



**Verified Carbon
Standard**

WIND POWER PROJECT AT THENI BY POWERICA LIMITED



India's Largest Carbon Credit Developer & Supplier

Document Prepared by EKI Energy Services Limited

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Brilliant Convention Centre Indore - 452010 (M.P, India)

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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 project activity involves an installation of 6 Wind Turbine Generators (WTG) of total generating capacity of 9.9 MW (6 units of Vestas make V82 WTG). The WTG units are installed in Theni district in the state of Tamilnadu, India. The main purpose of the project activity is to generate electrical energy through sustainable means using wind power resources and to contribute to climate change mitigation efforts. The project activity thus contributes to reduction in specific emissions (emissions of pollutant) including GHG emissions.

The project activity is a Greenfield project for generation of electrical energy using wind which is a renewable source of energy thus resulting in GHG emission reductions. In the absence of the project activity, the electricity thus supplied would have been generated through fossil fuel based thermal power plants; hence electricity supply from grid has been considered as the baseline scenario of this project.

The start date of the project activity is 13-September-2010, which is the date of commissioning of the first WTG. The project has been operational since the commissioning and has contributed to reduction in greenhouse gas emissions.

Total GHG emissions reductions achieved during the current monitoring period 11-September-2018 to 31-December-2019 is 16,698 tCO₂e as the result of supplying 17680.64 MWh electricity that would otherwise have been provided by fossil-fuel dominated grid.

1.2 Sectoral Scope and Project Type

Sectoral scope 1: Energy Industries (renewable / non-renewable sources).

Project type: Renewable energy project (Wind)

The project activity is not a grouped project

1.3 Project Proponent

Organization name	Powerica Limited
Contact person	Mr. Pradeep Gupta
Title	Head - Wind Energy Division
Address	9 th Floor, Godrej Coliseum, Sion (E)

	Mumbai – 400022, Maharashtra, India
Telephone	+ 91 22 4001 2000
Email	pradeep.gupta@powericaltd.com

1.4 Other Entities Involved in the Project

Organization name	EKI Energy Services Limited
Role in the Project	Project Consultant
Contact person	Mr. Souvik Mitra
Title	Project Manager
Address	Office No 201, Plot No 48, Scheme 78, Vijay Nagar Part- II, Indore 452010, India
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1.5 Project Start Date

The project start date is 13-September-2010 which is the date of commissioning of the first phase of the 9.9 MW wind power project.

1.6 Project Crediting Period

The project has begun generating GHG emission reductions from 13-September-2010. Hence, first crediting period for VCS is 13-September-2010 to 12-September-2020.

1.7 Project Location

The project activity located in Taluka: Andipatti, District: Theni, State: Tamilnadu.

The unique location information of the WTG is provided in the table below. The WTG numbers indicated in the table below are unique identification number provided by the state utility.

The geo-coordinates of each WTG are as follows:

WTG No.	HTSC No.	Latitude	Longitude	Village

TSSP1255	T-144	9° 59' 40"	77° 34' 10"	Shanmuga Sundarapuram
TM721	T-141	9° 58' 46"	77° 34' 43"	Mottanuthu
TSSP158	T-142	9° 59' 08"	77° 34' 39"	Shanmuga Sundarapuram
TM41	T-145	9° 58' 34"	77° 35' 24"	Mottanuthu
TGU28	T-139	9° 57' 03"	77° 33' 33"	Usilampatti
TSSP174	T-143	9° 59' 23"	77° 34' 43"	Shanmuga Sundarapuram

1.8 Title and Reference of Methodology

Methodology: Grid connected renewable electricity generation

Reference: AMS-I.D. Version 16.0¹

Methodology AMS I.D. also refers to:-

- Tool to calculate the emission factor for an electrical system, Version 02, EB 50²

1.9 Participation under other GHG Programs

The project activity has also been registration with UNFCCC under Clean Development Mechanism (CDM) program, Registration reference number is 4572³. The project proponent has provided undertaking that it will not claim any GHG credits for UNFCCC CDM during the current monitoring period.

1.10 Other Forms of Credit

India is Non-annex1 country and there is no compliance with an emission trading program or to meet binding limits on GHG emissions for this project activity. The project is registered under CDM and UNFCCC (Registration ID 4572⁴). The project proponent (PP) has submitted undertaking that they will not claim same GHG emission reductions of the project from CDM and VCS. PP would not use net GHG emission reductions by the projects for compliance with emission trading program to meet binding limits on GHG emissions. PP has also submitted undertaking for not availing other forms of environmental credit for the same crediting period under consideration.

