



Monitoring report form (Version 05.1)

Complete this form in accordance with the Attachment "Instructions for filling out the monitoring report form" at the end of this form.

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 monitoring report	2.0	
Completion date of the monitoring report	19/05/2016	
Monitoring period number and duration of this monitoring period	Monitoring Period: 02 Monitoring Period duration: 16/11/2013 to 15/12/2015 (first & last days are included)	
Project participant(s)	The Ramco Cements Limited	
Host Party	India	
Sectoral scope(s)	Sectoral scope: 01 Energy Industries (renewable -/ non-renewable sources)	
Selected methodology(ies)	Consolidated baseline methodology for grid-connected electricity generation from renewable sources. Reference : ACM0002, Version : 12.3.0	
Selected standardized baseline(s)	Not Applicable	
Estimated amount of GHG emission reductions or net GHG removals by sinks for this monitoring period in the registered PDD	312,576 ¹ tCO ₂ e	
Total amount of GHG emission reductions or net GHG removals by sinks achieved in this monitoring period	GHG emission reductions or net GHG removals by sinks reported up to 31 December 2012	GHG emission reductions or net GHG removals by sinks reported from 1 January 2013 onwards
	Not Applicable	209,073 tCO ₂ e

¹ According to the registered PDD, the estimated annual emission reductions are 156,288 tCO₂e (for 365days). The current monitoring period is from 16/11/2013 to 15/12/2015 (730 days). Therefore, emission reductions for this duration is (156,288*730/365) i.e. 312,576 tCO₂e (rounded down value).

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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The project activity involves the implementation and operation of 74 MW capacity wind energy project, in Coimbatore, Dindigul and Tirunelveli districts of Tamilnadu, India. The main purpose of the project activity is to generate clean electricity from renewable energy source (wind) and export the net electricity to the Southern grid of India. The project activity helps to reduce the Greenhouse Gases (GHG) emissions produced by the grid generation mix, which is mainly dominated by fossil fuel based power plants.

Technology employed in the project activity utilizes the kinetic energy of the wind which is converted into mechanical energy and subsequently into electrical energy. Under the project activity total 67 WTGs have been installed to generate clean power in Tamilnadu state. Out of 67 WTGs, 43 WTGs are of Enercon make with a capacity of 800 KW each and 24 WTGs are of Vestas make with a capacity of 1650 KW each. Location and capacity of wind turbine generators of the project activity are described below:

Table 1- Details of WTG Installations

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

Detailed technical description of the WTGs has been provided in Appendix - 3.

Relevant dates for the Project activity:

The project has been registered with UNFCCC on 18/10/2012 and the project UNFCCC registration number is 7647. The duration of the monitoring period considered under this monitoring report is 16/11/2013 to 15/12/2015 (both the dates included). The length of the crediting period for the project activity is 10 years. The important dates related to the project activity are listed below table.

Table 2- Relevant dates of the project activity

Project activity	Dates
Start date of the project activity (i.e. date of the Letter of Intent (LoI) for purchase of 12*1650 KW Turbines to Vestas)	15/04/2007
Commissioning date of first set of WTGs under the project activity.	04/06/2007
Commissioning date of last WTG under the project activity (Commissioning Date of entire WTGs under the project activity has been explicitly mentioned under Appendix-2)	23/05/2008
CDM Registration date of the project activity	18/10/2012
Crediting Period	01/11/2012 to 31/10/2022 (Fixed)
1 st Periodic Monitoring period	01/11/2012 to 15/11/2013

Project activity is in continuous operation since the respective dates of commissioning.

Emission reductions achieved in the current monitoring period:

The duration of the current monitoring period considered under this monitoring report is 16/11/2013 to 15/12/2015 (inclusive of both the dates). The emission reduction achieved under this monitoring period is 209,073 tCO₂e.

A.2. Location of project activity

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- a. Host Party – India
- b. State – TamilNadu
- c. Districts – Coimbatore, Dindigul and Tirunelveli districts.



