Monitoring report form for CDM project activity (Version 09.0)

MONITORING REPORT			
Title of the project activity	74 MW wind energy project in Tamilnadu, India		
UNFCCC reference number of the project activity	7647		
Version number of the PDD applicable to this monitoring report	12		
Version number of this monitoring report	01		
Completion date of this monitoring report	10/11/2021		
Monitoring period number	03		
Duration of this monitoring period	16/12/2015 to 31/12/2020 (First and last day included)		
Monitoring report number for this monitoring period	NA		
Project participants	1. M/s. The Ramco Cements Limited (India) 2. WeAct Pty Ltd (Australia)		
Host Party	India		
Applied methodologies and standardized baselines	Applied methodologies: ACM0002 ver. 12 - Consolidated baseline methodology for grid-connected electricity generation from renewable sources. standardized baselines: N/A		
Sectoral scopes	1 : Energy industries (renewable - / non-renewable sources)		
Amount of GHG emission reductions or net anthropogenic GHG removals achieved by the project activity in this monitoring period	Amount achieved before 1 January 2013	Amount achieved from 1 January 2013 until 31 December 2020	Amount achieved from 1 January 2021
	0	672,588	0
Amount of GHG emission reductions or net anthropogenic GHG removals estimated ex ante for this monitoring period in the PDD	789,147		

SECTION A. Description of project activity

A.1. General description of project activity

The project activity involves implementation of 74 MW capacity wind energy project, consisting of 67 Wind Turbine Generators (WTGs) by The Ramco Cements Limited (TRCL), in Coimbatore, Dindigul and Tirunelveli districts of Tamilnadu. Power generated from the identified WTGs is exported to the Southern grid of India. The project activity has been undertaken to harness the available wind power potential in the state of Tamilnadu. Out of the 67 WTGs installed under the project activity, 43 WTGs are of Enercon make with a capacity of 800 KW and 24 WTGs are of Vestas make with a capacity of 1650 KW, aggregating to a total capacity of 74 MW. The project is expected to generate about 168595.617 MWh of electricity per annum, which is exported to the Tamil Nadu State Electricity Board.

The project activity helps in emission reduction of Green House Gases (GHGs) by using renewable resource for generating power which otherwise would have been generated by using non-renewable, carbon intensive fuels. The implementation of project activity will achieve approximately 156,288 tCO2e emission reductions per annum by replacing electricity in the Southern grid, which is dominated by fossil fuel based thermal power plants. The spatial extent of the project boundary is the regional Southern grid. The grid is connected to four southern states, namely, Tamilnadu, Kerala, Karnataka and Andhra Pradesh.

The objective of the project activity is to construct, operate and maintain wind power projects in the state of Tamilnadu to provide renewable power to the state electrical grid. The project has led to reduced greenhouse gas emissions because it has displaced electricity from fossil fuel based power plants. Transmission lines are used to supply the electricity generated from the wind farm to the local substations and from the substations to the Southern grid.

The list specifying location, capacity and number of WTGs is provided below in Table

Table 1 Capacity, Location and no. of WTGs

S. No.	Location	Number of WTG	Capacity. of each WTG (kW)	Installed capacity (kW)
I	Udumalpet region, Coimbatore District	8	1650	13200
II	Udumalpet region, District Dindigul	43	800	34400
III	Thandayarkulam region, Tirunelveli District	8	1650	13200
IV	Uthumalai region, Tirunelveli District	8	1650	13200
	Total	**67**		**74000**

A.2. Location of project activity

Host Party – India
State – Tamil Nadu
Districts – Coimbatore, Dindigul and Tirunelveli districts.

Fig 1:- showing Tamilnadu state in the Indian map.

Fig 2:- showing the districts under the project activity

A.3. Parties and project participants

Parties involved	Project participants	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (host Party)	M/s. The Ramco Cements Limited (Private Entity)	No
Australia (Other party)	WeAct Pty. Ltd (Private Entity)	No

A.4. References to applied methodologies and standardized baselines

The details of the applied methodology and tools used in this project activity are listed below:

Methodology:
ACM0002 (Version 12.3.0) - Consolidated baseline methodology for grid-connected electricity generation from renewable sources.[1]

Tools Reference:

1. Tool to calculate the emission factor for an electricity system, (version 02.2.1[2])

[1] https://cdm.unfccc.int/methodologies/DB/XP2LKUSA61DKUQC0PIWPGWDN8ED5PG

[2] https://cdm.unfccc.int/Reference/tools/index.html

2. Tool for the demonstration and assessment of additionality (version 6[3])

Standardized baseline:
Not applicable

A.5. Crediting period type and duration

Crediting period type : Fixed
Duration of crediting period : 01/11/2012 – 31/10/2022
Length of crediting period : 10 Years 00Months

SECTION B. Implementation of project activity

B.1. Description of implemented project activity

In accordance with the para 244 of project standard (version 9) the description of the implemented registered CDM project activity is provided below:

First WTG under this project activity was started its commercial operation on 04/06/2007 and the project activity was registered with UNFCCC as CDM project on 18/10/2012. Commissioning dates for all the WTGs under this project activity are mentioned in Appendix-2. All the WTGs were commissioned prior to registration of project activity with UNFCCC. Hence the monitoring period is considered from the date of registration of the project activity. The project has been in operation since commissioning.

