VAJRAKARUR WIND POWER PROJECT IN ANDHRA PRADESH

Document Prepared By EKI Energy Services Limited

Project Title	Vajrakarur wind power project in Andhra Pradesh
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Monitoring Period	04-June-2018 to 31-March-2020 (inclusive of both days)
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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

Mytrah Vayu (Pennar) Private Limited (MVPPL) has set up 63 MW wind power project in the state of Andhra Pradesh in India. The project activity comprises of 30 number Wind Turbine Generators (WTG's) with a capacity of 2.1 MW each.

The project activity helped to reduce the supply demand gap in the state and also helped in contributing to the sustainable development by using wind energy as the source of power generation and reduction of GHG Emissions. The power (electricity) thus produced by the project activity is transmitted to the Andhra Pradesh grid. The project activity therefore displaced an equivalent amount of electricity which would have otherwise been generated in fossil fuel dominant electricity grid.

The project is using Suzlon's wind energy technology and has implemented S88 model 2.1MW WTGs. The commissioning details of the implemented project activity is given in section **Error! Reference source not found.**.

The start date of current monitoring period 04-June-2018 to 31-March-2020. The total GHG emission reductions or removals generated in this monitoring period is 175,417 tCO_2e.

1.2 Sectoral Scope and Project Type

The project activity falls under

Sectoral Scope: 01 - Energy industries (renewable / nonrenewable sources)

Project Type **:** I - Renewable Energy Projects

Title **:** Consolidated baseline methodology for grid-connected electricity generation from renewable sources

Reference : Approved consolidated baseline and monitoring methodology ACM0002, Version 13.0.0[1].

This project is not a grouped project activity.

1.3 Project Proponent

Organization name	Mytrah Vayu (Pennar) Private Limited (MVPPL)
Contact person	Mr. Santosh Kotti
Title	Assistant Manager
Address	8001, Q-City, S.No:109, Gachibowli, Hyderabad- 500 032, India.

[1] https://cdm.unfccc.int/methodologies/DB/VJI9AX539D9MLOPXN2AY9UR1N4IYGD

Telephone	Hyderabad 500032, Telangana, INDIA
Email	+91 9655967839

1.4 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the Project	Project Consultant
Contact person	Anjali Rao
Title	Project Manager
Address	Office No. 201, EnKing Embassy, Plot No. 48, Scheme No. 78,
Telephone	Part II, Vijay Nagar INDORE – 452010, India.
Email	9109120940

1.5 Project Start Date

The project start date for this project is said to be 31-March-2012. This is because the first WEG was commissioned as on the said date.

1.6 Project Crediting Period

The project is registered under Clean Development Mechanism (CDM) of UNFCCC with 10 years crediting period (Reference No: 9650) on 11-June-2013.[2] Crediting period of the project under CDM starts on 11-June-2013 and ends on 10-June-2023.

The project has begun generating GHG emission reductions from 31-March-2012. Hence, crediting period for VCS begins on 31-March-2012 and ends on 30-March-2022 considering 10 years fixed crediting period.
The project proponent will also not claim GHG emission reductions under two schemes for the same period.

1.7 Project Location

The project activity is located in Vajrakarur village, Anantapur district of Andhra Pradesh state, India. The geo-coordinates of location of the project activity are as follows:

S. No.	Location	Zone	Latitude (N)	Longitude (E)	Date of Commissioning
1	VAR 010	43 P	15⁰ 1’ 7.68”	77⁰ 1 4 ’ 37.18”	29-October-2012
2	VAR 015	43 P	15⁰ 0’ 27.99”	77⁰ 15’ 14.58”	29-October-2012
3	VAR 016	43 P	15⁰ 0’ 27.88”	77⁰ 16’ 1.56”	29-October-2012
4	VAR 018	43 P	15⁰ 0’ 4.79”	77⁰ 15’ 44.45”	18-June-2012

