Project design document form for CDM project activities

(Version 06.0)

Complete this form in accordance with the Attachment "Instructions for filling out the project design document form for CDM project activities" at the end of this form.

PROJECT DESIGN DOCUMENT (PDD)	
Title of the project activity	74 MW wind energy project in Tamilnadu, India
Version number of the PDD	12
Completion date of the PDD	25/05/2015
Project participant(s)	The Ramco Cements Limited[1]
Host Party	India
Sectoral scope and selected methodology(ies), and where applicable, selected standardized baseline(s)	**Sectoral scope: 01** Energy Industries (renewable -/ non-renewable sources) **Methodology:** Consolidated baseline methodology for grid-connected electricity generation from renewable sources. Reference : ACM0002, Version : 12.3.0 **Standardized baseline:** Not Applicable
Estimated amount of annual average GHG emission reductions	156,288 tCO_2e

[1] Erstwhile the name of the Project Participant was "M/s Madras Cements Limited", however the name has been changed to "THE RAMCO CEMENTS LIMITED" via Tamil Nadu Companies Registrar letter ref no. L26941TN1957PLC003566, dated 05 August 2013. All the relevant documents are submitted to DOE for verification. Hereinafter PP name has been referred as "The Ramco Cements Limited" or TRCL in abbreviated form.

SECTION A. Description of project activity

A.1. Purpose and general description of project activity

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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 156288 tCO_2e 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 A-1

Table A-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**

A brief background of the project developer:

The Ramco Cements Ltd is a Chennai based flag ship company of Ramco Group, a well known business group of South India. The main product of the company is portland cement manufactured through four advanced production facilities spread over Southern India. The production capacity of cement is 10 million tons per annum. TRCL is the sixth largest cement producer in the country and the second largest in South India. The company also produces ready mix concrete and dry mortar products.

Pre-project scenario:

In the pre project scenario, the equivalent amount of electricity would have been generated by the power plants connected with the Southern grid. These plants are dominated by the use of fossil fuels to generate electricity.

Baseline scenario:

This project activity is wind based renewable energy, zero emission power project connected to the Southern grid. The project activity generates about 168595.617 MWh of electricity per annum which is exported to the Southern grid. Hence, the baseline scenario according to the methodology ACM0002 is "Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources". The main green house gas that is prevented from being emitted into the atmosphere is CO_2 which would have otherwise been emitted from the fossil fuel fired power plants that are connected to the grid.

Ministry of Environment and Forests, Govt. of India has stipulated social, economic, environmental and technological well being as the four indicators for sustainable development. The project participants' view on the contribution of this project activity towards sustainable development is explained as below:

Social well being:

The wind mills are installed in unused barren lands thereby making the utilisation of land effective. The project has generated employment for the locals and uplifted their socio-economic lifestyle. The project activity has also led to the development of non-conventional renewable energy technology for production of power. The infrastructure in and around the project area has been improved due to the project activities. This includes development of road network and improvement of electricity availability in the region as the electricity is supplied to the regional Southern grid.

Economic well being:

The generated electricity will be sold to the regional Southern grid, thereby improving the grid frequency and availability of electricity to the local consumers. This will provide new opportunities for industries and economic activities to be setup in the area thereby resulting in greater local employment. The project activity also leads to diversification of the national energy supply, which is dominated by conventional fuel based generating units.

Environmental well being:

The electricity generated by project activity will be supplied to the Southern grid, which otherwise would have been generated by fossil fuels. Hence the project activity will help in reduction of the green house gases emission and air pollutants (especially NO_x, SO_2 and particulate matter), which would otherwise have been emitted by thermal plants. The project activity also helps in conservation of fossil fuels such as coal, oil and natural gas which are predominantly used for power generation.

Technological well being:

The project activity demonstrates the viability of grid connected wind energy technology in India. The project activity has installed high capacity wind turbine generators of 800KW and 1650KW. The success of above project will increase the reliability on efficient technology and large capacity wind mills

A.2. Location of project activity

A.2.1. Host Party

>>
India.

A.2.2. Region/State/Province etc.

>>
Tamil Nadu.

A.2.3. City/Town/Community etc.

>>
Project is located in Coimbatore, Dindigul and Tirunelveli districts of Tamilnadu.

A.2.4. Physical/Geographical location

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The project activity is located in the Udumalpet region covered under Coimbatore and Dindigul districts; and Thandayarkulam and Uthumalai regions of Tirunelveli district. The location of the project activity is shown in Fig A-1 and Fig A-2 below

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

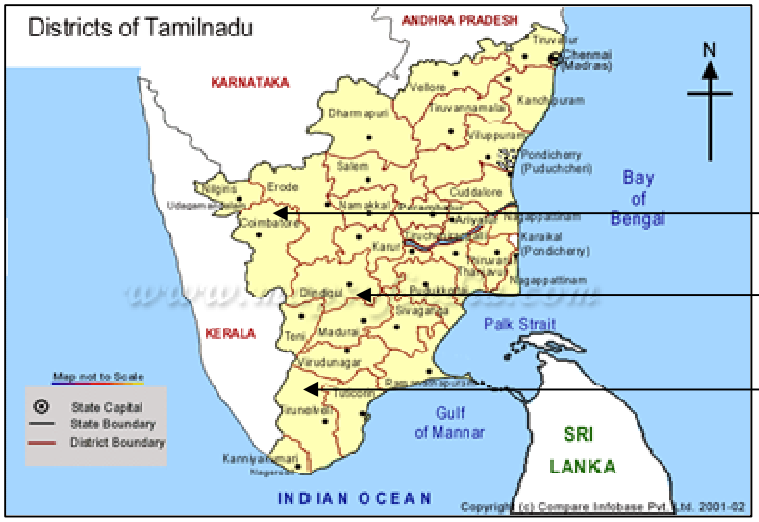

Fig 2:- showing the districts under the project activity

A.3. Technologies and/or measures

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The purpose of the proposed project is to generate zero-emission wind power and deliver it to the Southern regional grid. The project activity involves installation of 67 WTGs of different capacities in the state of Tamilnadu, India. The WTGs have been supplied by Enercon and Vestas. The electricity generated will be exported to the Tamil Nadu State Electricity Board. The project activity will supply the electricity generated to the Southern regional grid and replace the same amount of electricity from the grid connected thermal power plants.

The scenario prior to the implementation of the project activity is Southern regional grid providing the same quantity of electricity as the proposed project, mainly through thermal power plants. This project activity is wind based renewable energy source, zero emission power project connected to the Southern regional grid. Hence the baseline is that the electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources in the Southern grid.

The main greenhouse gas that is prevented from being emitted into atmosphere is CO_2 which would have otherwise been emitted from the fossil fuel fired power plants that are connected to the grid. It is estimated that implementation of project activity will generate approximately 156288 tCO_2 emission reductions annually.

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, Yaw system, Brakes, Nacelle, Pitch and Hub. Figure A-3 shows a typical WTG with arrangement of different parts

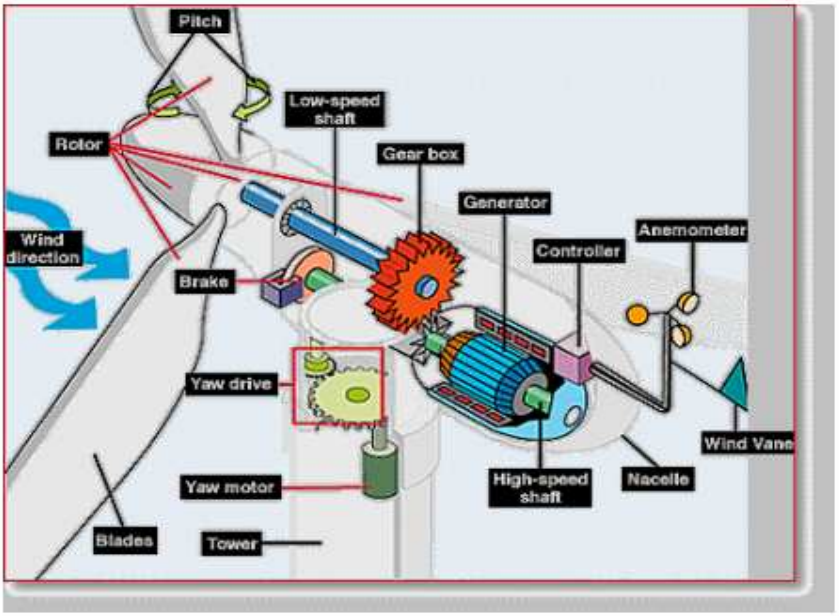

Fig A- 3 showing different parts of a wind mill

The technical specifications of the WTGs used in the project activity are mentioned in Annex 2 of this document.

The project activity uses wind energy to generate electricity and supplies it to grid. Thus the project activity is a totally environmentally safe technology and there is no technology transfer to the Host Party.

A.4. Parties and project participants

Party involved (host) indicates host Party	Private and/or public entity(ies) project participants (as applicable)	Indicate if the Party involved wishes to be considered as project participant (Yes/No)
India (host)	The Ramco Cements Limited (TRCL) - Private entity	No

A.5. Public funding of project activity

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The project does not involve any public funding from Annex – I countries.

SECTION B. Application of selected approved baseline and monitoring methodology and standardized baseline

B.1. Reference of methodology and standardized baseline

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Title – "Consolidated baseline methodology for grid-connected electricity generation from renewable sources" - ACM0002

Reference: http://cdm.unfccc.int/UserManagement/FileStorage/4W1SCKX3EMPO6AYGRJUTD7BQ8IVN0H

Version: 12.3.0

Sectoral Scope: 1

Date: Valid from 17 September 2010 onwards, Requests for registration can be submitted until 11 Jan 2013 23:59:59 GMT.

The methodology refers to the latest applicable versions of the following tools in order to calculate the emission reductions from the project activity:

1. Combined tool to identify the baseline scenario and demonstrate additionality, Version 04.0.0
- This tool is not use in the project activity, instead the baseline is selected as per the ACM0002, version 12.3.0 and the additionality is demonstrated by additionality tool.

2. Tool to calculate project or leakage CO2 emissions from fossil fuel combustion, Version 02
- This tool is not used in project activity as it does not use any fossil fuel.

3. Tool to calculate the emission factor for an electricity system (version 02.2.1)
- This tool is used in the project activity

4. Tool for the demonstration and assessment of additionality (version 6)
- This tool is used in the project activity

B.2. Applicability of methodology and standardized baseline

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The adopted baseline methodology ACM0002, version 12.3.0 has been chosen for the project activity based on the fulfillment of the applicability conditions as described below:

This methodology is applicable to grid-connected renewable power generation project activities that (a) install a new power plant at a site where no renewable power plant was operated prior to the implementation of the project activity (greenfield plant); (b) involve a capacity addition; (c) involve a retrofit of (an) existing plant(s); or (d) involve a replacement of (an) existing plant(s).