The technology employed, converts wind energy to electrical energy. In wind power generation, kinetic energy of wind is converted into mechanical energy and subsequently into electrical energy. Wind blowing at high speeds has a considerable amount of kinetic energy. When this kinetic energy passes through the blades of the wind turbines, it is converted into mechanical energy and rotates the wind blades. When the wind blades rotate, the connected generator also rotates, thereby producing electricity. The technology is a clean technology since there are no GHG emissions associated with the electricity generation. The main parts of a typical WTG are Blades, Rotor, Tower, Gearbox, Generator, Control system, and Yaw system, Brakes, Nacelle, Pitch and Hub. Figure 3 shows a typical WTG with arrangement of different parts.

The technology employed, converts wind energy to electricity. In wind power generation, energy of wind is converted into mechanical energy and subsequently into electrical energy. The technology is a clean technology since there are no GHG emissions associated with the electricity generation. The project activity has employed horizontal axis WTGs of different capacities (Enercon make 800 KW as 1* E-42 model and 42 * E-53 model, Vestas make 1650 KW as 24 * V82 model). The useful life of WTGs is 20 Years.

The main parts of a typical WTG are Blades, Rotor, Tower, Gearbox, Generator, Control system, and Yaw system, Brakes, Nacelle, Pitch and Hub. Figure shows a typical WTG with arrangement of different parts

[3] https://cdm.unfccc.int/Reference/tools/index.html

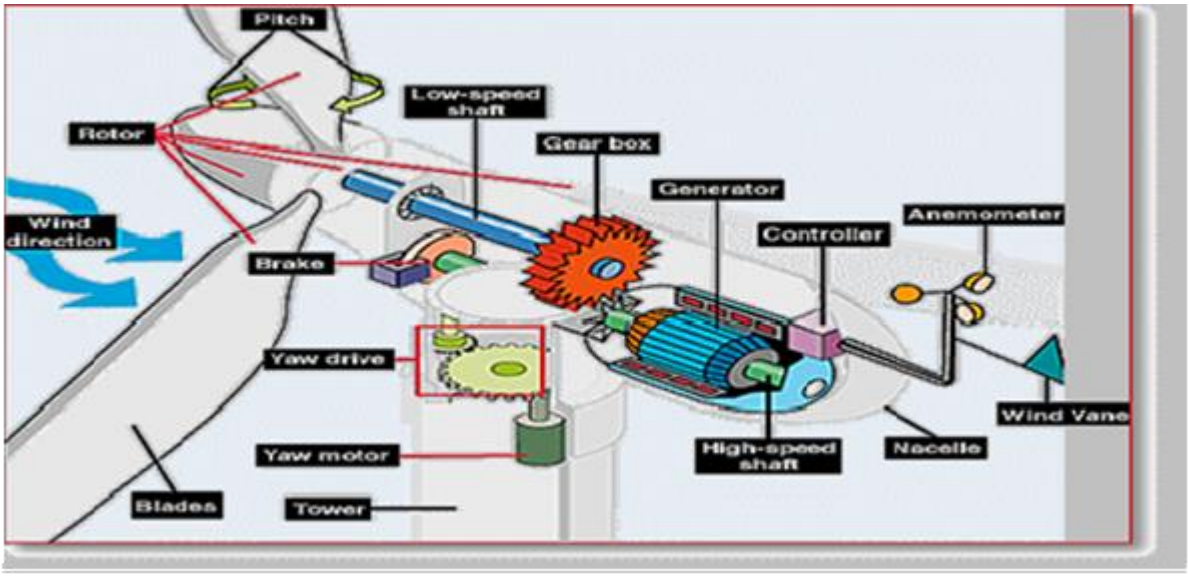

Figure Parts of WTGs

No adverse situation has arisen during the monitoring period of the project which may eventually impact the applicability of the methodology and affect the additionality of the project activity.

B.2. Post-registration changes

B.2.1. Temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents

There is no any temporary deviations from the registered monitoring plan, applied methodologies, standardized baselines or other methodological regulatory documents during current monitoring period.

B.2.2. Corrections

The name of the project participant as per Registered PDD, version 11 is “Madras Cements Limited”. The name of the project participant underwent a change from “Madras Cements Limited” to “The Ramco Cements Limited” during the previous monitoring period. The name change was also addressed in the Revised PDD, version 12, while requesting post registration changes from registered monitoring plan with UNFCCC. The Revised PDD, version 12 was approved by UNFCCC on 18/03/2016[4].

B.2.3. Changes to the start date of the crediting period

There is no Changes to the start date of the crediting period during current monitoring period.

B.2.4. Inclusion of monitoring plan

There is no inclusion of monitoring plan during current monitoring period.

B.2.5. Permanent changes to the registered monitoring plan, or permanent deviation of monitoring from the applied methodologies, standardized baselines, or other methodological regulatory documents

[4] https://cdm.unfccc.int/Projects/DB/SGS-UKL1349793965.06/view

The registered PDD, version 11 underwent a permanent change from the registered monitoring plan on account of the following:

a) Change in calibration frequency of energy meters from once in a year to once in 5 years.
b) Change in accuracy class of energy meters from 0.5 to 0.2, whenever the existing energy meters with accuracy class 0.5 needs to be replaced by a new energy meter.