[2] https://cdm.unfccc.int/Projects/DB/SGS-UKL1369989385.4/view

S. No.	Location	Zone	Latitude (N)	Longitude (E)	Date of Commissioning
5	VAR 019	43 P	14⁰ 59’ 52.17”	77⁰ 16’ 1.02”	30-October-2012
6	VAR 022	43 P	14⁰ 59’ 6.44”	77⁰ 15’ 44.64”	30-October-2012
7	VAR 023	43 P	14⁰ 58’ 56.84”	77⁰ 15’ 55.01”	18-June-2012
8	VAR 024	43 P	14⁰ 59’ 23.72”	77⁰ 16’ 35.89”	18-June-2012
9	VAR 026	43 P	15⁰ 0’ 43.37”	77⁰ 16’ 46.07”	30-October-2012
10	VAR 027	43 P	15⁰ 0’ 16.94”	77⁰ 17’ 36.85”	30-October-2012
11	VAR 028	43 P	15⁰0’ 4.62”	77⁰ 17’ 29.05”	30-October-2012
12	VAR 029	43 P	14⁰ 59’ 42.71”	77⁰ 17’ 18.65”	30-October-2012
13	VAR 030	43 P	14⁰ 59’ 30.30”	77⁰ 17’ 13.80”	30-October-2012
14	VAR 037	43 P	14⁰ 58’ 42.71”	77⁰ 18’ 35.17”	30-October-2012
15	VAR-038	43 P	14⁰ 58’ 21.07”	77⁰ 17’ 57.63”	31-March-2012
16	VAR-039	43 P	14°58’ 6.25”	77° 17’ 56.50”	31-March-2012
17	VAR-040	43 P	14° 57’ 44.42”	77°18’ 3.20”	31-March-2012
18	VAR 050	43 P	14° 59’ 58.87”	77° 19’4.90”	20-December-2012
19	VAR 051	43 P	15° 0’ 10.25”	77°18’ 55.68”	20-December-2012
20	VAR 203	43 P	15°1’ 6.13”	77° 15’ 21.67”	29-October-2012
21	VAR 204	43 P	15° 0’ 48.04”	77° 15’ 22.42”	29-October-2012
22	VAR 205	43 P	15°0’ 2.22”	77° 15’ 8.52”	29-October-2012
23	VAR 208	43 P	14° 58’ 13.90”	77° 16’ 27.42”	18-June-2012
24	VAR 209	43 P	14° 58’ 38.57”	77° 17’34.36”	31-March-2012
25	VAR 216	43 P	15°1’ 29.917”	77° 16’ 26.95”	30-October-2012
26	VAR 217	43 P	15° 1’ 16.78”	77° 16’ 42.34”	30-October-2012
27	VAR 300	43 P	15° 1’ 23.81”	77° 15’ 24.03”	29-October-2012
28	VK 108	43 P	15° 2’ 21.62”	77° 16’ 27.63”	29-October-2012
29	VK 109	43 P	15° 2’ 30.00”	77° 16’ 16.30”	29-October-2012
30	VK 110	43 P	15° 2’ 38.23”	77°16’ 5.95”	29-October-2012

The exact location is depicted in the following map

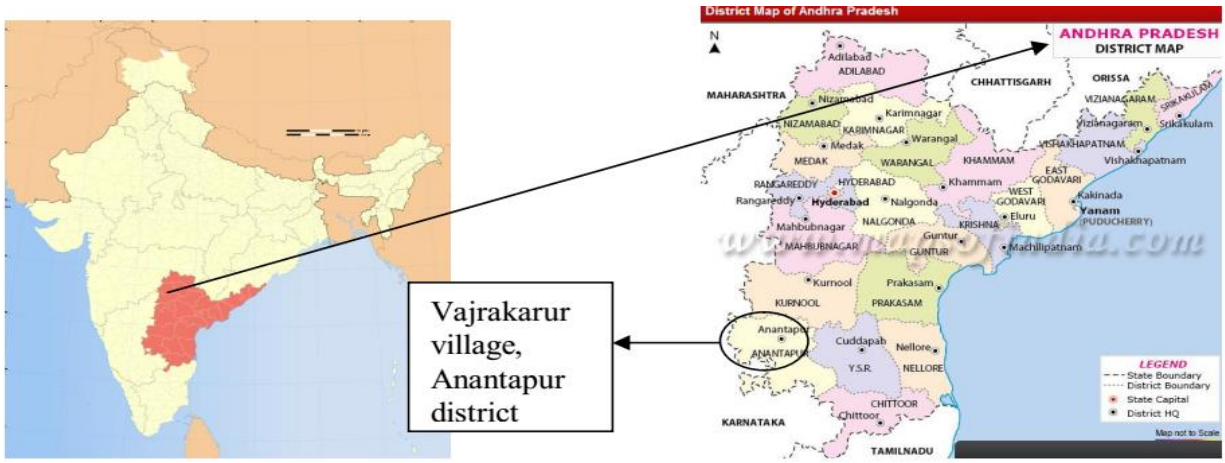


Figure 1. Project Site location

1.8 Title and Reference of Methodology

Title: Consolidated baseline methodology for grid-connected electricity generation from renewable sources.
Reference: Approved consolidated baseline and monitoring methodology ACM0002, Version 13.0.0[3].

Other tools referenced in this methodology are:

- Tool for the demonstration and assessment of additionality, Version 07.0.0 (EB70 Annex 08)[4]
- Tool to calculate project or leakage CO_2 emissions from fossil fuel combustion, Version 02 EB41[5] Annex 11.
- Tool to calculate the emission factor for an electricity system, Version 03.0.0 (EB70 Annex 22)[6]

1.9 Participation under other GHG Programs

The PP has participated under CDM mechanism of UNFCCC. The UN reference id 9650[2] of program with this project activity. The PP has not considered the credit from any other mechanism for the current monitoring plan. The undertaking is provided to confirm that there is no any double accounting for current monitoring period.

1.10 Other Forms of Credit

Below two forms of credits are not applicable for project activity:

- **Emission Trading Programs and Other Binding Limits:** The PP has not applied this project in any Emission Trading Programs and other Binding Limits.
- **Other Forms of Environmental Credit**: The PP has not applied this project in any other form of environmental credits.

1.11 Sustainable Development

Contribution to sustainable development:

Ministry of Environment and Forests, has stipulated economic, social, environment and technological well-being as the four indicators of sustainable development. The project contributes to sustainable development using the following ways.

