WIND BASED POWER GENERATION BY PANAMA WIND ENERGY PRIVATE LIMITED IN MAHARASHTRA, INDIA

Document Prepared by EKI Energy Services Limited

Project Title	Wind based power generation by Panama Wind Energy Private Limited in Maharashtra, India
Version	05
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Project ID	1671
Monitoring Period	01-November-2021 to 04-December-2022 (Inclusive of both days)
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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 100.8 MW wind power project is also known as Project Sky. The project activity uses Wind Turbine Generators (WTGs) manufactured by General Electric (GE). 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 exported to the regional grid system which is under the purview of the Unified National Grid of India. The project initially aimed to install 100.8 MW by March 2012, however, till now only 72 MW (45 WTGs in number) is implemented in different phases and are in operation.

Thus, out of the proposed 63 WTGs only 45 WTGs have been commissioned and further 18 WTGs referring to the project are still under the implementation stage. Moreover, WTG Location number 49 was decommissioned and hence is not operating during this monitoring period. So, during the current monitoring period from 01-November-2021 to 04-December-2022 a total of 44 WTGs were operational with a 70.4 MW capacity. PP is not taking a deviation as this is the last monitoring period of the fixed crediting period. Moreover, the monitoring period and crediting period are ending on the same date so the deviation if taken cannot be implemented in the subsequent verifications as the project has a fixed crediting period.

Relevant dates for the project activity:

Project got registered under CDM on 05-December-2012, and the CDM crediting period is from 05-December-2012 to 04-December-2022. For VCS project activity, the VCS crediting period is considered same as CDM crediting period. PP ensured that there is no any double accounting of emission reductions. The project activity adopts fixed crediting period of 10 years period in line with CDM registered PDD. The VCS crediting period start date is 05-December-2012 and commissioning dates are being mentioned over section 3.1

Total emission reductions achieved in this monitoring period:

The detailed date of commissioning is mentioned over Project Start Date 1.5 The project is running smoothly since commissioning having regular and schedule maintenance. During the current monitoring period i.e. 7th monitoring period, the project generated 100,093.18 MWh of electricity and 94,949 tCO_2e emissions have been avoided. The major breakdown is being mentioned over APPENDIX 2: Major Breakdown details.

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
Project Category : ACM0002: Grid-connected electricity generation from renewable sources - Version 12.3.0[1]
The project is not a grouped project activity.

1.3 Project Proponent

Organization name	Panama Wind Energy Private Limited
Contact person	Mr. Ashok Shintre
Title	Asset Manager
Address	Viman Nagar 1st Floor, Lunkad Towers, Pune Maharashtra 411014
Telephone	+91 20 26125060
Email	ashintre@panamagroup.com

1.4 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the Project	Project Consultant
Contact person	Mr. Vipul Sahu
Title	Project Manager
Address	Office No 201, Plot No 48, Scheme 78, Vijay Nagar Part- II, Indore 452010, India
Telephone	+91-9111112889
Email	vipul.sahu@enkingint.org, registry@enkingint.org

1.5 Project Start Date

Project Start Date: 22-February-2013

[1] http://cdm.unfccc.int/methodologies/DB/UB3431UT9I5KN2MUL2FGZXZ6CV71LT

The project start date is the date on which first WTG was commissioned under the Project activity. The commissioning details are mentioned in section 1.7 of MR.

1.6 Project Crediting Period

The VCS Project crediting period is be same as CDM crediting period i.e,. 05-December-2012 to 04-December-2022. The PP has taken CDM benefits from period 05-December-2012 to 01-April-2016[2]. PP is availing VCU benefits under current monitoring period i.e. 01-November-2021 to 04-December-2022.
Crediting Period Start date: 05-December-2012
Crediting Period End date: 04-December-2022
Monitoring Period: No: 7th periodical verification
The project activity adopts fixed crediting period of 10 years period in line with CDM registered PDD.

1.7 Project Location

The project location details are as below:

[2] https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1354531234.95/iProcess/Applus1461150700.65/view

