| PROJECT DESIGN DOCUMENT FORM<br>FOR CDM PROJECT ACTIVITIES (F-CDM-PDD)<br>Version 04.1 |
|---|

# PROJECT DESIGN DOCUMENT (PDD)

| | |
|---|---|
| **Title of the project activity** | 25.70 MW Bundled Wind Power Project in Udumalpet, Tamilnadu |
| **Version number of the PDD** | 05 |
| **Completion date of the PDD** | 01/04/2014 |
| **Project participant(s)** | Vestas Wind Technology (I) Pvt. Ltd.<br>Swedish Energy Agency |
| **Host Party(ies)** | India |
| **Sectoral scope and selected methodology(ies)** | ACM0002 “Approved Consolidated Baseline Methodology for grid connected electricity generation from renewable sources”<br>Version 06 (19th May, 2006)<br>Sectoral scope: 1 |
| **Estimated amount of annual average GHG emission reductions** | 40,756 |

**SECTION A. Description of project activity**

**A.1. Purpose and general description of project activity**

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The project is set up in the state of Tamil Nadu in Southern India. Tamil Nadu faces a demand-supply gap, which may be directly attributable to the growth in industrial activity as well as lack of investment in power projects. The present maximum monthly power shortage on demand power is 0.4% and shortage on peak load demand about 2.74%. The power demand in the state is estimated to grow at 5.84% annually.

The project is a wind based 25.70 MW with wind turbines of 750 kW, 950 kW and 1650 kW capacity erected in and around Udumalpet in Tamil Nadu. The project activity will generate greenhouse gas (GHG) emission reductions by avoiding $CO_2$ emissions from electricity generation by fossil fuel power plants that supply the Tamil Nadu State Grid and hence the southern regional electricity grid. Vestas India is coordinating the project which is a bundle of individual sub-projects.

By virtue of the fact that they are in the same area, all individual projects supply electricity using the TNEB transmission lines. It is in view of this that they are bundled as one single Project.

The Project will contribute to sustainable development of Tamil Nadu in various ways.

1. Most important is that it replaces thermal energy that is dispatched at the operating margin and also delay the expansion of any conventional power sources planned by the State.
2. The Project contributes to the overall energy goal of the State and the country which envisages 10% of the planned 100,000 MW to come from renewable sources.
3. It also increases the power supply to the local grid, improving stability and helping reduce losses in the distribution system.
4. The Project assists in a small way to narrow the large demand and supply gap in the State.
5. It reduces greenhouse gas emissions as well as emissions of local pollutants from power generation by using a cleaner energy source than what typically would have been used.
6. The development of the project also provides important knowledge and experience for other project developers that are striving to participate in the competitive national and regional market.

The project reduces about 40,756 tonnes of Carbon dioxide annually.

| Sl. No. | Project Participant | WEG (MW) | Commissioning Date | Location | HT. SC No. |
|---|---|---|---|---|---|
| 1 | Classis Knits India (P) Ltd. | 0.750 | 31.12.2004 | Kongalnagaram | 600 |
| | Classis Knits India (P) Ltd. | 0.750 | 31.12.2004 | Kongalnagaram | 601 |
| | Classis Knits India (P) Ltd. | 0.750 | 30.09.2004 | Kongalnagaram | 574 |
| 2 | Royal Classic Mills (P) Ltd | 0.750 | 18.03.2004 | Dasarpatti | 368 |