- **Social well-being:** The project helps in generating employment opportunities during the construction and operation phases. The project activity leads to development in infrastructure in the region like development of roads, telecommunication and also may promote business with improved power generation.

[3] https://cdm.unfccc.int/methodologies/DB/VJI9AX539D9MLOPXN2AY9UR1N4IYGD

[4] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf

[5] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-03-v2.pdf

[6] http://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v3.0.0.pdf

- **Economic well-being:** The project is a clean technology investment in the region, which would not have been taken place in the absence of the VCS benefits the project activity will also help to reduce the demand supply gap in the state. The project activity creates local employment generation which helps economic well-being of local people.
- **Technological well-being:** The successful operation of project activity leads to promotion of Wind based power generation and would encourage other entrepreneurs to participate in similar projects
- **Environmental well-being:** The project activity being a renewable source of energy, it reduces the dependence on fossil fuels and conserves natural resources which are on the verge of depletion. Due to its zero emission the project activity also helps in avoiding significant amount of GHG emissions.

2 SAFEGUARDS

2.1 No Net Harm

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[7].

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

[7] https://smartnet.niua.org/sites/default/files/resources/report-on-developmental-impacts-of-RE.pdf

used to records the grievances and feedback. During the current monitoring period, positive feedbacks had been received regarding site operation. No any grievances received during the current monitoring period, therefore, no any mitigation measures were required.

2.3 AFOLU-Specific Safeguards

This section is not applicable because the project activity is not AFOLU project activity.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

The first machine under the project activity was commissioned on 31-March-2012 and the last machine under the project activity was commissioned on 20-December-2012. The Project activity consist of 30 machines (2.1MW each) of Suzlon make S-88.Total capacity of 63MW. The commissioning schedule of the project activity is shown below.

Sl.No	Make	Location No.	Date of Commissioning
1	Suzlon	VAR209	31-March-2012
2	Suzlon	VAR38	31-March-2012
3	Suzlon	VAR39	31-March-2012
4	Suzlon	VAR40	31-March-2012
5	Suzlon	VAR18	18-June-2012
6	Suzlon	VAR208	18-June-2012
7	Suzlon	VAR23	18-June-2012
8	Suzlon	VAR24	18-June-2012
9	Suzlon	VAR204	29-October-2012
10	Suzlon	VAR15	29-October-2012
11	Suzlon	VAR16	29-October-2012
12	Suzlon	VAR205	29-October-2012
13	Suzlon	VAR10	29-October-2012
14	Suzlon	VAR108	29-October-2012
15	Suzlon	VAR109	29-October-2012
16	Suzlon	VAR110	29-October-2012
17	Suzlon	VAR203	29-October-2012
18	Suzlon	VAR300	29-October-2012
19	Suzlon	VAR217	30-October-2012
20	Suzlon	VAR216	30-October-2012
21	Suzlon	VAR26	30-October-2012
22	Suzlon	VAR30	30-October-2012
23	Suzlon	VAR28	30-October-2012

24	Suzlon	VAR27	30-October-2012
25	Suzlon	VAR22	30-October-2012
26	Suzlon	VAR29	30-October-2012
27	Suzlon	VAR19	30-October-2012
28	Suzlon	VAR37	30-October-2012
29	Suzlon	VAR50	20-December-2012
30	Suzlon	VAR51	20-December-2012

The salient features of implemented technology are as mentioned below:

MODEL	**S88- 2.1 MW³**
Operating Data	
Rated power	2.1 MW
Cut-in wind speed	4 m/s
Rated wind speed	14m/s
Cut-out wind speed	25 m/s
50 years gust wind speed	59.5 m/s
Wind Class	IEC-IIA
Rotor	
Diameter	88 m
Swept area	6082 m^2
Generator	
Type	Asynchronous slip ring type induction
Frequency	50/60 Hz
Braking System	
Aerodynamic brake	3 independent systems with blade pitching mechanism
Mechanical brake	Hydraulic fail safe disc brake system
Gearbox	
Type	3 stages
Yaw System	
Type	Driven by 3 electrical driven planetary
Bearings	Polyamide slide
Tower	
Type	Tubular Tower (4 Sections)

The project has supplied 195,539.94 MWh of electricity to the grid in the monitoring period, which indicates that the project has performed reasonably well during the monitoring period. Referring to the data available, it can be inferred that there has not been any major event that may impact the GHG emission reductions or removals and monitoring of the project activity. There are no other changes in the project activity.

As a part of regular maintenance, the machines are stopped for mechanical and electrical maintenance and for visual inspection in the current monitoring period.

3.2 Deviations

3.2.1 Methodology Deviations

There is no request for deviation applied during this monitoring period.

3.2.2 Project Description Deviations

The project activity does not request any deviation

3.3 Grouped Projects

This project activity is not a grouped project activity.