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

Tamilnadu state



Fig 2:- showing the districts under the project activity

Coimbatore district

Dindigul district

Tirunelveli district

A.3. Parties and project participant(s)

Party involved (host) indicates a host Party)	Private and/or public entity(ies) project participants (as applicable)	Indicate whether the Party involved wishes to be considered as project participant (yes/no)
India (host party)	The Ramco Cements Limited (Private Entity)	No

A.4. Reference of applied methodology and standardized baseline

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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.²

Tools Reference:

1. Tool to calculate the emission factor for an electricity system, (version 02.2.1³)
2. Tool for the demonstration and assessment of additionality (version 6⁴)

Standardized baseline:

Not applicable.

A.5. Crediting period of project activity

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Crediting Period : Fixed crediting period (10 years) has been considered for this project activity

Start date of the Crediting Period : 01/11/2012

Duration of the Crediting Period : 10 years (01/11/2012 – 31/10/2022)

Duration for the current Monitoring Period : 16/11/2013 – 15/12/2015 (both dates included)

A.6. Contact information of responsible persons/entities

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The Ramco Cements Limited.

The entity is a Project Participant and contact details are provided in the Appendix 1.

SECTION B. Implementation of project activity**B.1. Description of implemented registered project activity**

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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 employed⁵, 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

² <http://cdm.unfccc.int/methodologies/DB/MPY3HVJIMTKE5P0UNTYE827D6Q7EHB>

³ <http://cdm.unfccc.int/Reference/tools/index.html>

⁴ <http://cdm.unfccc.int/Reference/tools/index.html>

⁵ Detailed technical description of the WTGs has been provided in Appendix- 3.

parts of a typical WTG are Blades, Rotor, Tower, Gearbox, Generator, Control system, Yaw system, Brakes, Nacelle, Pitch and Hub. Figure 3 shows a typical WTG with arrangement of different parts.

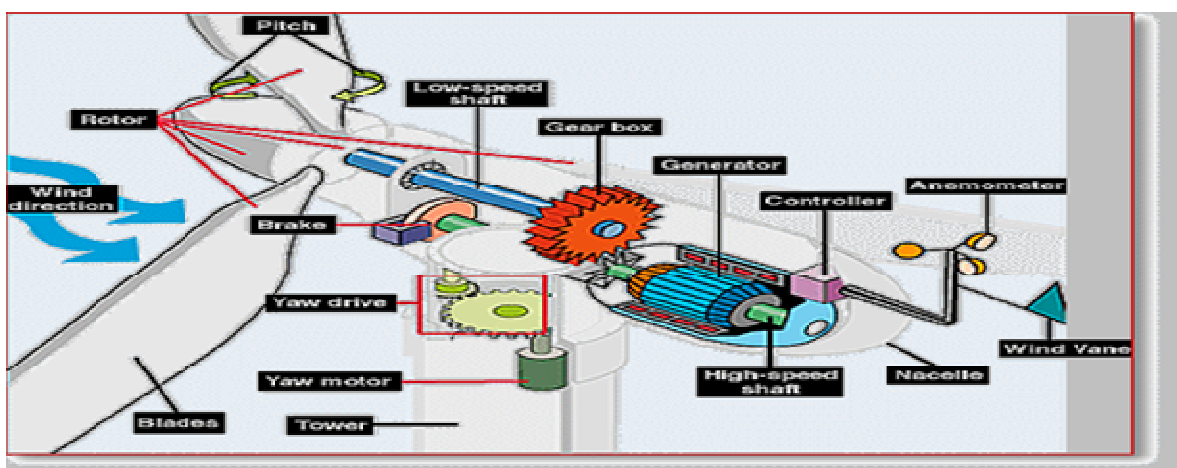


Fig.3 Parts of a WTG

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 registered monitoring plan, applied methodology or applied standardized baseline

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Not applicable.

B.2.2. Corrections

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Not

B.2.3. Changes to start date of crediting period

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Not applicable.

B.2.4. Inclusion of a monitoring plan to the registered PDD that was not included at registration

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Not applicable.