| | | | | | |
|---|---|---|---|---|---|
| 3 | Jayabalaji Dyeing | 0.750 | 18.03.2005 | Andhiyur | 644 |
| | Jayabalaji Dyeing | 0.750 | 22.03.2005 | Andhiyur | 672 |
| 4 | V V Minerals | 0.750 | 18.03.2005 | Andhiyur | 643 |
| | V V Minerals | 0.750 | 22.03.2005 | Andhiyur | 673 |
| 5 | Kongoor Textiles Process | 0.750 | 28.05.2004 | Kongalnagaram | 446 |
| 6 | GVG Industries Private Ltd | 0.750 | 18.03.2004 | Kongalnagaram | 359 |
| | GVG Paper Mills Private Ltd | 0.750 | 29.03.2004 | Kongalnagaram | 402 |
| | GVG Paper Mills Private Ltd | 0.750 | 24.06.2005 | Kongalnagaram | 841 |
| | SVPB Spinners Private Ltd | 0.750 | 18.03.2004 | Kongalnagaram | 357 |
| | SVA Syntex Private Ltd | 0.750 | 18.03.2004 | Kongalnagaram | 358 |
| 7 | Cylwin Knitwear | 0.750 | 30.03.2004 | Dasarpatti | 405 |
| 8 | City Mills Private Limited | 0.750 | 31.03.2004 | Kongalnagaram | 425 |
| | City Mills Private Limited | 0.750 | 29.03.2004 | Kongalnagaram | 395 |
| | City Mills Private Limited | 0.750 | 29.03.2004 | Kongalnagaram | 397 |
| | City Mills Private Limited | 1.650 | 28.05.2005 | Andhiyur | 824 |
| 9 | RB Wovens Private Limited | 0.750 | 31.12.2004 | Andhiyur | 599 |
| | RB Wovens Private Limited | 0.750 | 18.03.2005 | Andhiyur | 645 |
| 10 | Interocean Navigation Ltd | 0.950 | 26.03.2005 | Edayarpalayam | 689 |
| | Interocean Shipping India Pvt. Ltd | 1.650 | 11.01.2005 | Kongalnagaram | 602 |
| 11 | Shri Gowrishankarar Agencies Private Ltd. | 1.650 | 05.05.2005 | Andhiyur | 801 |
| 12 | Asian Wind Energy Private Limited | 1.650 | 30.09.2004 | Andhiyur | 581 |
| 13 | Sri Kannapiran Mills Ltd. | 1.650 | 10.02.2005 | Udumalpet | 613 |
| 14 | Prachi Exports | 0.750 | 30.03.2004 | Gomangalam | 413 |
| | Prachi Exports | 0.750 | 31.03.2004 | Gomangalam | 423 |

**A.2. Location of project activity**

**A.2.1. Host Party(ies)**

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India

**A.2.2. Region/State/Province etc.**

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Tamilnadu

### A.2.3. City/Town/Community etc.

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Taluka: Udumalpet

District: Tirupur

### A.2.4. Physical/Geographical location

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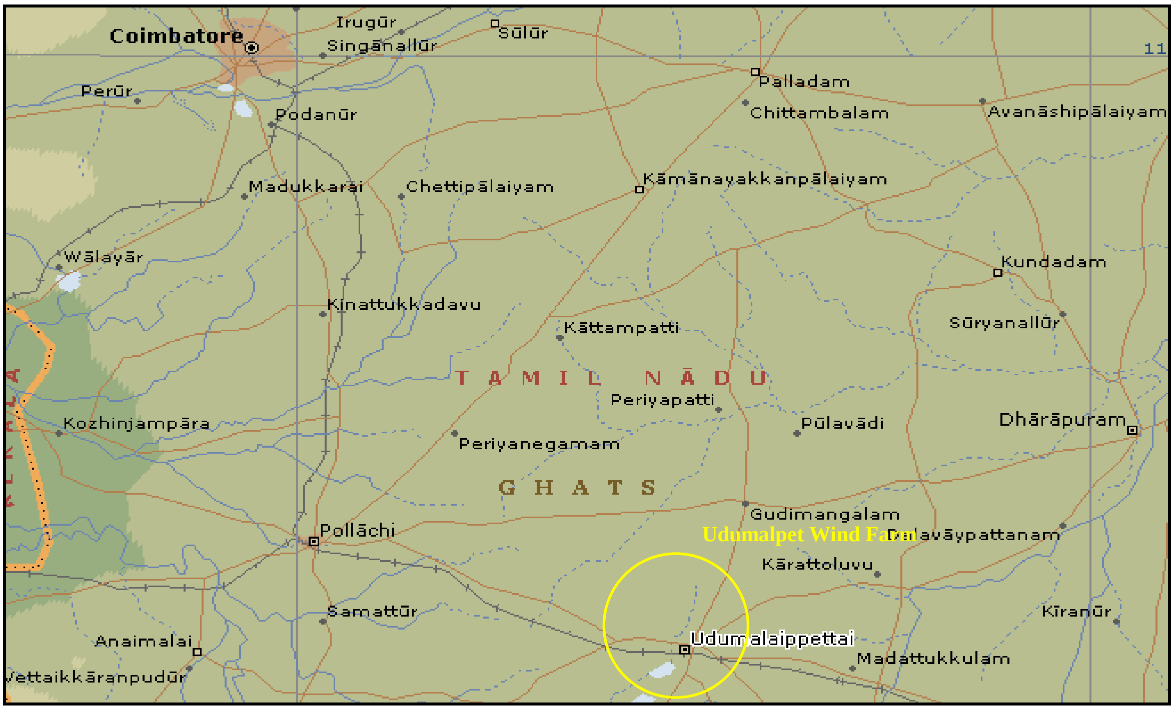
The project activity lies between the latitudes N 10°42’ and N 10°33’ and the longitudes E 77°7’ and E 77°14’. Figure 1 shows a map of the project site. The location where the project activity has been carried out is uncultivable barren and wasteland. The nearest town Udumalpet is about 15 km away from the project site.