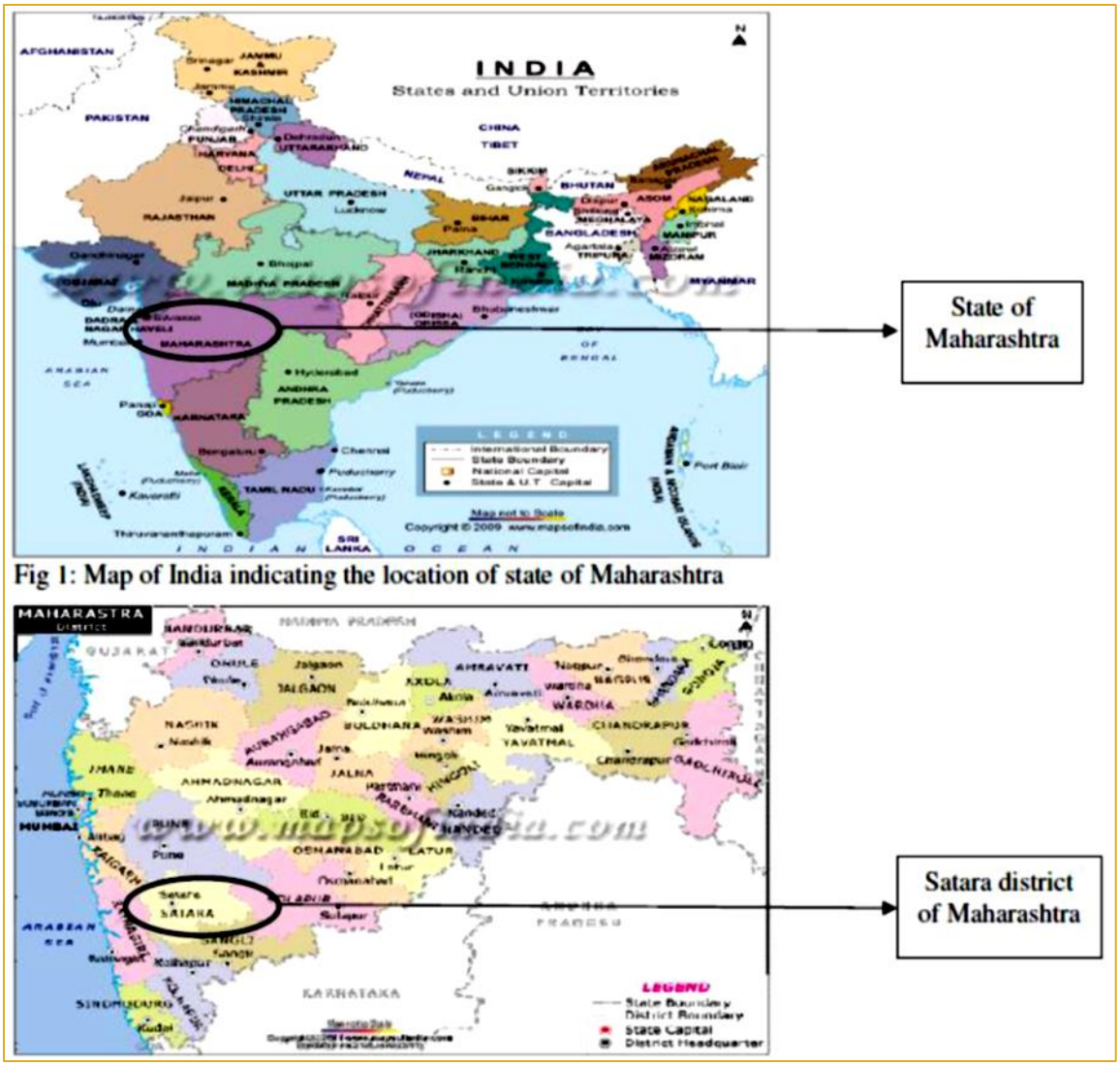


Fig 1: Map of India indicating the location of state of Maharashtra

Project Sky is located in the state of Maharashtra, within the Satara district, about 350 kms to the south of Mumbai. Approach roads are available from Bangalore-Pune National Highway no 4, from Pune 165 km to Karad and a further 45 km up to the project site at Sahayadri via the Karad – Patan state highway. The precise geo-coordinates of the WTGs are as follows:

Sr. No	Location No	Coordinate in Lat/Long		Date of Commissioning
		Latitude	Longitude	
1	Location No 1	N17 17 42.4	E73 46 33.3	
2	Location No 2	N17 17 51.2	E73 46 32.5	
3	Location No 3	N17 17 59.8	E73 46 32.3	
4	Location No 21	N17 18 19.7	E73 47 02.1	
5	Location No 24	N17 18 36.8	E73 46 59.5	
6	Location No 29	N17 19 08.7	E73 47 31.3	
7	Location No 30	N17 19 09.1	E73 47 48.7	

