

WIND BASED POWER GENERATION BY PANAMA WIND ENERGY GODAWARI PRIVATE LIMITED, PUNE IN THE STATE OF MAHARASHTRA, INDIA



Document Prepared By EKI Energy Services Limited

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1 PROJECT DETAILS

1.1 Summary Description of the Implementation Status of the Project

The purpose of the project activity is to generate power using renewable energy source (wind) and sell the power generated to the state grid. The project activity generates electricity using wind potential and converts it into kinetic energy using Wind turbines, which drives the alternators to generate energy. The generated electricity is being exported to the regional grid system which is under the purview of the NEWNE grid of India.

The project activity involves the installation of Wind Power Projects. The total installed capacity of the project is 80 MW; which involves operation of 40 Wind Turbine Generators (WTGs) with capacity of 2 MW each located at Maharashtra state in India. The project is promoted by **Panama Wind Energy Godawari Private Limited**.

The power produced displaces an equivalent amount of power from the grid, which is fed mainly by fossil fuel fired power plants. Hence, it results in reduction of GHG emissions. GHG emission reductions from the project activity is around 136,936 tonnes of CO₂ and total GHG emission reductions for the chosen 10 year crediting period will be 1,369,360 tonnes of CO₂.

The Project activity is a new facility (Greenfield) and the purpose of the project activity is to generate energy electricity by the utilization of wind velocity power and further selling the generated energy to the NEWNE Grid. In this process there is no consumption of any fossil fuel and hence the project does not lead to any greenhouse gas emissions. Thus, electricity is generated through sustainable means without causing any negative impact on the environment.

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

During the current monitoring period i.e. 02-February-2017 to 01-February-2018, 112,553 tCO₂ has been avoided.

1.2 Sectoral Scope and Project Type

The project activity falls under the following Sectoral scope and Project Type:

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

Project Type: I - Renewable Energy Projects

Methodology: ACM0002: Grid-connected electricity generation from renewable sources - Version 16.0¹

The project is not a grouped project activity.

1.3 Project Proponent

¹ <http://cdm.unfccc.int/methodologies/DB/EY2CL7RTEHRC9V6YQHLLAR6MJ6VEU83>

Organization name	Panama Wind Energy Godawari Private Limited
Contact person	Mr. Dinesh Jagdale
Title	Director & Chief Operating Officer
Address	Viman Nagar 1st Floor, Lunkad Towers,Pune Maharashtra 411 014
Telephone	+91 20 26125060
Email	djagdale@panama-group.com

1.4 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Contact person	Mr. Prakash Kr. Sahu
Title	Project Consultant
Address	Office no. 201, Plot 48, Scheme 78 part 2, Vijay Nagar, Near Brilliant Convention Centre, Indore - 452010 (M.P, India) Website www.enkingint.org
Telephone	+91 95 89 899649
Email	prakash@enkingint.org

1.5 Project Start Date

Project Start Date: 31-March-2014.

The project start date is the date on which first WTG was commissioned under the Project activity.

S. No.	Machine ID	DOC ²	Village	Taluka	District	State
1	G 1	7-Oct-14	Mulukwadi	Georai	Beed	Maharashtra
2	G 2	7-Oct-14	Mulukwadi	Georai	Beed	Maharashtra
3	G 3	7-Oct-14	Mulukwadi	Georai	Beed	Maharashtra
4	G 4	7-Oct-14	Mulukwadi	Georai	Beed	Maharashtra
5	G 5	6-Sep-14	Khoiti	Georai	Beed	Maharashtra
6	G 6	7-Oct-14	Mulukwadi	Georai	Beed	Maharashtra
7	G 7	7-Oct-14	Mulukwadi	Georai	Beed	Maharashtra
8	G 8	7-Oct-14	Mulukwadi	Georai	Beed	Maharashtra
9	G 9	7-Oct-14	Mulukwadi	Georai	Beed	Maharashtra
10	G 10	7-Oct-14	Mulukwadi	Georai	Beed	Maharashtra
11	G 11	7-Oct-14	Mulukwadi	Georai	Beed	Maharashtra
12	G 12	7-Oct-14	Manmodi	Georai	Beed	Maharashtra

