



**Verified Carbon
Standard**

VAJRAKARUR WIND POWER PROJECT IN ANDHRA PRADESH



**INFINITE
SOLUTIONS**

Document Prepared by Infinite Solutions

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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 power produced displaces an equivalent amount of power from the grid, which is fed mainly by fossil fuel fired power plants. Hence, as per VCS PD, it results in total electricity generation of 138,628 MWh/year and of GHG emission reductions of 124,363 tCO₂/year.

In the Pre- project scenario, the equivalent amount of electricity delivered to the grid by the project activity, would have otherwise been generated by the operation of grid-connected fossil fuel based power plants and by the addition of new generation sources

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 3.1. The first WTG was commissioned on 31-March-2012 and last WTG was commissioned on 20-December-2012

The start date of current monitoring period 01-June2021 to 28-February-2022. The total GHG emission reductions or removals generated in this monitoring period is 59,885 tCO₂e.

1.2 Sectoral Scope and Project Type

The project activity falls under

Sectoral Scope: 01 - Energy industries (renewable / nonrenewable sources) Project Type:- Renewable Energy Projects

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

Reference: Approved consolidated baseline and monitoring methodology ACM0002, Version 13.0.0¹.

This project is not a grouped project activity

1.3 Project Proponent

Organization name	Mytrah Vayu (Pennar) Private Limited (MVPPL)
Contact person	Mr. Ramesh Kure
Title	Assistant Manager
Address	1st Floor, 8001, 8th Floor, Q-City, Nanakramguda, Gachibowli, Hyderabad 500032, Telangana, INDIA
Telephone	+91 72888 75975
Email	cleancredits@mytrah.com

1.4 Other Entities Involved in the Project

Organization name	Infinite Solutions
Role in the Project	Carbon Consultant
Contact person	Richa Thakur
Title	Project Manager
Address	214-215 Milinda Manor, Opp. Next Treasure Island, 2 RNT Marg, Indore-452001
Telephone	+91-731-4050174
Email	richa@infisolutions.org

1.5 Project Start Date

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

¹ <https://cdm.unfccc.int/methodologies/DB/VJI9AX539D9MLOPXN2AY9UR1N4IYGD>

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-2013². Crediting period of the project under CDM starts on 11-June-2013 and ends on 10-June-2023.

Credits from CDM mechanism issued for period 11-June-2013 to 10-June-2014

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 14' 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
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

² <https://cdm.unfccc.int/Projects/DB/SGS-UKL1369989385.4/view>

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

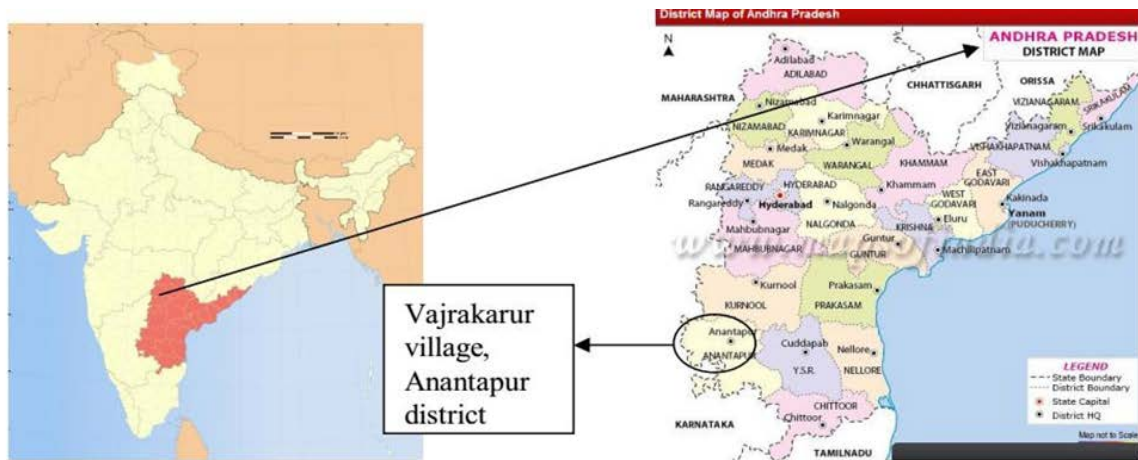


Figure 1. Project Site location

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 13.0.0³.