¹ <https://cdm.unfccc.int/methodologies/DB/W3TINZ7KKWCK7L8WTFQQOFQQH4SBK>

² <https://cdm.unfccc.int/methodologies/PAMethodologies/tools/am-tool-07-v2.pdf>

³ <https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1300097036.88/view>

⁴ <https://cdm.unfccc.int/Projects/DB/LRQA%20Ltd1300097036.88/view>

1.11 Sustainable Development

The Designated National Authority (DNA) for the Government of India (GoI) on the Ministry of Environment and Forestry (MoEF)⁵⁵, called the National CDM Authority (NCDMA), has stipulated four indicators on sustainable development for Clean Development Mechanism (CDM) projects structured in India. The project participants' view on the contribution of this project activity towards sustainable development follows these four indicators as explained below:

Social well-being:

- **Generating Local Employment:** The installation of wind power project in rural areas will result in generating local employment opportunities and capacity building of the local employees. The project activity would create both direct and indirect employment throughout the life-cycle of the project activity.
- **Encouragement to entrepreneurs:** The project will provide encouragement to other entrepreneurs to invest into renewable energy sources.

Economic well-being:

- **Rural Development:** The installation of wind power project will result in rural and infrastructural development in the surrounding rural areas
- **Economic Development:** The generation of wind power will result in improvising the reliability of the NEWNE Grid and thereby enhance economic development in the region.

Environment well-being:

- **Reduction in the consumption of fossil fuels:** The installation of power plant generating electricity through renewable resource such as wind power, would lead to reduction in usage of fossil fuels e.g. Coal, oil, natural gas.
- **Reduction in GHG emissions:** The reduction in usage of fossil fuels for electricity generation will result in reduction of the release of associated GHG emissions (CO₂ and CH₄ emissions).
- **Improvement of Air Quality:** The use of renewable energy for power generation will avoid the emission of air pollutants such as Suspended Particulate Matter (SPM), Sulphur Dioxide (SO₂) and Nitrogen Oxides (NO_x) thereby improvising the surrounding air quality
- **Conservation of Natural Resources:** Installation of wind power plant will result in conserving fast depleting natural resources such as coal, oil etc.

Technological well-being:

⁵⁵ Since June 2014, the name of DNA changed to Ministry of Environment, Forest and Climate Change (MoEFCC)

- **Advanced Technology:** The project activity involves installation and operation of state-of-art wind turbine generators (WTGs) of Vestas make. The implementation of these new technologies will help in increasing reliability of renewable energy generation and encourage development of even better technology in the future.
- **Safe and Sound Technology:** The project activity deploys the technology, which is environmentally safe and sound, as it does not produce greenhouse gases and any toxic or radioactive waste.

2 SAFEGUARDS

2.1 No Net Harm

The project does not involve any potential negative environmental and socio economic impacts and hence this criteria is not applicable to this project activity.

2.2 Local Stakeholder Consultation

Project Proponent had conducted local stakeholder consultation extensively during registration of the project through identification of stakeholders, invitation to them for meeting, explanation about the project in details in the meeting and resolution of comments/grievances/suggestions by the stakeholders.

The process of local stakeholder consultation is continuous. During the current monitoring period, the project proponent has kept grievance register in plant site office and sought comments/grievances/suggestions from local stakeholders including local community, government agencies and NGOs. Besides, the PP has also kept provision for submitting comments/grievances/suggestions from local stakeholders through direct mail. However, no major comments/grievances/suggestions have been received from the aforementioned stakeholders during the current monitoring period and all such minor suggestions have been take care by the PP.

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 project has been completed and the monitoring equipments were installed to monitor the parameters as described in the registered Project Description (PD). All the WTGs involved in the project activity are already commissioned and operational.

The salient features of the technology utilized are:

Vestas V82 1.65 MW 50Hz

Lifetime	20 years
Rated Power	1,650 kW
Rotor diameter	82 m
Swept area	5,281 m ²
No. of blades	3
Cut in wind speed	3.5 m/s
Cut out wind Speed	20 m/s
Rated wind speed	13 m/s
Regulation	Active-Stall
Hub Height	78 m
Generator Type	Asynchronous
Insulation	Class F

The WTGs are under operation since the date of commissioning and no event has been identified which may impact GHG emission reduction. The commissioning dates of all the WTGs are provided as below.