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{grid,OMsimple,y}$
Data unit	tCO_2/MWh
Description	Operating margin CO_2 emission factor of Southern Grid
Source of data	Central Electricity Authority:CO_2 Emission Database CEA CO_2 Baseline database Version 07[8]
Value applied	0. 9515
Justification of choice of data or description of measurement methods and procedures applied	The operating margin emission factor data has been deduced from CO_2 database. CEA CO_2 Baseline database Version 07
Purpose of Data	Calculation of combined margin emission factor of grid.
Comments	The operating margin emission factor is a 3-year generation-weighted average (2008-11). Data calculated to be 0 0.9515 The operating Margin is calculated ex ante and fixed during the crediting period.

[8] http://www.cea.nic.in/reports/others/thermal/tpece/cdm_co2/user_guide_ver7.pdf

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO_2/MWh
Description	Build margin CO_2 emission factor of Southern Grid
Source of data	Central Electricity Authority:CO_2 Emission Database CEA CO_2 Baseline database Version 07
Value applied	0.7339
Justification of choice of data or description of measurement methods and procedures applied	The operating margin emission factor data has been deduced from CO_2 database. CEA CO_2 Baseline database Version 07
Purpose of Data	Calculation of combined margin emission factor of grid.
Comments	The build Margin is calculated ex-ante and fixed during the crediting period. For ex-ante calculation the most recent data available has been used and the build margin thus calculated is 0.7339

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO_2/MWh
Description	Combined margin CO_2 emission factor of Southern Grid
Source of data	Central Electricity Authority: CO_2 Emission Database CEA CO_2 Baseline database Version 07
Value applied	0.8971
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per the procedures in "Tool to calculate the emission factor for an electricity system" based on CEA data.
Purpose of Data	Calculation of baseline emissions
Comments	The combined margin is calculated ex-ante and fixed for the entire crediting period and the combined margin thus calculated is 0.8971

4.2 Data and Parameters Monitored

Data / Parameter	$EG_{PJ,y}$
Data unit	MWh
Description	Net Electricity Supplied to the grid by the project activity.
Source of data	Calculated

Description of measurement methods and procedures to be applied	Metering system for the project activity consists of cluster metering system at 33kV. Each Cluster point have one main and one check meter (33kV metering point) All the clusters of the project activity is exclusively connected to WEGs of the project activity i.e. no WEGs of other project owners that are connected to these clusters. Summation of meter reading for all the clusters (connecting 30 machines) provide total electricity Generated by the project activity. In addition to cluster meters there is one set of main & check meter at Suzlon pooling sub-station (220kV metering point/Bulk metering point) where all the WEGs of project activity and non-project activity are connected. All main and check meters are two way tri-vector meters capable of recording import and export of electricity under the control of state electricity utility. All main and check meters are of 0.2% of accuracy class The procedures for metering and meter reading is as per the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD Monthly Joint Meter Reading recorded at all the meters is done by DISCOM utility in the presence of PP's representative (Suzlon) Joint meter reading recorded at cluster metering point indicates the values of export & import by the WEGs of project activity connected to 33 kV metering point. There is individual Joint meter reading for individual cluster metering point. Joint meter reading recorded at 220kV metering point at Suzlon pooling sub-station indicates the values of export and import by all the WTG's of the project activity and WTG's of non-project activity connected to 220kV metering point Net electricity supplied to the grid is used in calculation of emission reduction of the project activity.
Frequency of monitoring/recording	Recording : Monthly Monitoring :Not Applicable since it is a calculated parameter
Value monitored	195,539.94[9] MWh
Monitoring equipment	The details of energy meters used have been included on Appendix 1.

[9] Minimum Net value as per JMR and Invoice for CER calculation

QA/QC procedures to be applied	QA/QC procedures is implemented by DISCOM/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. Net electricity supplied ($EG_{PJ,y}$) to the grid by the project activity is cross checked with invoices submitted by the PP to the state utility. All the main meter and check meters are calibrated by state utility once in a year and records are available with PP. In case of delay in calibration, error factor is applied conservatively.
Purpose of the data	Calculation of baseline emissions
Calculation method	Net quantity of electricity exported by the project is calculated as the net of sum of export from individual meters, sum of import from individual meters and line losses.
Comments	The data is archived for two years after the end of the last crediting period or till the last issuance of CERs for the project activity, whichever is later The meter readings at the substation are recorded by APCPDCL representative every month The meters are fully under the jurisdiction of APCPDCL. The readings of net electricity supplied to the grid by each customer are made.

Data / Parameter	$EG_{export,y}$
Data unit	MWh
Description	Electricity exported by project activity to grid after apportioning of transmission losses between 33kV metering point (cluster meter) and 220kV metering point(Bulk metering point).
Source of data	Electricity exported by project activity is a calculated Parameter.
Description of measurement methods and procedures to be applied	Electricity exported by project activity to grid after apportioning of transmission losses between 33kV metering point (cluster meter) and 220kV metering point(Bulk metering point).
Frequency of monitoring/recording	Continuous measurement and at least monthly recording
Value monitored	202,247.33
Monitoring equipment	The details of energy meters used have been included

	on Appendix 1.
QA/QC procedures to be applied	Value of EGexport,y is cross checked from certified statement given by state utility showing cost of export and import. It may be noted that energy export by the project activity is imported by the grid from the project activity and therefore electricity export by the project activity is denoted as import by the grid in the certified statement by the state utility. QA/QC procedures is as implemented by DISCOM/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. All the main meter and check meters are calibrated by state utility once in a year and records are available with PP. In case of delay in calibration, error factor is applied conservatively.
Purpose of the data	Calculation of baseline emissions
Calculation method	Electricity exported by the project is calculated as the net of sum of export from each metering point at 33KV.
Comments	The data is archived for two years after the end of the last crediting period or till the last issuance of CERs for the project activity, whichever is later The meter readings at the substation are recorded by APCPDCL representative every month The meters are fully under the jurisdiction of APCPDCL. The readings of net electricity supplied to the grid by each customer are made.