The project activity is a grid connected renewable power generation project activity and

(a) The project is a Green field project (prior to the implementation of the project there was no renewable power plant operating at the project site)

(b) Does not involve any capacity addition

(c) Does not involve retrofitting of any or replacement of an existing plant

S. No.	Technology/Measures as per ACM0002 (version 12.3.0)	Project activity measures
1	The project activity is the installation, capacity addition, retrofit or replacement of a power plant/unit of one of the following types: hydro power plant/unit (either with a run-of-river reservoir or an accumulation reservoir), wind power plant/unit, geothermal power plant/unit, solar power plant/unit, wave power plant/unit or tidal power plant/unit.	The project activity is the installation of grid connected wind power plant.
2	In the case of capacity additions, retrofits or replacements (except for wind, solar, wave or tidal power capacity addition projects which use Option 2: on page 10 to calculate the parameter EGPJ,y): the existing plant started commercial operation prior to the start of a minimum historical reference period of five years, used for the calculation of baseline emissions and defined in the baseline emission section, and no capacity expansion or retrofit of the plant has been undertaken between the start of this minimum historical reference period and the implementation of the project activity.	Not relevant since the project activity is the installation of a new grid connected wind power plant.
3	In case of hydro power plants:- • The project activity is implemented in an existing reservoir, with no change in the volume of reservoir. • The project activity is implemented in an existing reservoir, where the volume of reservoir is increased and the power density of the project activity, as per definitions given in the Project Emissions section, is greater than 4 W/m2. • The project activity results in new reservoirs and the power density of the power plant, as per definitions given in the Project Emissions section, is greater than 4 W/m2.	Not relevant since the project activity is the installation of a new grid connected wind power plant.
4	The methodology is not applicable to the following: • Project activities that involve switching from fossil fuels to renewable energy sources at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site; • Biomass fired power plants; • Hydro power plants that result in new reservoirs or in the increase in existing reservoirs where the power density of the power plant is less than 4 W/m2.	Not relevant since the project activity is the installation of a new grid connected wind power plant.
5	In the case of retrofits, replacements, or capacity additions, this methodology is only applicable if the most plausible baseline scenario, as a result of the identification of baseline scenario, is “the continuation of the current situation, i.e. to use the power generation equipment that was already in use prior to the implementation of the project activity and undertaking business as usual maintenance”.	Not relevant since the project activity is the installation of a new grid connected wind power plant.
6	The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available	The project activity is connected to Southern grid. Geographic and system boundaries for the relevant grid (Southern) can be clearly defined and information on the characteristics of the grid is also available. The data is published by Central Electricity

		Authority of India (CEA CO2 baseline database version 04[2])

B.3. Project boundary

Source		GHGs	Included?	Justification/Explanation
Baseline scenario	Grid Electricity Generation	CO_2	Yes	CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity
		CH_4	No	Minor emission source
		N_2O	No	Minor emission source
Project scenario	Not applicable	CO_2	-	-
		CH_4	-	-
		N_2O	-	-
		…	-	-

There will be no emissions from the project activity since wind mills convert wind energy to electricity, which is an emission free technology According to the definition of project boundary in ACM0002 (Version 12.3.0) "The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to", and since the electricity generated by the proposed project will be connected to southern grid, the spatial extent of the project boundary of the proposed project includes the project power plants and all power plants connected physically to southern grid. According to the definition of project boundary in ACM0002 (Version 12.3.0) "The spatial extent of the project boundary includes the project power plant and all power plants connected physically to the electricity system that the CDM project power plant is connected to", and since the electricity generated by the proposed project will be connected to southern grid, the spatial extent of the project boundary of the proposed project includes the project power plants and all power plants connected physically to southern grid. The project boundary with the flow diagram is depicted in the figure B -1 below:

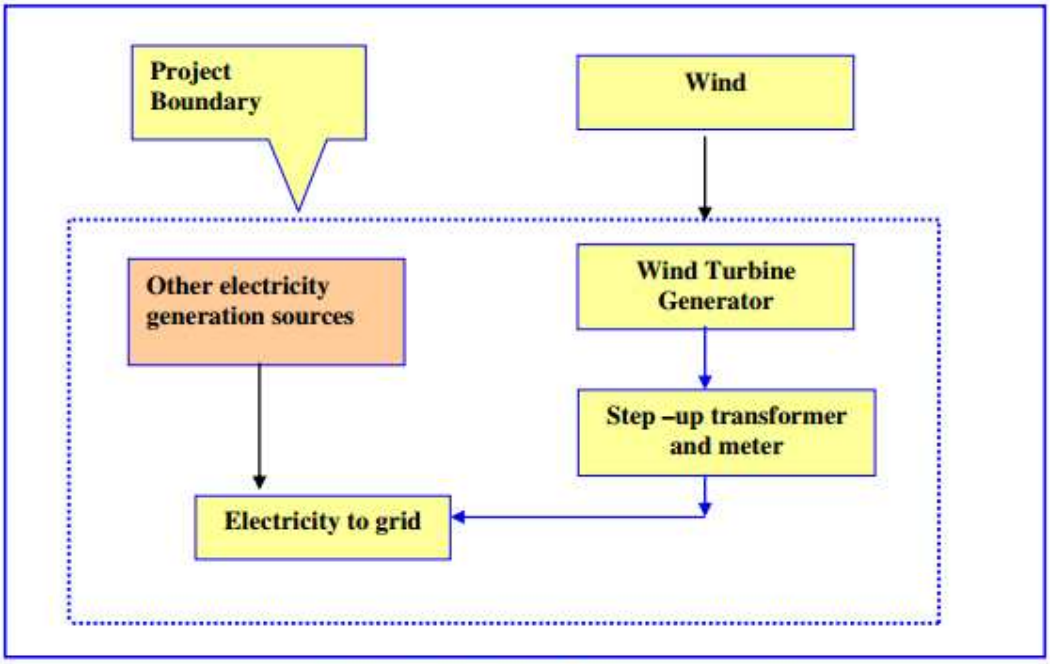

Figure B 1: Project boundary of the project activity

[2] Ref: http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

B.4. Establishment and description of baseline scenario

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Approved consolidated baseline methodology - ACM0002 stipulates following as the baseline scenario if the project activity is the installation of a new grid-connected renewable power plant/unit. “Electricity delivered to the grid by the project activity would have otherwise been generated by the operation of grid-connected power plants and by the addition of new generation sources, as reflected in the combined margin (CM) calculations”.

The proposed project is connected to the Tamil Nadu Electricity Board (TNEB) grid which is an integral part of the Southern regional grid in India and in the absence of the project activity the same quantity of electricity would have been generated by the operation of the power plants and the new generation sources within the Southern regional grid. Moreover the proposed project activity is not a retrofitting or modification of the existing electricity generation facility and hence the approach for formulating the baseline scenario would be the combined margin estimation of baseline emission factor. The details of combined margin estimation are illustrated below.

The baseline emission factor (EFy) is calculated as a combined margin (CM), consisting of the combination of operating margin (OM) and build margin (BM) factors. The steps involved in the calculation of CM as per “Tool to calculate emission factor of an electricity system”, version 02.2.1 are explained below.

Applicability:

The tool is not applicable if the project electricity system is located partially or totally in an Annex I country. The current project activity is fully located in India, which is a Non Annex I country.

Step 1: Identify the relevant electricity systems

The Indian electricity system is divided into two regional grids, viz. NEWNE and the Southern regional grid. The Southern regional grid comprises of the four Southern Indian states Andhra Pradesh, Karnataka, Kerala and Tamil Nadu. The project is connected to the Tamil Nadu state Electricity grid, an integral part of the Southern regional grid in India. Thus, the Southern grid is identified as the project electricity system.

Step 2: Choose whether to include off-grid power plants in the project electricity system (optional)

The project participant chooses to use the following option which includes only grid connected power plants in the project electricity system.

Option I: Only grid power plants are included in the calculation

Step 3: Select a method to determine the operating margin (OM)

The calculation of the Operating Margin emission factor ($EF_{grid,OM,\ y}$) is based on one of the following methods:

(a) Simple OM
(b) Simple adjusted OM
(c) Dispatch Data Analysis OM
(d) Average OM

As per Tool to calculate emission factor of an electricity system, version- 02.2.1, the simple operating margin (Simple OM) can be used only if low-cost/must-run resources constitute less than 50% of total grid generation in: 1) average of the five most recent years, or 2) based on long-term averages for hydroelectricity production. The share of low cost / must run resources of the selected grid over the past five years (2003-04 to 2007-08) has been estimated at 24.04 %, which is less than 50% of the gross grid generation. This is shown in table B.2. This satisfies the condition as delineated in the selected methodology, for using the simple OM (1a) for calculating the operating margin emission factor. Thus TRCL has adopted the ‘Simple OM’ (1a) method.

Table – B.2. - Power Generation Mix – Southern Region					
Year	2003-04	2004-05	2005-06	2006-07	2007-08
% contribution from low cost generating sources. (Ref: CEA's CO_2 baseline database, version 4.0)	16.20	21.61	27	28.31	27.1
% low cost generation out of total grid generation – Average of the five most recent years					**24.04**

Simple OM emission factor (EFOM, simple, y) is calculated as the generation-weighted average emissions per electricity unit (tCO_2/MWh) of all generating sources serving the system, not including low-operating cost and must-run power plants. The Simple OM can be calculated using either of the two following data vintages:

• **Ex ante option:** If the *ex ante option* is chosen, the emission factor is determined once at the validation stage, thus no monitoring and recalculation of the emissions factor during the crediting period is required. For grid power plants, use a 3-year generation-weighted average, based on the most recent data available at the time of submission of the CDM-PDD to the DOE for validation. For off-grid power plants, use a single calendar year within the five most recent calendar years prior to the time of submission of the CDM-PDD for validation.

• **Ex post option:** If the *ex post* option is chosen, the emission factor is determined for the year in which the project activity displaces grid electricity, requiring the emissions factor to be updated annually during monitoring. If the data required to calculate the emission factor for year y is usually only available later than six months after the end of year y, alternatively the emission factor of the previous year y-1 may be used. If the data is usually only available 18 months after the end of year y, the emission factor of the year proceeding the previous year y-2 may be used. The same data vintage (y, y-1 or y-2) should be used throughout all crediting periods.

For the project activity, the Ex ante option is chosen for calculating the simple OM, and is based on the Central Electricity Authority (CEA) database 3. The CEA data is provided in Annex 3 of the PDD.

Step 4: Calculate the operating margin emission factor according to the selected method.

The simple OM emission factor is calculated as the generation-weighted average CO_2 emissions per unit net electricity generation (tCO_2/MWh) of all generating power plants serving the system, not including low-cost/must-run power plants/units.

The simple OM may be calculated:

Option A: Based on the net electricity generation and a CO_2 emission factor of each power unit; or
Option B: Based on the total net electricity generation of all power plants serving the system and the fuel types and total fuel consumption of the project electricity system.

The Central Electricity Authority, Ministry of Power, Government of India has published a database of Carbon Dioxide Emission from the power sector in India based on detailed authenticated information obtained from all operating power stations in the country. This database i.e. The CO_2 Baseline Database provides information about the Operating Margin, Build Margin, and Combined Margin Emission Factors of all the regional electricity grids in India and also the generations in the relevant grids and is the latest available database in the public domain. The Operating Margin in the CEA database is calculated ex ante in line with the "Tool to calculate the emission factor for an electricity system" Version 2.2.1. Therefore, the data published in the CEA database has been used for calculating the operating margin. The CEA database uses the option B i.e. data on net electricity generation, the average efficiency of each power unit and the fuel type(s) used in each power unit, to calculate the OM of the different regional grids. The PP has calculated the Operating margin ex-ante in line with the tool with consideration of the weighted average operating margin of the last 3 years (2005-06, 2007-08, 2008-09) prior to the submission to the validation. The calculation of the same is discussed under Annex 3 of the PDD and also provided with the CER calculation sheet.

Step 5: Calculate the build margin(BM) emission factor

In terms of vintage of data, project participants can choose between one of the following two options:

Option 1: For the first crediting period, calculate the build margin emission factor ex ante based on the most recent information available on units already built for sample group m at the time of CDM-PDD submission to the DOE for validation. For the second crediting period, the build margin emission factor should be updated based on the most recent information available on units already built at the time of submission of the request for renewal of the crediting period to the DOE. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used. This option does not require monitoring the emission factor during the crediting period.

Option 2: For the first crediting period, the build margin emission factor shall be updated annually, ex post, including those units built up to the year of registration of the project activity or, if information up to the year of registration is not yet available, including those units built up to the latest year for which information is available. For the second crediting period, the build margin emissions factor shall be calculated ex ante, as described in Option 1 above. For the third crediting period, the build margin emission factor calculated for the second crediting period should be used.