Other tools referenced in this methodology are:

³ <https://cdm.unfccc.int/methodologies/DB/VJI9AX539D9MLOPXN2AY9UR1N4IYGD>

- Tool for the demonstration and assessment of additionality, Version 07.0.0 (EB70 Annex 08)⁴
- Tool to calculate project or leakage CO₂ emissions from fossil fuel combustion, Version 02 EB41⁵ 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 9650⁷ of program with this project activity. The PP has not considered the credit from any other mechanism for the current monitoring plan except from CDM for the period 11-June-2013 to 10-June-2014. 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 Contributions

As this section is not mandatory , PP doesnot want to claim any Sustainable Development Contribution now, separately SDC report will be submitted if required.

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>

⁷ <https://cdm.unfccc.int/Projects/DB/SGS-UKL1369989385.4/view>

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 same⁸.

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. 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

Not required as this is a non-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.

⁸ <https://smartnet.niua.org/sites/default/files/resources/report-on-developmental-impacts-of-RE.pdf>

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
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 features of implemented technology are as mentioned below:

MODEL	S88- 2.1 MW ⁹
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 generator
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 drives
Bearings	Polyamide slide
Tower	
Type	Tubular Tower (4 Sections)

The project has supplied 66,754 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.

⁹ <https://www.suzlon.com/in-en/energy-solutions/classic-fleet-wind-turbines>

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

Deviation 1

Data Adjustment in case of monitoring period different from billing period.

As the billing cycle differs from monitoring period, therefore In case the dates of a particular monitoring period do not match with the dates of the billing period, the net electricity exported to the grid would be calculated as follows:

$$D = (A/B)*C$$

Where:

A = Difference of number of days which are not matching of billing period and monitoring period.

B = Number of days of the billing period/ month which was not matched with the monitoring period.

C = Net Electricity supplied to the grid for that given billing period/ month.

The calculated value after apportioning would be used for calculation of emission reductions during that period. Based on the above procedure, the Monthly Certificate for Share of Electricity Generated shall be provided to the project participant. This is to be noted that the detail procedure of monitoring is illustrated here for the sake of understanding; for the preparation of monitoring report during periodic verifications, only the net electricity generation value mentioned in monthly wind energy certificates shall be directly used for emission reduction calculation. No other parameters as explained above shall be used and presented in the monitoring report.

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}
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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 ¹⁰
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 0.9515 The operating Margin is calculated ex ante and fixed during the crediting period.

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 build 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

¹⁰ https://cea.nic.in/wp-content/uploads/baseline/2020/07/user_guide_ver7.pdf

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	<p>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.</p> <p>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.</p> <p>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.</p> <p>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</p>

	<p>Meter Reading recorded at all the meters is done by DISCOM utility in the presence of PP's representative (Suzlon)</p> <p>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.</p>
Frequency of monitoring/recording	<p>Recording: Monthly</p> <p>Monitoring :Not Applicable since it is a calculated parameter</p>
Value monitored	66,754
Monitoring equipment	The details of energy meters used have been included on Appendix 1.
QA/QC procedures to be applied	<p>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.</p> <p>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.</p>
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 (Andhra Pradesh Central Power Distribution Company Limited) 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	$EG_{\text{export},y}$
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	73,900.76
Monitoring equipment	Not Applicable
QA/QC procedures to be applied	<p>Value of $EG_{\text{export},y}$ 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.</p> <p>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.</p>
Purpose of the data	Calculation of baseline emissions
Calculation method	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

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	567
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	Calculation of baseline emissions
Calculation method	Calculation of baseline emissions
Calculation method	Not Applicable
Comments	-

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	75,158.70
Monitoring equipment	The details of energy meters used have been included on Appendix 1.
QA/QC procedures to be applied	<p>The details of energy meters used have been included on Appendix 1 of Monitoring Report</p> <p>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.</p> <p>All the main meters and check meters are calibrated by state utility once a year and records are available with PP.</p>
Purpose of the data	Calculation of baseline emissions
Comments	
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	Electricity export to the grid is recorded by the 220 kV (main and check) at Suzlon pooling sub- station connecting machines of the