The above changes were made in the Revised PDD, version 12 and submitted to UNFCCC seeking approval for post registration changes along with the Request for Issuance for 1st monitoring period from 01/11/2012 to 15/11/2013. Both the requests, i.e Request for Post registration changes and Request for Issuance were approved by UNFCCC on 18/03/2016[5].

B.2.6. Changes to project design

Not Applicable

B.2.7. Changes specific to afforestation or reforestation project activity

Not Applicable

SECTION C. Description of monitoring system

Approved monitoring methodology ACM0002 / Version 12.3.0 Sectoral Scope: 1, “Consolidated baseline methodology for grid-connected electricity generation from renewable sources”, is proposed to be used to monitor the emission reductions. This approved monitoring methodology requires monitoring of the following:

- Net electricity generation from the project activity Electricity generation

As the emission reductions from the project are determined by the number of units exported to the grid it is mandatory to have a monitoring system in place and ensure that the project activity produces and supplies the rated power at the stipulated norms. The sole objective of having monitoring system is to have a constant watch on the emission reductions.

The delivered energy is metered by the project Participant and TNEB at the high voltage side of the step up transformers installed at each HTSC connection. In accordance with electricity standards electronic tri-vector meters capable of recording and storing the parameters have been installed. The main meters are maintained and owned by TNEB whereas the panel meters are maintained and owned by the equipment suppliers. The readings from main meter are recorded once in thirty days by the authorised representative of TNEB in presence of the representative of TRCL.

The net energy supplied to the grid is calculated (by deducting the quantum of power imported during off season for machine start up or any other requirement from the gross power supplied to the grid) and issued by TNEB as a “Monthly statement”. The monthly statement is the basis of emission reductions. The main meters and the meter boxes are kept sealed by the TNEB and a joint inspection is carried out on behalf of TRCL and TNEB, in the presence of its authorised representatives. TNEB hold the responsibility of carrying out calibration of all the metering instruments. The frequency of calibration of energy meters is proposed to be once in five years16.
Organisation structure:

The day to day operation of the WTGs at the ground level is looked after by the operator. The operator reports to the Assistant Engineer (AE) - Wind Farm, who is responsible for collecting the required information from the operator. The AE – Wind Farm records the generation on a daily

[5] https://cdm.unfccc.int/Projects/DB/SGS-UKL1349793965.06/view

basis for each service connection point and reports the cumulative generation to the Manager - Electrical. The Manager – Electrical reports to the DGM – Wind Farm on a daily basis. The DGM – Wind Farm is responsible for overall operation of the WTGs. The organisation structure is given below in Figure:

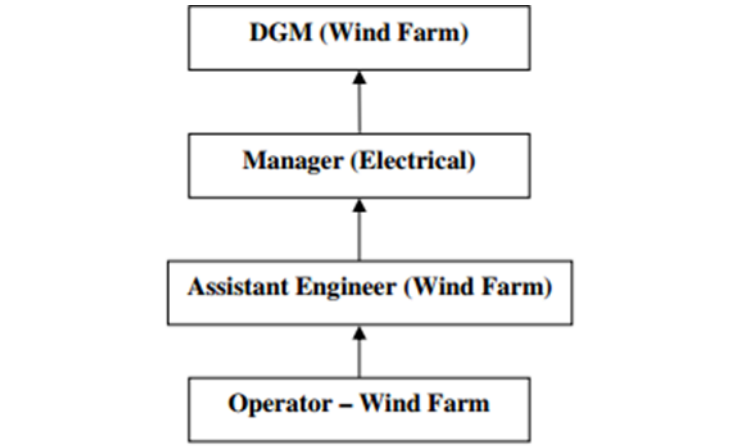

Fig B-2: Organisation structure for CDM project activity

CDM internal audit

The same project management team (detailed in the organisation structure above) is responsible for carrying out the CDM related internal audit programme.

Training and operation and maintenance arrangement

Since the project promoter does not have experience in the area of wind energy, individual agencies having requisite experience in establishing wind power plants have been appointed by TRCL so as to implement the identified project activity. All the agencies as appointed by TRCL are responsible for operation and maintenance (O&M) of the installed WTGs.

Procedures for maintenance of monitoring equipment

In the context of the identified project activity, main energy meter and check meter are the only equipment's which is required to track the monitoring parameters. As per the Power Purchase Agreement (PPA) with TNEB, all the energy meters and the meter boxes will be kept sealed by TNEB. Hence TNEB is responsible for maintenance of the main energy meter.

Procedures for handling data uncertainties In the event of failure of energy meter:

In the event of failure of energy meter:

The quantum of energy supplied to the grid by the project activity is the key parameter to be monitored. In the event of failure of energy meter the project Participant might depend upon the panel meter as fitted with the individual WTGs. Further it may be noted that in case of failure of energy meter, during the period when the faulty meter is replaced by new calibrated meter, the readings from the concerned WTG would not be available and therefore the emission reductions would not be accounted for. In this context it is to be noted that there would be separate joint meter readings (JMRs) for the faulty meter and new meter (for the faulty meter up to the time of replacement and for the new meter from the time of replacing the old faulty meter). As the emission reductions would be estimated based on the JMRs, the readings during the period of replacement of old faulty meter by new meter would not be accounted for in the calculations.