² Date Of commissioning

13	G 13	7-Oct-14	Manmodi	Georai	Beed	Maharashtra
14	G 14	6-Sep-14	Manmodi	Georai	Beed	Maharashtra
15	G 15	6-Sep-14	Manmodi	Georai	Beed	Maharashtra
16	G 16	7-Oct-14	Manmodi	Georai	Beed	Maharashtra
17	G 17	6-Sep-14	Manmodi	Georai	Beed	Maharashtra
18	G 18	7-Oct-14	Manmodi	Georai	Beed	Maharashtra
19	G 19	7-Oct-14	Khopti	Georai	Beed	Maharashtra
20	G 20	7-Oct-14	Manyarwadi	Georai	Beed	Maharashtra
21	G 21	5-Dec-14	Khopti	Georai	Beed	Maharashtra
22	G 22	6-Sep-14	Rajpimpri	Georai	Beed	Maharashtra
23	G 23	6-Sep-14	Rajpimpri	Georai	Beed	Maharashtra
24	G 24	31-Mar-14	Rajpimpri	Georai	Beed	Maharashtra
25	G 25	31-Mar-14	Rajpimpri	Georai	Beed	Maharashtra
26	G 26	25-Jul-14	Bangali Pimpla	Georai	Beed	Maharashtra
27	G 27	25-Jul-14	Sindkhed	Georai	Beed	Maharashtra
28	G28	25-Jul-14	Kombadwadi	Georai	Beed	Maharashtra
29	G 29	31-Mar-14	Kombadwadi	Georai	Beed	Maharashtra
30	G 30	31-Mar-14	Devimpri	Georai	Beed	Maharashtra
31	G 31	31-Mar-14	Kombadwadi	Georai	Beed	Maharashtra
32	G 32	25-Jul-14	Sushi	Georai	Beed	Maharashtra
33	G 33	31-Mar-14	Sushi	Georai	Beed	Maharashtra
34	G 34	31-Mar-14	Sushi	Georai	Beed	Maharashtra
35	G 35	31-Mar-14	Sushi	Georai	Beed	Maharashtra
36	G 36	31-Mar-14	Sushi	Georai	Beed	Maharashtra
37	G 37	31-Mar-14	Kumbhejgaon	Georai	Beed	Maharashtra
38	G 38	25-Jul-14	Sushi	Georai	Beed	Maharashtra
39	G 39	31-Mar-14	Kumbhejgaon	Georai	Beed	Maharashtra
40	G 40	31-Mar-14	Bangalipimpla	Georai	Beed	Maharashtra

1.6 Project Crediting Period

Crediting Period Start date: 31-March-2014

Crediting Period End date: 30-March-2024

The project activity adopts renewable crediting period of 10 years period which can be renewed for maximum 2 times.

1.7 Project Location

Sr. No.	Location No.	Village	Taluka	District	Latitude (D° M' Sec")	Longitude (D° M' Sec")
1	G01	Mulukwadi	Georai	Beed	N19 11 35.6	E75 43 38.4
2	G02	Mulukwadi	Georai	Beed	N19 11 12.3	E75 42 57.5
3	G03	Mulukwadi	Georai	Beed	N19 11 50.0	E75 43 19.7
4	G04	Mulukwadi	Georai	Beed	N19 11 30.1	E75 43 13.9
5	G05	Khopti	Georai	Beed	N19 13 35.5	E75 41 23.4
6	G06	Mulukwadi	Georai	Beed	N19 11 59.1	E75 43 35.4
7	G07	Mulukwadi	Georai	Beed	N19 11 20.6	E75 43 40.8

Sr. No.	Location No.	Village	Taluka	District	Latitude (D° M' Sec")	Longitude (D° M' Sec")
8	G08	Mulukwadi	Georai	Beed	N19 11 59.5	E75 43 07.2
8	G09	Mulukwadi	Georai	Beed	N19 12 04.9	E75 42 37.4
9	G10	Mulukwadi	Georai	Beed	N19 12 24.6	E75 43 13.1
10	G11	Mulukwadi	Georai	Beed	N19 11 35.6	E75 43 38.4
11	G12	Manmodi	Georai	Beed	N19 12 38.0	E75 43 18.6
12	G13	Manmodi	Georai	Beed	N19 12 23.5	E75 42 36.7
13	G01	Manmodi	Georai	Beed	N19 12 36.0	E75 42 18.5
14	G14	Manmodi	Georai	Beed	N19 12 50.5	E75 42 24.3
15	G15	Manmodi	Georai	Beed	N19 12 59.8	E75 42 10.8
16	G16	Manmodi	Georai	Beed	N19 13 17.1	E75 42 10.1
17	G17	Manmodi	Georai	Beed	N19 13 22.3	E75 41 58.6
18	G18	Khopti	Georai	Beed	N19 13 29.6	E75 42 29.3
19	G19	Manyarwadi	Georai	Beed	N19 13 41.9	E75 42 19.2
20	G20	Khopti	Georai	Beed	N19 13 45.5	E75 42 59.5
21	G21	Rajpimpri	Georai	Beed	N19 14 06.3	E75 41 40.6
22	G22	Rajpimpri	Georai	Beed	N19 13 54.1	E75 41 27.6
23	G23	Rajpimpri	Georai	Beed	N19 13 46.6	E75 41 03.1
24	G24	Rajpimpri	Georai	Beed	N19 13 34.5	E75 40 24.8
25	G25	Bangali Pimpla	Georai	Beed	N19 13 23.9	E75 40 11.5
26	G26	Sindkhed	Georai	Beed	N19 12 40.0	E75 37 28.9
27	G27	Kombadwadi	Georai	Beed	N19 13 09.5	E75 40 21.9
28	G28	Kombadwadi	Georai	Beed	N19 13 25.4	E75 39 28.6
29	G29	Devimpri	Georai	Beed	N19 13 43.7	E75 39 29.9
30	G30	Kombadwadi	Georai	Beed	N19 13 51.7	E75 39 06.1
31	G31	Sushi	Georai	Beed	N19 13 57.4	E75 39 33.0
32	G32	Sushi	Georai	Beed	N19 12 16.2	E75 37 44.2
33	G33	Sushi	Georai	Beed	N19 12 59.5	E75 38 47.3
34	G34	Sushi	Georai	Beed	N19 13 14.9	E75 38 57.3
35	G35	Sushi	Georai	Beed	N19 13 12.2	E75 38 26.2
36	G36	Kumbhejalgaon	Georai	Beed	N19 13 27.1	E75 38 20.9
37	G37	Sushi	Georai	Beed	N19 13 34.4	E75 38 00.3
38	G38	Kumbhejalgaon	Georai	Beed	N19 12 49.7	E75 38 08.6
39	G39	Bangalipimpla	Georai	Beed	N19 13 04.7	E75 37 53.8
40	G40	Mulukwadi	Georai	Beed	N19 12 58.0	E75 37 31.5