Data / Parameter	EG_{imp}
Data unit	MWh
Description	Electricity imported recorded at 33kV (JMR at 33kV metering point) cluster metering points connecting a total of 30 machines of the project activity
Source of data	Electricity import from grid as per the joint meter reading recorded at cluster metering points.
Description of measurement methods and procedures to be applied	Electricity import form grid is recorded by cluster meters (main and check) connecting 30 turbines at 33kV level.
Frequency of monitoring/recording	Continuous measurement and at least monthly recording
Value monitored	1078.30
Monitoring equipment	The details of energy meters used have been included

	on Appendix 1.
QA/QC procedures to be applied	Value of EG_{imp} is cross checked from certified statement given by state utility showing cost of export and import. It may be noted that energy import by the project activity is exported by the grid from the project activity and therefore electricity import by the project activity is denoted as export by the grid in the certified statement by the state utility. QA/QC procedures is implemented by DISCOM/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. All the main meter and check meters are calibrated by state utility once in a year and records are available with PP. In case of delay in calibration, error factor is applied conservatively.
Purpose of the data	Baseline emissions calculation
Calculation method	Not applicable
Comments	All the data items monitored under the monitoring plan is be archived for 2 years after the end of crediting period or till the last issuance of credits for this project activity whichever occurs later.

Data / Parameter	EG_{pe}
Data unit	MWh
Description	Electricity Export recorded at 33 kv (JMR at 33kV metering point) cluster points connecting total 30 machines of the project activity.
Source of data	Electricity export to the grid as per the joint meter reading recorded at cluster metering points
Description of measurement methods and procedures to be applied	Electricity export to the grid is recorded by the cluster meters (main and check) connecting 30 turbines at 33kV level.
Frequency of monitoring/recording	Continuous measurement and at least monthly recording
Value monitored	205,611.63
Monitoring equipment	The details of energy meters used have been included on Appendix 1 of Monitoring Report
QA/QC procedures to be applied	The value of (EG_{pe}) transmission loss is cross checked from the transmission loss calculation sheet of Suzlon and DISCOM.

	QA/QC procedures is implemented by DISCOM/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD
Purpose of the data	Baseline emissions calculation
Calculation method	Not applicable
Comments	All the data items monitored under the monitoring plan is archived for 2 years after the end of crediting period or till the last issuance of CERs for this project activity whichever occurs later.

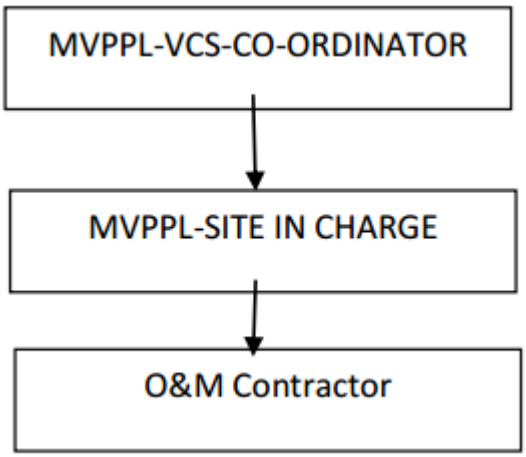
Data / Parameter	EG_e
Data unit	MWh
Description	Electricity export recorded at 220 kV meters (main and check) at Suzlon pooling station connecting machines of the project activity and the machines commissioned by other project developers.
Source of data	Electricity export to the grid as per joint Meter Readings recorded at 220kV of Suzlon pooling sub -station.
Description of measurement methods and procedures to be applied	Electricity export to the grid is recorded by the 220 kV (main and check) at Suzlon pooling sub- station connecting machines of the project activity and machines of other project developers.
Frequency of monitoring/recording	Continuous measurement and at least monthly recording
Value monitored	344,996.79
Monitoring equipment	The details of energy meters used have been included on Appendix 1 of Monitoring Report
QA/QC procedures to be applied	The value of EGe is cross checked from the transmission loss calculation sheet signed by the representatives of suzlon and discom. QA/QC procedures is implemented by Discom/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD. The energy meters (main & check) is calibrated by state utility once in a five year.
Purpose of the data	Baseline emissions calculation
Calculation method	Not applicable

Comments	All the data items monitored under the monitoring plan is archived for 2 years after the end of crediting period or till the last issuance of CERs for this project activity whichever occurs later.