**(Figure 1: Location Map of the project site.)**

### A.3. Technologies and/or measures

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The project involves the installation of Wind Electric Generators of NEG Micon. The WEGs are ideal for Indian meteorological conditions. WEGs of 750 kW and 1650 kW have been installed. The NM 48/750 WEG with a rated capacity of 750 kW is one of the machines well known for its best performance. The NM 48/750 WEG is a stall regulated machine with a cut-in speed of 4 m/s and a cut-out speed of 25 m/s. The NM 54/950 machine has a rated capacity of 950 kW and has cut-in and cut-out speeds similar to the NM 48/750. Whereas the NM 82/1650 with a rated capacity of 1650 kW is an ACTIVE STALL™ machine with cut-in and cut-out speeds of 2.5 m/s and 32 m/s, respectively. The NM 48/750 and NM 82/1650 machines are type tested and certified by DNV, Denmark A/S. The technical specification of the WEGs is as tabulated as below:

## TECHNICAL SPECIFICATION OF THE WEGs IN THE PROJECT ACTIVITY

| Sl No | Parameters | NM 48/750 | NM 54/950 | NM 82/1650 |
|---|---|---|---|---|
| 1 | **Operational Data** | | | |
| | Nominal Output | 750 kW | 950 kW | 1650 kW |
| | Power Regulation | Stall | Stall | Active-Stall™ |
| | Cut-In Speed | 4 m/s | 3.5 m/s | 3.5 m/s |
| | Cut-Out Speed | 25 m/s | 25 m/s | 24 m/s |
| 2 | **Rotor** | | | |
| | Rotor Diameter | 48.2 m | 54.5 m | 82 m |
| | Rotor Swept Area | 1824 $cm^2$ | 2333 m2 | 5281 $m^2$ |
| | Number of Blades | 3 nos. | 3 nos. | 3 nos. |
| 3 | **Brake System** | | | |
| | Blade tip Air Brake | Hydraulic, fail safe | Hydraulic, fail safe | Full Blade Pitch |
| | Disc Brake | Hydraulic | 1 Pcs. Hydraulic fail safe | Hydraulic Disc Brake |
| 4 | **Drive Train** | | | |
| | Gear type | Planetary - parallel axle | Planetary - Parallel axle | Planetary/Helical gears |
| | Ratio | 1:67.5 - 50Hz | 1.67.5 - 50 Hz | 1:70.2 - 50Hz |
| | Main Shaft | High quality forged shaft | Forged shaft and flange | High quality forged shaft |
| | Main Bearing | Spherical roller bearing | Spherical roller bearing | Self aligning roller bearing |
| | Cooling | Closed circiut liquid cooling | Heat exchanger with pump | Closed circiut liquid cooling |
| 5 | **Generator** | | | |
| | Type | Asynchronous | Asynchronous | Asynchronous |
| | Nominal Voltage | 690 V | 690 V | 690 V |
| | Nominal Frequency | 50 Hz | 50 Hz | 50 Hz |
| | Name Plate Rating | 750/200 kW | 950/200 kW | 1650/900 kW |
| | Cooling | Closed circuit liquid cooling | Liquid cooled with pump | Closed circuit liquid cooling |
| 6 | **Yaw** | | | |
| | Type | Ball Bearing | Sliding Bearing | Ball bearing slewing ring with gearing and yaw breaks |
| | Drive Mechanism | 4 electrical planetary gears | 3 electrical planetary gears | 6 active electric yaw drives |
| 7 | **Tower** | | | |
| | Type | Conical, Steel, PU Painted | Conical, Steel, Painted | Tubular, Steel, PU Painted |
| | Hub Height | According to type approvals | According to type approvals | According to approvals |
| 8 | **Controller** | | | |
| | Type | Computer controlling | Computer controlling | Microprocessor based computer control system |
| | Capacitor Bank | NO LOAD Compensated | NO LOAD Compensated | Automatic intelligent phase compensation logic, multistage |

The technical design of the NM 48/750, NM 54/950 and NM 82/1650 WEGs is from Vestas Wind Systems A/S, Denmark where a dedicated team of professionals are actively involved in design and testing. Vestas Wind Technology (I) Private Limited has had an effect on technology transfer. Vestas Wind Technology (I) Private Limited has manufacturing plants in Chennai.