In the event when verification period dates and billing cycle of WTGs in the project activity, do not coincide:

In the event when the individual verification period dates and billing cycle dates (or dates of JMRs) of the various WTGs in the project activity do not coincide, the following procedure would be adopted to estimate the net electricity supplied to the grid during the specific period/ or days where there is a mismatch.

The primary source of data for this period would be the daily TNEB meter readings taken by TRCL site staff from the TNEB meter. From the daily readings taken by TRCL staff daily emission reductions would be calculated and recorded in the log book. This value of emission reductions would then be added or subtracted from the JMRs.

For e.g. if the verification period ends on December 10 th of a particular year and the billing cycle is from 15th of one month to 15th of next month, then daily meter readings recorded by TRCL staff from 11th to 15th December would be subtracted from the JMR of that particular month. Similarly, if the verification period an end on December 15th of a particular year and the billing cycle is from 10th of one month to 10th of next month, then daily meter readings recorded by TRCL staff from 11th to 15th December would be added to the JMR of the previous month.

SECTION D. Data and parameters

D.1. Data and parameters fixed ex ante

Data/Parameter	**$EF_{grid,CM,y}$**
Unit	tCO_2e/MWh
Description	Combined margin emission factor of Southern regional electricity grid.
Source of data	Estimated figure based on the weighted average of OM and BM values calculated using data obtained from CEA database version 4[6] on CO_2 baseline emission factor for Indian Power Sector published by Central Electric Authority India.
Value(s) applied	0.927
Choice of data or measurement methods and procedures	Published data has been considered from national database.
Purpose of data/parameter	This data is used for baseline emission calculation.
Additional comments	This value is fixed for the entire crediting period.

D.2. Data and parameters monitored

Data/Parameter	**Net Electricity Quantity supplied to the grid ($EG_{facility,y}$)**
Unit	MWh
Description	Quantity of net electricity supplied to grid by the project activity.
Measured/calculated/ default	Calculated
Source of data	Joint Meter Reading Report
Value(s) of monitored parameter	725,553.42

[6] https://cea.nic.in/wp-content/uploads/baseline/2020/07/database_4.zip

Monitoring equipment	Net electricity exported to grid is calculated as the difference of electricity exported and electricity imported from grid. Energy meters are used for monitoring of electricity export and import.
Measuring/reading/recording frequency	Continuous measurement and recorded once in a month.
Calculation method (if applicable)	Let the gross electricity exported to the grid by the project activity be 'X' MWh Let the electricity imported from the grid by the project activity be: 'Y' MWh The electricity supplied to the grid is, $EG_y = (X – Y)$ MWh
QA/QC procedures	TNEB holds the responsibility of carrying out calibration of all the metering instruments. The frequency of calibration of energy meters is once in five year[7]. At site, the operator is responsible for data collection from TNEB which is reviewed by the Assistant Engineer (AE) and Manager (Electrical) before the same is communicated to the top management for further review and necessary action. The measured value of the meter cross checked with the records of sold electricity and conservative from the same will used in CER calculation. Accuracy class of energy meters: 0.5 / 0.2[8]
Purpose of data/parameter	This data is used for baseline emission calculation
Additional comments	Joint Meter Report is the primary source of data in all cases. Daily TNEB Meter readings recorded by TRCL staff in the log book is serve as the source of data when the individual verification period dates and the dates of JMRs of the various WTGs in the project activity do not coincide.

Data/Parameter	**Electricity exported ($EG_{export, y}$)**
Unit	MWh
Description	Quantity of electricity export to grid by the project activity.
Measured/calculated/ default	Measured
Source of data	Joint Meter Reading Report
Value(s) of monitored parameter	730,505.83
Monitoring equipment	Electricity exported to grid is directly monitored by TNEB energy meters. Type: Energy Meter Accuracy class of energy meter: 0.5 / 0.2 Frequency of calibration of meters: Once in five years.
Measuring/reading/recording frequency	Continuous measurement and recorded once in a month.

[7] As per the revised PDD (version 12, approved by CDM EB), the Energy meter shall be calibrated once in five years.

[8] The WTGs in the project activity have few meters with 0.2 accuracy class and few with 0.5 accuracy class. As per the TANGEDCO notification, process of replacing the existing energy meter of accuracy class 0.5 by 0.2 accuracy class is under progress whenever there will be meter replacement in case of faulty meter.

Calculation method (if applicable)	Electricity exported to project activity is directly monitored by energy meters.
QA/QC procedures	TNEB holds the responsibility of carrying out calibration of all the metering instruments. The frequency of calibration of energy meters is once in five years. At site, the operator is responsible for data collection from TNEB which is reviewed by the Assistant Engineer (AE) and Manager (Electrical) before the same is communicated to the top management for further review and necessary action.
Purpose of data/parameter	This data used for baseline emission calculation
Additional comments	Joint Meter Report is the primary source of data in all cases. Daily TNEB Meter readings recorded by TRCL staff in the log book is serve as the source of data when the individual verification period dates and the dates of JMRs of the various WTGs in the project activity do not coincide.