1.8 Title and Reference of Methodology

Methodology: ACM0002: Grid-connected electricity generation from renewable sources ---
Version 16.0, Sectoral Scope: 01, EB 81, Annex 9

<https://cdm.unfccc.int/methodologies/DB/EY2CL7RTEHRC9V6YQHLAR6MJ6VEU83>

The project activity also takes reference from following Tools from the tools prescribed by applied methodology:

1. **Tool for the demonstration and assessment of additionality** --- Version 07.0.0, EB 70,
Annex 8 <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v7.0.0.pdf>
2. **Tool to calculate the emission factor for an electricity system** --- Version 05.0, EB 87,
Annex 09 <https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v5.0.pdf>

1.9 Other Programs

The Project has applied for the CDM under the Kyoto protocol which is under validation stage, however currently the PP is not willing to go ahead with CDM and existing contract of CDM validation is terminated.³

³UNFCCC web link: <http://cdm.unfccc.int/Projects/Validation/DB/3EXK45ZD9TYCX75U55098OUPIT809D/view.html>

1.10 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 would help in generating employment opportunities during the construction and operation phases. The project activity will lead to development in infrastructure in the region like development of roads and also may promote business with improved power generation.

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 will generate power using zero emissions wind based power generation which helps to reduce GHG emissions and specific pollutants like SO_x, NO_x, and SPM associated with the conventional thermal power generation facilities.

Technological well-being: The successful operation of project activity would lead to promotion of wind based power generation and would encourage other entrepreneurs to participate in similar projects.

Environmental well-being: Wind 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 IMPLEMENTATION STATUS

2.1 Implementation Status of the Project Activity

The project activity involves the installation of Wind Power Projects. The total installed capacity of the project is 80 MW; which involves operation of 40 Wind Turbine Generators (WTGs) with capacity of 2 MW each located at Maharashtra state in India. The project is promoted by **Panama Wind Energy Godawari Private Limited**.

The Project activity is a new facility (Greenfield) and the electricity generated by the Project will be exported to the NEWNE electricity grid. The Project will therefore displace an equivalent amount of electricity which would have otherwise been generated by fossil fuel dominant electricity grid. The Project Proponent plans to avail the VCS benefits for the Project.

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

The project results in replacing anthropogenic emissions of greenhouse gases (GHG's) estimated to be approximately 136,936 tCO₂e per year, thereon displacing 140,160 MWh/year amount of electricity from the grid.

Wind Power Project Technology Details –

The technology employed, converts wind energy to electrical energy. In wind power generation, energy of wind is converted into mechanical energy and subsequently into electrical energy. The technology is an environment friendly technology since there are no GHG emissions associated with the electricity generation. There is no transfer of technology involved in the project activity.

The project activity comprises a total of 40 WTG's of Gamesa India Limited. The commissioning of the project activity has been completed and details are mentioned in section 1.5.

Technical details for Gamesa G97-2.0 MW⁴, 2000 KW Machine

Particulars	Details
Model	Gamesa G97-2.0 MW
Rated Power	2000kW
Diameter	97 m
Swept Area	7,390 m ²
Rotational Speed	9.6 - 17.8 rpm
Design Lifetime	25 years

Power generated by the wind turbines is collected at 33 kV and fed to pooling substation near Rajpimpri village (5 kms away), where it is stepped up to 132kV. The pooling station itself is then connected to 132 kV grid at MSETCL existing Substation Georai.

Emission Reductions from anthropogenic sources:

The wind power generated from the Project will be displacing the electricity generated from thermal power stations feeding into NEWNE grid and is replacing the usage of diesel generators for meeting the power demand during shortage periods. Since, the wind power is Green House Gas (GHG) emissions free, the power generated will prevent the anthropogenic GHG emissions generated by the fossil fuel based thermal power stations comprising coal, diesel, furnace oil and gas. The estimation of GHG reductions by this project is limited to carbon dioxide (CO₂) only.