WTG No.	HSTC No.	Location	Date of commissioning
TSSP 1255 (POWER 2)	T 144	Shanmuga Sundarapuram	13-September-2010
TM721 (POWER 5)	T 141	Mottanuthu	13-September-2010
TSSP 158 (POWER 4)	T 142	Shanmuga Sundarapuram	13-September-2010
TM 41 (POWER 6)	T 145	Mottanuthu	17-September-2010
TGU28 (POWER 1)	T 139	Usilampatti	13-September-2010

TSSP174 (POWER 3)	T 143	Shanmuga Sundarapuram	13-September-2010
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The energy meters are installed at each WTG site and also at substation feeder line. The WTGs undergone normal operation and maintenance schedule including some breakdowns of some WTGs for some periods. The details of breakdown details of the project is mentioned in APPENDIX 2.

3.2 Deviations

3.2.1 Methodology Deviations

No methodology deviation is applied during the monitoring period.

3.2.2 Project Description Deviations

The deviation in project activity is provided below:

As per registered CDM PDD, the calibration frequency is once in every two years. The calibration of meters is not in control of PP and same is done by state electricity board. The state electricity board does not follow any fixed calibration frequency; hence deviation is requested for change in calibration frequency as once in five years. This calibration frequency is as per CEA notification

http://www.aegcl.co.in/Metering_Regulations_Of_CEA_17_03_2006.pdf. (page no. 12)

The updated version available from the year 2019 also upholds the same frequency of testing of meters. This can be found in the web-link below:

[_http://www.cea.nic.in/reports/regulation/CEA_metering_regulation_amendment_2019.pdf](http://www.cea.nic.in/reports/regulation/CEA_metering_regulation_amendment_2019.pdf)

The deviation request was approved by VERRA in the last verification. The change in calibration frequency does not have any impact on ER calculations as during monthly reading state electricity board official and PP representative check the meter conditions.

Also both parties accepts the reading and PP raise the invoice to state electricity board based on monthly JMR reading. Thus financial obligations are involved which ensures that meters are running accurately.

The deviation is in accordance with the existing national regulation for testing of meters (monitoring equipment) in the host country and the monitoring parameter thus measured is cross-checked by invoices issued by state electricity transmission utility. Hence the deviation does not have any impact of value of monitored parameter and thus on the value of GHG emission reductions. Thus the deviation does not impact the applicability of the methodology, additionality or the appropriateness of the baseline scenario of the project activity.

3.3 Grouped Projects

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

4 DATA AND PARAMETERS

4.1 Data and Parameters Available at Validation

Data / Parameter	EF _{Grid,OM,y}
Data unit	tCO ₂ /MWh
Description	Weighted average of 3 years , 2006-07, 2007-08 and 2008-09) CO ₂ Operating Margin emission factor of the Southern(erstwhile) grid
Source of data	Central Electricity Authority:CO ₂ Emission Database CEA CO ₂ Baseline database Version 05, November 2009
Value applied	0.9868
Justification of choice of data or description of measurement methods and procedures applied	Obtained from the CEA database on CO ₂ Baseline for Indian Power Sector, Version 04 as the weighted average of Operating Margin (incl. imports) for years 2006-07, 2007-08 and 2008-09 of Southern grid
Purpose of Data	Calculation of baseline emissions
Comments	The value is fixed and it is same for the entire crediting period

Data / Parameter	EF _{Grid,BM,y}
Data unit	tCO ₂ /MWh
Description	Build margin CO ₂ emission factor of Southern (erstwhile) grid
Source of data	Central Electricity Authority:CO ₂ Emission Database CEA CO ₂ Baseline database Version 05; November 2009
Value applied	0.8179
Justification of choice of data or description of measurement methods and procedures applied	Obtained from the CEA database on CO ₂ Baseline for Indian Power Sector, Version 05, November 2009
Purpose of Data	Calculation of baseline emissions