8	Location No 33	N17 19 18.1	E73 47 27.0	Yet to Commission
9	Location No 35	N17 18 59.5	E73 47 54.8	
10	Location No 36	N17 19 06.7	E73 48 09.0	
11	Location No 44	N17 19 00.2	E73 48 37.4	
12	Location No 53	N17 18 40.9	E73 48 53.1	
13	Location No 54	N17 18 48.5	E73 48 57.0	
14	Location No 59	N17 18 32.6	E73 49 17.6	
15	Location No 60	N17 18 40.6	E73 49 20.4	
16	Location No 39	N17 19 50.4	E73 48 40.3	
17	Location No 57	N17 19 12.7	E73 49 08.7	
18	Location No 58	N17 19 22.7	E73 49 15.5	
19	Location No 4	N17 18 18.2	E73 47 19.8	01-January-2014
20	Location No 5	N17 19 52.2	E73 48 58.8	02-July-2013
21	Location No 6	N17 19 37.4	E73 48 50.2	02-July-2013
22	Location No 7	N17 18 56.2	E73 49 19.9	02-July-2013
23	Location No 8	N17 18 43.3	E73 46 48.0	22-April-2013
24	Location No 9	N17 18 49.6	E73 46 37.0	22-February-2013
25	Location No 10	N17 18 56.3	E73 46 42.8	22-February-2013
26	Location No 11	N17 19 02.3	E73 46 49.5	22-February-2013
27	Location No 12	N17 19 09.8	E73 46 53.0	22-February-2013
28	Location No 13	N17 19 16.1	E73 46 59.4	22-February-2013
29	Location No 14	N17 19 22.5	E73 47 05.5	10-May-2013
30	Location No 15	N17 19 28.6	E73 47 12.8	06-March-2013
31	Location No 16	N17 19 34.8	E73 47 19.5	22-April-2013
32	Location No 17	N17 19 39.8	E73 47 28.0	10-May-2013
33	Location No 18	N17 19 00.7	E73 49 33.5	28-May-2013
34	Location No 19	N17 19 30.8	E73 47 35.6	06-March-2013
35	Location No 20	N17 19 36.6	E73 47 45.0	22-April-2013
36	Location No 22	N17 18 26.1	E73 47 14.7	28-May-2013
37	Location No 23	N17 18 27.7	E73 47 27.0	28-May-2013
38	Location No 25	N17 18 45.3	E73 47 00.6	06-March-2013
39	Location No 26	N17 18 53.0	E73 47 04.7	10-May-2013
40	Location No 27	N17 18 59.8	E73 47 10.7	06-March-2013
41	Location No 28	N17 19 06.7	E73 47 18.1	06-March-2013
42	Location No 31	N17 18 56.4	E73 50 01.9	13-June-2013
43	Location No 32	N17 18 33.6	E73 48 31.8	26-October-2013
44	Location No 34	N17 18 10.1	E73 47 24.3	28-May-2013
45	Location No 37	N17 18 41.0	E73 48 37.3	28-May-2013
46	Location No 38	N17 19 44.8	E73 47 37.7	22-April-2013
47	Location No 40	N17 19 39.7	E73 48 33.6	13-February-2014
48	Location No 41	N17 19 44.9	E73 48 56.0	28-May-2013
49	Location No 42	N17 19 31.8	E73 49 09.3	07-July-2013
50	Location No 43	N17 18 54.7	E73 47 25.7	22-April-2013
51	Location No 45	N17 19 08.6	E73 48 40.5	13-June-2013
52	Location No 46	N17 19 16.4	E73 48 43.0	28-May-2013
53	Location No 47	N17 19 19.9	E73 48 52.8	13-June-2013

54	Location No 48	N17 19 27.6	E73 48 59.3	13-June-2013
55	Location No 49[3]	N17 18 50.6	E73 47 56.6	01-January-2014
56	Location No 50	N17 18 20.0	E73 48 54.6	13-February-2014
57	Location No 51	N17 18 25.2	E73 48 47.2	13-February-2014
58	Location No 52	N17 18 31.6	E73 48 53.1	01-January-2014
59	Location No 55	N17 18 57.1	E73 49 02.3	28-May-2013
60	Location No 56	N17 19 04.4	E73 49 07.2	01-January-2014
61	Location No 61	N17 18 48.5	E73 49 22.2	07-July-2013
62	Location No 62	N17 18 49.0	E73 49 40.0	01-January-2014
63	Location No 63	N17 18 52.9	E73 49 51.8	28-May-2013

Table 1: Geo-coordinates, Commissioning Date and The latitude and longitude of project activity is as below

1.8 Title and Reference of Methodology

Methodology: ACM0002: Grid-connected electricity generation from renewable sources --- Version 12.3.0, Sectoral Scope: 01, EB 66[4]

The following tools have been used for the project activity under consideration –

- Tool to calculate emission factor for an electricity system
  Reference: Version 02.2.1/EB – 63, Annex 19[5]
- Tool for the demonstration and assessment of additionality
  Reference: Version 06.0.0, EB- 65, Annex 21[6]

1.9 Participation under other GHG Programs

The Project has applied for the CDM under the Kyoto protocol and registered with CDM having UNFCCC ref number as UN8524[7].The project activity avails GHG emissions reductions for only one program and there is no any double accounting for the same.

[3] WTG Location no.49 was decommissioned in 2014 due to technical reasons. Hence, it is non-operational during the current monitoring period. A total of 44 WTGs are operational during the current monitoring period. PP is not taking a deviation as this is the last monitoring period of the fixed crediting period. Moreover, the monitoring period and crediting period are ending on the same date so the deviation if taken cannot be implemented in the subsequent verifications as the project has a fixed crediting period.

[4] https://cdm.unfccc.int/methodologies/DB/8W400U6E7LFHHYH2C4JR1RJWWO4PVN

[5] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-07-v2.2.1.pdf

[6] https://cdm.unfccc.int/methodologies/PAmethodologies/tools/am-tool-01-v6.0.0.pdf

[7] https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1354531234.95/view

1.10 Other Forms of Credit

The project has not included in National or International Emission Trading Programs and Other Binding Limits. The project activity is not availing any REC/IREC[8] benefits and the same can be confirmed from publicly available link of REC generators[9].

PP does not avail other forms of environmental credit for the same crediting period under consideration. The project is now only eligible to create National Renewable Energy Certificate in which PP has not applied. The same be cross-checked with the Web-link: https://www.recregistryindia.nic.in/index.php/publics/accredited_regens

1.11 Sustainable Development Contributions

Sustainable Development Contributions:
The project activity has beneficial effect on the local environment and employment in the nearby region. Clean Electricity generation through Wind technology result in avoidance of consumption of fossil fuels which results in contribution to SDG 7. The emission avoidance through these activities results in contribution to SDG 13. All the workers at site are trained which results in increase of skills, which contributes to SDG 4. Detailed indicators are mentioned in table 2. This is a voluntary project activity doesn't contribute to achieving any nationally stated sustainable development priorities. There is no compliance for monitoring and reporting the emission reduction and SDG contribution from the project activity.