Data/Parameter	**Electricity imported ($EG_{import, y}$)**
Unit	MWh
Description	Electricity imported to project activity
Measured/calculated/ default	Measured
Source of data	Joint Meter Reading Report
Value(s) of monitored parameter	4,952.41
Monitoring equipment	Electricity exported to grid is directly monitored by TNEB energy meters. Type: Energy Meter Accuracy class of energy meter: 0.5 / 0.2 Frequency of calibration of meters: Once in five years.
Measuring/reading/recording frequency	Continuous measurement and recorded once in a month.
Calculation method (if applicable)	Electricity imported to project activity is directly monitored by energy meters.
QA/QC procedures	TNEB holds the responsibility of carrying out calibration of all the metering instruments. The frequency of calibration of energy meters is once in five years. At site, the operator is responsible for data collection from TNEB which is reviewed by the Assistant Engineer (AE) and Manager (Electrical) before the same is communicated to the top management for further review and necessary action.
Purpose of data/parameter	This data used for baseline emission calculation
Additional comments	Joint Meter Report is the primary source of data in all cases. Daily TNEB Meter readings recorded by TRCL staff in the log book is serve as the source of data when the individual verification period dates and the dates of JMRs of the various WTGs in the project activity do not coincide.

D.3. Implementation of sampling plan

Not Applicable

SECTION E. Calculation of emission reductions or net anthropogenic removals

E.1. Calculation of baseline emissions or baseline net removals

According to the approved methodology ACM0002 (Version 12.3.0) emission reductions are calculated as

$ER_y = BE_y – PE_y$
Where:
BE_y : Baseline Emissions in year y (tCO_2e/yr)
PE_y : Project Emissions in year y ($t\ CO_2e/yr$)

Estimation of Baseline Emissions
As per ACM0002 (Version 12.3.0), the baseline emissions are to be calculated as follows:
$BE_y = EG_{facility\ ,\ y}\ X\ EF_{grid,CM\ ,y}$

Where:
BE_y : Baseline emissions (tCO_2e)
$EG_{facility,y}$: Quantity of net electricity generation that is produced and fed into the grid as a result of the implementation of the project activity in year (MWh)
$EF_{grid,CM\ ,y}$: Combined margin CO_2 emission factor for grid (tCO_2e/MWh)

The Baseline emission factor ($EF_{grid,CM\ ,y}$) is 0.927 tCO_2e/MWh has been estimated and validated for the project activity. This is fixed for the entire crediting period as per the registered PDD.

Baseline Emissions
= 725,553.42 X 0.927 tCO_2e/MWh
= 672,588 t CO_2e (Rounded down to nearest integer)

E.2. Calculation of project emissions or actual net removals

According to the baseline methodology ACM0002 (Version 12.3.0), the GHG emission of the proposed project within the project boundary is zero.
i.e. Project Emission (PEy) = 0.

E.3. Calculation of leakage emissions

No anthropogenic Green House Gases by sources outside the project boundary that are significant, measurable and attributable to the project activity are identified. Hence, no leakage is considered from the project activity. In addition, project proponents confirm that the renewable energy technology is not transferred from another activity. Hence, no leakage calculation is required. I.e. LEy = 0.

E.4. Calculation of emission reductions or net anthropogenic removals

	Baseline GHG emissions or baseline net GHG removals ($t\ CO_2e$)	Project GHG emissions or actual net GHG removals ($t\ CO_2e$)	Leakage GHG emissions ($t\ CO_2e$)	GHG emission reductions or net anthropogenic GHG removals ($t\ CO_2e$)			
				Before 01/01/ 2013	From 01/01/ 2013 until 31/12/ 2020	From 01/01/ 2021	Total amount
Total	672,588	0	0	0	672,588	0	672,588

E.5. Comparison of emission reductions or net anthropogenic removals achieved with estimates in the registered PDD

Amount achieved during this monitoring period ($t\ CO_2e$)	Amount estimated ex ante for this monitoring period in the PDD ($t\ CO_2e$)

Amount achieved during this monitoring period (t CO_2e)	Amount estimated ex ante for this monitoring period in the PDD (t CO_2e)
672,588	789,147

E.5.1. Explanation of calculation of "amount estimated ex ante for this monitoring period in the PDD"

Considering the annual average emission reductions as per the registered PDD which is 156,288 tCO_2e per year, the number of days since commissioning covered during the current monitoring period comes out to be 1843 days. The amount estimated is using unitary method i.e. 156,288/365*1,843= 789,147 tCO_2e.

E.6. Remarks on increase in achieved emission reductions

The achieved emission reduction is 14.77 % lower than the estimated emission reductions. This is due to lower PLF achieved during the current monitoring period as compared to the estimated PLF in the registered PDD.

E.7. Remarks on scale of small-scale project activity

This project activity remains large scale throughout the monitoring period.

Appendix 1. Detailed location and commissioning dates of wind turbine generators (WTGs)