Comments	The value is fixed and it is same for the entire crediting period
Data / Parameter	$EF_{Grid,CM,y}$
Data unit	tCO ₂ /MWh
Description	Combined margin CO ₂ emission factor for Southern(erstwhile) grid
Source of data	Central Electricity Authority:CO ₂ Emission Database CEA CO ₂ Baseline database Version 05; November 2009
Value applied	0.9445
Justification of choice of data or description of measurement methods and procedures applied	<p>The combined margin emissions factor is calculated as follows:</p> $EF_{grid,CM,y} = EF_{grid,OM,y} * w_{OM} + EF_{grid,BM,y} * w_{BM}$ <p>The following default values should be used for w_{OM} and w_{BM}: For Wind power generation project activities: $w_{OM} = 0.75$ and $w_{BM} = 0.25$ for the selected crediting period Data compiled in CEA CO₂ CDM database is in line with the requirements Version 02.2.1 of “Tool to calculate the emission factor for an electricity system”</p>
Purpose of Data	Calculation of baseline emissions
Comments	The value is fixed and it is same for the entire crediting period

4.2 Data and Parameters Monitored

Data / Parameter	EG_y
Data unit	MWh
Description	Quantity of net electricity exported to grid in year y
Source of data	TNEB Statements
Description of measurement methods and procedures to be applied	<p><u>Monitoring Equipment</u>: Electrical Energy Meters which are electronic tri-vector meters</p> <p><u>Data type</u> :Measured & Calculated</p> <p><u>Archiving</u>: Paper & Electronic</p>

	<p><u>Recording Frequency:</u> Daily</p> <p><u>Responsibility:</u> The O&M site-in-charge shall be responsible for the regular recording of data.</p> <p><u>Calibration Frequency:</u> The meters shall be calibrated once in every five years.</p>
Frequency of monitoring/recording	Continuous monitoring and monthly recording
Value monitored	17680.64
Monitoring equipment	<p>Monitoring Equipment: Electrical Energy Meters which are electronic tri-vector meters</p> <p>Accuracy: 0.5s Calibration frequency: The meters are calibrated once in five year as per CEA notification and deviation requested. Please refer section 3.2.2 of MR for deviation in calibration frequency from that mentioned in registered PD.</p> <p>Details of energy meters along with the calibration of the meters are provided in APPENDIX 1.</p>
QA/QC procedures to be applied	The Quantity of net electricity generation from the certificates for share of electricity are cross-checked with the invoices for the sale of power by Powerica Limited. Meter calibration are conducted once every five years; besides there is an internal audit system is in place as mentioned in the Registered VCS PD.
Purpose of the data	Calculation of baseline emissions
Calculation method	--
Comments	The Monitored Data to be kept for a minimum of two years after the end of the crediting period or the last issuance whichever is later.

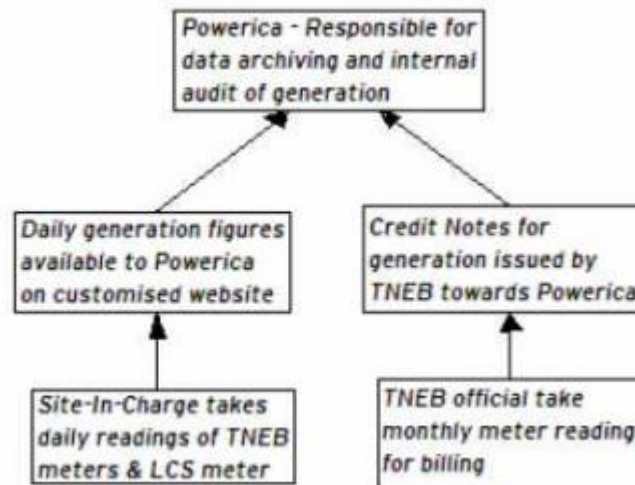
4.3 Monitoring Plan

The project activity is in accordance with approved small scale methodology AMS I.D, and therefore, of the simplified M&P for small-scale CDM project activities-Version 16, - Grid connected renewable electricity generation.

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 methodology is based on ex-ante determination of the baseline emission

factor, the monitoring of baseline emission factor is not required. The sole parameter for monitoring is the electricity exported to the grid. The Project is operated and managed by Vestas Wind Technology India Private Limited (Vestas). Vestas will have a designated Site-In-Charge (O&M) on site who will be responsible for monitoring the electricity exported from the project activity. The overall flow of information has been depicted using the following hierarchical structure:



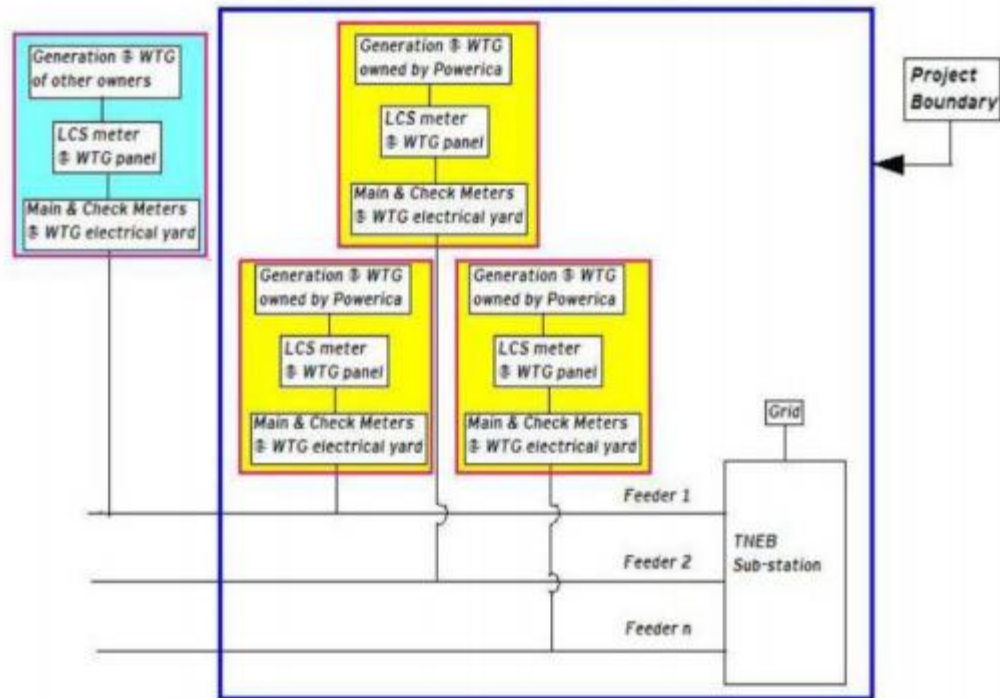


Figure 3: Project Boundary Diagram

The monitoring is done at the WTG electrical yard substation using a TNEB owned electronic tri-vector meters. The net electricity exported to grid is calculated as the product of difference of current and previous TNEB meter readings multiplied with the multiplying factor of the meter.

Additionally, all the WTGs at the site are connected to a central monitoring system located at that site only. This system captures daily generation figures which are later made available to Powerica on the customized website of Vestas.

Internal audits & Performance review

The records are regularly audited and checked by the senior officials from project proponent on an annual basis. The officials will monitor the actual emission reduction. The personnel responsible for taking readings at site are adequately trained.

Emergency Preparedness

In the context of the project activity, the meters will be kept in sealed by TNEB and all maintenance will be taken up by TNEB only. In case of failure of the main meter, generation value of controller meter would be considered. The state electricity board has removed check meters, hence only main meters are part of project activity.

The project promoters have contracted the technology supplier for providing O&M services for the power project. The service provider would be responsible for maintenance of the

necessary spare parts and consumables for the maintenance of the WTGs such as anemometers, wind vanes and sensors, oil filters, batteries, auxiliary motors and pumps, WTG controllers, slip rings, limit switches and sensors, detergents & solvents etc. The service provider would also be responsible for supply of necessary main components of the WTG such as main gearboxes, blades, generators, towers, hubs, main shafts & bearings, ground and top controller and hydraulic systems. The service provider would also ensure that occupational health and safety procedures are adhered to during the operation & maintenance activities. Additionally, spare meters would also be kept available at the site for replacement in case of failure of any of the monitoring equipment.

5 QUANTIFICATION OF GHG EMISSION REDUCTIONS AND REMOVALS

5.1 Baseline Emissions

The emission factor value has been fixed Ex-ante and the same shall be used for the monitoring period. Net Electricity Generated is obtained by deducting total import (from grid) from total export (to grid). These values are taken from the statements showing energy generated through Wind Mill issued by state electricity board in Tamil Nadu (Tamil Nadu Generation & Distribution Corporation Ltd).

