Electricity export to the grid as per joint meter reading (Form B) issued by HESCOM, taken at 33 kV metering point and can be sourced from JMR for 22.8 MW of the project activity.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value will be taken from the JMR (Form B) taken at 33kV metering point and will be applied directly.
Description of measurement methods and procedures to be applied:	<p>Monitoring: Electricity export to the grid will be recorded by the meters (one main and one check) connecting 38 turbines at 33kV point. Refer section B.7.2 and Annex – 4 for an illustration of the provisions for measurement methods.</p> <p>Frequency of recording data: Monthly</p> <p>Recording: The values electricity export to the grid is sourced from one JMR for 22.8 MW at 33 kV metering point.</p> <p>Responsibility: Joint responsibility of Enercon and state utility</p>
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by state utility and the PP except or otherwise explicitly stated in the PDD. Refer Annex – 4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The data will be archived on electronic media as well as on paper. The archive will be kept for the period up to two years after the completion of the crediting period.

Data / Parameter:	EGimport
Data unit:	MWh (Mega-Watt hour)
Description:	Electricity Import recorded at the meters (one main and one check) connecting 38 machines of the project activity.
Source of data to be used:	Electricity import from the grid as per joint meter reading issued by HESCOM, taken at 33kV metering point and can be sourced from JMR for 22.8 MW of the project activity.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value will be taken from the JMR (Form B) taken at 33 kV metering point and will be applied directly.
Description of measurement methods and procedures to be applied:	<p>Monitoring: Electricity import from the grid will be recorded by meters (one main and one check) connected to the 38 machines at 33kV point. Refer section B.7.2 and Annex – 4 for an illustration of the provisions for measurement methods.</p> <p>Frequency of recording data: Monthly</p> <p>Recording: The values electricity import to the grid is sourced from one JMR for</p>

	22.8 MW at 33 kV metering point. Responsibility: Joint responsibility of Enercon and state utility
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by state utility and the PP except or otherwise explicitly stated in the PDD. Refer section B.7.2 Annex – 4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The data will be archived on electronic media as well as on paper. The archive will be kept for the period up to two years after the completion of the crediting period.

Data / Parameter:	T_E
Data unit:	MWh (Mega-Watt hour)
Description:	Transmission loss for export between the metering location at 33 kV point and the metering location at 110 kV at the Enercon substation.
Source of data to be used:	Transmission Loss for export will be sourced from the joint meter reading (Form B) issued by HESCOM, taken at 33kV metering point for the project activity.
Value of data applied for the purpose of calculating expected emission reductions in section B.5	This value is certified by the State utility in the JMR (Form B). This value will be directly sourced from the JMR (Form B).
Description of measurement methods and procedures to be applied:	<p>Monitoring: Transmission loss between metering location at 33 kV and the metering location at 110 kV at Enercon substation is applied to the meter reading taken at meters connected at 33 kV point for the project activity.</p> <p>Enercon Substation is connected to the machines of the project activity and the machines commissioned by the other project owners. Therefore transmission loss is applied by the state utility as reflected in the JMR (Form B) taken at 33kV point. The JMR (Form B) is signed by the representatives of Enercon and the state utility. Refer section B.7.2 and Annex – 4 for an illustration of the provisions for measurement methods.</p> <p>Frequency of recording data: Monthly</p> <p>Recording: The value of transmission loss is sourced from JMR for 22.8 MW at 33 kV metering point.</p> <p>Responsibility: Joint responsibility of Enercon and state utility</p> <p>Refer section B.7.2 and Annex – 4 for an illustration of the provisions for measurement methods.</p>
QA/QC procedures to be applied:	QA/QC procedures will be as implemented by state utility and the PP. Refer section B.7.2 and Annex – 4 for an illustration of the provisions for QA/QC procedures.
Any comment:	The data will be stored in hard format and values will be taken from JMR.

The data will be stored in hard format and soft format by PP (Enercon) at the project site office. Joint meter reading is taken in the presence of the persons representing Enercon [Operation and Maintenance Contractor]. The archive will be kept for the period up to two years after the completion of the crediting period.

B.7.2 Description of the monitoring plan:
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Approved monitoring methodology ACM0002 / Version 06 Sectoral Scope: 1, “Consolidated methodology for grid-connected electricity generation from renewable sources”, by CDM - Meth Panel is proposed to be used to monitor the emission reductions.