B.2.5. Permanent changes from registered monitoring plan, applied methodology or applied standardized baseline

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Not applicable.

B.2.6. Changes to project design of registered project activity

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Not applicable.

B.2.7. Types of changes specific to afforestation or reforestation project activity

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Not applicable.

SECTION C. Description of monitoring system

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According to the registered PDD, following parameter is being monitored in the project activity:

- Net Electricity Quantity supplied to the grid ($EG_{\text{facility}, y}$)
- Electricity exported ($EG_{\text{export}, y}$)
- Electricity imported ($EG_{\text{import}, y}$)

The parameter (Net Electricity Quantity supplied to the grid) is calculated as difference of gross electricity exported and electricity imported from grid. The monthly Joint Meter Readings (JMRs) issued by State Electricity Utility reflects the direct reading of electricity exported from the site and electricity imported from the grid.

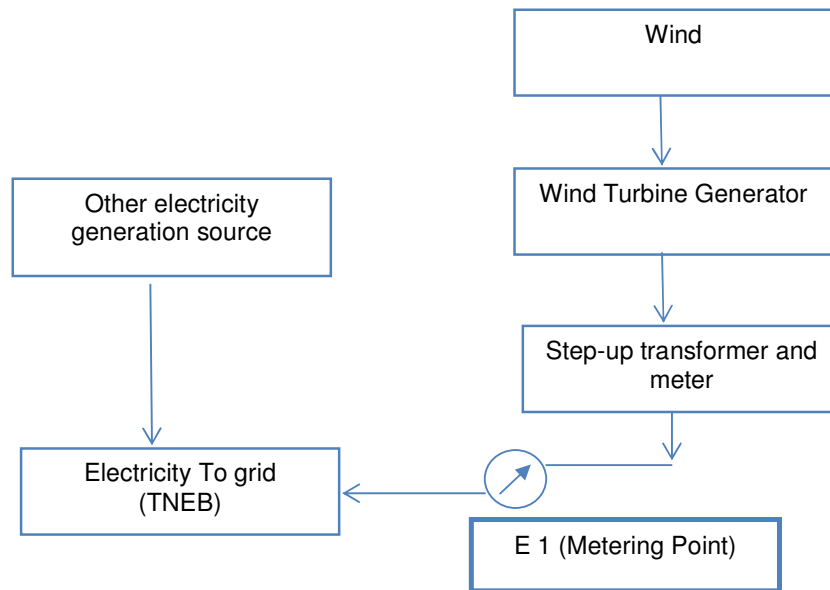


Fig 4: Project line diagram

All the energy meters are under the purview of TNEB (state electricity utility) for calibration. The frequency of the meter calibration is once in 5 years, the JMR is the primary source of data in all cases and the basis of emission reductions. Daily TNEB meter readings is also recorded and monitored by project operational & management team in the log books; these readings 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.

Operational and Management structure for the project activity:

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 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 organization structure is given below.

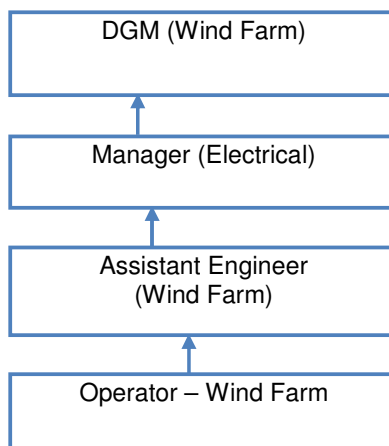


Fig 5: Organization structure for CDM project activity

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

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 are kept sealed by TNEB. Hence TNEB is responsible for maintenance of the energy meters.

Procedures for handling data uncertainties

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 meters 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 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 is adopted to estimate the net electricity supplied to the grid during the specific period/ or days where there is a mis-match.

“The primary source of data for this period is the daily TNEB meter readings taken by TRCL site staff from the TNEB meter. This daily recorded value is added or subtracted from the JMR value to coincide the verification period dates and billing cycle dates.”