**A.4. Parties and project participants**

| Party involved (host) indicates a 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) |
|---|---|---|
| Government of India (Host Country) | Vestas Wind Technology (I) Private Limited. | No |
| Government of Sweden | Swedish Energy Agency | Yes |

Vestas Wind Technology India Private Limited will be the sole focal point of contact for all communications related to this CDM project activity with NCDMA and the CDM-EB of UNFCCC.

**A.5. Public funding of project activity**

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There is no public funding involved in this project activity.

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

**B.1. Reference of methodology**

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Methodology : ACM0002

Title : Consolidated baseline methodology for grid-connected electricity generation from renewable sources

Sectoral Scope : 01

Version : 06 (19th May, 2006)

http://cdm.unfccc.int/methodologies/DB/UB3431UT9I5KN2MUL2FGZXZ6CV71LT

**Title: "Tool to calculate emission factor for an electricity system"**

Version1 (From 19 Oct 2007 )

EB 35 Annex 12

**B.2. Applicability of methodology**

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ACM0002/Version 06/Sectoral Scope (19 May 2006) is applicable to grid-connected renewable power generation project activities under the following conditions:

1. Applies to electricity capacity additions from:
   1.1. Run-of-river hydro power plants; hydro power projects with existing reservoirs where the volume of the reservoir is not increased
   1.2. Wind sources

1.3. Geothermal sources
1.4. Solar sources
1.5. Wave and tidal sources

2. This methodology is not applicable to project activities that involve switching from fossil fuels to renewable energy at the site of the project activity, since in this case the baseline may be the continued use of fossil fuels at the site
3. The geographic and system boundaries for the relevant electricity grid can be clearly identified and information on the characteristics of the grid is available
4. Applies to grid connected electricity generation from landfill gas capture to the extent that it is combined with the approved "Consolidated baseline methodology for landfill gas project activities (ACM0001)

The project activity uses wind power to generate electricity and hence matches with the applicability criteria Sub clause 1.2 of Clause 1

The project under consideration does not have any fuel switching at the project site and hence qualifies under Clause 2 above as well.

Since the geographic and system boundaries of the project are well defined, it could be concluded that the methodology selected is appropriate for this project.

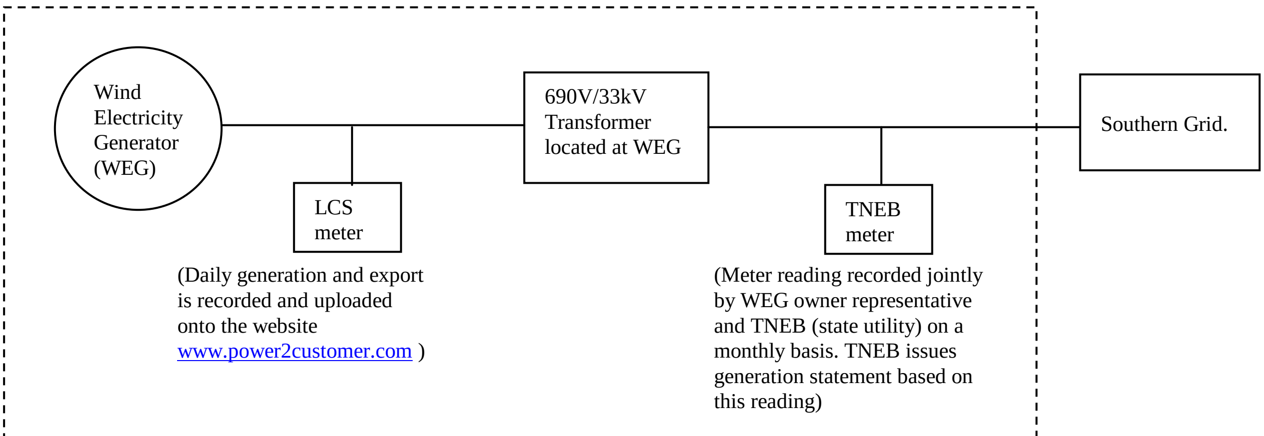
There is no relevance between the project and Clause 4 of the applicability criteria.