The project participant has chosen Option 1 for vintage of the data
The build margin emissions factor is the generation-weighted average emission factor (tCO_2/MWh) of all power units m during the most recent year y for which power generation data is available. The data published in the CEA database has been used for calculating the build margin emission factor. The CO_2 Baseline Database provides information about the Operating Margin, Build Margin, and Combined Margin Emission Factors of all the regional electricity grids in India in line with the "Tool to calculate the emission factor for an electricity system" Version 2.2.1.

Step 6: Calculate the combined margin emissions factor

The combined margin emissions factor is calculated as follows:

$EFy = EF_{grid,CM,y} = w_{OM} * EF_{grid, OM, y} + w_{BM} * EF_{grid, BM, y}$

Where:

$EF_{grid, BM, y}$: Build margin CO_2 emission factor in year y (tCO_2/MWh)

$EF_{grid, OM, y}$: Operating margin CO_2 emission factor in year y (tCO_2/MWh)

w_{OM} : Weight of operating margin emissions factor

w_{BM} : Weight of build margin emissions factor

(where $w_{OM} + w_{BM} = 1$).

As provided in the tool following default values should be used for w_{OM} and w_{BM}:

Wind and solar power generation project activities: $w_{OM} = 0.75$ and $w_{BM} = 0.25$ (owing to their intermittent and non-dispatchable nature) for the crediting period. The calculation of the combine margin is provided under Annex 3 as well as CER calculation sheet. This comes to 0.927 tCO_2/MWh.

Technology/activities to be employed in the absence of the proposed project activity

If the project activity had not been implemented then, equivalent power that is being generated by the identified wind power project would have been drawn from the fossil fuel dominated Southern regional grid mix leading to GHG emissions into the atmosphere. This alternative is the continuation of the current situation and is the most likely baseline option.

B.5. Demonstration of additionality

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The project activity has displaced fossil fuel based electricity that would otherwise have been provided for the operation and expansion of the Southern regional grid, hence reducing the emission of green house gases. Within the scope of the adopted baseline methodology, tool for the demonstration and assessment of additionality, Version 6, EB 65 Annex 21 has been used to demonstrate the additionality.

Prior consideration of CDM

CDM revenue has been considered for determining the project cash flows towards analysing the financial viability of the project activity during the project designing stage itself. The evidences regarding serious

CDM consideration and other project related third party communication have been provided to the DOE during validation. Further, it is to be noted that TRCL was developing a bundled CDM project for their WTGs that were installed prior to the start date of the present project activity. A consultant and a DOE were appointed to carry out the CDM advisory services for that particular project. The PDD for the bundled project was Webhosted on the UNFCCC website:
http://cdm.unfccc.int/Projects/Validation/DB/AOLO0C51SE7IUL19FP3B27HORLRSK0/view.html for global stakeholder comments during 09 April 06 – 09 May 06, which clearly indicate that TRCL had knowledge of CDM prior to conceptualization of the current project activity, and that CDM has been an integral and essential part for TRCL to develop wind power projects.

The table B.5.1 below explains in detail the chronology of events.

Table B.5.1: Chronology of events for understanding the prior consideration

Date	Chronology of the CDM project implementation
09 Apr 2006 – 09 May 06	Webhosting of 41.6 MW project by TRCL for global stakeholder comments[3] (Previous CDM project developed by the Project Participant)
29th March 07	Proposals received from WTG suppliers Vestas and Enercon
5 Apr 07	Approval of the project activity with CDM consideration by the TRCL Management. The committee approved the investment in windmills beginning with 13.2 MW at Thandayarkulam, Tirunelveli district which would be followed by 60.8 MW at other locations in Tamil Nadu. Thereby, the Board approved investment for the total capacity of 74 MW on the said date.
15 Apr 07	TRCL releases Letter of Intent (LoI) for purchase of 12*1650 KW Turbines to Vestas (project activity start date)
25th May 07	TRCL gives purchase orders corresponding to 42 no. of WTGs of capacity 800 KW to Enercon
09th July 07	TRCL gives purchase orders corresponding to 1 no. of WTG of capacity 800 Kw to Enercon
23 July 07	Commissioning date of first set of WTGs under the project activity.
28th August 07	Agreement Signed with Ecoinvest Carbon for CDM project development Consultancy
Sep 07 onwards	Continuous communication between TRCL and Ecoinvest Carbon

[3] http://cdm.unfccc.int/Projects/Validation/DB/AOLO0C51SE7IUL19FP3B27HORLRSK0/view.html

14th November 2007	TRCL gives purchase orders corresponding to 12*1650 Kw WTGS to Vestas
31 March 2008	Commissioning date of last set of WTGs under the project activity
28th May 09	Validation Contract signed by TRCL with SGS
24 Jun 09	Webhosting of PDD for global stakeholder comments
23 Feb 10	Presentation to DNA for Host Country Approval
12 Aug 10	Receipt of Host Country Approval from Indian DNA.

From the above discussion, it can be concluded that continuous and real actions were taken by TRCL to secure CDM status for the project in parallel with its implementation, and that prior consideration of CDM was taken, as per Para 6 of EB 62 Annex 13.

The additionality for the project activity has been demonstrated in accordance with the 'Tool for demonstration and assessment of additionality' Version 06.

Step-wise approach for demonstration of additionality

Step 1. Identification of alternatives to the project activity consistent with current laws and regulations

Sub-step1a. Define alternatives to the project activity:
The alternatives available to the project participant or similar project developers are:

Alternative 1: Proposed project activity is not undertaken as CDM project activity. This alternative is in compliance with all legal and regulatory requirements; however, the relatively low Internal Rate of Return (IRR) on equity of the project activity indicates that this alternative is financially less attractive if CDM fund flow is not considered.

Alternative 2: Continuing with the current situation i.e. no project activity. In this alternative, the project activity would not be implemented and therefore equivalent power that is generated by the identified wind power project will be drawn from the fossil fuel dominated Southern regional grid mix leading to GHG emissions into the atmosphere. This alternative i.e. generation of equivalent power from fossil fuel dominated southern regional grid (or the continuation of the current situation) is the most likely baseline option in the absence of the project activity.

Outcome of Sub-step 1a: All of the above identified alternatives are realistic and credible alternatives available to the project participants.

Outcome of sub-step 1b: All the alternatives are in compliance with all applicable legal and regulatory requirements (Indian Electricity Act 2003, The National Electricity Policy) including the environmental regulations (Environmental Protection Act 1987).

Step 2. Investment analysis
TRCL has chosen the investment analysis in order to demonstrate the additionality, further the guidelines on Investment analysis, version 05, EB62, Annex 5 is referred in demonstration of the same.

Sub-step 2a. Determine appropriate analysis method

Simple cost analysis (Option 1) can not be used because the project activity generates financial or economic benefits other than CDM related income. Out of investment comparison analysis (Option II) and the benchmark analysis (Option III), benchmark analysis has been used to conduct an investment analysis, as the project activity can also be developed by any other project developer and the investment in the project activity was not must for project participant.

Sub-step 2b. – Option III. Apply benchmark analysis

An investment analysis of the project activity was conducted considering equity IRR as the financial indicator. Furthermore, since the project involved installation of wind mills from two different suppliers, two separate equity IRRs, one pertaining to 24*1.65 MW Vestas machines, and another pertaining to 43*0.8 MW, have been computed and presented below.

Selection of Benchmark

The equity IRR of the project activity has been computed over a lifetime of project and then compared against a benchmark return. The approach that has been used to arrive at the benchmark is explained As per paragraph 6 (b) of the additionality tool 'The benchmark of the project activity can be established based upon the cost of financing of the project activity'. The capital structure of the project involves only equity component and project is totally conceptualized and financed with the equity.

The cost of equity has been determined based upon the Capital Asset Pricing Model (CAPM). CAPM is an economic model which is used towards assigning value to any stocks, securities, derivatives by means of relating risk and expected return. The underlying algorithm of CAPM[4] is as follows:

$r = R_{f1} + Beta\ (R_m - R_{f2})$

Where,
r = Expected return from a security
R_{f1} = Rate of a risk free investment
R_m = Expected market return
R_{f2} = Average Return of a risk free investment
Beta = Indicator towards measuring the volatility of the security, relative to the asset class.

It is apparent from the above equation that the expected return from a security is the return of a risk-free investment plus Beta times the difference between the expected market return and the return from the risk-free investment (termed as market risk premium). Hence CAPM justifies that the expected return of an investor should be commensurate with the higher expected risk of the investment.

In words, the algorithm says

Expected Return from a security = Risk free return + Market risk Premium * Beta

Thus, in order to apply CAPM, the following estimates are required

- Risk Free rate
- Market Risk Premium
- Beta

The life time of the project activity is 20 years and time period chosen for Risk Free Rate, Market Risk Premium, Average Risk Free return, Expected market rate of return is approximate 16 years from 1991 to 2007 in order to have a comparable and accurate estimate of the returns calculated over the longest period possible considering data availability. The starting period from 1991 for calculation of market return was chosen because it is the earliest data available on Bombay Stock Exchange (BSE) database. Following that, the period for market return, and average risk free rate is chosen as the same approximate 16 year period from 1991 to 2007 for consistency and accuracy purpose.

Risk Free Rate

The risk free rate is the return on a security (or a portfolio of securities) that is free from default risk. Typically, the rate of long term government bonds are used to determine the risk free rate in the context of the present project activity YTM[5] (Yield to Maturity) over a period of 20 years has been considered to represent the risk free rate. The value for the month of December 2006 is used by the PP. The value is 7.6931%.

[4] 5 http://www.investopedia.com/articles/06/CAPM.asp

[5] Reserve Bank of India monthly bulletin for February 2007 (Published on 15 February 2007) , http://www.rbi.org.in/scripts/BS_ViewBulletin.aspx?Id=8225

Market Risk Premium

The market risk premium is the difference between the expected market rate of return and the average risk free rate and is usually measured by looking at the average of the historical returns on a market portfolio. In the context of the present project activity, the period of January - 1991 to March - 2007 has been selected to calculate the expected market return and average risk free return. This is conservative approach as compared to considering the risk free rate of the year 2006-07 only. The same has been demonstrated in the benchmark calculation sheet, submitted to the DOE.

Average Risk Free return

The geometric mean of government dated securities from the year 1991-92 to 2006-07[6] represents the average risk free return. In the context of the present project activity this value is 10.04 %.

Expected market rate of return

In the context of the present project activity, the BSE Sensex has been chosen in calculation of the market risk. This index represents nearly 93% of the total market capitalization on BSE. To add to it, this index covers all 20 major industries of the economy in India thus making it an appropriate index to choose. The period of 1991 to 2007 has been selected to calculate the expected market return as the data is publically available from 1991 only. The stock index (Bombay Stock Exchange)[7] over a period of 16.25 years (Jan 1991 to March 2007) prior to the investment decision making has been used towards determining the market return (R_m). The market return during that period has been estimated at 16.94 %.

Thus the market risk premium estimated is

Market risk premium (Rm – Rf) = 16.94 % – 10.04 %
= 6.9 %

However the market risk premium should not be viewed on a standalone basis. The overall risk premium depends on market risk premium as well as on a parameter called Beta, which has been explained below

Beta:

Equity Beta is the measure of the expected volatility of a particular stock relative to a well-diversified market portfolio. It measures the systematic risk of a stock, i.e. the risk that cannot be eliminated in a well-balanced, diversified portfolio. The beta of equity is calculated as the covariance between its return and the return on a well-diversified market portfolio, divided by the variance of the return on a welldiversified market portfolio.

Equity Beta (e) = Covariance (r, rm) / Variance (rm)

Towards determining the value of Equity Beta, listed companies which are also involved in the similar business domain have to be compared.

In India, the only power generating company that has its presence entirely in the wind sector is BF Utilities. The beta value of BF Utilities has been considered as the average of three years prior to the project start date as represented in a tabular form below[8].