[8] https://www.irecstandard.org/registries/

[9] https://www.recregistryindia.nic.in/index.php/publics/registered_regens

Table 2: Sustainable Development Contributions

Row number	SDG Target	SDG Indicator	Net Impact on SDG Indicator	Current Project Contributions	Contributions Over Project Lifetime
1)	7.2	7.2.1: Renewable energy share in the total final energy consumption	Implemented activities to increase	About 100,093.18 MWh renewable electricity has been supplied to Unified national Grid during the reported period that helps to increase the renewable energy share in the energy mix.	Overall 100,093.18[10] MWh renewable electricity has been supplied to Unified national Grid that helps to increase the renewable energy share in the energy mix. As no SDG reporting has been done previously, therefore current and overall project contributions are same.
2)	4.4	4.4.1 Proportion of youth and adults with information and communications technology (ICT) skills, by type of skill	Implemented activities to increase	Together with the technology supplier, the Project organize 10 training during current monitoring period. Training related to soft and technical skills.	Overall, 10 trainings are provided. Since the SDG 4 indicator introduced in the current MR, the current project contributions and over project contributions are same.
3)	13.0	Tonnes of greenhouse gas emissions avoided or removed	Implemented activities to increase	By supplying 100,093.18 MWh of clean electricity (generated through wind power) to Unified national Grid, the project avoided release of 94,949 tCO_2e in to the atmosphere during the reporting period.	Overall prevented the release of 94,949 tCO_2e into the atmosphere as no SDG reporting has been done previously, therefore current and overall project contributions are the same.

[10] The current and overall project contributions are same because there has never been any prior SDG reporting.

2 SAFEGUARDS

2.1 No Net Harm

The project activity does not involve any major construction activity. It primarily requires the installation of the WTGs, 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 power project activity operations do not result in direct air pollution, noise pollution. Please refer below web link for the same[11].

Thus, there are no impacts due to implementation of project activity on air, water, soil quality and ambience are envisaged due to the construction and operation of the project activity.

No net harm assessment is required during project development and implementation process. Since the project is already implemented and the maintenance of WTG having almost zero impact on local environment. However, during the current monitoring period, no major maintenance occurred. Details are in Appendix 2.

2.2 Local Stakeholder Consultation

As a part of continuous feedback from stakeholders, mechanism was established to consider and implement grievances or inputs received from the local stakeholders. Meeting with local stakeholder and continuous grievance is a part of stakeholder engagement. In case of physical meeting, a prior information to concern authorities, meeting notice, formal telephonic call is made in-order to remind and extract maximum engagement. The participation and feedbacks are logged in an attendance register and feedback registers respectively. The overall responsibility lies with Site In-charge under the supervision from the Head Office team. In case of grievances, the nature of probable resolution is discussed with the plant head office and implemented by the site in-charge. The responsibilities included invitations, follow-up's, organizing meeting, feedbacks, documentation and successful grievance redressal, if any. The physical meeting was organized at the time of validation and the stakeholders of the project activity were invited to attend the stakeholder meeting on 07-May-2011 through newspaper advertisement (in Sakal, dated 04-May-2011). A stakeholder meeting was held at Karad, District Satara on 07-May-2011, involving the local stakeholders. The meeting was attended by local villagers, panchayat members and representatives of PWEPL. The local stakeholders were informed about the

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

continuous grievance mechanisms and the contact information for the site representative is shared.

For the global stakeholders, the suggestion and the grievance can be submitted to ashintre@panamagroup.com . Also, Local stakeholders are informed the contact information for the site representative and Site in-charge so they may report relevant suggestions or complaints. During the current monitoring period, there were no other comments logged by the local stakeholders for the current and prior monitoring periods. The grievance register copy is shared with VVB.

2.3 AFOLU-Specific Safeguards

Not applicable to this as this is not an AFOLU project activity.

3 IMPLEMENTATION STATUS

3.1 Implementation Status of the Project Activity

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 proposed 100.8 MW wind power project is also known as Project Sky. The project activity uses Wind Turbine Generators (WTGs) manufactured by General Electric (GE). 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 exported to the regional grid system which is under the purview of the Unified National Grid of India. The project initially aimed to install 100.8 MW by March 2012, however, till now only 72 MW (45 WTGs in number) is implemented in different phases. WTG Location number 49 has been decommissioned in the year 2014 due to technical reasons. Hence, it is non-operational during the current monitoring period. PP is not taking a deviation as this is the last monitoring period of the fixed crediting period. Moreover, the monitoring period and crediting period are ending on the same date so the deviation if taken cannot be implemented in the subsequent verifications as the project has a fixed crediting period. A total of 44 WTGs are operational during the current monitoring period with 70.4 MW capacity. The project implementation schedule is given as below:

WTG ID	Connecting Feeder	No. of WTGs	Date of commissioning
Location No. - 9,10,11,12,13	Feeder -1	5	22-February-2013
Location No. - 8	Feeder -1	1	22-April-2013
Location No. – 31	Feeder - 4	1	13-June-2013
Location No. - 45,47,48	Feeder - 3	3	13-June-2013
Location No. - 16,20,38,43	Feeder - 2	4	22-April-2013
Location No. - 4, 49[12]	Feeder -1	2	1-January-2014

[12] WTG Location number 49 has been decommissioned in the year 2014 due to technical reasons. Hence, it is non-operational during the current monitoring period. A total of 44 WTGs are operational during the current monitoring period.

