

B.7 Application of the monitoring methodology and description of the monitoring plan:

B.7.1 Data and parameters monitored:

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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 two 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 $= 68.8 \text{ MW (Capacity)} \times 26.5\% \text{ (PLF)} \times 8760 \text{ (hours)} \text{ MWh}$ $= 159,712 \text{ MWh}$
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 and details of metering has been explained in monitoring plan in section B.7. 2. Metering system for the project activity consists of two sets of main and check meters at 33 kV metering location. Both sets of meters are two-way trivector meters capable of recording import and export of electricity.</p> <p>In addition to this there is one set of main and check meter (bulk meter) at 220 kV metering point at the Enercon India Limited (hereafter referred as “Enercon” in the revised monitoring plan) substation. 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 net electricity supplied to the grid by the project activity at high voltage (220 kV) side of Enercon substation, the KPTCL/Discom (hereafter referred as “state utility” in the revised monitoring plan) applies the transmission loss between 220 kV metering point at Enercon substation at Dasudi village and meter reading recorded at the 33 kV metering points for all the machines that are connected to 220 kV bulk meter at Enercon substation. 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 220 kV.</p> <p>Frequency of recording data: Monthly</p> <p>Recording: The values of net electricity supplied to the grid is sourced from two JMR for 56.8 MW and 12 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 net electricity supplied to the grid mentioned in the two JMRs of the project for 56.8 MW and 12 MW 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. Refer Appendix 1 for location of metering points at 33kV and 220 kV.
Any comment:	The data for net 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.
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Data / Parameter:	EGexport
Data unit:	MWh (Mega-Watt hour)
Description:	Summation of electricity Export recorded at meters (two main and two check) connecting 86 machines of the project activity and can be sourced from two JMR issued by BESCOM for 56.8 MW and 12 MW at 33 kV metering point.
Source of data to be used:	Electricity export to the grid as per two joint meter readings (FormB) taken at 33 kV metering point.
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:	Monitoring: Electricity export to the grid will be recorded by the meters (two main and two check) connecting 86 turbines at 33kV point. Refer section B.7.2 and Annex – 4 for an illustration of the provisions for measurement methods. Frequency of recording data: Monthly Recording: The values electricity export to the grid is sourced from two JMR for 56.8 MW and 12 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 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:	Summation of electricity Import recorded at the meters (two main and two check) connecting 86 machines of the project activity and can be sourced from two JMR issued by BESCOM for 56.8 MW and 12 MW at 33 kV metering point.
Source of data to be used:	Electricity import from the grid as per two joint meter reading taken at 33kV metering point.
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:	Monitoring: Electricity import from the grid will be recorded by meters (two main and two check) connected to the 86 machines at 33kV point. Refer section B.7.2 and Annex – 4 for an illustration of the provisions for measurement methods. Frequency of recording data: Monthly Recording: The values electricity import to the grid is sourced from two JMR for 56.8 MW and 12 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 220 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) 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 JMRs (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 220 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 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 two JMR for 56.8 and 12 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 --- Version 6”, 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 are two main and check meters dedicated to project activity at 33 kV metering point for the project activity. The one set of main and check meter is connected to 56.8 MW and other set of the main and check meter is connected to 12 MW of the project activity. In addition to this there is one set of main and check meter (bulk meter) at 220 kV metering point at the Enercon 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 by the project at 220 kV at the Enercon 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. Net 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:

$$Z = \frac{(X1 + X2 + X3 + X4 + \dots .Xn) - Y}{(X1 + X2 + X3 + X4 + \dots .Xn)} \times 100$$

Where,

Z = Percentage transmission loss for export incurred in transmission 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 220kV metering point (bulk meter: main and check) at high voltage side of receiving sub-station. **Refer Appendix 1 for schematic of the flow diagram.**

Summation of meter readings 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)

$$= (X1 + X2 + X3 + X4 + \dots .Xn)$$

X_i = Energy Export Reading (X_i) 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. $X_1, X_2, X_3, \dots, X_n$ 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 220 kV by internally connected lines. **Refer Appendix 1 for schematic of the flow diagram**

Y = Energy Export Reading at bulk meter installed at high voltage side of transformer of the receiving sub-station at 220 kV connecting machines of the project activity and other project developers. **Refer Appendix 1 for schematic of the flow diagram.**

Energy Export by the project activity at 33 kV metering point is as follows:

$$EG_{\text{export}} = X1 + X2$$

Where, X1 & X2 is the export reading recording at 33kV metering points for project activity.

$$\text{Transmission Loss in Export (TE)} = \text{Transmission Loss (Z)} * \text{Energy Export at 33kV metering point (EG}_{\text{Export}})$$

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

$$\text{Net Energy Export after adjustment of transmission loss} = \text{EG}_{\text{Export}} - \text{Transmission Loss (TE)}$$

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.

$$\text{Transmission Loss in Import (TI)} = 15\% * \text{Energy Import at 33kV metering point (EG}_{\text{Import}})$$

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

$$\begin{aligned} \text{Net Energy Import after adjustment of transmission loss} &= \text{EG}_{\text{Import}} + 15\% * \text{EG}_{\text{Import}} \\ &= 115\% * \text{EG}_{\text{Import}} \end{aligned}$$

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.

$$EG_y = EG_{\text{Export}} - 115\% * \text{EG}_{\text{Import}} - \text{Transmission Loss (TE)}$$

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 220 kV metering point at Enercon substation
4. Net 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 net 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 220kV metering point (bulk meters: main and check) at Enercon substation
2. Transmission loss calculation endorsed / confirmed jointly by the representatives of Enercon and the state utility.

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

STRUCTURE**RESPONSIBILITY**

Managing Director
Enercon India Ltd

CDM Team
co-ordinator



Review, Corrective action

Corporate
CDM Team



Review, internal audit

Regional Service
Heads



Check, authorize & forward
Monitoring data

O&M Team



Monitor, record, report and
archive data

Annex 4

MONITORING INFORMATION

- **Metering:** Net electricity supplied to the grid is metered jointly by state utility and Enercon through two sets of main and check meters at 33 kV metering point connecting exclusively the machines of project activity after adjusting for transmission loss.

In addition to this there is one set of main and check meter (Bulk meter) at 220 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 220 kV metering points for the project activity is attached as Appendix 1.

- **Metering Equipment:** Metering system for the project activity consists of two sets of main and checks meters at 33kV metering point and one set of main and check meters at 220 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 two JMRs at 56.8 MW and 33 MW at 33kV metering point in the presence of representatives of state utility and Enercon. The JMRs at 33kV metering point contains the value of energy exported, energy imported, transmission loss and net electricity supplied to the grid during the recording period. This JMR is certified by the Executive Engineer of the state utility and Enercon. These certified readings are then used to prepare the invoices to be raised on Discom. Thus the net 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 main & check meters connected at metering points with RR. No. KBCWP 01 (220kV metering point), KBCWP 02 (33kVmetering point) & KBCWP03 (33kV metering point) (please refer project layout Appendix 1) will be tested / calibrated for accuracy annually by either of KPTCL or BESCOM based on the availability of EB officials. KPTCL is a transmission utility and BESCOM is distribution licensee in the state of Karnataka.

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.

The schematic showing the location of meters for the project activity is given in Appendix 1:

Appendix 1: Schematic for location of meters at 33kV metering points and the bulk meter at 220 kV at Enercon sub-station.