BF Utilities Beta Value	
2004-05	0.7358
2005-06	0.9876
2006-07	0.7299
Average	**0.82**

[6] http://rbidocs.rbi.org.in/rdocs/AnnualReport/PDFs/rbi98ar4-e.pdf (for year 1991-1998) and http://rbidocs.rbi.org.in/rdocs/AnnualReport/PDFs/72286.pdf (for year 1998 to 2006)

[7] 8 http://www.bseindia.com/ ; http://www.bseindia.com/histdata/hindices.asp

[8] Source: Capitaline Database. Screenshot of database submitted to DOE during validation

Thus, the above beta value of 0.82 has been used in the computation of benchmark.

Further, as questioned by the DOE at the stage of Validation, the PP has also calculated the Benchmark with consideration of the Beta values of major listed companies in power sector. Details of the same calculation are also provided in the Benchmark calculation sheet. It is observed the Beta values as considered by the TRCL for BFU Limited is conservative than other computation and same only was used at the time of decision making. Thus, TRCL has proposed the Benchmark calculation with use of BF Utilities only.

Hence, after accounting for all the variables discussed above the expected return on equity is

Expected Return on Equity = Risk free return + Market risk Premium * Beta
= 7.6931 % + (6.8981 %) * 0.82
= 13.35 %

An investment analysis of the project activity was conducted considering equity IRR as the financial indicator. The equity IRR of the project activity has been computed over a period of 20 years and then compared against the benchmark return of 13.35% which has been established based upon the tool for the demonstration and assessment of additionality, version 6.

Sub-step 2c. Calculation and comparison of financial indicators

The internal rate of return (IRR) on investment as financial indicator is one of the known financial indicator used by banks, financial institutions and project developer for making investment decision. The financial indicator chosen is the internal rate of return of the project (IRR) as suggested by additionality tool. For the investment analysis a useful life of 20 years has been considered for projections of cash flow.

The following tables B- 3 and B – 4 show the assumptions used for calculation of IRR and project specific parameters with references for WTGs of Vestas and Enercon respectively.

Table – B3: Information and assumptions for Equity IRR (Post-tax) computation for WTGs of Vestas make[9]

Parameter	Value	Reference
No.of WTGs	24 Nos	As envisaged by PP
Capacity of each WTG	1.65 MW	Proposal from Vestas dated 29/03/2007
Capital Cost-Cost per WTG - Rs in lacs	1122.00	Proposal from Vestas dated 29/03/2007
Capacity Utilization Factor (CUF)	27.51% with de-rating of 1% every year after 10th year	Third party PLF study dated 29/04/2010 (Conservative of tariff order and third Party PLF study chosen for financial analysis)
Tariff	Rs. 2.9 / KWh fixed for 20 years	As per TNERC Tariff Order dated 15/05/2006 and its amendment dated 18/05/2006 http://tnerc.tn.nic.in/Orders/NCESamend.pdf http://tnerc.tn.nic.in/Orders/CPP%20Order-approved%20host%20copy.pdf
Life of plant	20 years	As per TNERC Tariff Order dated 15/05/2006 and its amendment dated 18/05/2006 http://tnerc.tn.nic.in/Orders/NCESamend.pdf http://tnerc.tn.nic.in/Orders/CPP%20Order-approved%20host%20copy.pdf
Depreciation Rate	4.5 % under Straight Line Method up to 90%	As per TNERC Tariff Order dated 15/05/2006 and its amendment dated 18/05/2006 http://tnerc.tn.nic.in/Orders/NCESamend.pdf http://tnerc.tn.nic.in/Orders/CPP%20Order-approved%20host%20copy.pdf

[9] 1 Lac = 01. million

O & M Expenses	Rs.9.5 lacs per WTG and 7.5% escl. every year after 2nd year up to 4 years. Base price of 2nd year is considered again in 5th year and escalation of 7.5% in 6th years to next 4 years. This practice has been followed up to 20th year	As per the offer from the Vestas dated 29/03/2007
Debt	0%	As envisaged by PP and actually invested
Equity	100%	As envisaged by PP and actually invested
Insurance cost	0.75% on the project cost every year with a reduction of 0.5 % every year after the 5th year	As per TNERC Tariff Order dated 15/05/2006 and 18/05/2006 http://tnerc.tn.nic.in/Orders/NCESamend.pdf http://tnerc.tn.nic.in/Orders/CPP%20Order-approved%20host%20copy.pdf
Working capital	Nil	-
MAT Rate	11.33%	http://finance.indiamart.com/taxation/corporate_tax/rates.html
Corporate Tax Rate	33.99%	
Total Project Cost (Plant and Machinery) in lacs	26254.56	Calculated
Employee expenses	Rs. 0.4 lacs / MW	Estimate based on actual expenditure incurred on other existing projects by the PP prior to current project conceptualization
Administrative expenses	Rs. 0.7 lacs / MW	

Table – B 4: Information and assumptions for Equity IRR (Post-tax) computation for WTGs of Enercon make

Parameter	Value	Reference
No.of WTGs	43	As envisaged by PP
Capacity of each WTG	0.8 MW	Proposal from Enercon dated 29/03/2007
Capital Cost-Cost perWTG - Rs in lacs	425	Proposal from Enercon dated 29/03/2007
Capacity Utilisation Factor (CUF)	27.46% with de-rating of 1% every year after 10th year	As per TNERC Tariff Order dated 18/05/2006 (conservative approach – as compared to third party PLF study) http://tnerc.tn.nic.in/Orders/NCESamend.pdf
Tariff	Rs. 2.9 / Kwh	As per TNERC Tariff Order dated 15/05/2006 and its amendment dated 18/05/2006 http://tnerc.tn.nic.in/Orders/NCESamend.pdf http://tnerc.tn.nic.in/Orders/CPP%20Order-approved%20host%20copy.pdf
Life of plant	20 years	As per TNERC Tariff Order dated 15/05/2006 and its amendment dated 18/05/2006 http://tnerc.tn.nic.in/Orders/NCESamend.pdf http://tnerc.tn.nic.in/Orders/CPP%20Order-approved%20host%20copy.pdf and suppliers information in proposal
Depreciation Rate	4.5 % under Straight Line Method up to 90%	As per TNERC Tariff Order dated 15/05/2006 and its amendment dated 18/05/2006 http://tnerc.tn.nic.in/Orders/NCESamend.pdf http://tnerc.tn.nic.in/Orders/CPP%20Order-approved%20host%20copy.pdf
O & M Expenses	Rs.6 lacs per WTG and 5% escl. every year after 2nd year.	As per O&M proposal from Enercon
Debt	0%	Actual financing and conceptualization
Equity	100%	Actual financing and conceptualization
Insurance cost	0.75% on the project cost every year with a reduction of 0.5 % every year after the 5th year	As per TNERC Tariff Order dated 15/05/2006 and its amendment dated 18/05/2006 http://tnerc.tn.nic.in/Orders/NCESamend.pdf http://tnerc.tn.nic.in/Orders/CPP%20Order-approved%20host%20copy.pdf
Working capital	Nil	-
MAT Rate	11.33%	http://finance.indiamart.com/taxation/corporate_tax/rates.html
Corporate Tax Rate	33.99%	
Total Project Cost in lacs	18275.00	Calculated
Employee expenses	Rs. 0.4 lacs / MW	Estimate based on actual expenditure incurred on other existing projects by the PP prior to current project conceptualization
Administrative expenses	Rs. 0.7 lacs / MW	

Tariff Rate: The tariff of INR 2.90/ kWh considered during project conceptualization was taken from the TNERC tariff order. However, during project execution, the actual tariff received to the PP was INR 2.7/ kWh for 42.3 MW while only 31.7 MW received the tariff of INR 2.90/ kWh as can be observed from the power purchase agreements (PPAs) with TNEB. This has led to further weakening of the financial viability of the project as the PP did not receive the tariff of 2.90/ kWh for all the WTGs as envisaged as per TNERC tariff orders. However, the tariff of INR 2.90/ kWh considered during project conceptualization is taken in the financial calculation and this is conservative approach.

PLF: Based on the proposal received, the investment decision was taken by the PP on 05/04/2007. During the conceptualization the PLF considered in the calculation for both Vestas and Enercon machines was from the TNERC tariff order dated 15/05/2006, which was available with the PP. Thetariff order dated 15/05/2006 mentions the PLF as 26.7% with de-rating of 1% every year after 10th year. Further an amendment in the tariff order dated 15/05/2006 was published on 18/05/2006, which has revised the PLF as 27.46% for all new projects.

However, at the later stage, after the start date of the project activity, the guidance on PLF, EB 48 Annexure 11 was published. Thus in accordance with the paragraph 3(b), the PP has conducted a third party PLF study report of each project location. The average PLF received from the all the project locations are mentioned as below.

Average PLF for Vestas Site: As per the study, the average PLF for all Vestas WTGs comes to 27.51%. This is higher than as mentioned in the tariff order amendment dated 18/05/2006 (27.46%). So, taking conservative approach, TRCL has considered the PLF from Third Party study in the financial calculation, even though it was not available at the time of investment decision.

Average PLF for Enercon Site: As per the study, the average PLF for all Enercon WTGs comes to 24.28%. This is lower than as mentioned in the tariff order amendment dated 18/05/2006 (27.46%). So, taking conservative approach, TRCL has considered the PLF from tariff order amendment in the financial calculation.

The equity IRR without CDM for the project activity is provided in Table B-5 below:

Table B-5: Equity IRR without CDM funds

Make of WTGs	Equity IRR without CDM (%)
24 * 1.65 MW Vestas	6.17%
43 * 0.8 MW Enercon	9.45%

Comparison against the benchmark return of 13.35%.

The equity IRR for the project activity without CDM revenue has been found to be below the benchmark value of 13.35%.

Sub-step 2d. Sensitivity analysis

The identified project being a grid connected renewable energy power generation activity would be extremely susceptible to the annual generation which in turn is a function of the availability of wind in the region. The Plant Load Factor (PLF) indicates the extent of energy used out of the available energy. According to guidelines on Investment analysis, version 05, EB62, Annex 5 para 20 , "only variables, including the initial investment cost, that constitute more than 20% of either total project costs or total project revenues should be subjected to reasonable variation" in the sensitivity analysis. The Capacity Utilisation factor for the WTGs also affects the total project revenues. Similarly, tariff for the sale of electricity and O& M cost also affects the total project revenues directly. Hence, Capacity Utilisation Factor of the project activity, tariff and O&M cost are considered as the most suitable variable parameters to carry out the sensitivity analysis. Also, according to guidelines on Investment analysis, version 05, EB62, Annex 5 para 21 , variations in the sensitivity analysis should at least cover a range of +10% and –10%. Since, a reduction of 10 % in PLF and tariff will lead to further reduction of project IRR, which is already well below the benchmark, only an increase of 10 % has been considered. A 10% increase in the tariff and 10% reduction in O&M cost has been considered, which is highly unlikely. Accordingly, table B-6 below demonstrates how the profitability of the project will be affected if the Plant Load Factor (PLF) and tariff are increased by 10% and O&M cost reduction by 10%.

Table B-6.1: Sensitivity analysis for 24 * 1.65 MW Vestas Machines

Parameter	Generation (PLF)	Project cost	Tariff	O&M cost
Variation	Equity IRR			
10%	**7.63%**	**4.72%**	**7.63%**	**6.06%**
0%	**6.17%**	**6.17%**	**6.17%**	**6.17%**
-10%	**4.47%**	**7.63%**	**4.47%**	**6.28%**
Threshold limits	Increase by 54%. This is not possible as PP has already considered the most conservative PLF from tariff order and third party report.	Decrease by 38%. This is not deemed possible as actual project cost has varied less than 10% of proposal price.	Increase by 54%. This is not deemed possible as PPA for 20 years fixed tariff is already signed.	Decrease by 668%. This is not possible as with zero O&M cost also project does not cross benchmark.