Location No. – 42	Feeder - 3	1	7-July-2013
Location No. - 50,51	Feeder - 4	2	13-February-2014
Location No. - 5,6	Feeder - 3	2	2-July-2013
Location No. – 7	Feeder - 4	1	2-July-2013
Location No. - 14,17,26	Feeder - 2	3	10-May-2013
Location No. - 41,46	Feeder - 3	2	28-May-2013
Location No. - 22,23,34	Feeder - 2	3	28-May-2013
Location No. - 18,37,55,63	Feeder - 4	4	28-May-2013
Location No. – 40	Feeder - 3	1	13-February-2014
Location No. - 52,56,62	Feeder - 4	3	1-January-2014
Location No. – 61	Feeder - 4	1	7-July-2013
Location No. – 32	Feeder - 3	1	26-October-2013
Location No. - 15,19,25,27,28	Feeder - 2	5	06-March-2013

Thus, out of the proposed 63 WTGs only 45 WTGs have been commissioned and further 18 WTGs referring to the project are still under the implementation stage. Total operational WTGs during the current monitoring period- 44.

Brief description of the installed technology and equipment:

The project activity involves WTG supplied by GE. The WTGs are GE XLE 1.6 MW machines. The WTGs implemented in this project have been supplied by GE as complete unit without any technology transfer.

The technical details of the WTG are as follows:

Rotor:	
Diameters	82.5 m
Number of Blades	3
Swept area	5346m^2
Rotor speed range	9-18 rpm
Rotational direction	Clockwise looking downwind
Maximum tip speed	77.2 m/s
Orientation	Upwind
Speed regulation	Pitch control
Aerodynamic brakes	Full feathering
Pitch System:	
Principle	Independent blade pitch control
Actuation	Individual electric drive
Yaw System:	
Yaw rate	0.5 degree/s

Emission Reductions from anthropogenic sources:

The wind power generated from the Project is displacing the electricity generated from grid connected power plants. Since, the wind power is Green House Gas (GHG) emissions free, the power generated prevents the anthropogenic GHG emissions generated by grid connected power

plants comprising coal, diesel, furnace oil and gas. The estimation of GHG reductions by this project is limited to carbon dioxide (CO_2) only. Also, the WTG ID number 49 is not operating due to technical reasons since 2014 and discontinued due to major operating expenses. Once a lucrative tariff introduces by State then PP is planning to operate WTG 49 and rest of the non-commissioned sites.

During the current monitoring period, the project generated 100,093.18 MWh of electricity and 94,949 tCO_2e emissions have been avoided. The earliest commissioning date is 31-March-2014. The achieved GHG emission is 34.72 % is lower than the estimated value due to Right of way issues[13] (Force majeure event due to ROW (it the strip of land immediately below and adjacent to a transmission line)). The ROW factor was not in the control of PP and it has been resolved in march 2022. The plant was shut down for 3347 Hours 48 Minutes which is 34.96 % of the total operating hours during the current monitoring Period and major breakdown is being mentioned over APPENDIX 2: MAJOR BREAKDOWN DETAILS.

3.2 Deviations

2.1.1 Methodology Deviations

No methodology deviation is applied during the monitoring period.

2.1.2 Project Description Deviations

Deviation 1:

The project initially aimed to install 100.8 MW by March 2012, however, till now only 72 MW (45 WTGs in number) is implemented in different phases and are in operation. The rest are behind due the delay in signing of PPA for all wind farm by state government.

Thus, out of the proposed 63 WTGs only 45 WTGs has been commissioned and further 18 WTGs referring to the project is still under the implementation stage. These deviations are already approved in previous verification.

3.3 Grouped Projects

The project is not a grouped project thus this is not applicable.

4 DATA AND PARAMETERS

[13] For the current project, ROW issues refer to rerouting the transmission lines in the project's nearby area. As per PPA non-availability of transmission lines is categorized as a force majeure event, therefore no generation is accounted.

4.1 Data and Parameters Available at Validation

Data / Parameter	$EF_{grid,OM,y}$
Data unit	tCO_2/MWh
Description	Operating margin CO_2 emission factor for Unified National Grid in the year y
Source of data	"Baseline Carbon Dioxide Emission Database Version 6.0" published by the Central Electricity Authority, Ministry of Power, Government of India[14].
Value applied	0.9941
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per ACM0002 with 3 years vintages (2007-08,2008-09,2009 10) data obtained from "CO_2 Baseline Database for Indian Power Sector" version 6 published by the CEA, MoP, GoI, which is based on "tool to calculate emission factor for an electricity system, version 2.2.1".
Purpose of 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	This is the build margin for the Unified National Grid of India
Source of data	"CO_2 Baseline Database for Indian Power Sector" version 6 published by the CEA, MoP, GoI. Weblink: www.cea.nic.in[14]
Value applied	0.8123
Justification of choice of data or description of measurement methods and procedures applied	Calculated as per ACM0002 with year 2009-10 data obtained from "CO_2 Baseline Database for Indian Power Sector" version 6 published by the CEA, MoP, GoI. Which is based on "tool to calculate emission factor for an electricity system, version 2.2.1".
Purpose of 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

[14] https://cea.nic.in/wp-content/uploads/baseline/2020/07/user_guide_ver6.pdf

Description	This is the combined margin for the Unified National Grid of India
Source of data	CEA database version 6[14]
Value applied	0.9486
Justification of choice of data or description of measurement methods and procedures applied	Combined margin emission factor has been calculated by the Central Electricity Authority in accordance with CDM methodology: ACM0002 and tool to calculate the emission factor for an electricity system
Purpose of Data	For the calculation of the Baseline Emission
Comments	This parameter is fixed ex-ante for the entire crediting period.