2.2 Deviations

2.2.1 Methodology Deviations

No methodology deviation is applied during the monitoring period

2.2.2 Project Description Deviations

No project description deviation is applied during the monitoring period.

⁴ <http://www.gamesacorp.com/en/products-and-services/wind-turbines/gamesa-g97-20-mw-iiia-en.html>

2.3 Grouped Project

Not applicable as the project is not a group project.

2.4 Safeguards

2.4.1 No Net Harm

The project activity does not involve any major construction activity. It primarily requires the installation of the wind turbines, interfacing the generators with the State Electricity Board by setting up HT transmission lines and installation of other accessories.

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 project activity operations do not result in direct air pollution, noise pollution. Please refer below web link for the same

<http://mnre.gov.in/file-manager/UserFiles/report-on-developmental-impacts-of-RE.pdf> .

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.

2.4.2 Local Stakeholder Consultation

As per VCS Guidelines, this section is not mandatory as the project is already registered.

As a part of continuous feedback from stakeholders, there were no other major comments or protest raised by the stakeholders and they were totally in support for setting up of these kinds of projects in the region. The PP also placed a grievance register onsite in where the stakeholder can put down his/her complain and the same if found genuine will be addressed immediately.

3 DATA AND PARAMETERS

3.1 Data and Parameters Available at Validation

Data / Parameter	EF _{grid,OM,y}
Data unit	tCO ₂ /MWh
Description	Operating Margin CO ₂ emission factor in year y
Source of data	Calculated from CEA database, Version 10, December 2014 ⁵
Value applied	0.9862 (NEWNE Grid)
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per “Tool to calculate the emission factor for an electricity system, version 05.0.0” as 3-year generation weighted average using data for the years 2011-2012, 2012-2013 & 2013 2014. The data are obtained from “CO ₂ Baseline Database for Indian Power Sector” version 10.0, published by the Central

⁵ http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver10.pdf

	Electricity Authority, Ministry of Power, Government of India.
Purpose of the data	For the calculation of the Baseline Emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	$EF_{grid,BM,y}$
Data unit	tCO ₂ /MWh
Description	Build Margin CO ₂ emission factor in year y
Source of data	Calculated from CEA database, Version 10, December 2014
Value applied	0.9495 (NEWNE Grid)
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per "Tool to calculate the emission factor for an electricity system, version 05.0.0" for the year 2013-2014. The data is obtained from "CO ₂ Baseline Database for Indian Power Sector" version 10.0, published by the Central Electricity Authority, Ministry of Power, Government of India.
Purpose of the data	For the calculation of the Baseline Emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

Data / Parameter	$EF_{grid,CM,y}$
Data unit	tCO ₂ /MWh
Description	Combines Margin CO ₂ emission factor in year y
Source of data	Calculated from CEA database, Version 10, December 2014 ⁶
Value applied	0.9770 (NEWNE Grid)
Justification of choice of data or description of measurement methods and procedures applied	The combined margin emissions factor is calculated as follows: $EF_{grid,CM,y} = EF_{grid,OM,y} * W_{OM} + EF_{grid,BM,y} * W_{BM}$ Where: $EF_{grid,BM,y}$ = Build margin CO₂ emission factor in year y (tCO₂/MWh) $EF_{grid,OM,y}$ = Operating margin CO₂ emission factor in year y (tCO₂/MWh) W_{OM} = Weighting of operating margin emissions factor (%) = 75% W_{BM} = Weighting of build margin emissions factor (%) = 25%
Purpose of the data	For the calculation of the Baseline Emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

3.2 Data and Parameters Monitored

Data / Parameter	$EG_{PJ,y}$
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⁶ http://www.cea.nic.in/reports/planning/cdm_co2/user_guide_ver10.pdf

Data unit	MWh
Description	Quantity of net electricity generation supplied by the project (Wind) plant/unit to the grid in year y
Source of data	Joint meter readings by MSECDCL
Description of measurement methods and procedures to be applied	The value of net electricity generation supplied to the grid as per Joint Meter Reading Report forms the basis for calculation of the emission reductions; which is cross checked from the invoice raised to DISCOM and found equivalent. Net electricity supplied to grid is calculated as the difference of the measured values of “export” and “import” of electricity through the dedicated SEB energy meter installed at the delivery point (i.e. the connected substation). Net electricity generated and supplied by the project (Wind) plant/unit to the grid = Electricity Export to the grid – Electricity Import from the grid Monthly meter readings are taken from the main and check meter installed at the substation and certified by the representatives of SEB Officials and the representatives of the project proponent. for apportioning procedure refer section 4.3 of the PD.
Frequency of monitoring/recording	Continuous monitoring, hourly measurement and at least monthly recording
Value monitored	115,203
Monitoring equipment	Monitoring: Tri vector meter will be used Data type: Measured Type of meter: Static type meter (Main & Check). Both are Bidirectional meters. Class of meter: 0.2s
QA/QC procedures to be applied	• The energy meter reading are taken on monthly basis • Energy meters will be calibrated once in a five year⁷ and faulty meters will be duly replaced immediately. • All the energy meters are under the control of state utility and calibration of energy meters is also under the jurisdiction of state utility. • The Net electricity exported to the grid is cross checked against the invoice raised by the PP towards the DISCOM and found equivalent.
Purpose of the data	Calculation of Baseline emissions
Calculation method	-
Comments	The data would be archived electronically and maintained for the entire crediting period plus two years.