Table B-6.2: Sensitivity analysis for 43 * 0.8 MW Enercon Machines

Parameter	Generation (PLF)	Project cost	Tariff	O&M cost
Variation	Equity IRR			
10%	**11.26%**	**7.73%**	**11.26%**	**9.04%**
0%	**9.45%**	**9.45%**	**9.45%**	**9.45%**
-10%	**7.38%**	**11.23%**	**7.38%**	**9.63%**
Threshold limits	Increase by 23%. This is not possible as PP has already considered the most conservative PLF from tariff order and third party report.	Decrease by 20%. This is not deemed possible as actual project cost has varied less than 10% of proposal price.	Increase by 23% This is not deemed possible as PPA for 20 years fixed tariff is already signed.	Decrease by 245%. This is not possible as with zero O&M cost also project does not cross benchmark.

Thus in light of the above discussion it can be concluded that the project activity is not the most economically attractive option without CDM revenues. Even with a 10 % increase in the PLF and tariff, which is highly unlikely considering prevailing trends, the IRR remains well below of the benchmark, if CDM benefits are not opted for. As apparent, CDM funds would certainly enable the project activity in ensuring financial sustainability, by bridging the gap between IRR and the benchmark return.

Step 3. Barrier Analysis:

The additionality has been demonstrated through investment analysis and the barrier analysis is not opted by the project participants.

Step 4. Common Practice Analysis

The proposed project activity is not demonstrated as First of its kind and also the proposed project activity does not fall under the four types of measures mention in the paragraph 6 of Tool for the demonstration and assessment of additionality (Version 6, EB65 Annex 21). Therefore existing common practice is identified and discussed as per the paragraph 44 and 45 of Tool for the demonstration and assessment of additionality, version 06 through the following sub-steps:

Sub-step 4a. Analyze other activities similar to the proposed project activity:

As per the guidance provided in the additionality tool 'Provide an analysis of any other activities that are operational and that are similar to the proposed project activity. Projects are considered similar if they are in the same country/region and/or rely on a broadly similar technology, are of a similar scale, and take place in a comparable environment with respect to regulatory framework, investment climate, access to technology, access to financing, etc. Other CDM project activities (registered project activities and project activities which have been published on the UNFCCC website for global stakeholder consultation as part of the validation process) are not to be included in this analysis'.

Region selection:

Each state in India has its separate state electricity regulatory commission which determines the tariff for projects located in that state. Hence, the investment climate with respect to promotional policies is different in each state of India. Accordingly, Tamilnadu state in which the project is located has been selected as applicable geographical area and similar project activity in this state have been analysed.

Analysis of other activities operating in comparable environment with respect to regulatory framework and investment climate in the state of Tamil Nadu which is the region under consideration:

1) Prior to September 2001: The wind power tariff in Tamil Nadu was based on MNES policy. The tariff set out was at Rs. 2.25 per unit for the base year 1994-95 with annual escalation of 5% 11.

2) September 2001 and onwards: The wind power tariff in Tamil Nadu deviated from MNES guidelines and the Tamil Nadu Electricity Board (TNEB) set tariff as below:

a) TNEB tariff order 2001 with tariff of INR 2.70 per unit and no escalation[10]
b) TNERC tariff order 2006 with tariff rate of INR 2.90 per unit and no escalation[11]

Wind power installations prior to September 2001 are of a different environment with respect to regulatory framework and investment climate as compared to installations post September 2001 and hence are not comparable to each other. The project activity is the installation of 74 MW wind based energy generation by TRCL and activities of similar scale have to be considered in the analysis. For this purpose, wind power installations having a capacity within the range of 37 MW to 111 MW (i.e. -50% to +50% of capacity of the project activity) in the state of Tamil Nadu for considering similar capacity.

Further, the projects excluded from the definition of a similar scale project and the justification for the exclusions is provided below:

1. Exclusively captive wind power projects - A captive wind project is different from the project selling its generated output to the grid in the following ways:

a. A captive project is essentially implemented to meet the power requirements of an industry. Thus, there is a definite need for power which has to be secured from some sources. Meeting this requirement, the investor is likely to try and secure the cheapest and most attractive source of power. The investment will be justified only if the cost of generation through captive installation is lesser than the HT tariff offered by the grid to draw power. The baseline scenario will be different for such an investor and the risk undertaken by captive investor will be different from an investor selling power to the grid.

2. Small scale wind power project activities bundled together from a large scale CDM project have not been considered for the analysis as the scale of these projects and the scale of investment is not comparable to the project activity under consideration.

3. Project activities implemented post the investment decision for the project activity i.e. post April, 2007, since for common practice analysis as per the "Tool for demonstration and assessment of additionality" Version 06.0.0, only those projects can be compared which are under operation prior to the start of the proposed project activity.

Thus, in context of the present project activity, wind power projects installed by a private investor having a capacity within the range of 37 MW to 111 MW in the state of Tamil Nadu after September 2001 to the date of decision making have been appropriately considered for comparison purpose under common practice analysis. For this analysis, section 6 of the Indian Windpower Directory[12] has been referred, which provides a detailed list of private windfarm owners in India. It provides the name of the owner, location of the wind mills including district and state, number of wind mills and their capacity and the year of commissioning. Post analysis of the above detailed directory, it is found that there is no wind power project of a similar capacity in the state of Tamil Nadu invested by a single private investor in a year, post September 2001 is found. Thus, as per the guidance on common practice analysis in the latest additionality tool, it can be concluded that activities of similar scale have not diffused in the concerned region and thus the project activity is not a common practice in the region.

Sub-step 4b: Discuss any similar Options that are occurring:

[10] Reference: Page no. 27 of TNERC tariff order dated 15-5-2006 (http://tnerc.tn.nic.in/orders/nces%20order%20-approved%20order%20host%20copy.pdf)

[11] (http://tnerc.tn.nic.in/orders/nces%20order%20-approved%20order%20host%20copy.pdf)

[12] Reference: Section 6, Pages 3 – 118, of Indian wind power directory, 9 th Edition, September 2009. Copy of the same has been submitted to the DOE during validation

This step is to be discussed only if similar activities are widely observed and commonly carried out. For the proposed CDM Project activity this step is not required since the project activity is not a common practice in the region.

Thus, Steps 4(a) and 4(b) of the additionality tool are satisfied. Hence, the project activity is additional.

Hence in light of the above discussion it can be concluded that registering the project activity as a CDM project activity will provide a revenue stream which would improve the financial viability of the project activity and the project's cash flow. The equity IRRs without CDM revenue are less than the benchmark value of 13.35 % and CDM revenues will enable improve the financial viability of the projects. The CDM revenues will assist the investor in realizing returns commensurate to the risks in development and operations of the project. It will also assist in offsetting the extra costs that the developer had to bear to facilitate the investments.

However, the project Participant took the decision of taking the investment risks and secured financing through internal accruals so as to invest in the CDM project activity after computing the proposed carbon financing. Besides the direct financing risk, the project activity is also shouldering the additional transaction costs such as preparing documents, supporting CDM initiatives and maintaining monitoring protocol to fulfil CDM requirements.

The project Participants are shouldering a significant market or financial risk by taking a pro-active approach in showing confidence in the Kyoto Protocol/CDM mechanism. The project Participant's decision to invest in the CDM project activity and in additional transaction costs such as preparing documents, supporting CDM initiatives and developing and maintaining M&V protocol to fulfil CDM requirements was guided by the anthropogenic greenhouse gas emission reductions the project activity would result in and its associated carbon financing the project activity would receive through sale of CERs under the Clean Development Mechanism. The revenue from the CDM funds proves to be vital to project's feasibility and would significantly improve the sustainability of the project activity

B.6. Emission reductions

B.6.1. Explanation of methodological choices

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Description of formulae used to estimate baseline emissions (emissions units of tCO_2e):

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 (tCO2e/yr)
PE_y : Project Emissions in year y (t CO2e/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. PEy = 0

Therefore the above equation is simplified to ERy = BEy

Estimation of Baseline Emissions

As per the methodology the baseline emissions include only CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing gridconnected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

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

Where:
BE_y : Baseline emissions in year y (tCO2/yr)

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

$EF_{grid,CM,y}$: Combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version 2.2.1 of the " to calculate the emission factor for an electricity system" (tCO2/MWh)

Calculation of $EG_{PJ,y}$

The calculation of $EG_{PJ,y}$ is different for (a) greenfield plants, (b) retrofits and replacements, and (c) capacity additions. Since the project activity is a Greenfield plant therefore

$EG_{PJ,y} = EG_{facility,y}$

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

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh)

Calculation of $EG_{PJ,y}$ in case the individual verification period dates and the dates of Joint Monitoring Reports (JMR) of various WTGs in the project activity do not coincide

JMR (which mentions the net electricity export to the grid) will be the primary source of data in all cases. In case where the individual verification period dates and the dates of JMRs of various WTGs in the project activity do not coincide Daily TNEB meter readings recorded by TRCL staff in the log book will serve as the source of data only for those particular days. For such a period, net electricity exported to the grid is calculated by using the same method as used by TNEB i.e. by subtracting the import reading from total export reading.

$EG_{PJ,y} = EG_{export,y} - EG_{import,y}$

Calculation of $EF_{grid,CM,y}$

The combined margin emission factor consists of two components i.e. the operating and the build margin which have been calculated by the Central Electricity Authority (CEA) and available in the CEA website. The same has also been mentioned in Annex- 3 of this document. The approach to estimate the emission factor in the combined margin method has been detailed in section B.4 of this document. Considering the emission factors for these two margins the combined margin, EFy is given by:

$EF_y = EF_{grid,CM,y} = w_{OM} * EF_{grid,OM,y} + w_{BM} * EF_{grid,BM,y}$

Where:
$EF_{grid,BM,y}$: Build margin CO2 emission factor in year y (tCO2/MWh)

$EF_{grid,OM,y}$: Operating margin CO2 emission factor in year y (tCO2/MWh)

w_{OM} : Weight of operating margin emissions factor

w_{BM} : Weight of build margin emissions factor

(where $w_{OM} + w_{BM} = 1$).

According to the baseline methodology ACM0002 (version 12.3.0), the weights for OM and BM are 0.75 and 0.25 respectively for wind power generation activities owing to their intermittent and non-dispatchable nature.

B.6.2. 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 on CO2 baseline emission factor for Indian Power Sector published by Central Electric Authority (http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm), India. Default weights of 0.75 and 0.25 have been described to OM and BM respectively because of the intermittent and non- dispatchable nature of wind energy
Value(s) applied	0.927
Choice of data or Measurement methods and procedures	The National data has been used .The Combine margin has been calculated as per the tool to calculate the emission factor for an electricity system. Version 2.2.1.
Purpose of data	Calculation of Baseline emission calculation
Additional comment	This value is fixed for the crediting period

B.6.3. Ex ante calculation of emission reductions

>>
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)

PEy: Project Emissions in year y (t CO2e/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.
PEy = 0

Therefore the above equation is simplified to
$ER_y = BE_y$

Estimation of Baseline Emissions

As per the methodology the baseline emissions include only CO2 emissions from electricity generation in fossil fuel fired power plants that are displaced due to the project activity. The methodology assumes that all project electricity generation above baseline levels would have been generated by existing gridconnected power plants and the addition of new grid-connected power plants. The baseline emissions are to be calculated as follows:

$BEy = EG_{PJ,y} X EF_{grid,CM,y}$

Where:
BE_y : Baseline emissions in year y (tCO_2/yr)

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

$EF_{grid,CM,y}$: Combined margin CO2 emission factor for grid connected power generation in year y calculated using the latest version 2.2.1 of the "Tool to calculate the emission factor for an electricity system" (tCO2/MWh)

Calculation of $EG_{PJ,y}$
The calculation of EGPJ,y is different for (a) Greenfield plants, (b) retrofits and replacements, and (c) capacity additions. Since the project activity is a Greenfield plant therefore

$EG_{PJ,y} = EG_{facility,y}$

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

$EG_{facility,y}$ = Quantity of net electricity generation supplied by the project plant/unit to the grid in year y (MWh/yr)

For simplification for the ex-ante calculation the electricity import at this stage is considered as nil. Thus, the estimated quantity of net annual electricity generation supplied by the project activity to the grid is 168595.617 MWh/year. The PLF considered in the ex-ante calculation of the EGfacility,y are 27.51% for Vestas WTGs and 24.28% for Enercon WTGs based on the third party PLF assessment report.