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. There is one main and check meter dedicated to project activity at 33 kV metering point for the project activity. In addition to this there are two main and check meters (bulk meters) at 110 kV metering point at the Enercon substation and are connected to the machines of the project activity and the machines commissioned by the other project developers. Therefore in order to determine the electricity supplied to the grid by the project at 110 kV at the Bannikoppa substation, the state utility applies the transmission loss to the meter reading recorded at the 33 kV metering point. The transmission loss calculated by the state utility is endorsed / confirmed jointly by the representatives of Enercon and the state utility. The transmission loss applied to the project activity by the state utility is reflected in the JMR (Form B) recorded at 33kV metering point. Electricity supplied to the grid is calculated by applying transmission loss to the meter readings taken at 33 kV metering location of the project activity.

The procedure for calculation of transmission loss as given in the PPA is set-out below:

$$Z = \frac{(X1+X2+X3...+Xn)-Y}{(X1+X2+X3...+Xn)} \times 100$$

Z = Percentage transmission loss for export incurred in transmission line between the meter located at 33 kV metering point and the meters located at 110kV metering point (two bulk meters) high voltage side of receiving sub-station.

Xi = Energy Export Reading of energy meter installed at 33kV metering point

Here Xi represents X1, X2, X3,...Xn which are the meters that are installed at 33kV metering point and are connected to the receiving substation by internally connected lines to the receiving station.

Y = Energy Export Readings at bulk meters (two in number) installed at high voltage side of transformer of the receiving station at 110 kV.

The Export Reading Xi is adjusted for transmission loss that is determined by the state utility and is applied directly to the JMR (Form B) taken at 33 kV metering point. This can be checked from the JMR signed jointly by the representatives of Enercon and the state utility.

Transmission Loss in Export (TE) = Percentage Transmission Loss (Z) * Energy Export at 33kV metering point (EGExport)

Empirical Formula for Energy Export after adjustment of transmission loss (Equation 1)

Net Energy Export after adjustment of transmission loss = **EG_{export} – Transmission Loss (TE)**

The transmission loss in export is generally less than 5%. However in case of Energy Import, the state utility conservatively applies adjustment of 15% to the import values noted at 33 kV metering point.

Transmission Loss in Import (**TI**) = 15% * Energy Import at 33kV metering point (EG_{Import})

Empirical Formula for Energy Import after adjustment of transmission loss (Equation 2)

Net Energy Import after adjustment of transmission loss = **EG_{import} +15%*EG_{import}**
= 115%* EG_{import}

Therefore Energy Supplied to Grid after adjustment of transmission loss is difference of equation 1 and 2 as given in the JMR (Form B) signed jointly by Enercon and the state utility.

EG_y = EG_{export} – 115%*EG_{import} – Transmission Loss (TE)

The Joint meter reading noted at 33 kV metering location contains the following data:-

1. Electricity Export (EG_{export})
2. Electricity Import (EG_{import})
3. Transmission Loss (TE) between 33 kV metering point and 110 kV metering point (two bulk meters) at Enercon substation
4. Electricity supplied to the Grid [EG_{export}-115%*EG_{import}-TE]

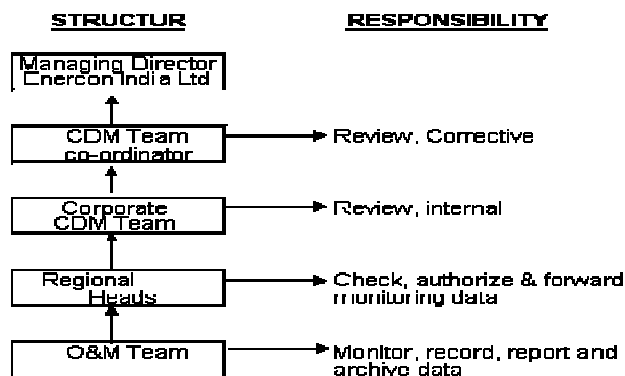
JMR is signed by the representatives of Enercon and the state utility. The meter readings (both export and import), transmission loss and electricity supplied to the grid are recorded in the JMR (33 kV metering point). Hence all these values will be reproduced from the JMR for calculation of emission reductions.