Wind Mill HTSC No.	No. of WEGs & Capacity in 'KW'	Make	Location	Latitude (N Degree Minutes Second)	Longitude (E Degree Minutes Second)	Date of commissio ning
D97	1X800	ENERCON	Melkaraipatti	N10 36 5.822	E77 24 2.497	23/07/2007
D98	1X800	ENERCON	Melkaraipatti	N10 35 25.7	E77 27 25.556	23/07/2007
D99	1X800	ENERCON	Melkaraipatti	N10 35 17.777	E77 27 40.388	23/07/2007
D100	1X800	ENERCON	Kozhumankundan	N10 33 22.967	E77 25 31.349	23/07/2007
D101	1X800	ENERCON	Medapadi	N10 33 32.172	E77 25 10.455	02/08/2007
D102	1X800	ENERCON	Medapadi	N10 33 21.471	E77 25 5.923	02/08/2007
D122	1X800	ENERCON	Kozhumankundan	N10 33 47.03	E77 26 6.389	27/09/2007
D116	2X800	ENERCON	Muthunaickenpatti	N10 35 55.43, N10 35 52.793	E77 24 59.435, E77 25 12.37	27/09/2007
D115	1X800	ENERCON	Muthunaickenpatti	N10 33 48.419	E77 24 31.989	27/09/2007
D121	2X800	ENERCON	Melkaraipatti	N10 33 12.822, N10 35 18.626	E77 27 16.773, E77 27 10.868	27/09/2007
D120	1X800	ENERCON	Melkaraipatti	N10 35 34.50	E77 27 15.17	27/09/2007
D119	2X800	ENERCON	Melkaraipatti	N10 35 52.105, N10 36 6.094	E77 27 14.39, E77 27 6.084	27/09/2007

Wind Mill HTSC No.	No. of WEGs & Capacity in 'KW'	Make	Location	Latitude (N Degree Minutes Second)	Longitude (E Degree Minutes Second)	Date of commissio ning
D118	1X800	ENERCON	Melkaraipatti	N10 39 53.363	E77 27 5.333	27/09/2007
D117	1X800	ENERCON	Melkaraipatti	N10 36 33.779	E77 27 5.877	27/09/2007
D129	7X800	ENERCON	Melkaraipatti	N10 36 7.969, N10 36 14.638, N10 36 20.462, N10 36 26.492, N10 36 30.692, N10 36 33.355, N10 36 43.574	E77 28 1.439, E77 28 5.537, E77 27 57.231, E77 27 51.525, E77 27 42.812, E77 27 26.820, E77 27 26.244	28/09/2007
D134	1X800	ENERCON	Rajampatti	N10 35 26.614	E77 24 49.969	02/01/2008
D133	1X800	ENERCON	Rajampatti	N10 37 1.551	E77 26 33.839	02/01/2008
D132	2X800	ENERCON	Rajampatti	N10 35 11.947, N10 36 46.863	E77 24 49.427, E77 26 44.245	02/01/2008
D140	2X800	ENERCON	Rajampatti	N10 36 1.294, N10 35 44.379	E77 24 45.736, E77 24 45.439	15/03/2008
D139	2X800	ENERCON	Rajampatti	N10 35 51.574, N10 36 41.402	E77 24 48.981, E77 246 31.245	15/03/2008
D135	7X800	ENERCON	Rajampatti	N10 37 17.098, N10 37 24.643, N10 37 30.434, N10 37 10.151, N10 37 13.542, N10 37 4.232, N10 36 57.384	E77 26 55.041, E77 26 38.692, E77 26 51.136, E77 26 28.152, E77 26 10.488, E77 26 7.092, E77 26 13.319	15/03/2008
D138	2X800	ENERCON	Rajampatti	N10 36 51.945, N10 37 1.115	E77 25 40.589, E77 25 45.298	15/03/2008

D137	1X800	ENERCON	Rajampatti	N10 37 15.869	E77 25 47.388	15/03/2008
D136	1X800	ENERCON	Rajampatti	N10 37 28.380	E77 25 49.131	15/03/2008
U1459	1X1650	VESTAS	Udumalpet	N10 35 51.42	E77 14 8.7	27/07/2007
U1460	1X1650	VESTAS	R. Velur	N10 34 29.88	E 77 11 26.1	31/07/2007
U1464	1X1650	VESTAS	Venasapatti	N10 37 14.34	E77 12 4.86	16/08/2007
U1465	1X1650	VESTAS	Ragalpavi	N10 34 50.64	E77 11 18.9	16/08/2007
U1468	1X1650	VESTAS	Thungavi	N10 37 45.6	E77 21 51.24	22/08/2007
U1469	1X1650	VESTAS	Thungavi	N10 37 59.1	E77 21 48.24	22/08/2007
U1522	1X1650	VESTAS	Thungavi	N10 38 10.5	E77 21 31.2	29/03/2008
U1532	1X1650	VESTAS	Metrathi	N10 38 33.54	E77 20 18.24	31/03/2008
2505	1X1650	VESTAS	Vadi	N8 58 097	E77 27 .549	31/12/2007
2506	1X1650	VESTAS	Rajagopaperi	N8 57 .193	E77 27 .533	22/01/2008
2507	1X1650	VESTAS	Vadi	N8 57 .504	E77 27 .620	24/01/2008
2509	1X1650	VESTAS	Anaikulam	N9 00 06.2	E77 27 24.3	04/02/2008
2510	1X1650	VESTAS	Vadi	N8 59 02.7	E77 28 06.4	13/02/2008
2522	1X1650	VESTAS	Rajagopaperi	N8 56 .944	E77 27 .823	17/03/2008
2616	1X1650	VESTAS	Rajagopalaperi	N8 56 40.7	E77 27 48.0	22/04/2008
2629[9]	1X1650	VESTAS	Uthumalai	N8 58 20.3	E77 32 47.7	23/05/2008
2357[10]	1X1650	VESTAS	Therku Valliyoor	N8 19 45.8	E77 37 30.2	04/06/2007