Calculation of $EF_{grid,CM,y}$

The combined margin emission factor consists of two components i.e. the operating and the build margin which have been calculated by the Central Electricity Authority (CEA) and available in the CEA website. The same has also been mentioned in Annex- 3 of this document. The approach to estimate the emission factor in the combined margin method has been detailed in section B.4 of this document.

Considering the emission factors for these two margins the combined margin, EFy is given by:

$EF_y = w_{OM} * EF_{grid,OM,y} + w_{BM} * EF_{grid,BM,y}$

Where:

$EF_{grid,BM,y}$: Build margin CO_2 emission factor in year y (tCO_2/MWh)

$EF_{grid,OM,y}$: Operating margin CO_2 emission factor in year y (tCO_2/MWh)

w_{OM} : Weight of operating margin emissions factor

w_{BM} : Weight of build margin emissions factor

(where $w_{OM} + w_{BM} = 1$).

According to the baseline methodology ACM0002 (version 12.3.0), the weights for OM and BM are 0.75 and 0.25 respectively for wind power generation activities owing to their intermittent and nondispatchable nature.

The combined baseline emission factor of the Southern Grid is 0.927 tCO_2/MWh.

Calculation of BE_y
The baseline emissions are to be calculated as follows:
$BE_y = E_{GPJ,y} X EF_{grid,CM,y}$
= 168595.617 MWh/year * 0.927 tCO_2/MWh.
= 156288 tCO_2/year

As ERy = BEy for the project activity so,

ERy = 156288 tCO_2/year

B.6.4. Summary of ex ante estimates of emission reductions

Year	Baseline emissions (t CO_2e)	Project emissions (t CO_2e)	Leakage (t CO_2e)	Emission reductions (t CO_2e)
Year 1[13]	156288	0	0	156288
Year 2	156288	0	0	156288
Year 3	156288	0	0	156288

[13] Year 1 starts from 01/11/2012 or the date of registration with UNFCCC, whichever is earlier.

Year 4	156288	0	0	156288
Year 5	156288	0	0	156288
Year 6	156288	0	0	156288
Year 7	156288	0	0	156288
Year 8	156288	0	0	156288
Year 9	156288	0	0	156288
Year 10	156288	0	0	156288
Total	**1562880**	**0**	**0**	**1562880**
Total number of crediting years	10			
Annual average over the crediting period	156288	0	0	156288

B.7. Monitoring plan

B.7.1. Data and parameters to be monitored

Data / Parameter	Net Electricity Quantity supplied to the grid ($EG_{facility , y}$)
Unit	MWh
Description	Quantity of net electricity generation supplied by the project plant/unit to the grid in year
Source of data	Joint meter readings at the project site
Value(s) applied	168,595.617
Measurement methods and procedures	For measuring the energy supplied by the project activity, an energy meter is provided by TNEB near every WTG which is capable of measuring export and import of energy of the WTG. From the export and import, the net electricity supplied to the grid will be calculated. The metering equipment is located at each HTSC connection and the energy is metered by the TNEB at the high voltage side of the step up transformers installed at each HTSC connection. Monthly meter reading of the main meter is recorded by the authorized representatives of TNEB in presence of the representative of TRCL.
Monitoring frequency	Measurement frequency: Continuous Recording frequency: Monthly
QA/QC procedures	The energy meter will be calibrated by TNEB as per their standard procedures. Accuracy class of energy meter: 0.5 / 0.2[14] Frequency of calibration of meters: Once in five years[15]. The measure value of the meter will be cross checked with the records of sold electricity and conservative from the same will used in CER calculation.
Purpose of data	Calculation of baseline emission
Additional comment	The data will be archived and kept till 2 years after the end of crediting period.

Data / Parameter	Electricity exported ($EG_{export , y}$)

[14] 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.

[15] The frequency of calibration has been revised to 'once in five years' under a 'Post Registration Change request', as demonstrated under the Appendix 6.

Unit	MWh
Description	Electricity exported to the Southern grid by the project activity
Source of data	Joint meter readings (JMR)
Value(s) applied	168,595.617
Measurement methods and procedures	For measuring the energy export by the project activity, an energy meter is provided by TNEB near every WTG which is capable of measuring export and import of energy. The metering equipment is located at each HTSC connection and the energy is metered by the TNEB at the high voltage side of the step up transformers installed at each HTSC connection. Daily meter reading of the main meter is recorded by TRCL staff in a log book.
Monitoring frequency	Measurement frequency: Continuous Recording frequency: Monthly
QA/QC procedures	The energy meter will be calibrated by TNEB as per their standard procedures Accuracy class of energy meter: 0.5 / 0.2 Frequency of calibration: Once in five years[16].
Purpose of data	Calculation of baseline emission
Additional comment	The data will be archived and kept till 2 years after the end of crediting period. JMR (which mentions the net electricity export to the grid) 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 only when the individual verification period dates and the dates of JMRs of various WTGs in the project activity do not coincide. For these periods, net electricity exported to the grid is calculated by using the same method as used by TNEB i.e. by subtracting the import reading from total export reading.

Data / Parameter	Electricity imported ($EG_{import,y}$)
Unit	MWh
Description	Electricity imported to the Southern grid by the project activity
Source of data	Joint meter readings
Value(s) applied	0
Measurement methods and procedures	For measuring the energy export by the project activity, an energy meter is provided by TNEB near every WTG which is capable of measuring export and import of energy. The metering equipment is located at each HTSC connection and the energy is metered by the TNEB at the high voltage side of the step up transformers installed at each HTSC connection. Daily meter reading of the main meter is recorded by TRCL staff in a log book.
Monitoring frequency	Measurement frequency: Continuous Recording frequency: Monthly
QA/QC procedures	The energy meter will be calibrated by TNEB as per their standard procedures Accuracy class of energy meter: 0.5 / 0.2 Frequency of calibration: Once in five years[16].
Purpose of data	Calculation of baseline emission

Additional comment	The data will be archived and kept till 2 years after the end of crediting period. JMR (which mentions the net electricity export to the grid) 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 only when the individual verification period dates and the dates of JMRs of various WTGs in the project activity do not coincide. For these periods, net electricity exported to the grid is calculated by using the same method as used by TNEB i.e. by subtracting the import reading from total export reading

B.7.2. Sampling plan

>>
Not applicable.

B.7.3. Other elements of monitoring plan

>>
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 years[16].

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 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 Fig B-2:

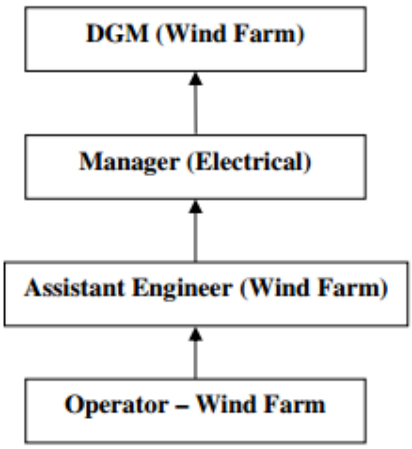

Fig B-2: Organisation structure for CDM project activity

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 equipments 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.

B.8. Date of completion of application of methodology and standardized baseline and contact information of responsible persons/ entities

>>

01/11/2011
Shri K. Selvanayagam
Company Secretary, The Ramco Cements Limited.

The Ramco Cements Limited is a Project Participant and contact details are further provided at the Appendix 1.

SECTION C. Duration and crediting period

C.1. Duration of project activity

C.1.1. Start date of project activity

>>
15/04/07, the date of Purchase order of the first lot of WTGs under the project activity

C.1.2. Expected operational lifetime of project activity

>>
20 years, 0 month

C.2. Crediting period of project activity

C.2.1. Type of crediting period

>>
Fixed crediting period is chosen

C.2.2. Start date of crediting period

>>
01/11/2012 or date of registration with UNFCCC whichever is earlier

C.2.3. Length of crediting period

>>
10 years, 00 Months.

SECTION D. Environmental impacts

D.1. Analysis of environmental impacts

>>

The project activity does not fall under the purview of Environmental Impact Assessment Notification S.O. 1533 (E) by Ministry of Environment and Forests, Government of India dated 14/09/2006 and its latest amendment S.O 3067 (E) dated 01/12/2009 of the Ministry of Environment and Forests (MoEF), Government of India (GOI) and the project activity is exempted from environmental clearances. The project activity has no significant impact on the environment. However, certain foreseen impacts due to the project activity are discussed below:

During construction

Impact on air

Movement of construction material during construction phase would have caused some air quality impacts which are negligible.

Impact on water

Proper sanitary arrangements were provided by project Participants and therefore impact on water was minimized.

Impact on Land use

The project Participants have bought the land for a worthwhile application (promoting renewable energy) and obtained necessary approvals for installation of windmills. There was no dislocation of people due to the project activity.

Impact due to noise

Personal protective equipments were provided to workers involved in the construction activity to mitigate the effects of noise pollution. However the project construction did not have impact on ambient noise levels.

Taking into consideration the project life cycle, the magnitude of the impacts during the construction phase is found to be negligible and would exist for a temporary period, till the end of construction phase.

Therefore, it would not effect the environment considerably. The impacts on the environment due to construction activities of wind turbines are negligible

Operation and Maintenance Phase

Systematic and scientific maintenance of all equipments has been undertaken to ensure the best safety standards.

Impact on air

Wind power plants do not contribute to atmospheric pollution as no fuel combustion is involved during any stage of the operation.

Impact on water

There is absolutely no effluent discharge during operation of wind turbine generators.

Impact on ecology

There are no known migratory birds/endangered species in the region of project activity. Therefore no harm on the ecological environment is envisaged.

Impact due to noise

Noise is generated due to the movement of rotor blades. Noise levels are much below the regulatory norms. It has no direct effect on the population, as the area is less populated and noise generated will be attenuated by ambient conditions.

Socio-Economic Impacts

There is no inconvenience to the local community due to the transmission lines. The project activity helps the up-liftment of skilled and unskilled manpower in the region. The project will be providing employment opportunities not only during the construction phase, but also during its operational lifetime. The project activity improves employment rate and livelihood of the local population. Moreover, the project generates eco-friendly, GHG free power which contributes to sustainable development of the region.

Conclusion

The net impact under environmental pollution category would be positive as all necessary abatement measures would be adopted and periodically monitored. The project activity does not have any major adverse impacts on environment during its construction or operational phase. The socio economic parameters would show positive impacts due to increased job opportunities.

D.2. Environmental impact assessment

>>
The project activity does not fall under the purview of Environmental Impact Assessment notification of the Ministry of Environment and Forests (MoEF), Government of India (GOI) and the project activity is exempted from environmental clearances. The details of environmental impacts during construction and operational stages are already provided in section D.1 which indicates that the impacts are insignificant.

SECTION E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

>>
The project Participant conducted stakeholder consultation meetings for different WTGs at different locations. The dates of different meetings conducted are tabulated below:

Meeting Dates	Locations/Sites	Identification/ Reference of WTGs	Invitation/public notice date
20/6/2007	Thandayarkulam	1.65MW*8 (Ref: Row no 41 to 48 in the table at Appendix 1)	01/06/2007
18/08/2007	Udumalpet	1.65*8 (Re: Row no 25 to 32 in the table at Appendix 1)	01/08/2007
27/02/2008	Muthunacikkenpatti	0.8*43 (Ref: Row no 1 to 24 in the table at Appendix 1)	31/01/2008
06/06/2008	Uthumalai	1.65MW*8 (Ref: Row no 33 to 40 in the table at Appendix 1)	15/05/2008

The following are the local stakeholders identified for the project activity:
- Local community & Villages
- Local village administration, Nodal agencies
- Tami Nadu Electricity Board (TNEB)

Invitation Process:
All the stakeholders have been invited through public notice and personal invitation letters distributed by PP in local language[16] and the documentary evidence[17] towards the same have been submitted to the DOE. TRCL requested the stakeholders to provide their comments on the project activity. During the meetings Minutes of the meeting, comments and attendance were recorded and have been submitted to DOE.