⁷ http://www.aegcl.co.in/Metering_Regulations_Of_CEA_17_03_2006.pdf, page 12

3.3 Monitoring Plan

Aim of monitoring:

The monitoring methodology specified in the methodology requires that the project-monitoring plan to consist of monitoring of quantity of net electricity supplied to the grid in the year y . In order to monitor the mitigation of GHG due to the project activity, the total energy exported needs to be measured. The net energy supplied to grid by the project activity multiplied by emission factor for regional grid, would form the baseline for the project activity.

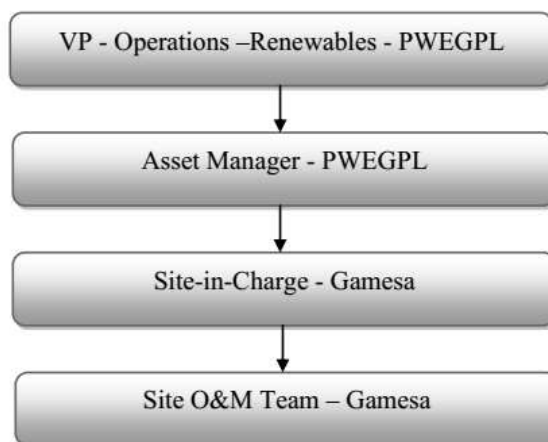
Since the baseline emission factor is based on an ex-ante determination, monitoring of this parameter is not required. The sole parameter for monitoring is the net electricity exported to the grid.

Monitoring roles and responsibilities

The operational and management structure implemented for data monitoring is as follows:

The monitoring plan is developed in accordance with the modalities and procedures for CDM project activities and is proposed for grid-connected wind power project being implemented in Maharashtra, India. The monitoring plan, which will be implemented by the project proponent describes about the monitoring organisation, parameters to be monitored, monitoring practices, quality assurance, quality control procedures, data storage and archiving.

The authority and responsibility for registration, monitoring, measurement, reporting and reviewing of the data rests with the project proponent. PP proposed the following structure for data monitoring, collection, data archiving and calibration of equipments for this project activity. The team comprises of the following members:



PP has assigned the responsibility of operation and maintenance of WTGs to Gamesa wind turbines private limited.

Responsibilities of Head: Overall functioning and maintenance of the project activity.

Responsibilities of Plant In-charge: Responsibility for Maintains the data records, ensures completeness of data, and reliability of data (calibration of equipments).

Responsibilities of Shift In-charge: Responsibility for day to day data collection and maintains day to day log book for monitored data.

QA/QC procedures:

The energy meters at the feeders are maintained and owned by MSEB. Neither the project proponent nor the site personnel have any control over it. The records will be cross-checked with the records of sold electricity to MSEDCL. The meters are calibrated by MSEB at-least once in five years.

Data Archiving:

Monthly data is being archived electronically and in paper form and stored for the entire crediting period and two years thereafter.

Training and maintenance requirements:

Training on the machine is an essential pre-requisite, to ensure necessary safety of man and machine. Further, in order to maximize the output from the WTGs, it is extremely essential, that the engineers and technicians understand the machines and keep them in good health. In order to ensure, that O&M team is deft at handling technical snags on top of the turbine, the necessity of ensuring that they are capable of climbing the tower with absolute ease and comfort has been established. Each and every site personnel is provided with proper training to meet the requirements of the Operations and maintenance. This ultimately leads to creativity in problem solving.

A monthly joint meter reading of the energy meters is taken by MSEDCL officials and O&M contractors (representatives of the project investor). Apportioning of net electricity generation from each WTG connected to NEWNE grid is then determined as follows:

1	Apportioning Ratio	=	$\frac{\text{Generation at WTG Controller}}{\text{Total Generation of All WTG Controller for the feeder}}$
2	Electricity Import from WTG by the grid (EG_{import})	=	Import from Main/Check Meter * Apportioning Ratio
3	Electricity Export to the WTGs by the grid (EG_{export})	=	Export from Main/Check Meter * Apportioning Ratio
4	Net electricity generated by WTG	=	Electricity Import from WTG by the grid – Electricity Export to the WTGs by the grid