2358	1X1650	VESTAS	Therku Valliyoor	N8 19 19.4	E77 37 38.7	04/06/2007
2359	1X1650	VESTAS	Therku Valliyoor	N8 19 39.6	E77 37 12.8	04/06/2007
2360	1X1650	VESTAS	Therku Valliyoor	N8 19 32.7	E77 37 34.3	04/06/2007
2361	1X1650	VESTAS	Samugaranga puram	N8 18 45.0	E77 40 06.8	05/06/2007
2362	1X1650	VESTAS	Samugaranga puram	N8 18 53.6	E77 40 36.3	05/06/2007
2367	1X1650	VESTAS	Soundarapan diapuram	N8 18 40.9	E77 39 30.4	14/06/2007
2368	1X1650	VESTAS	Therku Valliyoor	N8 19 55.1	E77 36 59.8	15/06/2007

Appendix 2. Technical specification of WTGs

VESTAS V 82 (1650 kW) WTG

OPERATIONAL CONDITIONS

Calculated lifetime : 20 years

Cut in wind speed : 3.5 m/s

Cut out wind speed : 20 m/s

Maximum rotational speed : 14.4 rpm

MAIN SPECIFICATION

Rotor Diameter : 82 m

No of Rotor Blade 3

Power Control : Active stall

Rotational speed (Synchronous) : 14.4 rpm

Rotor position : Upwind

Nominal power : 1650 kW

Hub height : 78 m

ROTOR

Rotor Diameter : 82 m

Tilt angle 50

Swept area : 5281 m2

BLADE

Material : Carbon Fibre/ Epoxy/ Wood

Blade length : 40 m

Blade profile : FFA-W3, NACA 63.4

Air Brake : Full Blade

HUB

Type : Spherical

Material : EN-GJS-400-18U-LT

MAIN SHAFT

Type : Forged shaft and flange

Material : 34 CrNiM06

MAIN BEARING

Front bearing : Spherical roller bearing

MAIN GEARBOX

Gear ratio : 1:70.2

Mechanical Power : 1800 kW

COUPLINGS

Gearbox/generator : Flexible

GENERATOR

Nominal power : 1650 kW

Rotational speed (Synchronous) : 1012 rpm at rated power

Insulation class : F/B

Protection class (IEC529) : IP54

MACHINE FRAME

Type : Casted front end

Material : EN-GJS-400-18U-LT

YAWING SYSTEM

Yaw bearing, type : ball bearing, internal gearing

Yaw motor : 6 Nos.

Yaw gear : 6 pcs

Gearing ratio : 1/1666

Yaw brake : Hydraulic disc brake, 6 pcs

MECHANICAL BRAKE

Type : Fail safe – Hydraulic release

Position : Mounted on High speed shaft

No of calipers : 1 pc

TOWER

Type : Conical tubular

Height (optional) : 75.5 m

Corrosion protection : Acc. to ISO 12944: C5 I

CONTROL SYSTEM

Manufacture : Vestas control systems

Type : Microprocessor based

ENERCON E - 53 (800 kW) WTG

The Wind Energy Converter E- 53 features variable speed and active pitch control. The Generator is flanged directly to the hub.

Turbine model : Enercon E - 53

Rated power : 800KW

Rotor Diameter : 53 m

Hub height : 75 m

Turbine type : Gearless horizontal axis wind turbine with variable rotor speed

Power regulation : Independent electromechanical pitch system for each blade

Cut in wind speed : 3 m/s

Rated wind speed : 12.5 m/s

Cut out wind speed : 28 – 34 m/s

Extreme wind speed : 59.5 m/s

Rated rotational speed : 31.5 rpm

Operational range rot speed : 16 – 31.5 rpm

Orientation : Upwind

No of Blades 3

Blade material : Glass fibre reinforced epoxy

Gear box type : Gear less

Generator type : Synchronous

Braking : Aerodynamic

Output Voltage : 400 V

Yaw system : Active yawing with 4 electric yaw drives with brake motor and friction bearing

Tower : 74 m Concrete tower

ENERCON E - 48 (800 kW) WTG

The Wind Energy Converter E- 48 features variable speed and active pitch control. The Generator is flanged directly to the hub.

Turbine model : Enercon E - 48

Rated power : 800KW

Rotor Diameter : 48 m

Hub height : 75 m

Turbine type : Gearless horizontal axis wind turbine with variable rotor speed

Power regulation : Independent electromechanical pitch system for each blade

Cut in wind speed : 3 m/s

Rated wind speed : 12.5 m/s

Cut out wind speed : 28 – 34 m/s

Extreme wind speed : 59.5 m/s

Rated rotational speed : 31.5 rpm

Operational range rot speed : 16 – 31.5 rpm

Orientation : Upwind

No of Blades 3

Blade material : Glass fibre reinforced epoxy

Gear box type : Gear less

Generator type : Synchronous

Braking : Aerodynamic

Output Voltage : 400 V

Yaw system : Active yawing with 4 electric yaw drives with brake motor and friction bearing