Data / Parameter	L_{ep}
Data unit	MWh
Description	Total percentage of transmission loss for export between the metering point at 33 kV (sum of all the WEGs connected to Bulk metering point including non-project activity as well as project activity WTG's) metering points and the metering point at 220kV at Suzlon pooling substation.
Source of data	Transmission Loss is directly applied from the monthly generation report for the project activity.
Description of measurement methods and procedures to be applied	Transmission loss between metering point at 33kV and at metering point of 220kV at Suzlon Sub-station is applied to meter reading taken at meters connected at 33kV for the project activity. Suzlon pooling sub-station is connected to the machines of the project activity and the machines commissioned by the other project owners. Therefore, transmission loss is applied to the project activity by the state utility as reflected in the JMR taken at 33kV level. The JMR is signed by the representatives of Suzlon and the state utility.
Frequency of monitoring/recording	Recording: Monthly Monitoring: Not Applicable since it is calculated parameter.
Value monitored	3,364.30
Monitoring equipment	The details of energy meters used have been included on Appendix 1 of Monitoring Report
QA/QC procedures to be applied	QA/QC procedures is implemented by Discom/State utility pursuant to the provisions of the power purchase agreement except or otherwise explicitly stated in the PDD.
Purpose of the data	Baseline emissions calculation
Calculation method	Not applicable
Comments	All the data items monitored under the monitoring plan is archived for 2 years after the end of crediting period or till the last issuance of CERs for this project activity whichever occurs later.

4.3 Monitoring Plan

The organizational structure of this CDM project activity is as follows:



The project participant has entered into an agreement with the WTG- Supplier for the operation and maintenance of WTGs. The WTG supplier has dedicated and technically well-equipped O&M team for day to day Operation and maintenance of each WTG. O&M contractor provides a monthly report, which includes generation data, major breakdown events and machine availability. Project Manager is responsible for recording of monthly Joint Meter Readings of export and import. Monthly power export and import data is sent regularly to CDM coordinator of MVPPL.

Metering system for the project activity consists of cluster metering system at 33kV. Each Cluster point have one main and one check meter (33kV metering point) All the clusters of the project activity is **Metering and Monitoring Plan details:** The general conditions set out for metering, recording, meter readings, exclusively connected to WEGs of the project activity i.e. there is no WEGs of other project owners that are connected to these clusters. Summation of meter reading for all the clusters (connecting 30 machines) provides total electricity generated by the project activity. In addition to cluster meters there is one set of main & check meter at Suzlon pooling sub-station (220kV metering point/Bulk metering point) where all the WEGs of project activity and non-project activity are connected. All main and check meters are two way tri-vector meters capable of recording import and export of electricity under the control of state electricity utility. All main and check meters are of 0.2% of accuracy class. Monthly Joint Meter Reading recorded at all the meters is done by Discom utility in the presence of PP's representative (Suzlon). Joint meter reading recorded at cluster metering point indicates the values of export & import by the WEGs of project activity connected to 33 kV metering point. There is individual Joint meter reading for individual cluster metering point. Joint meter reading recorded at 220kV metering point at Suzlon pooling sub-station indicates the values of export and import by all the WTG's of the project activity and WTG's of non-project activity connected to 220kV metering point Net electricity supplied to the grid is used in calculation of emission reduction of the project activity.
Metering and Monitoring Plan details: The general conditions set out for metering, recording, meter readings, meter inspections, Test & Checking and communication shall be applicable as per the PPA (Power purchase agreement) with the State electricity board except or otherwise explicitly mentioned in the PDD.

Metering: The electricity generated by the WTGs are monitored through energy meters connected to a set of WTGs of the PP at the project site. The electricity generated is stepped up by 33 kV transmission lines and fed to the metering point which has main meter and check meter. The electricity is fed from this metering point to 33/220 kV pooling sub-station where the bulk meter (main meter and check meter) has been installed and the same has been presented in the diagram below. The bulk meter at the sub-station measures total electricity exported by the different project participants located at the site.

The PP has made clusters of WTGs at the project site for the purpose of metering. Each cluster main and the check meter. All the clusters of the project activity is exclusively connected to WTGs of the project activity i.e. there is no WTGs of other project owners that are connected to these clusters.

It is clear that the clusters meters (dedicated meters/ individual meters) of project activity and other customers are connected to the Suzlon pooling sub- station at bulk metering point at 220 kV. Since the main and check meters at 220 kV metering point at the Suzlon Pooling station is connected to the machines of the project activity and the machines commissioned by other project developers, therefore in order to determine the net electricity supplied to the grid at 220kV at Suzlon sub-station, the state utility apply the apportioning of transmission loss to the meter reading recorded at 33kV.

The total % of transmission loss for the export between 220KV metering point at Suzlon substation and all WTGs connected to the sub-station is calculated by the state utility is endorsed / confirmed jointly by the representatives of Suzlon and the state utility. The transmission the state utility is reflected in transmission loss calculation sheet signed by the representatives of Suzlon and DISCOM. Net Electricity exported to the grid is calculated by applying transmission loss to the meter readings taken at 33 kV metering point of the project activity.

The procedure for calculation of Transmission loss is as follows:

Each project developer has dedicated individual metering system at 33kV. Energy export ($EG_{export,y}$) and energy import (E_{imp}) is recorded for the individual developers at 33 KV metering point; Where N is number of project developers connected to 220kV metering point of Suzlon substation.