Above steps for calculation of EG_{import} and EG_{export} are carried out by MSEDCL Officials & energy break-up sheet is issued by the MSEDCL Officials. Based on the break-up sheets Project investor raises invoice to DISCOM which forms the cross-check for the net electricity generated. The Project investor has no role in the entire procedure of apportioning

Emergency Preparedness and Uncertainty Procedure:

In case Main meter or check meter is found to be outside the acceptable limits of accuracy or faulty or not functioning properly, it would be repaired, recalibrated or replaced as soon as possible. In the event that the Main meter is not in service as a result of maintenance, repairs or calibration, the check meter will be used. In case both the main and check meter are found to be outside the acceptable limits of accuracy or faulty or not functioning properly, both the meters

shall be calibrated immediately and the error percentage found in the main meter during its calibration shall be applied to its metered energy data for the entire period since its last calibration to obtain the corrected value of net electricity exported to the grid. However no such case has been observed.

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

- Apportioning the net electricity exported to grid, as recorded in the consolidated Share Certificate / JMR Report / Credit Notes certified by the respective state discom, based on the number of days in the monitoring period and the number of days for which Share Certificate / JMR Report / Credit Notes was prepared.

The calculated value after apportioning would be used for calculation of emission reductions during that period.

4 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

4.1 Baseline Emissions

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

Where:

BE_y : Baseline emissions in year y (tCO₂e/yr)

$EG_{PJ, y}$: Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the VCS project activity in year y (MWh/yr)

$EF_{grid, CM, y}$: Combined margin CO₂ emission factor for grid connected power generation in year y calculated using the latest version of the "Tool to calculate the emission factor for an electricity system" (tCO₂e/MWh)

Parameter	Unit	Value
$EG_{PJ, y}$	MWh	115,203
$EF_{grid, CM, y}$	tCO ₂ e/MWh	0.9770
		= 115,203 * 0.9770
		= 112,553 tCO ₂ e

4.2 Project Emissions

$PE_{FF, y} = 0$, As per para 37 of ACM0002 version 16, "For all renewable energy power generation project activities, emissions due to the use of fossil fuels for the backup generator can be neglected"

$$PR_{FF, y} = 0$$

4.3 Leakage

As per para 60 of ACM0002 version 16, No leakage emissions need to be considered for the project activity.

4.4 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)
02-Feb-17 to 31-Dec-17	112,384	0	0	109,799
01-Jan-18 to 01-Feb-18	2,819	0	0	2,754
Total	112,553	0	0	112,553

APPENDIX 1: FEEDER AND CALIBRATION DETAILS

Feeder and Calibration Details

WTG ID	Feeder Connectivity	No. of WTGs	Date of Calibration of Main Meter	Main Meter Sr. No.	Date of Calibration of Check Meter	Check Meter Sr. No.	Validity of Calibration of Main Meter	Validity of Calibration of Check Meter
Location No. - 38,26,32	Feeder No. 1	3	16-Jul-16	5288748	27-07-16	5288752	15-Jul-21	26-Jul-21
Location No. - 24,25,29,30,31	Feeder No. 1	5	16-Jul-16		27-07-16		15-Jul-21	26-Jul-21
Location No. - 21	Feeder No. 2	1	16-Jul-16	5288749	27-07-16	5288753	15-Jul-21	26-Jul-21
Location No. - 5,22,23	Feeder No. 2	3	16-Jul-16	5288749	27-07-16	5288753	15-Jul-21	26-Jul-21
Location No. - 33,34,35,36,37,39,40	Feeder No. 2	7	16-Jul-16	5288749	27-07-16	5288753	15-Jul-21	26-Jul-21
Location No. - 27,28	Feeder No. 2	2	16-Jul-16	5288749	27-07-16	5288753	15-Jul-21	26-Jul-21
Location No. - 1,2,3,4,6,7,8,10,11	Feeder No. 3	9	16-Jul-16	5288751	27-07-16	5288750	15-Jul-21	26-Jul-21
Location No. - 9,12,13,16,18,19,20	Feeder No. 4	7	16-Jul-16	5288755	27-07-16	5288754	15-Jul-21	26-Jul-21
Location No. - 17,14,15	Feeder No. 4	3	16-Jul-16	5288755	27-07-16	5288754	15-Jul-21	26-Jul-21