The methodology is designed to be applicable to grid-connected wind power projects and determines the baseline for grid electricity generation at the combined margin. The Project is a wind energy project that is connected to a predominantly thermal based grid, and is likely to affect the operating margin, and in the long term, the build margin. This is with accordance to what has been laid down in the CDM Modalities and Procedures.

**B.3. Project boundary**

The project boundary for the project activity is selected as per the approved methodology ACM0002, Version 6. As per the methodology, 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.

Tool to calculate emission factor for an electricity system, Version 1 defines grid/ project electricity system by the spatial extent of the power plants that are physically connected through transmission and distribution lines to the project activity and that can be dispatched without significant transmission constraints. The project activity evacuates power to the Southern regional grid. A diagrammatic presentation of the project boundary is given below:



The GHGs and emission sources included in or excluded from the project boundary are listed in the table below:

| | Source | Gas | Included | Justification/Explanation |
|---|---|---|---|---|
| **Baseline** | $CO_2$ emissions from electricity generation in fossil fuel fired power plants that is displaced due to the project activity | $CO_2$ | Yes | Main emission source |
| | | $CH_4$ | No | Minor emission source |
| | | $N_2O$ | No | Minor emission source |
| **Project** | For geothermal power plants, fugitive emissions of $CH_4$ and $CO_2$ from non-condensable gases contained in geothermal steam. | $CO_2$ | No | The present project activity is a Greenfield wind power project. Hence, not applicable |
| | | $CH_4$ | No | |
| | | $N_2O$ | No | |
| | $CO_2$ emissions from combustion of fossil fuels for electricity generation in solar thermal power plants and geothermal power plants | $CO_2$ | No | The present project activity is a Greenfield wind power project. Hence, not applicable |
| | | $CH_4$ | No | |
| | | $N_2O$ | No | |
| | For hydro power plants, emissions of $CH_4$ from the reservoir. | $CO_2$ | No | The present project activity is a Greenfield wind power project. Hence, not applicable |
| | | $CH_4$ | No | |
| | | $N_2O$ | No | |

The project boundary is defined as the notional margin around a project within which the project's impact (in terms of GHG reduction) will be assessed. According to ACM0002/Version 13/ the spatial extent of this project activity includes the project site and all the power plants connected physically to the electricity system that the CDM power project is connected to. Thus, it is the zone encompassing the WEG installations to the nearest grid interconnection point.

There are three choices available for choosing the grid system for the project activity, viz. national grid, regional grid or state grid. Since the CDM project would be supplying electricity to the southern regional grid it is preferable to take the regional grid as project boundary than the state boundary. It also minimizes the effect of inter state power transactions, which are dynamic and vary widely. Considering free flow of electricity among the member states and the union territory through the Southern Region Load Dispatch Centre (SRLDC), the entire southern grid is considered as a single entity for estimation of baseline. Additionally the southern grid is also connected with other regional grids, however, the net exchange of energy within the regional grids is very small, and thus the other regional grids are not included in the boundary. The Southern Region comprising the States of Andhra Pradesh, Karnataka, Kerala and Tamilnadu and the Union Territories of Pondicherry and Goa encompassing an area of approximately 637,000 Square Kilometers, constituting about 20% of the total area of the country.

As per the Baseline Study in the Southern Region Grid, it is estimated that the primary and critical source of emission is the $CO_2$ emissions from the conventional power generation systems, which is a part of the baseline study. The other likely emissions are that of $CH_4$ and $N_2O$, but both emissions were conservative and are excluded for simplification of the project. Also, indirect emissions can result from project construction, transportation of materials and other upstream activities. In the case of this Project, these emissions are thought to be comparable or less to the life cycle emissions which would result from the eventual construction and operation of alternative capacity. The life cycle emissions of alternative power generation plants, in particular fossil fuel plants, are much higher than from wind power plants due to the nature of activities involved like mining, refining and transportation of fossil fuel. The project does not claim emissions reductions from these activities. Therefore no significant net leakage from the above activity was identified. The Methodology does not take into account the leakage that would arise from the import and export of electricity to the local grid. It is concluded that since this is a wind power Project, there would be minimum or no leakage and hence this is considered insignificant.