Tower : 74 m Concrete tower

Appendix 3. Details on Energy Meter changes

HTSC No.	Old meter serial no.	New meter serial no.	Date of meter change	Accuracy class of new meter
D 97	321	B 116	29/03/2016	0.2s
	B 116	B 171	01/06/2016	0.2s
D 98	04892637	627631	21/12/2016	0.2s
D 99	04892636	624771	21/12/2016	0.2s
D 100	04892640	624773	24/12/2016	0.2s
D 101	13192497	3033773	19/01/2018	0.2s
D 102	04892642	624774	24/12/2016	0.2s
D 115	HT 02120292	3033542	09/01/2018	0.2s
D 116	14193322	3033541	09/01/2018	0.2s
D 117	15193068	3033532	08/01/2018	0.2s
D 118	TN 902861	3033531	08/01/2018	0.2s
D 119	10267837	627635	21/12/2016	0.2s
D 120	04959602	627547	21/12/2016	0.2s
D 121	04901297	627639	21/12/2016	0.2s
	627639	HT 2180266		0.2s
D 122	15198103	3033547	09/01/2018	0.2s
D 129	15196250	3033538	08/01/2018	0.2s
D 132	4901448	627632	24/12/2016	0.2s
D 133	1519232	3033533	08/01/2018	0.2s
D 134	04901367	627550	21/12/2016	0.2s
D 135	TN 902395	3033537	08/01/2018	0.2s
D 136	14191988	3033534	08/01/2018	0.2s
D 137	HT 02120283	3033535	08/01/2018	0.2s

D 138	14192002	3033536	08/01/2018	0.2s
D 139	14193328	3033540	09/01/2018	0.2s
D 140	TN 902403	3033539	09/01/2018	0.2s

HTSC No.	**Old meter serial no.**	**New meter serial no.**	**Date of meter change**	**Accuracy class of new meter**
2357	12090151	X 0369852	22/01/2018	0.2s
2358	TN 902008	16196176	03/09/2016	0.2s
2359	13192519	X 0369703	22/01/2018	0.2s
2360	15198072	X 0369433	22/01/2018	0.2s
2361	TNB 04109	16196210	01/08/2016	0.2s
2362	12091943	X 0369851	22/01/2018	0.2s
2367	12091957	X 0369435	22/01/2018	0.2s
2368	04892607	16196260	03/09/2016	0.2s
2505	09593234	TN 3577	21/03/2017	0.2s
2506	09593235	TN 3887	05/04/2017	0.2s
2507	09593236	TN 03403	21/03/2017	0.2s
2509	09593237	TN 3578	21/03/2017	0.2s
2510	09593239	TN 3465	21/03/2017	0.2s
2522	09593240	TN 3888	21/03/2017	0.2s
2616	10287890	TN 3889	21/03/2017	0.2s
2629	12092089	17256261	27/11/2017	0.2s

HTSC No.	Old meter serial no.	New meter serial no.	Date of meter change	Accuracy class of new meter
1459	13192511	3033948	30/01/2018	0.2s
1460	12091961	3033953	31/01/2018	0.2s
1464	15198106	3033950	31/01/2018	0.2s
1465	HT 2110724	16196186	05/06/2017	0.2s
1468	04889975	HT 2160247	06/02/2017	0.2s
	HT 2160247	4321903	19/12/2020	0.2s
1469	04889961	HT 2160246	06/02/2017	0.2s
	HT 2160246	5840087	19/12/2020	0.2s
1522	TN 901621	HT 2160248	06/02/2017	0.2s
1532	15193091	3033335	17/01/2018	0.2s

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Document information

Version	*Date*	*Description*
09.0	8 October 2021	Revision to: • Ensure consistency with version 03.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN).
08.0	6 April 2021	Revision to: • Reflect the "Clarification: Regulatory requirements under temporary measures for post-2020 cases" (CDM-EB109-A01-CLAR).
07.0	31 May 2019	Revision to: • Ensure consistency with version 02.0 of the "CDM project standard for project activities" (CDM-EB93-A04-STAN); • Add a section on remarks on the observance of the scale limit of small-scale project activity during the crediting period; • Add "changes specific to afforestation or reforestation project activity" as a possible post-registration changes; • Clarify the reporting of net anthropogenic GHG removals for A/R project activities between two commitment periods; • Make editorial improvements.

Version	*Date*	*Description*
06.0	7 June 2017	Revision to: • Ensure consistency with version 01.0 of the “CDM project standard for project activities” (CDM-EB93-A04-STAN); • Make editorial improvements.
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: • Include provisions related to delayed submission of a monitoring plan; • Provisions related to the Host Party; • Remove reference to programme of activities; • Overall editorial improvement.
04.0	25 June 2014	Revisions to: • Include the Attachment: Instructions for filling out the monitoring report form (these instructions supersede the "Guideline: Completing the monitoring report form" (Version 04.0)); • Include provisions related to standardized baselines; • Add contact information on a responsible person(s)/ entity(ies) for completing the CDM-MR-FORM in A.6 and Appendix 1; • Change the reference number from *F-CDM-MR* to *CDM-MR-FORM*; • Editorial improvement.
03.2	5 November 2013	Editorial revision to correct table in page 1.
03.1	2 January 2013	Editorial revision to correct table in section E.5.
03.0	3 December 2012	Revision required to introduce a provision on reporting actual emission reductions or net GHG removals by sinks for the period up to 31 December 2012 and the period from 1 January 2013 onwards (EB 70, Annex 11).
02.0	13 March 2012	Revision required to ensure consistency with the "Guidelines for completing the monitoring report form" (EB 66, Annex 20).
01.0	28 May 2010	EB 54, Annex 34. Initial adoption.

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