SECTION D. Data and parameters**D.1. Data and parameters fixed ex ante or at renewal of crediting period**

Data/parameter:	$EF_{grid,CM,y}$
Unit	tCO ₂ e/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 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	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	225537.268
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:	<p>TNEB holds the responsibility of carrying out calibration of all the metering instruments. The frequency of calibration of energy meters is once in five year⁶.</p> <p>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.</p> <p>The measured value of the meter will be cross checked with the records of sold electricity and conservative from the same will used in CER calculation.</p> <p>Accuracy class of energy meters: 0.5 / 0.2⁷</p>
Purpose of data:	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	Description:
Measured/calculated/default	Measured
Source of data	Joint Meter Reading Report.
Value(s) of monitored parameter	227560.068
Monitoring equipment	<p>Electricity exported to grid is directly monitored by TNEB energy meters.</p> <p>Type: Energy Meter</p> <p>Accuracy class of energy meter: 0.5 / 0.2</p> <p>Frequency of calibration of meters: Once in five years.</p>
Measuring/reading/recording frequency:	Continuous measurement and recorded once in a month.
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 proposed to be 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:	This data used for baseline emission calculation

⁶ As per the revised PDD (version 12, approved by CDM EB), the Energy meter shall be calibrated once in five years.

⁷ 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.

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.
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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	2022.800
Monitoring equipment	Electricity imported from 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 proposed to be 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:	This data used for baseline emission calculation
Additional comments:	Joint Meter Report will be the primary source of data in all cases. Daily TNEB Meter readings recorded by TRCL staff in the log book will 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

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Not applicable.

SECTION E. Calculation of emission reductions or GHG removals by sinks

E.1. Calculation of baseline emissions or baseline net GHG removals by sinks

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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 ($t CO_2e/yr$)

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. $PE_y = 0$

Therefore the above equation is simplified to

$$ER_y = BE_y$$

Estimation of Baseline Emissions

As per ACM0002 (Version 12.3.0), the baseline emissions are to be calculated as follows:

$$BE_y = EG_{\text{facility}, y} \times EF_{\text{grid}, \text{CM}, y}$$

Where:

BE_y : Baseline emissions (tCO₂e)

$EG_{\text{facility}, y}$: 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)

$EF_{\text{grid}, \text{CM}, y}$: Combined margin CO₂ emission factor for grid (tCO₂e/MWh)

The Baseline emission factor ($EF_{\text{grid}, \text{CM}, y}$) is 0.927 tCO₂e/MWh has been estimated and validated for the project activity. This is fixed for the entire crediting period as per the registered PDD.

Emission Reduction Calculation:

For the entire project activity, for the period 16/11/2013 to 15/12/2015

The gross electricity exported to the grid by the project activity
= 227,560,068 kWh

The electricity imported from the grid by the project activity
= 2,022,800 kWh

Net Electricity Export to grid = (227,560,068 – 2,022,800) = 225,537,268 kWh

Baseline Emissions

= (225,537,268/1000 MWh) X (0.927 tCO₂e/MWh)
= 209,073.05 tCO₂e
= **209,073.00 tCO₂e** (round down)

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

In the current monitoring period, the verification period dates and billing cycle dates (or dates of JMRs) of the various HTSC No. in the project activity do not coincide, hence the primary source of data for this period is the daily TNEB meter readings recorded by TRCL site staff from the TNEB meter.

Example: for HTSC 2505:

The monitoring period starts on 16/11/2013, the JMR dates are 05/11/2013 to 05/12/2013 (for HTSC in Uthumalai Site). Hence the daily meter reading recorded by TRCL staff for 16/11/2013 to 05/12/2013 has been considered to match the current monitoring period of the particular month JMR (November 2013). The same value has been used for the emission reduction calculation.

Similarly verification period ends on 15/12/2015, the JMR dates are 05/12/2015 to 05/01/2016. Hence the daily meter reading recorded by TRCL staff for the period 05/12/2015 to 15/12/2015 has been considered to match the current monitoring period of the particular month JMR (December 2015). The same value has been used for the emission reduction calculation.