4.2 Data and Parameters Monitored

Data / Parameter	$EG_{facility,y}$
Data unit	MWh
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid during this monitoring period
Source of data	Credit note/ reports generated by Maharashtra State Electricity Distribution Company Limited (MSEDCL)
Description of measurement methods and procedures to be applied	The value of net electricity generation supplied to the grid as per Joint Meter Reading / Credit Notes Report forms the basis for calculation of the emission reductions; which can be cross checked from the invoice raised to DISCOM (Maharashtra State Electricity Distribution Company Limited) Net electricity supplied to grid is calculated as the difference of the measured values of "export" and "import" of electricity through the dedicated State Electricity Board (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.
Frequency of monitoring/recording	Continuous monitoring, hourly measurement and at least monthly recording.

Value monitored	100,093.18
Monitoring equipment	Monitoring: Tri vector meter is 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 main and check meters is of accuracy class 0.2s and shall be calibrated at least once in three years. The records are cross-checked with the records of sold electricity to Maharashtra State Electricity Distribution Company Limited (MSEDCL).
Purpose of the data	Calculation of Baseline emissions
Calculation method	Accuracy Class: 0.2s Archiving Policy: Paper & Electronic Net generation (MWh)= Export (MWh)-Import (MWh) For measuring the energy delivered by the project activity, one set of main meters (part of interconnection facilities) and check meters is provided at each of the 4 feeders by the project proponent and respective electricity distribution company Maharashtra State Electricity Distribution Company Limited (MSEDCL). Monthly joint meter / Credit Notes readings of the main meters and check meters located at 4 feeders (sub-station) is taken by the designated officials of the company and Maharashtra State Electricity Distribution Company Limited (MSEDCL). The summation of all 4 feeder meters reading is be used for billing and emission reduction calculation purpose. Monthly joint meter / Credit Notes readings are taken by the designated officials of the two parties on the synchronization date of each unit as well as once during the monthly cycle.
Comments	The readings of each of the main meters located at 4 feeders are used for emission reduction calculation purpose. These 4 feeders are connected to the WTGs covered in the project activity only.

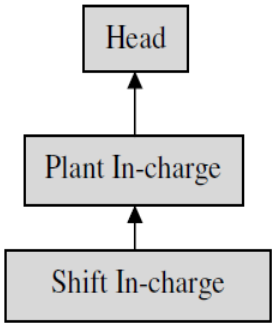
4.3 Monitoring Plan

Roles & Responsibility Structure:

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 is implemented by the project proponent describes about the monitoring organization, parameters to be monitored, monitoring practices,

quality assurance, quality control procedures, data storage and archiving. Supervisory control and data acquisition (SCADA) s used for continuous monitoring and the Credit Notes / JMR is prepared based upon the controller data upon the approval of the concerned authorities.
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 equipment's for this project activity. The team comprises of the following members: -

Organisational Structure for Monitoring



PP has assigned the responsibility of operation and maintenance of WTGs to GE India Industrial 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 equipment's).

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 Maharashtra State Electricity Board (MSEB). Neither the project proponent nor the site personnel have any control over it. The records are cross-checked with the records of sold electricity to MSEDCL. The meters are calibrated by MSEB at-least once in three years.

Data Archiving:
Monthly data shall be archived electronically and in paper form and stored for the entire crediting period and two years thereafter.