**B.4. Establishment and description of baseline scenario**

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The project category is renewable electricity generation for a grid system, which is fed by both fossil fuel fired generating plants (using fossil fuels such as coal, natural gas, diesel, naphtha etc.) and non-fossil fuel based generating plants (such as hydro, nuclear, biomass and wind). Hence, the applicable baseline, as per ACM0002, is the kWh produced by the renewable generating unit multiplied by an emission factor (measured in $kgCO_2/kWh$) calculated in a transparent and conservative manner.

The project involves installation, commissioning and operation of 5 numbers of 1.65 MW, 1 number of 0.95 MW and 22 numbers of 0.75 MW totally contributing 25.7 MW of power to the regional grid.

With reference to ACM0002/Version 13, for project activities that do not modify or retrofit an existing electricity generation facility, the baseline scenario is the following:

In the absence of the CDM project activity, the electricity that is being delivered to the grid by this project would have been generated by the operation of grid-connected power plants and by the additions of new generation sources, as reflected in the combined margin calculations.

The baseline identified fits this scenario.

**Approach**

The baseline methodology approach 48(a) called “existing actual or historical emissions, as applicable” has been applied in the context of the project activity. The approach selected in the baseline methodology checks the additionality of the project activity and determines the baseline emission factor for selected baseline scenario.

As per the ACM0002 methodology, the combined margin is calculated based on the weighted average of the operating margin emission factor and the weighted average of the build margin emission factor. This methodology suggests that weightage for wind projects is 75:25 for conservative purposes 50:50 was considered. norms. The project is to have equal effects on both operating as well as build margins. However, it is important to note that wind power plants are different to most types of power plants, both conventional and new, in the variability of the resource.

**Baseline scenario**

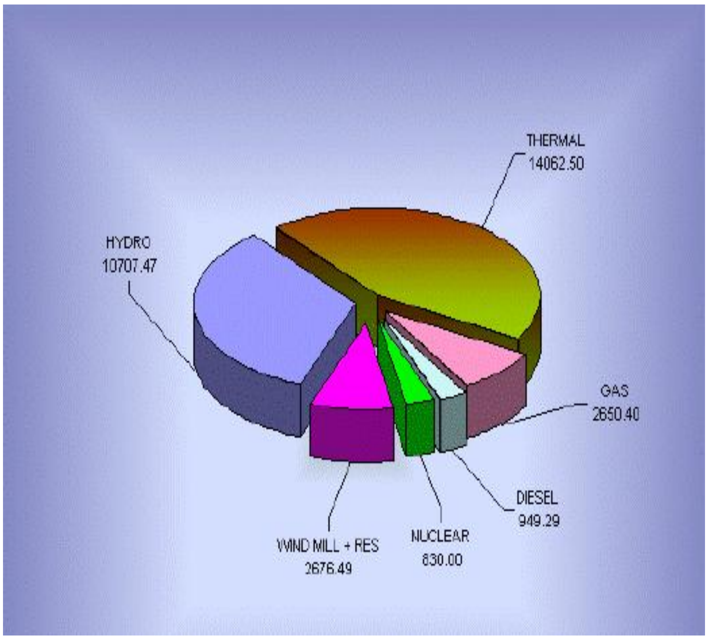
In the southern grid, electricity delivered to the grid by the project would have Wotherwise been generated by the operation of grid-connected power plants operational by the addition of new generation sources.

**Power Supply Position – Southern grid**

The registered peak demand of the Southern Regional grid during 2004 - 2005 was 22364 MW indicating an increase of 1.99 % over the previous year. The unrestricted maximum demand was 22717 MW. The overall capacity shortage in the region was of the order of 0.62 % to 6.43 % during the year 2004-05. The maximum monthly capacity shortages were of the order of 0.12 % to 5.08 % in Andhra Pradesh, 0.25 % to 13.26 % in Karnataka, 4.64 % to 4.90 % in Kerala and 0.4 % to 2.74 % in Tamilnadu.

The installed capacity of Southern Region at the end of financial year 2004-05 was 31876.15 MW. The total installed capacity comprises Hydro- 10707.47 MW (33.59 %), Thermal+ Gas+ Diesel- 17662.19 MW (55.41 %), Nuclear- 830 MW (2.60 %) and Wind+ R.E.S- 2676.49 MW (8.40 %). There was an increase of 6.58 % in the installed capacity over the previous year through addition of 1969.23 MW in Southern Region. The Hydro Thermal ratio was 38:62 as on 31.03.2005. Source: CEA – Southern Regional Electricity Board – Bangalore. Annual Report 2004-05.