[16] The copies of Invitation both in Tamil & English translation are submitted to DOE

[17] A consolidated document file is submitted to DOE which includes the scans of all documents related to LSM.

E.2. Summary of comments received

>>

Stakeholders present in the meeting appreciated the work done by TRCL and thanked them for the various job opportunities created. Stakeholders were of the opinion that due to the establishment of the windmills, the following benefits have been achieved:

Employment opportunities have increased;
Standard of living has improved;
Businesses are flourishing;
Roads have been built and there has been a marked improvement in the infrastructure

The details of the minutes of the meeting with the comments received are provided to the DOE during the validation.

Some of the comments are mentioned below[18]:

Name of the Attendees	Meeting reference (date/site)	Stakeholders Comments/Concerns / Queries	Answers/ Justification	Remarks
Ramasamy	18/8/2007 Udumalpettai	Impact of the project on the general quality of the life of the people	Economic upliftment and improvement in infrastructure	Answer was Satisfactory for the attendee.
V. Shanmugam servai	06/06/2008 Uthumalai	Did the project impacted/changed the landscape of the region hills	No major change in the landscape	
P. Gunasekar	20/06/2007 Thandayarkulam	Employment opportunities	Employment opportunity provided.	
N. Subramanian	27/02/2008 Muthunaickkenpatti	Will it reduce the rainfall and increase heat in that area?	No scientific basis for such instances.	

E.3. Report on consideration of comments received

>>

There were no adverse comments received during the meeting. Also, the Project Design Document (PDD) would be hosted in UNFCCC website for global stakeholders' comments.

SECTION F. Approval and authorization

>>

Project activity has already available required approvals and authorizations.
Project activity has received Host Country Approval (LoA) from Indian DNA, on 12 Aug 2010.

- - - - -

[18] The comments were recorded during the meeting and same can be evident from the supportive provided.

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

Project participant and/or responsible person/ entity	☒ Project participant ☐ Responsible person/ entity for application of the selected methodology (ies) and, where applicable, the selected standardized baselines to the project activity
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	600004
Country	India
Telephone	+9144 28478666
Fax	+9144 28478676
E-mail	
Website	http://www.ramcocements.co.in/
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. Affirmation regarding public funding

No public funding for this project activity was received from Annex 1 Parties. The project activity is totally financed by the funds of TRCL.

Appendix 3. Applicability of methodology and standardized baseline

(Source: Central Electricity Authority, CO2 baseline database, Version 4.0, September/October 2008, Available at the link of http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm)

Net Generation in Operating Margin (GWh)			
	2005-06	**2006-07**	**2007-08**
NEWNE	359,271	379,471	401,642
South	100,978	109,116	114,702
India	460,249	488,587	516,343
Simple Operating Margin (tCO_2/MWh) (incl. Imports)			
	2005-06	**2006-07**	**2007-08**
NEWNE	1.02	1.01	1.00
South	1.01	1.00	0.99
India	1.02	1.01	1.00
Build Margin (tCO_2/MWh) (not adjusted for imports)			
	2005-06	**2006-07**	**2007-08**
NEWNE	0.67	0.63	0.60
South	0.71	0.70	0.71
India	0.68	0.65	0.63

The project activity is part of the Southern grid and data for the same has been used in the calculation.

Weighted Average OM of 3 latest years (2005-06, 2006-07, 2007-08) = 0.998 tCO2/MWh

BM of latest year (2007-08) = 0.713 tCO2/MWh

Since, the project activity is a wind based renewable energy, as the tool to calculate emission factor for an electricity system, version 02.2.1,

Combined Margin (CM) = 0.75 * OM + 0.25 * BM
= 0.75 * 0.998 + 0.25 * 0.713
= 0.927 tCO2/MWh

Appendix 4. Further background information on ex ante calculation of emission reductions

Required information are provided in the section B.6.3.

Appendix 5. Further background information on monitoring plan

The Monitoring and Verification (M&V) procedures define a project-specific standard against which the project's performance (i.e. GHG reductions) and conformance with all relevant criteria will be monitored and verified. It includes developing suitable data collection methods and data interpretation techniques for monitoring and verification of GHG emissions with specific focus on technical / efficiency / performance parameters. It also allows scope for review, scrutinize and benchmark all this information against reports pertaining to M & V protocols.

The M&V Protocol provides a range of data measurement, estimation and collection options/techniques indicating in each case, preferred options consistent with good practices. This allows project managers and operational staff, auditors, and verifiers to apply the most practical and cost-effective measurement approaches to the project. The aim is to enable this project to have a clear, credible, and accurate set of monitoring, evaluation and verification procedures. The purpose of these procedures would be to direct and support continuous monitoring of project performance/key project indicators to determine project outcomes, greenhouse gas (GHG) emission reductions.

As 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 generates and exports 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 to TNEB grid is metered by TNEB, along with the project Participant, at the high voltage side of the step up transformers installed at each HTSC connection. The metering equipment is located at the HTSC connection for WTGs connected to it.

In accordance with electricity standards electronic tri-vector meters capable of recording and storing the parameters has been installed. The main meters are maintained and owned by TNEB in Tamilnadu whereas the panel meters are maintained and owned by the equipment supplier. The readings are recorded from the main meter once in thirty days by the authorised representative of TNEB in presence of the representative of TRCL. The net energy exported to the grid is calculated (The quantum of power imported during off season for machine start up or any other requirement is deducted from the gross power exported 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 is the responsible authority for ensuring accuracy level of all the meters through proper calibration at their respective sites.

Project Parameters affecting Emission Reduction

Monitoring Approach

The general monitoring principles are based on:
• Frequency
• Reliability
• Registration and reporting

As the emission reduction units from the project are determined by the number of units exported to the grid (and then multiplying with appropriate emission factors sourced from Central Electricity Authority) it becomes important for the project to monitor the net export of power to the grid on real time basis.

Frequency of monitoring
The electricity exported will be monitored on a continuous basis. It will be recorded by TRCL staff in site log book on a daily basis. It will be recorded by TNEB once in a month in presence of TRCL staff.

Reliability

The amount of emission reduction units is proportional to the net energy export from the project activity. Thus the kWh meter reading is the final value from project side. The reliability of the monitoring system is governed by the accuracy of the measurement system and the quality of the equipment to produce the result.

Registration and reporting

In addition to the records maintained by TRCL, TNEB also monitors the power exported to the grid and certifies the same.

Appendix 6. Summary of post registration changes

A permanent change to the registered monitoring plan is being requested under this Appendix 6 of this PDD. In line with the Appendix 1 of Project Standard Version 9, PP is requesting hereby a 'Post Registration Change' (PRC) submission with regard to the frequency of calibration of energy meters.

The registered PDD prescribes that the frequency of meter calibration is once in a year and TNEB holds the responsibility of carrying out the calibration of all the meters. However, the actual and current situation is different. There is delay in calibration witnessed in the project site which is not under the control of PP.

During the first monitoring period, the project activity has experienced significant delay in meter calibration for which the registered frequency of calibration could not be adhered. PP has given efforts to conduct regular/periodic calibration by means of follow ups with TNEB; also PP has submitted written applications to TNEB requesting calibration/testing of the meters in both the project sites[19]. However, there is no regular/periodic calibration activity conducted by TNEB.

Therefore, in view of the above situation and uncertainty in meter calibration at TNEB, PP is requesting for a permanent change[20] in the registered PDD to readdress the frequency of calibration. In this regard, PP has referred to the CEA notification 2006[21], which confirms that *"all interface meters shall be tested at least once in five years. These meters shall also be tested whenever the energy and other quantities recorded by the meter are abnormal or inconsistent with electrically adjacent meters"*. **Hence the revised frequency of all the energy meters installed in the project activity shall be once in five years.**

The relevant sections of this revised PDD (version 12, dated 25/05/2015) are updated to include the frequency of calibration as 'once in five years'.

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[19] Letters to TNEB dated 10th Feb 2014 & 9th Feb 2015 and their acknowledgement copies.

[20] This PRC is in line with the Appendix 1 of the Project Standard, version 09, referred under the para 5(a).

[21] Reference: http://www.aegcl.co.in/Metering_Regulations_Of_CEA_17_03_2006.pdf.

Attachments:

Annex 1

Detailed location and commissioning date of wind turbine generators (WTGs)

Wind Mill SC No.	No. of WEGs & Capacity in 'KW'	Make	S.F. Nos.	Location	Latitude (N Degree Minutes Second)	Longitude (E Degree Minutes Second)	Date of commissioning.
D97	1X800	ENERCON	702/1A(P)	Melkaraipatti	N10 36 5.822	E77 24 2.497	23.07.2007
D98	1X800	ENERCON	451/1(P)	Melkaraipatti	N10 35 25.7	E77 27 25.556	23.07.2007
D99	1X800	ENERCON	461/1(P),457/1(P)	Melkaraipatti	N10 35 17.777	E77 27 40.388	23.07.2007
D100	1X800	ENERCON	305(P)	Kozhumankundan	N10 33 22.967	E77 25 31.349	23.07.2007
D101	1X800	ENERCON	1/1(P)	Medapadi	N10 33 32.172	E77 25 10.455	02.08.2007
D102	1X800	ENERCON	9	Medapadi	N10 33 21.471	E77 25 5.923	02.08.2007
D122	1X800	ENERCON	228/2A2	Kozhumankundan	N10 33 47.03	E77 26 6.389	27.09.2007
D116	2X800	ENERCON	222, 210/1	Muthunaickenpatti	N10 35 55.43, N10 35 52.793	E77 24 59.435, E77 25 12.37	27.09.2007
D115	1X800	ENERCON	166/3 & 165/2(P)	Muthunaickenpatti	N10 33 48.419	E77 24 31.989	27.09.2007
D121	2X800	ENERCON	471(P)SOUTH, 472(P),471(P)NORTH	Melkaraipatti	N10 33 12.822, N10 35 18.626	E77 27 16.773, E77 27 10.868	27.09.2007
D120	1X800	ENERCON	616/1A(P)	Melkaraipatti	N10 35 34.50	E77 27 15.17	27.09.2007

D119	2X800	ENERCON	649/1C2(P) ,644(P)	Melkaraipatti	N10 35 52.105, N10 36 6.094	E77 27 14.39, E77 27 6.084	27.09.2007
D118	1X800	ENERCON	644(P)	Melkaraipatti	N10 39 53.363	E77 27 5.333	27.09.2007
D117	1X800	ENERCON	665/1A(P)	Melkaraipatti	N10 36 33.779	E77 27 5.877	27.09.2007
D129	7X800	ENERCON	670/1B(P), 347(P),349 (P)SOUTH , 356/4A,3G, 5C, 358/1(P)N ORTH, 416, 676(P), 675/1(P)	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	44/3A	Rajampatti	N10 35 26.614	E77 24 49.969	02.01.2008
D133	1X800	ENERCON	103/1B	Rajampatti	N10 37 1.551	E77 26 33.839	02.01.2008
D132	2X800	ENERCON	53/1(P), 54/1(P) & 2(P)	Rajampatti	N10 35 11.947, N10 36 46.863	E77 24 49.427, E77 26 44.245	02.01.2008
D140	2X800	ENERCON	69/1B(P), 70/1,2(P)	Rajampatti	N10 36 1.294, N10 35 44.379	E77 24 45.736, E77 24 45.439	15.03.2008
D139	2X800	ENERCON	78/5,6(P), 100/1(P),2(P)	Rajampatti	N10 35 51.574, N10 36 41.402	E77 24 48.981, E77 246 31.245	15.03.2008
D135	7X800	ENERCON	26/1(P),27/ 1(P), 12/1B3(P), 148/1,2(P), 144/4(P), 110/1A(P), 115/1(P), 110/3(P))	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	225/2A2,2 A3,2A4,22 4/1(P), 125/1(P), 2(P0	Rajampatti	N10 36 51.945, N10 37 1.115	E77 25 40.589, E77 25 45.298	15.03.2008