In addition to the JMR (Form B) at 33kV metering location for the project activity, the following documents will also be provided to the DoE for verification:

1. JMR (Form B) at 110kV metering point (two bulk meters) at Enercon substation
2. Transmission loss calculation endorsed / confirmed jointly by the representatives of Enercon and the state utility.

The electricity supplied to the grid can be cross checked from the invoices raised on the state utility for supply of electricity supplied to the grid.

The Project is operated and managed by Enercon (India) Ltd. The operational and management structure implemented by Enercon is as follows:



Annex 4

MONITORING INFORMATION

The reference of the monitoring information as described under this section has been taken from the PPA.

- **Metering:** Electricity supplied to the grid is metered jointly by state utility and Enercon through one main and one check meter at 33 kV metering point connecting exclusively the machines of project activity.

In addition to this there are two main and check meters (Bulk meters) at 110 kV metering point at Enercon substation covering machines of the project activity and machines of other project developers. The schematic diagram indicating location of meters at 33 kV and 110 kV metering points for the project activity is attached as Appendix 1.

- **Metering Equipment:** Metering system for the project activity consists of one main and one check meter of 0.2 percent accuracy class at 33kV metering point and two main and check meters at 110 kV metering point. All the meters are **two-way Trivector meters capable of recording import and export of electricity**. The meters installed are capable of recording and storing half hourly readings of all electrical parameters for a minimum period of 35 days with digital output.
- **Meter Readings:** The electricity supplied to the grid is recorded by taking JMR for 22.8 MW at 33kV metering point in the presence of representatives of state utility and Enercon. The JMR at 33kV metering point contains the value of energy exported, energy imported, transmission loss and electricity supplied to the grid during the recording period. This JMR is certified by state utility. These certified readings are then used to prepare the invoices to be raised on Discom. Thus the electricity supplied to the grid as mentioned in the JMR can be crosschecked with the value mentioned in the invoices.
- **Inspection of Energy Meters:** All main and check energy meters and all associated instruments, transformers installed at the Project are of 0.2% accuracy class. Each meter is jointly inspected and sealed on behalf of the Parties and is not to be interfered with by either Party except in the presence of the other Party or its authorized representatives.

- **Meter Test Checking:** All main and check meters are tested for accuracy with reference to a portable standard meter. The portable standard meter is owned by state utility. The main and check meters shall be deemed to be working satisfactorily if the errors are within specifications for meters of 0.2 accuracy class. The consumption registered by the main meters alone will hold good for the purpose of metering electricity supplied to the grid as long as the error in the main meters is within the permissible limits. All the meters will be tested / calibrated for accuracy annually.

If during the meter test checking,

- The main meter is found to be within the permissible limit of error and the corresponding check meter is beyond the permissible limits, then the meter reading will be as per the main meter as usual. The check meter shall, however, be calibrated immediately.
- The main meter is found to be beyond permissible limits of error, but the corresponding check meter is found to be within permissible of error, then the meter reading for the month up to the date and time of such test shall be as per the check meter. There will be a revision in the meter reading for the period from the previous calibration test up to the current test based on the readings of the check meter. The main meter shall be calibrated immediately and meter reading for the period thereafter till the next monthly meter reading shall be as per the calibrated main meter.
- Both the main meters and the corresponding check meters are found to be beyond the permissible limits of error, both the main meters shall be immediately calibrated and the correction applied to the reading registered by the main meter to arrive the correct reading of energy supplied for metering electricity supplied to the grid for the period from the last month's meter reading up to the current test. Meter reading for the period thereafter till the next monthly reading shall be as per the calibrated main meter.

Training imparted to the Personnel

Enercon India Ltd has been instrumental in imparting training to the persons it recruits to serve in the organisation. EIL has a separate training facility, called **Enercon Training Academy**, which gives training to the persons who are to be deployed On-Site to take care of all the activities starting from project construction to operation to maintenance. The training facility is located at Daman and is fully functional and equipped with qualified trainers, training equipments, classrooms and hostel facilities. The training academy has a fixed schedule which is applicable to all those who reside in the training academy. The training schedule and the training period depend upon the role the trainee has to perform. The trainers are well equipped to judge the capabilities of the trainees.

All trainees, who are to be associated to the technical side of project are given six to twelve months' rigorous training on all the aspects of wind turbine installation and maintenance depending upon the requirements. Enercon conducts periodical test to rate the trainees and thus they are deployed as per the outcomes of their performance during the training period.

Appendix 1