Baseline emissions are calculated by multiplying the Net electricity exported to the grid with net baseline emission factor, as given in the registered VCS PD.

$$BE_y = EG_y \times EF_{Grid,CM,y}$$

Where,

BE_y = Baseline Emissions (tCO₂/year)

EG_y = Net Electricity exported to grid in year y (MWh)

$EF_{Grid,CM,y}$ = Baseline Emission Factor (Combined margin CO₂ emission factor for grid)

Total net electricity exported to grid during the monitoring period= 17,680.64 MWh

$EF_{Grid,CM,y} = 0.9445 \text{ tCO}_2/\text{MWh}$

Therefore, Baseline Emission (BE_y) = 17,680.64 X 0.9445 = 16,698 tCO₂

Period	Total Net Electricity Exported to Grid (MWh)	Baseline Emission Factor(tCO ₂ /MWh)	Baseline Emissions(tCO ₂)

11-September-2018 to 31-December-2018	1,235.07	0.9445	1,166
01-January-2019 to 31-December-2019	16,445.57	0.9445	15,532
Total	17,680.64		16,698

Hence the baseline emission calculated for the reported monitoring period is i.e. $BE_y = 16,698 \text{ tCO}_2\text{e}$

5.2 Project Emissions

No project emissions are applicable to this wind electric power project, since the electricity generation is based on wind resources, which does not involve in combustion or generation of emissions from fossil fuels. Hence, these emission sources are neglected.

$$PE_y = 0$$

5.3 Leakage

No leakage emissions are considered. The main emissions potentially giving rise to leakage in the context of electric sector projects are emissions arising due to activities such as power plant construction and upstream emissions from fossil fuel use (e.g. extraction, processing, and transport). These emission sources are neglected.

$$LE_y = 0$$

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

$$BE_y = 16,698 \text{ tCO}_2\text{e}$$

$$PE_y = 0 \text{ tCO}_2\text{e}$$

$$LE_y = 0 \text{ tCO}_2\text{e}.$$

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)
2018	1,166	0	0	1,166
2019	15,532	0	0	15,532
Total	16,698	0	0	16,698

The actual VER is about 44% less than the estimated VCUs. 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.

APPENDIX 1: METER CALIBRATION DETAILS

WTG No.	Make	Meter Serial No.	Year 2017	Due date of Calibration
TGU 28 SS(T-139)	HPL	627560	17-May-2017	17-May-2022
TM 41 SS(T-145)	HPL	624763	17-May-2017	17-May-2022
TSSP 158 SS(T-142)	HPL	624852	17-May-2017	17-May-2022
TSSP 174 SS(T-143)	HPL	627558	17-May-2017	17-May-2022
TM 721 SS(T-141)	HPL	627555	17-May-2017	17-May-2022
TSSP 1255 SS(T-144)	HPL	627553	17-May-2017	17-May-2022

Earlier there were check meters also installed as back up meters, however state electricity board had removed that check meters and only main meters are used for export, import values. Hence that main meters are mentioned in above table.

As per registered CDM PDD, the calibration frequency is once in every two years. The calibration of meters is not in control of PP and same is done by state electricity board. The state electricity board does not follow any fixed calibration frequency, hence deviation is requested for change in calibration frequency as once in five years and deviation request was approved by VERRA in last verification. This calibration frequency is as per CEA notification

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

The updated version available from the year 2019 also upholds the same frequency of testing of meters. This can be found at

http://www.cea.nic.in/reports/regulation/CEA_metering_regulation_amendment_2019.pdf

Based on once in five year calibration frequency as per requested deviation, there is no any delay in calibration and no error factor is applicable for current monitoring period.

APPENDIX 2: BREAKDOWN DETAILS

Date from	Date to	Duration (Hours)	Turbine name	Event Allocation	Category	Reason	PAMC Remark
10-December-2018	29-March-2019	2679.4	POWER 4	Manufacturer	WTG Breakdown	-	Yaw Signals Invalid
31-May-2019	06-June-2019	142.14	POWER 5	Utility	Force Majeure	Unauthorized Person Entered	"WTG Stopped due to HV Breaker Tripped because of Unauthorized Person entered into USS Yard. So WTG Restored after HV Breaker recharged.
28-September-2019	31-December-2019	2189.45	POWER 4	Manufacturer	WTG Breakdown	--	Yaw Signals Invalid
29-September-2019	28-November-2019	1404.03	POWER 2	Manufacturer	Predictive Maintenance	--	WTG Stopped for Oil Leakage in HUB Inspection work; During Inspection the Some gap found near to the Root End Flange Portion in Blade C; As per Vestas Technology instruction , not to run the WTG until further instruction; Vestas Investigation work in Progress." WTG Restored after all the 03 Blades replaced

							by Vestas.
20-November-2019	30-December-2019	952.53	POWER 6	Manufacturer	WTG Breakdown	Blade Failure	WTG Stopped due to Blade Tip damaged because of Lightning; WTG restored after Blade "C" replaced by Vestas. The Detailed RCA will be shared by Vestas later.