Similar procedure has been followed for other HTSC Nos. and the details of the same have been provided in emission reduction sheet separately.

Month-wise Gross electricity export, Electricity import, Net electricity export and Baseline Emission

details are listed below:

Table 3 : Thandayarkulam Site

Month	Gross Electricity Supplied to Grid (EGexport) (kWh)	Electricity Imported from the Grid (EGimport) (kWh)	Net Electricity Exported (EGfacility,y= EGexport - EGimport) (kWh)	Emission Factor (EFgrid,cm,y), tCO ₂ /MWh	Baseline Emissions (BEy), tCO ₂
Dec-13	886530	27150	859380	0.927	796.65
Jan-14	2567100	4140	2562960	0.927	2375.86
Feb-14	2383560	9150	2374410	0.927	2201.08
Mar-14	1809960	9840	1800120	0.927	1668.71
Apr-14	1300800	27150	1273650	0.927	1180.67
May-14	595410	26370	569040	0.927	527.50
Jun-14	3327180	15300	3311880	0.927	3070.11
Jul-14	3415920	10710	3405210	0.927	3156.63
Aug-14	3402240	9150	3393090	0.927	3145.39
Sep-14	2215590	12540	2203050	0.927	2042.23
Oct-14	1193280	26730	1166550	0.927	1081.39
Nov-14	335580	28440	307140	0.927	284.72
Dec-14	2367300	5610	2361690	0.927	2189.29
Jan-15	1474560	12960	1461600	0.927	1354.90
Feb-15	2017950	3360	2014590	0.927	1867.52
Mar-15	1158240	17100	1141140	0.927	1057.84
Apr-15	589650	24210	565440	0.927	524.16
May-15	228900	29310	199590	0.927	185.02
Jun-15	1996170	7710	1988460	0.927	1843.30
Jul-15	3099420	7500	3091920	0.927	2866.21
Aug-15	2455830	17460	2438370	0.927	2260.37
Sep-15	2039370	15480	2023890	0.927	1876.15
Oct-15	1538700	17640	1521060	0.927	1410.02
Nov-15	327540	26490	301050	0.927	279.07
Dec-15	615930	13080	602850	0.927	558.84
	43342710	404580	42938130		39803.65

Table 4 : Pushpathur Site

Month	Gross Electricity Supplied to Grid (EGexport) (kWh)	Electricity Imported from the Grid (EGimport) (kWh)	Net Electricity Exported (EGfacility,y= EGexport - EGimport) (kWh)	Emission Factor (EFgrid,cm,y), tCO ₂ /MWh	Baseline Emissions (BEy), tCO ₂
Dec-13	513624	21740	491884	0.927	455.98
Jan-14	1021644	25344	996300	0.927	923.57
Feb-14	1087548	20820	1066728	0.927	988.86

Mar-14	2093980	13092	2080888	0.927	1928.98
Apr-14	1822840	18348	1804492	0.927	1672.76
May-14	1688876	25264	1663612	0.927	1542.17
Jun-14	8436576	15808	8420768	0.927	7806.05
Jul-14	13450304	12932	13437372	0.927	12456.44
Aug-14	14112316	20784	14091532	0.927	13062.85
Sep-14	7417748	25908	7391840	0.927	6852.24
Oct-14	3223200	25468	3197732	0.927	2964.30
Nov-14	476892	36252	440640	0.927	408.47
Dec-14	644148	26164	617984	0.927	572.87
Jan-15	456036	29768	426268	0.927	395.15
Feb-15	987948	26472	961476	0.927	891.29
Mar-15	1003204	23088	980116	0.927	908.57
Apr-15	998028	26544	971484	0.927	900.57
May-15	640984	37328	603656	0.927	559.59
Jun-15	3586436	34588	3551848	0.927	3292.56
Jul-15	11389444	21172	11368272	0.927	10538.39
Aug-15	11304212	19484	11284728	0.927	10460.94
Sep-15	5941928	26444	5915484	0.927	5483.65
Oct-15	3333752	32856	3300896	0.927	3059.93
Nov-15	474832	35732	439100	0.927	407.05
Dec-15	244700	56412	188288	0.927	174.54
	96351200	657812	95693388		88707.77