APPENDIX 2: MAJOR BREAKDOWN DETAILS

Date	Turbine No	INT. GRID FAILURE-Total	EXT. GRID FAILURE-Total	UNSCHEDULED DOWN TIME	DOWN TIME	STOPPAGE DETAILS
16-Feb-17	G 32	0:00	0:00	6:58	0:00	error 5234 error in phase t of the rectifier from 0:48 to 7:46
25-Feb-17	G 27	0:00	0:00	8:29	0:00	error 205 low level on hydraulic group refrigeration oil from 8:24 to 10:07 & error 10007 manual stop for oil seal replacement work from 11:15 to 18:01
6-Mar-17	G 07	0:00	0:00	6:07	0:00	error 205 low level hydraulic group refrigeration oil from 9:36 to 12:26 , 19:51 to 23:08
6-Mar-17	G 10	0:00	0:00	17:25	0:00	error 10007 manual stop for yaw drive replacement work from 00:00 to 17:25
7-Mar-17	G 07	0:00	0:00	15:20	0:00	error 10007 manual stop for hoist pipe & oil seal replacement work from 2:44 to 18:04
13-Mar-17	G 06	0:00	0:00	6:35	0:00	error 101 maximum winding error from 8:37 to 10:40 & error 10007 manual stop for general inspection work from 10:41 to 15:13
6-Apr-17	G 14	0:00	0:00	5:50	0:00	error 10007 manual stop for oil seal replacement work from 10:28 to 16:18
13-Apr-17	G 08	0:00	0:00	6:50	0:00	error 1825 circuit breakers not ok from 6:25 to 7:27 , 7:46 to 13:34
14-Apr-17	G 27	0:00	0:00	6:15	0:00	10007 manual stop for oil seal replacement work from 9:31 to 15:46
15-Apr-17	G 27	0:00	0:00	9:22	0:00	10007 manual stop for oil seal replacement work from 10:27 to 19:49
20-Apr-17	G 12	0:00	0:00	6:11	0:00	error 10007 manual stop for oil seal replacement work from 9:04 to 15:15
6-May-17	G 11	0:00	0:28	11:19	0:00	error 9905 LC taken by customer from 16:15 to 16:43 & error 2118 bus error /interbus failure from 12:26 to 23:45
7-May-17	G 11	0:00	0:00	9:08	0:00	error 2118 Bus error / inter bus failure from 11:12 to 12:18,12:32 to 20:34
7-May-17	G 25	0:00	0:25	5:09	0:00	error 5216 Grid voltage failure from 16:58 to 17:23 & error 5201 magnetothermal trigger of the stator protection from 18:05 to 18:34,18:50 to 20:50 & error 2118 Bus error / inter bus failure from 20:53 to 23:33
7-May-17	G 38	0:00	0:00	5:39	0:00	error 205 low level hydraulic group of refrigeration oil from 5:44 to 7:53 & error 5201 magnetothermal trigger of the stator protection from 17:55 to 21:25
10-May-17	G 20	0:00	0:00	6:11	0:00	error 700 PLC / converter communication failure from 17:05 to 23:16
11-May-17	G 24	0:00	0:00	5:08	0:00	error 10007 manual stop for general inspection work for trouble shooting work from 11:56 to 13:03 & error 538 converter intel high ambient temperature alarm from 16:39 to 20:40
17-May-17	G 05	0:00	0:00	5:52	0:00	error 10007 manual stop for oil seal replacement work from 9:03 to 14:55
17-May-17	G 25	0:00	0:00	5:24	0:00	error 2118 bus error/ interbus failure from 3:32 to 4:25 ,5:41 to 10:12
19-May-17	G 11	0:00	0:00	7:49	0:00	error 205 low level hydraulic group of refrigeration oil from 6:33 to 8:21 , 10:33 to 15:22 , 22:24 to 23:28 ,23:51 to 23:59
20-May-17	G 11	0:00	0:00	23:59	0:00	error 10007 manual stop for low level hydraulic group of refrigeration oil from 00:00 to 23:59
21-May-17	G 11	0:00	0:00	7:21	0:00	error 10007 manual stop for low level hydraulic group of refrigeration oil from 00:00 to 7:21
23-May-17	G 11	0:00	0:00	5:05	0:00	error 10007 manual stop for temperature trouble shooting work from 11:47 to 16:52