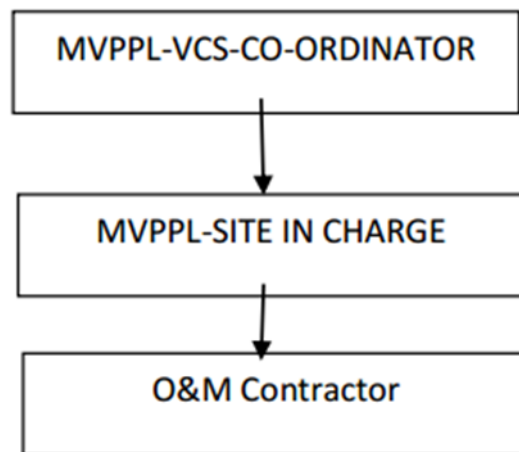
procedures to be applied	project activity and machines of other project developers.
Frequency of monitoring/recording	Continuous measurement and at least monthly recording
Value monitored	171,888
Monitoring equipment	The details of energy meters used have been included on Appendix 1 of Monitoring Report
QA/QC procedures to be applied	The value of EG_e 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 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/year
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	1,240
Monitoring equipment	Not applicable
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	Transmission loss calculation is done by state electricity board and is not in control of Project participant.
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 ($EG_{\text{export},y}$) 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:

$$L_{ep}(\%) = \frac{(X_{\text{Export},1} + X_{\text{Export},2} + \dots + X_{\text{Export},N}) - EG_e}{(X_{\text{Export},1} + X_{\text{Export},2} + \dots + X_{\text{Export},N})} * 100$$

Where,

EG_e = Electricity export to the grid recorded at Suzlon substation.

Value of L_{ep} is calculated by state utility and sourced directly from the transmission loss calculation sheet.

Hence,

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

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

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.

$$EG_{PJ,y} = EG_{\text{export},y} - E_{g_{\text{imp}}}$$

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 VVB 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 a activity is as follows:

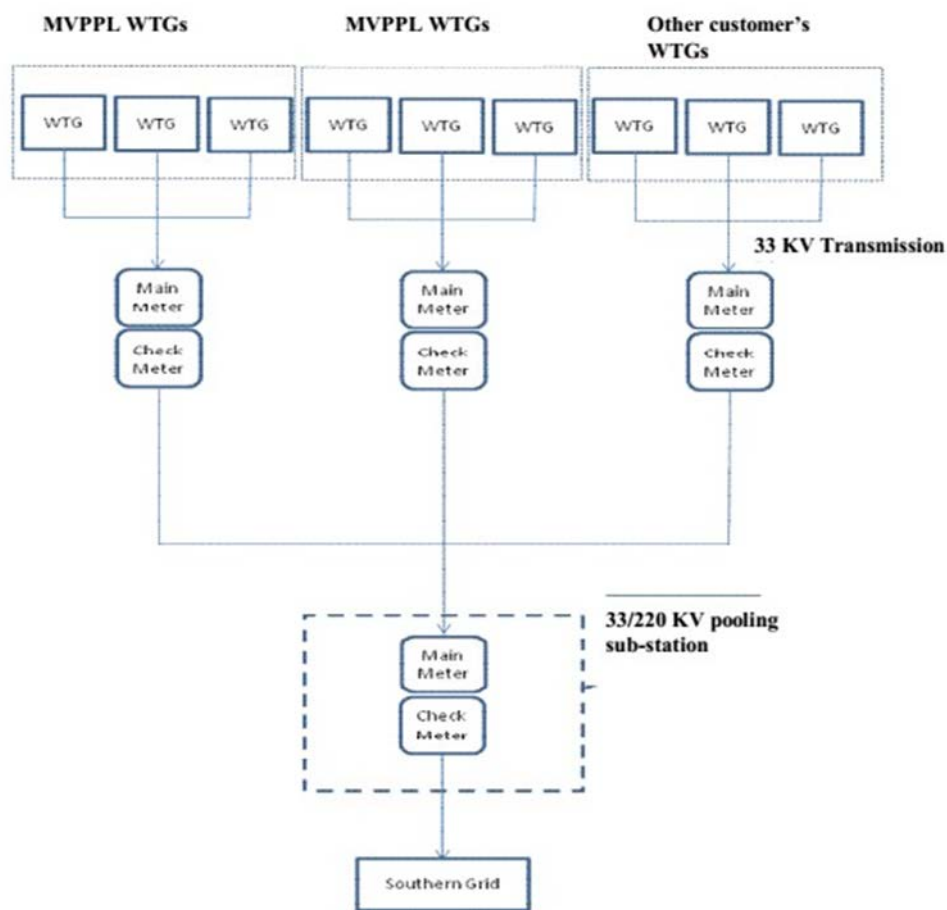


Figure 2. Schematic diagram indicating the metering system

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.

Data Adjustment in case of monitoring period different from billing period.

In case the dates of a particular monitoring period do not match with the dates of the billing period, the net electricity exported to the grid would be calculated as follows:

$$D = (A/B) * C$$

Where:

A = Difference of number of days which are not matching of billing period and monitoring period.

B = Number of days of the billing period/ month which was not matched with the monitoring period.

C = Net Electricity supplied to the grid for that given billing period/ month.

The calculated value after apportioning would be used for calculation of emission reductions during that period. Based on the above procedure, the Monthly Certificate for Share of Electricity Generated shall be provided to the project participant. This is to be noted that the detail procedure of monitoring is illustrated here for the sake of understanding; for the preparation of monitoring report during periodic verifications, only the net electricity generation value mentioned in monthly wind energy certificates shall be directly used for emission reduction calculation. No other parameters as explained above shall be used and presented in the monitoring report.

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.

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

Where:

BE_y : Baseline Emissions in year y; tCO₂

$EG_{PJ,y}$: Net Electricity Supplied to the grid by the project activity. ;MWh

$EF_{grid,CM,y}$: Emission Factor in year y; t CO₂e/MWh

As per registered CDM PDD, combined margin emission factor is 0.8971 tCO₂/MWh. Hence the baseline emissions for the project activity for the current monitoring period are as follows.

$$BE_y = EG_{PJ,y} * EF_{grid,CM,y} = 66,754 * 0.8971 = 59,885 \text{ tCO}_2\text{e (Round down value)}$$

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 ₂ e)	Project emissions or removals (tCO ₂ e)	Leakage emissions (tCO ₂ e)	Net GHG emission reductions or removals (tCO ₂ e)
2021	53,089	0	0	53,089
2022	6,796	0	0	6,796
Total	59,885 (rounded down)	0	0	59,885(rounded down)

The actual VER is 35.62% 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 are conservative.

APPENDIX 1: CALIBRATION CERTIFICATE

WTG ID	Capacity	Main Meter	Check meter	Make	Accuracy Class	Previous Calibration date	Due date	Calibration date	Due date
VAR 38, VAR39, VAR 40, VAR209, VAR18, VAR 208, VAR 23,VAR 024 (Phase 1 WTGs)	16.8	0019 00 2777 11	00190 0 2780	L&T	0.2s	26-November-2020	25-November-2021	12-January-2022	11-January-2023
VAR204, VAR15, VAR16, VAR205, VAR10 ,V K108, VK09, VK110 (Phase 2 WTGs)	16.8	0019 00 9485 12	00190 0 2785	L&T	0.2s	21-November-2020	20-November-2021	22-January-2022	21-January-2023
VAR217, VAR216 ,V AR26 (Phase 3 WTGs)	6.3	0019 00 1690 13	00190 0 1701	L&T	0.2s	21-November-2020	20-November-2021	21-January-2022	20January-2023
VAR 22,VAR29, VAR19(P hase 4 WTGs)	6.3	0019 00 1702	00200 0 3301	L&T	0.2s	21-November-2020	20-November-2021	29-January-2022	28-January-2023
VAR203, VAR300 (Phase 5 WTGs)	4.2	0019 00 1657 15	00190 0 1666	L&T	0.2s	21-November-2020	20-November-2021	22-January-2022	21-January-2023