Total % of transmission losses for export (L_{ep}) are calculated as using the following formula:

Where,
EGe = Electricity export to the grid recorded at Suzlon substation.
Value of Lep is calculated by state utility and sourced directly from the transmission loss calculation sheet.

$$Lep(\%) = \frac{(XExport,1 + XExport,2 + \ldots\ldots XExport,N) - EGe}{(XExport,1 + XExport,2 + \ldots\ldots XExport,N)} * 100$$

Hence,
Electricity exported by project activity to grid after apportioning of transmission losses between 33kV metering point (Cluster meter) & 220kV metering point (Bulk meter)

$$EG_{export,\,y} = EG_{pe} * (1 - L_{ep}(\%))$$

The Joint meter reading noted at 33 KV metering location contains the following data:
1. Electricity Export
2. Electricity Import

The net electricity supplied to the grid is calculated as follows.

$$EG_{PJ,y} = EG_{export,\ y} - Eg_{imp}$$

Electricity exported by the project activity ($EG_{PJ,y}$) is used for CER computation.

QA/QC Procedure: All the meters are calibrated/ tested once in a year. In case of the failure of the main meter, readings was obtained from the check meter, in case of the check meter failure also, there is a standby meter that is operational from which readings is taken.

The calibration is done by the officials of the state utility. Copy of calibration/testing certificate is kept as record by the PP and presented to the DoE for verification. The project participant is Mytrah Vayu (Pennar) India Private Limited is keeping and monitoring the data for electricity generation and calibration reports post project implementation. Suzlon India is O&M contractor is having the responsibility of activities such as Maintaining electricity generation records, calibration records and maintenance of the WEGs (Wind Energy Generators).

Layout of metering arrangement for the project activity is as follows:

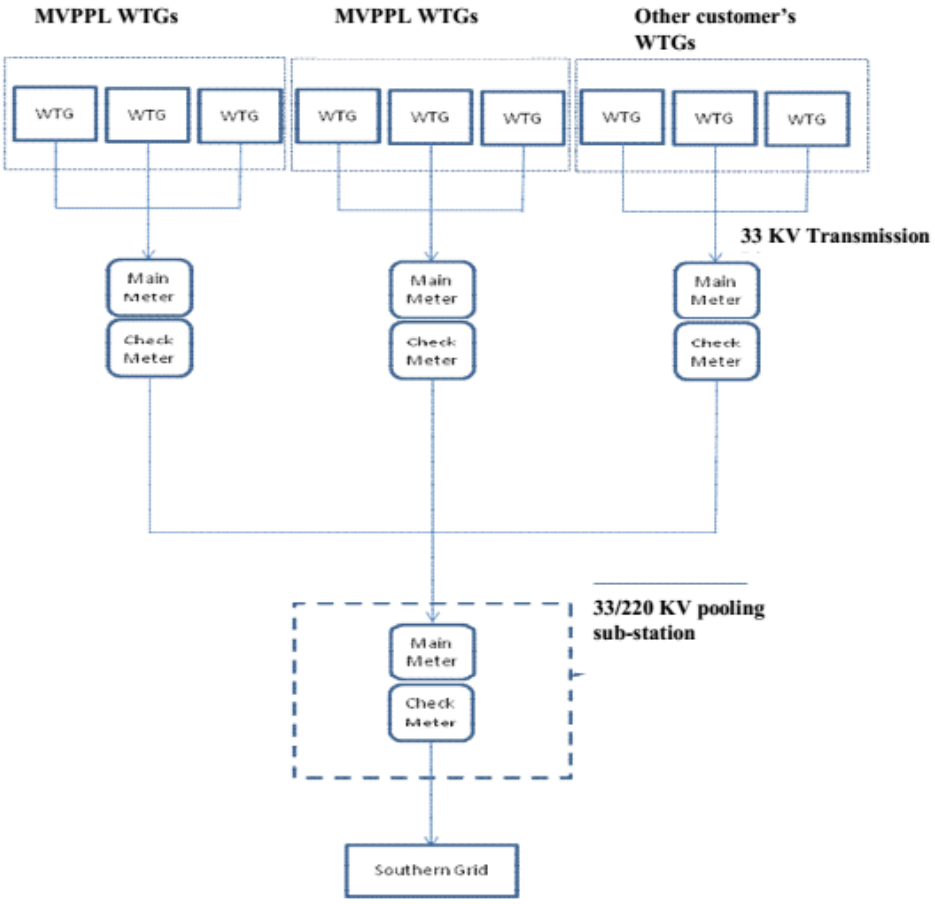


Figure 2. Schematic diagram indicating the metering system

The PP make clusters of WTGs at the project site for the purpose of metering. Each cluster have a main and the check meter. All the clusters of the project activity is exclusively be connected to WTGs of the project activity i.e. there is no WTGs of other project owners that are connected to these clusters.