D137	1X800	ENERCON	204/2(P) & 126/1(P)	Rajampatti	N10 37 15.869	E77 25 47.388	15.03.2008
D136	1X800	ENERCON	199(P)	Rajampatti	N10 37 28.380	E77 25 49.131	15.03.2008
U1459	1X1650	VESTAS	186(P),188 /1AA(P)	Udumalpet	N10 35 51.42	E77 14 8.7	27.07.2007
U1460	1X1650	VESTAS	163/1	R. Velur	N10 34 29.88	E 77 11 26.1	31.07.2007
U1464	1X1650	VESTAS	59/3B(P),2 53/C1(P)	Venasapatti	N10 37 14.34	E77 12 4.86	16.08.2007
U1465	1X1650	VESTAS	252/B1 C(P),253/C 1(P)	Ragalpavi	N10 34 50.64	E77 11 18.9	16.08.2007
U1468	1X1650	VESTAS	446/3,446/ 4	Thungavi	N10 37 45.6	E77 21 51.24	22.08.2007
U1469	1X1650	VESTAS	440/2A,2B	Thungavi	N10 37 59.1	E77 21 48.24	22.08.2007
U1522	1X1650	VESTAS	370/1C1 1C2(P)	Thungavi	N10 38 10.5	E77 21 31.2	29.03.2008
U1532	1X1650	VESTAS	525/2(P)	Metrathi	N10 38 33.54	E77 20 18.24	31.03.2008
2505	1X1650	VESTAS	179	Vadi	N8 58 097	E77 27 .549	31.12.2007
2506	1X1650	VESTAS	58	Rajagopalaperi	N8 57 .193	E77 27 .533	22.01.2008
2507	1X1650	VESTAS	324	Vadi	N8 57 .504	E77 27 .620	24.01.2008
2509	1X1650	VESTAS	87	Anaikulam	N9 00 06.2	E77 27 24.3	04.02.2008
2510	1X1650	VESTAS	37	Vadi	N8 59 02.7	E77 28 06.4	13.02.2008
2522	1X1650	VESTAS	196	Rajagopalaperi	N8 56 .944	E77 27 .823	17.03.2008
2616	1X1650	VESTAS	234	Rajagopalaperi	N8 56 40.7	E77 27 48.0	22.04.2008
2629	1X1650	VESTAS	654	Uthumalai	N8 58 20.3	E77 32 47.7	23.05.2008
2357	1X1650	VESTAS	525	Therku Valliyoor	N8 19 45.8	E77 37 30.2	04.06.2007
2358	1X1650	VESTAS	538	Therku Valliyoor	N8 19 19.4	E77 37 38.7	04.06.2007
2359	1X1650	VESTAS	529	Therku Valliyoor	N8 19 39.6	E77 37 12.8	04.06.2007

2360	1X1650	VESTAS	568	Therku Valliyoor	N8 19 32.7	E77 37 34.3	04.06.2007
2361	1X1650	VESTAS	931	Samugarangapuram	N8 18 45.0	E77 40 06.8	05.06.2007
2362	1X1650	VESTAS	754	Samugarangapuram	N8 18 53.6	E77 40 36.3	05.06.2007
2367	1X1650	VESTAS	150	Soundarapandiapuram	N8 18 40.9	E77 39 30.4	14.06.2007
2368	1X1650	VESTAS	502	Therku Valliyoor	N8 19 55.1	E77 36 59.8	15.06.2007

Annex 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	: 5^0
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
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

Annex 3

Power evacuation details of the WTGs

The Ramco Cements Ltd

HTSC NO.	Make	Generation Details Vol. / Freq.		Step Up Transformer	Sub-Station Transformer Capacity	Sub-Station Transformer Location
D97	ENERCON	440 V	50 Hz	22000/440V	110/22KV -5 Nos, 5 X 25 MVA	Melakaraipatti
D98	ENERCON	440 V	50 Hz	22000/440V	110/22KV -5 Nos, 5 X 25 MVA	Melakaraipatti
D99	ENERCON	440 V	50 Hz	22000/440V	110/22KV -5 Nos, 5 X 25 MVA	Melakaraipatti
D100	ENERCON	440 V	50 Hz	22000/440V	110/22KV -5 Nos, 3 X 25 MVA	Thaliyuthu
D101	ENERCON	440 V	50 Hz	22000/440V	110/22KV -5 Nos, 3 X 25 MVA	Thaliyuthu
D102	ENERCON	440 V	50 Hz	22000/440V	110/22KV -5 Nos, 3 X 25 MVA	Thaliyuthu
D122	ENERCON	440 V	50 Hz	22000/440V	110/22KV -5 Nos, 5 X 25 MVA	Melakaraipatti
D116	ENERCON	440 V	50 Hz	22000/440V	110/22KV -5 Nos, 5 X 25 MVA	Melakaraipatti
D115	ENERCON	440 V	50 Hz	22000/440V	110/22KV -5 Nos, 5 X 25 MVA	Melakaraipatti
D121	ENERCON	440 V	50 Hz	22000/440V	110/22KV -5 Nos, 5 X 25 MVA	Melakaraipatti
D120	ENERCON	440 V	50 Hz	22000/440V	110/22KV -5 Nos, 5 X 25 MVA	Melakaraipatti
D119	ENERCON	440 V	50 Hz	22000/440V	110/22KV -5 Nos, 5 X 25 MVA	Melakaraipatti
D118	ENERCON	440 V	50 Hz	22000/440V	110/22KV -5 Nos, 5 X 25 MVA	Melakaraipatti
D117	ENERCON	440 V	50 Hz	22000/440V	110/22KV -5 Nos, 5 X 25 MVA	Melakaraipatti
D129	ENERCON	440 V	50 Hz	22000/440V	110/22KV -5 Nos, 5 X 25 MVA	Melakaraipatti
D134	ENERCON	440 V	50 Hz	22000/440V	110/22KV -5 Nos, 5 X 25 MVA	Melakaraipatti
D133	ENERCON	440 V	50 Hz	22000/440V	110/22KV -5 Nos, 5 X 25 MVA	Melakaraipatti
D132	ENERCON	440 V	50 Hz	22000/440V	110/22KV -5 Nos, 5 X 25 MVA	Melakaraipatti
D140	ENERCON	440 V	50 Hz	22000/440V	110/22KV -5 Nos, 5 X 25 MVA	Melakaraipatti
D139	ENERCON	440 V	50 Hz	22000/440V	110/22KV -5 Nos, 5 X 25 MVA	Melakaraipatti
D135	ENERCON	440 V	50 Hz	22000/440V	110/22KV -5 Nos, 5 X 25 MVA	Melakaraipatti
D138	ENERCON	440 V	50 Hz	22000/440V	110/22KV -5 Nos, 5 X 25 MVA	Melakaraipatti

D137	ENERCON	440 V	50 Hz	22000/440V	110/22KV -5 Nos, 5 X 25 MVA	Melakaraipatti
D136	ENERCON	440 V	50 Hz	22000/440V	110/22KV -5 Nos, 5 X 25 MVA	Melakaraipatti
U1459	VESTAS	690 V	50 Hz	22000/690/400V	110/22KV -2 Nos, 2 X 25 MVA	Udumalpet
U1460	VESTAS	690 V	50 Hz	22000/690/400V	110/22KV -3 Nos, 2 X 16 MVA,1X 25MVA	Poolankinar
U1464	VESTAS	690 V	50 Hz	22000/690/400V	110/22KV -3 Nos, 2 X 16 MVA,1X 25MVA	Poolankinar
U1465	VESTAS	690 V	50 Hz	22000/690/400V	110/22KV -3 Nos, 2 X 16 MVA,1X 25MVA	Poolankinar
U1468	VESTAS	690 V	50 Hz	22000/690/400V	110/22KV -5 Nos, 4 X 25 MVA,1X16 MVA	Thungavi
U1469	VESTAS	690 V	50 Hz	22000/690/400V	110/22KV -5 Nos, 4 X 25 MVA,1X16 MVA	Thungavi
U1522	VESTAS	690 V	50 Hz	22000/690/400V	110/22KV -5 Nos, 4 X 25 MVA,1X16 MVA	Thungavi
U1532	VESTAS	690 V	50 Hz	22000/690/400V	110/22KV -5 Nos, 4 X 25 MVA,1X16 MVA	Thungavi
2505	VESTAS	690 V	50 Hz	33000/690/400V	230/33KV, 4 X 50 MVA	Veeranam
2506	VESTAS	690 V	50 Hz	33000/690/400V	230/33KV, 4 X 50 MVA	Veeranam
2507	VESTAS	690 V	50 Hz	33000/690/400V	230/33KV, 4 X 50 MVA	Veeranam
2509	VESTAS	690 V	50 Hz	33000/690/400V	230/33KV, 4 X 50 MVA	Veeranam
2510	VESTAS	690 V	50 Hz	33000/690/400V	230/33KV, 4 X 50 MVA	Veeranam
2522	VESTAS	690 V	50 Hz	33000/690/400V	230/33KV, 4 X 50 MVA	Veeranam
2616	VESTAS	690 V	50 Hz	33000/690/400V	230/33KV, 4 X 50 MVA	Veeranam
2629	VESTAS	690 V	50 Hz	33000/690/400V	230/33KV, 4 X 50 MVA	Veeranam
2357	VESTAS	690 V	50 Hz	33000/690/400V	110/33KV -3 Nos, 110/11KV -1 No. 4 X 16 MVA	Thandayarkulam
2358	VESTAS	690 V	50 Hz	33000/690/400V	110/33KV -3 Nos, 110/11KV -1 No. 4 X 16 MVA	Thandayarkulam
2359	VESTAS	690 V	50 Hz	33000/690/400V	110/33KV -3 Nos, 110/11KV -1 No. 4 X 16 MVA	Thandayarkulam

2360	VESTAS	690 V	50 Hz	33000/690/400V	110/33KV -3 Nos, 110/11KV -1 No. 4 X 16 MVA	Thandayarkulam
2361	VESTAS	690 V	50 Hz	33000/690/400V	110/33KV -3 Nos, 110/11KV -1 No. 4 X 16 MVA	Thandayarkulam
2362	VESTAS	690 V	50 Hz	33000/690/400V	110/33KV -3 Nos, 110/11KV -1 No. 4 X 16 MVA	Thandayarkulam
2367	VESTAS	690 V	50 Hz	33000/690/400V	110/33KV -3 Nos, 110/11KV -1 No. 4 X 16 MVA	Thandayarkulam
2368	VESTAS	690 V	50 Hz	33000/690/400V	110/33KV -3 Nos, 110/11KV -1 No. 4 X 16 MVA	Anna Nagar

Annex 4

Sustainable development action plan

TRCL will contribute 2% of its CER revenues in sustainable development of the area. The following table lists the sustainable development scope and the monitoring action plan of the scope.

Sustainable Development	Monitoring Action Plan
Back filling of mines and greenery development Part of this amount will be spent for back-filling of some of the mines and sustenance of the greenery which Madras Cements will be willing to take up.	Every month the old mines will be back-filled and greenery will be planted, so that the environment will not be disturbed. Periodic visits by the mines officials will be undertaken to monitor the progress and proper documentation will be maintained regarding the amount spent and evidence of the work progress.
Health facilities to under privileged Part of the amount will also be utilized in health care of the underprivileged segments of the society and improvement of health levels in the society.	The progress of work and the amount spent towards such health care will be documented by our Administrative staff. The beneficiary list also will be maintained and ensure that maximum number of eligible people benefit from such facilities.