VAR50, VAR51 (Phase 6 WTGs)	4.2	001900167716	0019001682	L&T	0.2s	26-November-2020	25-November-2021	28-January-2022	27-January-2023
VAR30, VAR28, VAR27 (Phase 7)	6.3	0019006559	0019006560	L&T	0.2s	26-November-2020	25-November-2021	12-January-2022	11-January-2023
VAR 37 (Phase 8 WTGs)	2.1	001900279818	0019002799	L&T	0.2s	26-November-2020	25-November-2021	12-January-2022	11-January-2023

The calibration is delayed by 03 months, hence error factor is applied in November 2021 and January 2022

Metering details at 33/220 KV pooling station

Main Meter	Check Meter	Make	Accuracy Class	Calibration Date	Calibration Due Date	Calibration Date	Calibration Due Date
XC559940	XC559941	Secure	0.2s	18-February-2020	17-February-2021	18-February-2021	17-February-2022

APPENDIX 2: BREAKDOWN DETAILS

Date	Location	Duration	Event Description	Action Taken
7-June-21	VK108	2.6	Pitch 1 Over Voltage	Team not able to attend WTG due to ROW issue
8-June-21	VK108	24.0	Pitch 1 over Current	Pitch 1 over curred error occurred team not able to attend the WTG due to ROW issue
9-June-21	VK108	16.4	Pitch 1 Over Current	pitch break coil two blades replaced new ones. Delay due to ROW issue
18-June 21	VAR10	24.0	SFS Crowbar Current Limit Exceeded Stop	SFS Crowbar Current Limit Exceeded Stop "Error occurred" Generator encoder cable failure Replacement WIP,
19-June-21	VAR10	24.0	Generator DE & NDE Bearing failure	Gen DE bearing replacement and NDE Pearing replacement work in process.
20-June-21	VAR10	21.7	SFS Crowbar Current Limit Exceeded Stop	SFS Crowbar Current Limit Exceeded Stop" Error Occurred" Generator encoder cable failure Replacement WIP, and DE,NDE bearing also replacement WIP, DE bearing Changed, NDE bearing Changing done then restore the WTG
23-June-21	VAR10	3.1	Elec Power HighStop	troubleshooting WIP
24-June-21	VAR10	6.7	Elec Power HighStop	Generator bearing winding failure WIP
24-June-21	VAR10	17.1	Elec Power HighStop	Generator bearing winding failure WIP
25-June-21	VAR203	15.0	Preventive Check	endoscopy work completed and hss shaft work under process
25-June-21	VAR10	24.0	Elec_PwrFluctuations	generator megger winding value check and sharing engineering team
25-June-21	VAR203	15.0	Preventive Check	endoscopy work completed and hss shaft work under process
26-June-21	VAR203	24.0	Preventive Check	HSS Bearing Replacement WIP
26-June-21	VAR10	21.5	Elec_PwrFluctuations	Gen. Inspection WIP
26-June-21	VAR10	1.7	Elec_PwrFluctuations	Gen. Inspection WIP
26-June-21	VAR203	24.0	Preventive Check	HSS Bearing Replacement WIP
27-June-21	VAR203	24.0	Preventive Check	hss shaft replace work in proces