The clusters meters (dedicated meters/ individual meters) of project activity and other customers are connected to the Suzlon pooling sub- station at bulk metering point at 220 kV. Since the main and check meters at 220 kV metering point at the Suzlon Pooling station is connected to the machines of the project activity and the machines commissioned by other project developers, therefore in order to determine the net electricity supplied to the grid at 220kV at Suzlon sub-station, the state utility apply the apportioning of transmission loss to the meter reading recorded at 33kV. The total % of transmission loss for the export between 220kV metering point at Suzlon sub-station and all the WTGs connected to the substation is calculated by the state utility is endorsed / confirmed jointly by the representatives of Suzlon and the state utility. The transmission the state utility is reflected in transmission loss calculation sheet signed by the representatives of Suzlon and Discom. Net Electricity exported to the grid is calculated by applying transmission loss to the meter readings taken at 33 kV metering point of the project activity.

Metering Equipment: Metering equipment is electronic trivector meter of 0.2% accuracy class.

Meter Readings: The monthly meter reading is taken jointly by the parties (Suzlon personal and personals of State utility) for every last month. At the conclusion of each meter reading an appointed representative of State Utility and Enercon sign a document indicating the number of Kilowatt (kWh) indicated by the meter.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

The baseline emissions are the product of electrical energy baseline $EG_{BL, y}$ expressed in MWh of electricity produced by the renewable generating unit multiplied by the grid emission factor.

Baseline emission factor is calculated as combined margin, consisting of a combination of operating margin (OM) and build margin (BM) factors.

$BE_y = EG_{PJ,y} * EF_{CO2,grid,y}$

Where:

BE_y : Baseline Emissions in year y; t CO_2
$EG_{PJ,y}$: Energy baseline in year y; kWh
$EFCO_2$: Emission Factor in year y; t CO_2e/kWh

As per registered CDM PDD, combined margin emission factor is 0.8971 tCO_2/MWh. Hence the baseline emissions for the project activity for the current monitoring period are as follows.

$BE_y = EG_{PJ,y} * EF_{CO2} = 195,539.94 * 0.8971 = 175,417\ tCO_2e$ (Rounddown value)

5.2 Project Emissions

The project activity involves in harnessing wind power. So the emissions from the project are zero.

5.3 Leakage

The project activity is a Greenfield wind power project and there is no technology transfer with respect to this project activity. Hence the Leakage emissions for the project are zero.

5.4 Net GHG Emission Reductions and Removals

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
04/06/2018 to 31/12/2018	71,998	0	0	71,998
01/01/2019 to 31/12/2019	93,241	0	0	93,241
01/01/2020 to 31/03/2020	10,178	0	0	10,178
Total	175,417	0	0	175,417

The actual VER is 22.81% 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 because the monitoring period is not matching with the billing period. The above variations is conservative.

APPENDIX 1 -CALIBRATION DETAILS

Meter Arrangement at Transmission line:

WTG ID	Capacity	Main Meter	Check meter	Make	Accuracy Class	Calibration Date	Valid till Date	Calibration Date	Valid till Date	Calibration date	Valid till date
VAR 38, VAR39, VAR 40, VAR209, VAR18, VAR 208, VAR 23,VAR 024 (Phase 1 WTGs)	16.8	12091060	12091061	L&T	0.2s	26-February-2018	25-February-2019	23-February-2019	22-February-2020	18-February-2020	17-February-2021
VAR204, VAR15, VAR16, VAR205, VAR10,VK108, VK09, VK110 (Phase 2 WTGs)	16.8	12091057	12091058	L&T	0.2s	26-February-2018	25-February-2019	23-February-2019	22-February-2020	18-February-2020	17-February-2021
VAR217, VAR216,VAR26 (Phase 3 WTGs)	6.3	12091064	12091065	L&T	0.2s	26-February-2018	25-February-2019	23-February-2019	22-February-2020	18-February-2020	17-February-2021
VAR22, VAR29, VAR19 (Phase 4 WTGs)	6.3	12091069	12091070	L&T	0.2s	26-February-2018	25-February-2019	23-February-2019	22-February-2020	18-February-2020	17-February-2021
VAR203, VAR300 (Phase 5 WTGs)	4.2	12091085	12091086	L&T	0.2s	26-February-2018	25-February-2019	23-February-2019	22-February-2020	18-February-2020	17-February-2021
VAR50, VAR51 (Phase 6 WTGs)	4.2	12091075	12091076	L&T	0.2s	26-February-2018	25-February-2019	23-February-2019	22-February-2020	18-February-2020	17-February-2021
VAR30, VAR28, VAR27 (Phase 7 WTGs)	6.3	12091066	12091072	L&T	0.2s	26-February-2018	25-February-2019	23-February-2019	22-February-2020	18-February-2020	17-February-2021

VAR 37 (Phase 8 WTGs)	2.1	12091080	12091081	L&T	0.2s	26-February-2018	25-February-2019	23-February-2019	22-February-2020	18-February-2020	17-February-2021

Metering details at 33/220 KV polling station:

Main Meter	**Check Meter**	**Make**	**Accuracy Class**	**Calibration Date**	**Calibration Due Date**	**Calibration Date**	**Calibration Due Date**	**Calibration Date**	**Calibration Due Date**
XC559940	XC559941	Secure	0.2s	26-February-2018	25-February-2019	23-February-2019	22-February-2020	18-February-2020	17-February-2021