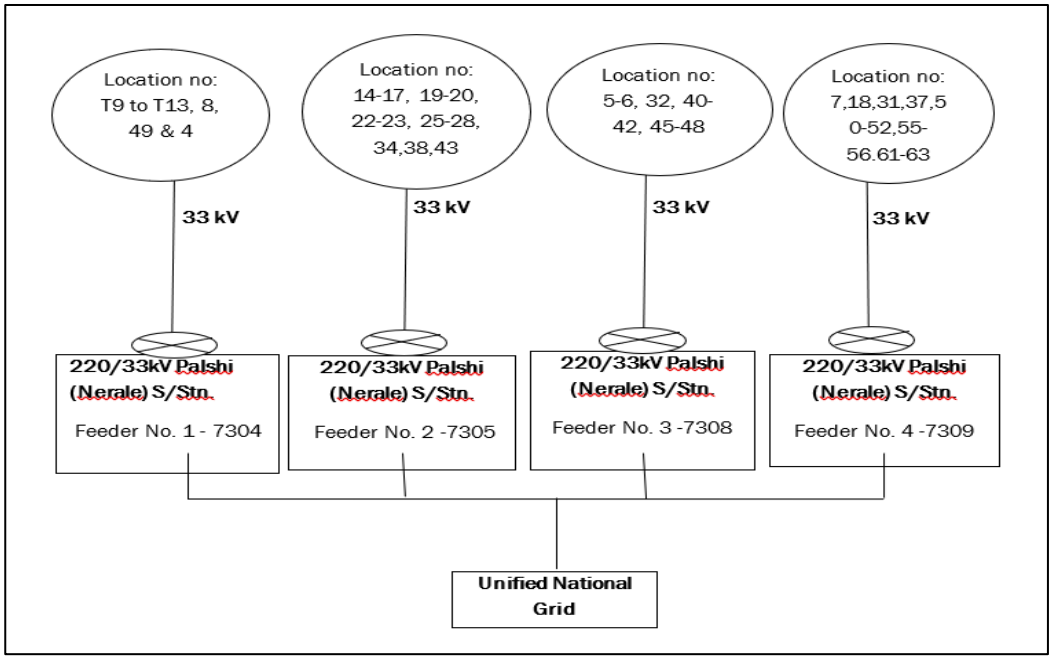
Emergency preparedness:
In case Main meter or check meter is found to be outside the acceptable limits of accuracy or faulty or not functioning properly, it is being repaired, recalibrated or replaced as soon as possible. In the event that the Main meter is not in service as a result of maintenance, repairs or calibration, the check meter is being 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 mater 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 is being 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 is being used for calculation of emission reductions during that period.

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 all site personnel are provided with proper training to meet the requirements of the operations and maintenance. This ultimately leads to creativity in problem solving.
The below mentioned diagram represents the monitoring systems, voltage levels and metering arrangements at the Project site. The power generated by the WTGs implemented under the project are connected to feeder meters located at substation. There are 4 feeders dedicated for WTGs covered under this project activity only. Pair of check meters and main meters is provided at each of the four feeders. The main meter reading at the 4 feeders at sub-station is jointly undertaken by MSEDCL and project proponent representatives.
Power generated by the WTGs is collected at 33 kV and fed to pooling (sub) station near Nerale Village (8 kms away), where it is stepped up to 220 kV (national grid). The pooling station itself is then connected to existing 2X220 kV single circuit lines (750m away) from Koyana (Pophali) to Karad and Pedambe to Karad.



5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

As per the approved methodology: ACM0002 "Consolidated baseline methodology for grid connected electricity generation from renewable sources. (Version 12.3.0)" baseline emissions for the project activity are calculated by multiplying the net quantity of electricity supplied by this project activity (EGBL, y) with the CO_2 baseline emission factor for the electricity displaced due to the project ($EFCO_2$) as follows:

$BEy = EF_{CO2,\ grid,\ y} * EG_{BL,\ y}$

Where,

$EF_{CO2,grid,y}$	=	Baseline emission factor
	=	0.9486 tCO_2e/MWh
$EG_{BL,y}$	=	Net electricity supplied to the Unified National Grid (MWh)
	=	100,093.18 MWh
BE_y	=	100,093.18 x 0.9486
	=	94,949 tCO_2e (round down values)

5.2 Project Emissions

PE_y = 0, As per ACM0002 version 12.3.0, "For all renewable energy power generation project activities, emissions due to the use of fossil fuels for the backup generator can be neglected"

5.3 Leakage

As per ACM0002 version 12.3.0, No leakage emissions need to considered for the project activity.

5.4 Net GHG Emission Reductions and Removals

The Formula used to calculate the net emission reduction for the project activity is

$ER_Y = BE_y - PE_y - LE_y$

Where,

ER_y = Emission Reduction in tCO_2/year
BE_y = Baseline emission in tCO_2/year
PE_y = Project emissions in tCO_2/year
LE_y = Leakage Emissions in tCO_2/year

For the project activity during the current monitoring period, as per section 5.1

BE_y = 94,949 tCO_2e
PE_y = 0 tCO_2e
LE_y = 0 tCO_2e

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)
01-November-2021 to 31-December 2021	-646	0	0	-646
01-January 2022 to 04-December-2022[15]	95,595	0	0	95,595
Total	**94,949**	**0**	**0**	**94,949**

[15] Due to a mismatch in the meter reading date and end date of the Monitoring period, the Export values have been apportioned using the DGR values. As a conservative approach, full-month import values have been considered.

The baseline emission removals in vintage year 2021 is due to the non-generating months and accounted imports for the same duration. The achieved GHG emission is 34.72 % is lower than the estimated value due to due to ROW issues (Force majeure event due to ROW (it is the strip of land immediately below and adjacent to a transmission line)). The ROW factor was not in the control of PP and it has been resolved in march 2022. The observed PLF during the current monitoring period generating month (including the prior imports) is 14.52 % which is 7.72 % less than PLF considered in registered PD. The non-generating month declaration related to force majeure events is submitted to VVB. The lower generation is conservative.