27-June-21	VAR10	22.3	Elec_PwrFluctuations	Generator winding value good condition and dry pard replace,encoder cable now work in process
27-June-21	VAR203	24.0	Preventive Check	hss shaft replace work in process
28-June-21	VAR203	24.0	Preventive Check	hss bearing replacement work in process
28-June-21	VAR10	17.3	Elec_PwrFluctuations	Generator encoder cable replacement done then wtg restored
28-June-21	VAR203	24.0	Preventive Check	hss bearing replacement work in process
29-June-21	VAR27	4.4	Preventive Check	Wtg manual stop for changing DE and NDE bearing replacement work
29-June-21	VAR203	24.0	HSS Shaft Failure	hss shaft replace work in procces
29-June-21	VAR203	24.0	HSS Shaft Failure	hss shaft replace work in procces
30-June-21	VAR27	10.7	Generator Bearing problem	generator bearing replacement WIP
30-June-21	VAR27	6.3	Generator Bearing problem	generator bearing replacement WIP
30-June-21	VAR27	6.6	Generator Bearing problem	generator bearing replacement WIP
30-June-21	VAR203	24.0	HSS Shaft Failure	gear box HSS shaft replacement WIP
30-June-21	VAR203	24.0	HSS Shaft Failure	gear box HSS shaft replacement WIP
1-July-21	VAR27	24.0	Generator Bearing problem	generator DE bearing was replaced
1-July-21	VAR203	23.8	HSS Shaft Failure	HSS shaft bearing replaced , WTG under observation
2-July-21	VAR27	24.0	Generator Bearing problem	generator DE bearing was replaced
2-July-21	VAR203	15.3	HSS Shaft Failure	HSS shaft bearing replaced & restored the WTG
3-July-21	VAR27	15.6	Generator Bearing problem	generator DE & NDE bearing changed ,after bearing changing found smooth functioning in bearing
13-July-21	VAR50	24.0	Generator Bearing problem	Generator Bearing Problem
14-July-21	VAR50	24.0	Generator Bearing problem	DE Bearing Replacement WIP
15-July-21	VAR50	23.8	Generator Bearing problem	DE Bearing Replaced then Restore the WTG
15-July-21	VAR51	19.9	Pitch Brake Not Released	work in process, ssr relay not available in site
16-July-21	VAR51	18.5	Pitch Brake Not Released	SSR Relay Replaced Delay Due to Material Arrangement for Gandikota

5-August-21	VAR27	21.9	Elec_PwrFluctuations	hss shaft replacement activity, work under process
6-August-21	VAR27	24.0	Elec_PwrFluctuations	hss shaft replacement activity,work under process
7-August-21	VAR27	15.8	HSS Shaft Failure	hss shaft replacement work under process
7-August-21	VAR27	7.2	HSS Shaft Failure	hss shaft replacement work under process
8-August-21	VAR27	17.0	HSS Shaft Failure	hss shaft replacement work and alignment work complete restore wtg
8-September-21	VK110	6.7	Elec YawSensor ErrStop	WIP
9-September-21	VK110	24.0	Elec YawSensor ErrStop	Work in progress
10-September-21	VK110	1.8	Elec YawSensor ErrStop	Checked all connection found 690v not coming at yaw contactor so replaced with new cable
29-September-21	VAR28	11.9	HSS Shaft Failure	Manual stop for HSS Shaft replacement purpose
30-September-21	VAR28	24.0	HSS Shaft Failure	Manual stop for HSS Shaft replacement purpose
5-October-21	VAR217	9.9	Pitch 1 Over Current	Found first blade lust drive changed work purpose
6-October-21	VAR217	24.0	Pitch 1 Over Current	frequency converter 1&3 was changed, pitch brake coil was changed. Found pitch motor failure troubleshooting work in progress.
7-October-21	VAR217	15.4	Pitch 1 Over Current	Replaced new pitch motor for Blade1
13-October-21	VAR216	16.6	Preventive Check(Damper plate crack)	Coupling new damper plate fixing was done capacitor panel cleaning was done
13-October-21	VAR216	7.2	Preventive Check(Damper plate crack)	Coupling new damper plate fixing was done capacitor panel cleaning was done
14-October-21	VAR216	1.7	Preventive Check(Damper plate crack)	Coupling new damper plate fixing was done capacitor panel cleaning was done
20-October-21	VAR18	5.4	SFS Crowbar FB Fired Stop	After grid failure error occurs and WIP
21-October-21	VAR18	20.7	SFS Crowbar FB Fired Stop	As per check list all points verified and confirmation taken from Site OE then WTG restored.
23-October-21	VK110	8.2	Elec YawSensor ErrStop	4 core power cable was damaged need to replace. Waiting for material.
24-October-21	VK110	10.6	Elec YawSensor ErrStop	Found phase cable was failure ,interchanged with ground cable, WTG running under deviation, material was

				arranged from another site for deviation correction purpose.
24-October-21	VK110	9.0	Elec YawSensor ErrStop	Found phase cable was failure ,interchanged with ground cable, WTG running under deviation, material was arranged from another site for deviation correction purpose.
26-October-21	VAR208	9.8	Elec FB YawCW Error	Pending YPM NC closing progress and yaw drive 1 is failure, work in progress.
27-October-21	VAR208	24.0	Elec FB YawCW Error	Manual stop for New yaw drive replacement work under progress.