Table 5 : Uthumalai Site

Month	Gross Electricity Supplied to Grid (EGexport) (kWh)	Electricity Imported from the Grid (EGimport) (kWh)	Net Electricity Exported (EGfacility,y= EGexport - EGimport) (kWh)	Emission Factor (EFgrid,cm,y), tCO ₂ /MWh	Baseline Emissions (BEy), tCO ₂
Dec-13	61980	21090	40890	0.927	37.91
Jan-14	125970	26400	99570	0.927	92.30
Feb-14	222240	21180	201060	0.927	186.38
Mar-14	218550	25620	192930	0.927	178.85
Apr-14	548340	30390	517950	0.927	480.14
May-14	816030	25020	791010	0.927	733.27
Jun-14	4190220	3630	4186590	0.927	3880.97
Jul-14	5909940	1110	5908830	0.927	5477.49
Aug-14	5015550	1110	5014440	0.927	4648.39
Sep-14	3101670	4020	3097650	0.927	2871.52
Oct-14	2119380	11670	2107710	0.927	1953.85
Nov-14	1132050	19710	1112340	0.927	1031.14
Dec-14	158370	26280	132090	0.927	122.45
Jan-15	67950	23940	44010	0.927	40.80

Feb-15	104400	22080	82320	0.927	76.31
Mar-15	125490	22620	102870	0.927	95.36
Apr-15	206010	34290	171720	0.927	159.18
May-15	293010	19230	273780	0.927	253.79
Jun-15	1420800	10320	1410480	0.927	1307.51
Jul-15	3523140	2070	3521070	0.927	3264.03
Aug-15	5434080	780	5433300	0.927	5036.67
Sep-15	4024350	8640	4015710	0.927	3722.56
Oct-15	2343030	10350	2332680	0.927	2162.39
Nov-15	243900	22920	220980	0.927	204.85
Dec-15	183060	18570	164490	0.927	152.48
	41589510	413040	41176470		38170.59

Table 6 : Udumalpet Site

Month	Gross Electricity Supplied to Grid (EGexport) (kWh)	Electricity Imported from the Grid (EGimport) (kWh)	Net Electricity Exported (EGfacility,y= EGexport - EGimport) (kWh)	Emission Factor (EFgrid,cm,y), tCO ₂ /MWh	Baseline Emissions (BEy), tCO ₂
Dec-13	104388	26600	77788	0.927	72.11
Jan-14	548772	28076	520696	0.927	482.69
Feb-14	764772	23532	741240	0.927	687.13
Mar-14	391272	33224	358048	0.927	331.91
Apr-14	994624	23092	971532	0.927	900.61
May-14	1074648	26072	1048576	0.927	972.03
Jun-14	3462208	7100	3455108	0.927	3202.89
Jul-14	5804120	2180	5801940	0.927	5378.40
Aug-14	5759728	1980	5757748	0.927	5337.43
Sep-14	3710728	7184	3703544	0.927	3433.19
Oct-14	2568056	17724	2550332	0.927	2364.16
Nov-14	599804	34360	565444	0.927	524.17
Dec-14	358048	32552	325496	0.927	301.73
Jan-15	273008	36780	236228	0.927	218.98
Feb-15	527888	27028	500860	0.927	464.30
Mar-15	343624	29528	314096	0.927	291.17
Apr-15	477108	33344	443764	0.927	411.37
May-15	535328	26484	508844	0.927	471.70
Jun-15	1802036	16472	1785564	0.927	1655.22
Jul-15	4117672	2720	4114952	0.927	3814.56
Aug-15	5185168	2120	5183048	0.927	4804.69
Sep-15	3738112	10544	3727568	0.927	3455.46
Oct-15	2372864	12996	2359868	0.927	2187.60
Nov-15	414332	36732	377600	0.927	350.04