APPENDIX 1: CALIBRATION RECORDS

Calibration Details of the WTGs installed in the project activity have been provided below:

Location	**Feeder No. 1 - 7304**	
WTG Connected	8 WTG's (Location no: 4, 8-13, 49[16])	
Accuracy class	0.2 s	
Type of meter	**Main Meter**	**Check Meter**
Meter Make	Elster	Elster
Model / Type	Alpha A1800	Alpha A1800
Meter Sr. No.	16595568	13813597
Date of calibration	31-March-2021	02-July-2021
Due date of Calibration	30-March-2024	01-July-2024
Meter Change Date	Not Applicable	28-April-2022
New Meter Make	Not Applicable	Schneider
New Model / Type	Not Applicable	ER300P
New Meter Sr. No.	Not Applicable	22001171
New Date of calibration	02-July-2021	25-March-2022
New Due date of Calibration	01-July-2024	24-March-2025

Location	**Feeder No. 2 - 7305**	
WTG Connected	15 WTG's (Location no: 14-17, 19-20, 22-23, 25-28, 34,38,43)	
Accuracy class	0.2 s	
Type of meter	**Main Meter**	**Check Meter**
Meter Make	Elster	Elster
Model / Type	Alpha A1800	Alpha A1800
Meter Sr. No.	16595569	13813601
Date of calibration	31-March-2021	31-March-2021
Due date of Calibration	30-March-2024	30-March-2024

Location	Feeder No. 3 – 7308	
WTG Connected	10 WTG's (Location no: 5-6, 32, 40-42, 45-48)	
Accuracy class	0.2 s	
Type of meter	**Main Meter**	**Check Meter**
Meter Make	Elster	Elster
Model / Type	Alpha A1800	Alpha A1800

[16] WTG Location no.49 has been decommissioned in the year 2014 due to technical reasons. Hence, it is non-operational during the current monitoring period. A total of 44 WTGs are operational during the current monitoring period.

Meter Sr. No.	13813599	13132610
Date of calibration	02-July-2021	02-July-2021
Due date of Calibration	01-July-2024	01-July-2024

Location	**Feeder No. 4 - 7309**	
WTG Connected	12 WTG's (Location no: 7,18,31,37,50-52,55-56,61-63)	
Accuracy class	0.2 s	
Type of meter	**Main Meter**	**Check Meter**
Meter Make	Elster	Elster
Model / Type	Alpha A1800	Alpha A1800
Meter Sr. No.	13132640	13813602
Date of calibration	02-July-2021	02-July-2021
Due date of Calibration	01-July-2024	01-July-2024
Meter Change Date	28-April-2022	Not Applicable
New Meter Make	Schneider	Not Applicable
New Model / Type	ER300P	Not Applicable
New Meter Sr. No.	22001172	Not Applicable
New Date of calibration	25-March-2022	Not Applicable
New Due date of Calibration	24-March-2025	Not Applicable

APPENDIX 2: MAJOR BREAKDOWN DETAILS

Out of Total 9576 hours, 3347 Hours 48 Minutes is the total Breakdown duration during the current monitoring Period and Stoppage details are tabulated below:

Date	Stoppage details	Breakdown Hours
01-April-2022	Rotor CCU collective fault	15:23
06-April-2022	Battery Voltage Not ok A1	09:26
07-April-2022	Pitch Thyristor 3 Fault	12:16
09-April-2022	Gearbox oil over temperature	10:51
22-April-2022	Gearbox oil level too low	24:00
22-April-2022	Asymmetric generator current	09:22
23-April-2022	Gearbox oil level too low	15:30
26-April-2022	Top box fuse or motor protection alarm	11:26
10-May-2022	Gearbox oil temperature high	11:05
16-May-2022	Turbine restoration after grid outage	09:00
16-May-2022	Turbine restoration after grid outage	09:00
16-May-2022	Battery voltage not ok	09:28
22-May-2022	Turbine communication fault	14:40
15-June-2022	Gearbox oil pressure too low	13:41
29-June-2022	Pitch thyristor 3 fault and Pitch Communication short term fault axis 3	14:27
08-July-2022	Converter side rotor current fault	23:59
10-July-2022	Gearbox oil over temperature	13:11
10-July-2022	Pitch thyristor 3 fault	13:14
12-July-2022	Pitch thyristor 3 fault	23:59
13-July-2022	Gearbox oil over temperature from thermal switch	14:29
13-July-2022	Pitch thyristor 3 fault	23:13
14-July-2022	Line side CCU current fault	14:32
14-July-2022	Gearbox oil over temperature from thermal switch	23:52

18-July-2022	Rotor side CCU collective faults	14:44
09-August-2022	Wind vane failure	09:41
14-August-2022	Pitch thyristor 3 fault	12:12
15-August-2022	Pitch thyristor 1 fault	19:35
15-August-2022	Battery charging voltage not OK, Pitch battery replacement activity Pitch thyristor 3 fault	19:47
16-August-2022	Pitch thyristor 3 fault	18:20
18-August-2022	Battery voltage not ok axis-3 & Rotor CCU temperature warning	16:30
30-August-2022	Rotor CCU temperature fault	09:35
30-August-2022	Safety chain Battery charging not ok axis-1 Main on dropped out	20:56
30-August-2022	Yaw Brake Voltage 230 Volt not OK	10:49
31-August-2022	Rotor CCU temperature fault	13:32
14-October-2022	Gearbox oil pressure too low	11:03
01-November-2021 to 28-February-2022	Plant is not generating electricity due to Right of Way issues[17].	2880:00

[17]For the current project, ROW issues refer to rerouting the transmission lines in the project's nearby area. As per PPA non-availability of transmission lines is categorized as a force majeure event, therefore no generation is accounted.