29-May-17	G 39	0:00	0:00	9:04	0:00	error 800 pitch activation error from 7:01 to 9:05 ,12:45 to 18:40 & error 530 High T invertreer inductance from 20:26 to 21:31
30-May-17	G 06	0:00	0:00	7:48	0:00	error 5203 Heating / coolant thermal magnetic failure from 00:00 to 3:57 & error 10007 manual stop for heating coolant thermal magnetic trouble shooting work from 11:02 to 14:53
15-Jun-17	G 09	0:00	0:00	5:03	0:00	error 10007 manual stop for blade bolt torquing work from 10:52 to 15:55
15-Jun-17	G 23	0:00	0:05	5:03	0:00	error 5216 grid voltage failure from 15:36 to 15:41& error 10007 manual stop for Reactive power setting from 13:14 to 13:20 & error 700 PLC /convertor communication failure from 19:02 to 23:59
15-Jun-17	G 26	0:00	0:03	5:39	0:00	error 5216 grid voltage failure from 15:50 to 15:53 & error 5201 mangetohermic trigger of the stator protection from 15:54 to 21:33
15-Jun-17	G 32	0:00	0:03	7:19	0:00	error 5216 grid voltage failure from 15:50 to 15:53 & error 800 pitch activation error 15:58 to 23:17
17-Jun-17	G 09	0:00	0:00	5:23	0:00	error 10007 manual stop for tower bolt torquing & sonic allignment gear box for alligment from 11:49 to 17:12
28-Jun-17	G 25	0:00	0:00	7:49	0:00	error 2118 Bus error /interbus failure from 5:01 to 7:10 ,7:34 to 13:14
29-Jun-17	G 25	0:00	0:00	8:31	0:00	error 800 pitch activation error from 11:27 to 17:43 & error 2118 bus error /interbus failure from 21:44 to 23:59
1-Jul-17	G 25	0:00	0:00	13:52	0:00	error 2118 Bus error /interbus failure from 00:00 to 0:47 ,2:42 to 3:23 ,5:13 to 8:14 , 8:49 to 12:27 , 12:48 to 18:33
2-Jul-17	G 25	0:00	0:00	8:12	0:00	error 2118 Bus error /interbus failure from 3:23 to 4:07 ,7:38 to 11:48 ,13:31 to 16:49
3-Jul-17	G 25	0:00	0:00	12:50	0:00	error 2118 Bus error /interbus failure from 1:48 to 14:38
8-Jul-17	G 20	0:00	0:00	5:35	0:00	error 205 low level hydraulic group refrigeration oil from 18:24 to 23:59
10-Jul-17	G 27	0:00	0:00	5:05	0:00	error 2118 bus error /interbus failure from 1:49 to 2:55 ,4:24 to 4:41 ,4:44 to 5:22 ,5:53 to 8:57
12-Jul-17	G 40	0:00	0:00	5:34	0:00	error 222 very low pressure on hydraulice unit from 18:38 to 19:12 & error 509 generator slipping ring high temperature from 18:40 to 23:40
14-Jul-17	G 26	0:00	0:00	5:56	0:00	error 409 generator/rotor dercrepancy form 17:44 to 23:40
18-Jul-17	G 39	0:00	0:00	6:38	0:00	error 804 difference between 2 blades very high from 00:00 to 6:38
20-Jul-17	G 28	0:00	0:00	6:17	0:00	error 403 High T (gear box oil) from 00:00 to 0:32 & error 421 Gear box pump replacement work from 11:30 to 17:15
25-Jul-17	G 39	0:00	0:00	6:20	0:00	error 804 difference between two blade very high from 10:45 to 15:56 & error 2118 bus error/interbus failure from 17:51 to 19:00
28-Jul-17	G 26	0:00	0:00	14:31	0:00	error 10007 manual stop for NDE bearing replacement work from 9:28 to 23:59
29-Jul-17	G 26	0:00	0:00	23:59	0:00	error 10007 manual stop for NDE bearing replacement work from 00:00 to 23:59
29-Jul-17	G 39	0:00	0:00	8:24	0:00	error 804 difference between 2 blades very high from 14:41 to 18:26 ,19:20 to 23:59
30-Jul-17	G 26	0:00	0:00	23:59	0:00	error 10007 manual stop for NDE bearing replacement work from 00:00 to 23:59
30-Jul-17	G 39	0:00	0:00	13:48	0:00	error 804 difference between 2 blades very high from 0:03 to 0:29 ,0:29 to 4:51 ,5:08 to 6:42 ,7:08 to 8:53 ,9:41 to 11:50 ,12:17 to 15:49
31-Jul-17	G 26	0:00	0:00	23:59	0:00	error 10007 manual stop for NDE bearing replacement work from 00:00 to 23:59
22-Aug-17	G 21	0:00	0:00	5:17	0:00	error 800 pitch activation error from 00:00 to 5:17

26-Aug-17	G 18	0:00	0:00	9:33	0:00	error 5201 magnetothermic trigger of the stator protection from 00:16 to 2:04 ,2:17 to 5:03 ,6:24 to 8:44 ,8:48 to 11:27
14-Sep-17	G 24	0:00	0:00	5:35	0:00	Error 10007 manual stop for oil seal replacement work from 11:16 to 16:51
27-Oct-17	G 10	0:00	0:00	5:01	0:00	error 10007 Manual stop for Pitch cydainder oil seal Replacement work from 10:27 to 15:28
1-Dec-17	G 18	0:00	0:00	5:34	0:00	error 5205 Magnetothermic Stator Protection fail / door open from 5:42 to 6:38 , 7:20 to 8:14 , 8:55 to 9:36 ,20:11 to 21:00 ,21:08 to 21:57 , 21:57 to 23:22
16-Dec-17	G 37	0:00	0:00	11:33	0:00	error 5243 excess current phase r of stator from 0:01 to 11:34
28-Dec-17	G 11	0:00	0:00	6:38	0:00	error 5203 heating/coolant thermal magnetic failure from 0:01 to 0:53 & error 907 hub emergency mode trigger from 2:09 to 2:42 & error 907 hub emergency mode trigger from 3:15 to 3:39 & error 907 error hub emergency mode trigger from 6:29 to 8:11 & error 907 hub emergency mode trigger from 9:40 to 12:47