Dec-15	348340	48944	299396	0.927	277.54
	46276648	547368	45729280		42391.04

Table 7 : Summary of Emission Reduction for current Monitoring period

Period	Location	Gross Electricity Supplied to Grid (EGexport) (kWh)	Electricity Imported from the Grid (EGimport) (kWh)	Net Electricity Exported (EGfacility,y= EGexport - EGimport) (kWh)	Emission Factor (EFgrid,cm,y) tCO ₂ /MWh	Baseline Emissions (BEy), tCO ₂
16/11/2013 to 15/12/2015	Thandayarkulam	43342710	404580	42938130	0.927	39803.65
	Pushpathur	96351200	657812	95693388	0.927	88707.77
	Uthumalai	41589510	413040	41176470	0.927	38170.59
	Udumalpet	46276648	547368	45729280	0.927	42391.04
	Total	227560068	2022800	225537268		209073.05

E.2. Calculation of project emissions or actual net GHG removals by sinks

>>

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

>>

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. Summary of calculation of emission reductions or net GHG removals by sinks

Item	Baseline emissions or baseline net GHG removals by sinks (t CO ₂ e)	Project emissions or actual net GHG removals by sinks (t CO ₂ e)	Leakage (t CO ₂ e)	GHG emission reductions or net GHG removals by sinks (t CO ₂ e) achieved in the monitoring period		
				Up to 31/12/2012	From 01/01/2013	Total amount
Total	209,073	0	0	Not Applicable	209,073	209,073

E.5. Comparison of actual emission reductions or net GHG removals by sinks with estimates in registered PDD

Item	Values estimated in ex ante calculation of registered PDD	Actual values achieved during this monitoring period
Emission reductions or GHG removals by sinks (t CO ₂ e)	312,576 ⁸	209,073

E.6. Remarks on difference from estimated value in registered PDD

>>

Actual CERs generated during this first monitoring period (16/11/2013 – 15/12/2015) is lower than the estimated CERs with respect to comparable period in the registered PDD. This is due to lower PLF achieved during the low wind season during the current monitoring period.

⁸ The emission reductions have been extrapolated for 730 days as this monitoring period consists of 730 days.

Appendix 1. Contact information of project participants and responsible persons/entities

Project participant and/or responsible person/ entity	<input checked="" type="checkbox"/> Project participant <input checked="" type="checkbox"/> Person/entity responsible for completing the CDM-MR-FORM
Organization name	The Ramco Cements Limited
Street/P.O. Box	98 A , Dr. Radhakrishna Road, Mylapore
Building	5 th floor , Corporate Office , “Auras Corporate Centre”
City	Chennai
State/region	Tamil Nadu
Postcode	600 004
Country	India.
Telephone	+9144 28478666
Fax	+9144 28478676
E-mail	ksn@ramcocements.co.in
Website	
Contact person	
Title	Company Secretary
Salutation	Mr.
Last name	Selvanayagam
Middle name	
First name	K.
Department	-
Mobile	
Direct fax	
Direct tel.	
Personal e-mail	ksn@ramcocements.co.in

Appendix 2. 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 commissioning
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

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	Rajagopalaperi	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	Rajagopalaperi	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	Samugarangapuram	N8 18 45.0	E77 40 06.8	05/06/2007
2362	1X1650	VESTAS	Samugarangapuram	N8 18 53.6	E77 40 36.3	05/06/2007
2367	1X1650	VESTAS	Soundarapandiapuram	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

⁹ Last WTG commissioned under the project activity.

¹⁰ First set of WTGs commissioned under the project activities are – HTSC No 2357, 2358, 2359 and 2360.

Appendix 3. 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 m ²

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
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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

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Document information

<i>Version</i>	<i>Date</i>	<i>Description</i>
05.1	4 May 2015	Editorial revision to correct version numbering.
05.0	1 April 2015	Revisions to: <ul style="list-style-type: none"> • 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: <ul style="list-style-type: none"> • 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 <i>F-CDM-MR</i> to <i>CDM-MR-FORM</i>; • 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 (EB70, 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).
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