The project will generate electricity from WEGs in the State of Tamilnadu. The project activity has been essentially conceived for selling the generated output to the state electricity utility. Hence the wind power generated from the project site will be replacing the electricity generated from thermal power stations feeding into regional grid (during power surplus time). Since wind power is free from $CO_2$ emissions, the power generated will reduce the anthropogenic Green House Gas (GHG) emissions that would have otherwise been generated by the fossil fuel based thermal power stations comprising coal, diesel, furnace oil and gas. The estimation of GHG reductions by this project is limited to carbon-di-oxide ($CO_2$) only.




**(Figure 2: Fuel mix of Southern Regional Electricity grid)**

## Identification of Baseline scenario

The methodology lays down certain steps by which the baseline is determined. The baseline methodology identifies the project as being additional and not the baseline scenario. The Project will impact the operating margin, build margin and thus the combined margin. The methodology is designed to have the grid combined margin as the baseline scenario.

For grid connected electricity generation projects it is important to ascertain whether the project has some impact on the grid's electricity generating pattern. It has been established in the CDM modalities and procedures that the use of the combined margin which takes into account the operating and build margins can be used to determine the effect of the power project to the grid.

This methodology proposes to compute the combined margin emissions as the baseline emissions, under the condition that the project seems to affect both the operating and build margins. The following steps are provided to confirm that the project fits the above-mentioned condition.

Operating margin displacement is relevant to most grid-connected wind power generation projects. Indeed, the operating margin is affected by most power plants connected to the grid, regardless of their generation type. This methodology will not be useful if the project only displaces projects at the build margin. It is assumed that the wind project will have an impact on the operating margin as well and hence this methodology would be suitable. The operating margin is derived through historical dispatch data or operating costs of each plant. This approach is only preferred if the data is readily available. In this project, the data is available and hence has been used.

Coming to the second step, it is argued that many wind power projects do not affect the build margin due to the following two factors:

1. The real contribution by wind power projects are much smaller than their estimated capacities indicate, given that their capacity factor, the amount of power produced in comparison to the rated output, is roughly one-third of that of conventional plants.

2. Wind power plants are regarded as unreliable capacity due to the uncontrollable and to a certain extent variable nature of wind, diminishing their value in power generation capacity planning.

If we take a large capacity wind farm with a high total capacity as compared to the grid, then there is a possibility that it will affect the grid, and hence will impact build margin enough to be taken in as a factor determining it.

The build margin so defined is easily determined if detailed data is available in official reports. Although generation and fuel usage data must be obtained through official reports or equivalent readily accessible sources, interview-based data collection for the commissioning dates of each generating type, where unavailable, should be sufficient.

The general approach to establish the combined margin which recommends averaging out the operating margin and build margin, where:

a. The operating margin is the weighted average of all resources except low-cost/must-run facilities.
b. The build margin is the generation-weighted average emission rate of the most recent 20% of plants built (on a generation basis) or the most recent five (5) plants, whichever is greater.

The Combined Margin is then calculated based on the weighted average of the operating margin emission factor and the build margin emission factor.

It is important to note that the Project does not take leakage into account as per the ACM0002. Wind energy does not have any Project emissions and thus the emission reductions that are calculated for the Project are real.

**B.5. Demonstration of additionality**

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The additionality of the Udumalpet Wind farm Project is established with an in-depth discussion on investment analysis with certain discussions on barriers, relating to the Project itself as well as within the scope of the State grid. As per the selected methodology ACM0002, the project developer is required to establish that the GHG emission reductions due to the project activity are additional to those that would have occurred in the absence of the current project activity as per the “Tool for the demonstration and assessment of additionality”

**USE OF THE ADDITIONALITY TOOL**

***Step 0. Preliminary screening based on the starting date of the project activity***

**1. If project participants wish to have the crediting period starting prior to the registration of their project activity, they shall:**

**(a) Provide evidence that the starting date of the CDM project activity falls between 1 January 2000 and the date of the registration of a first CDM project activity, bearing in mind that only CDM project activities submitted for registration before 31 December 2005 may claim for a crediting period starting before the date of registration;**

The project started in March 2004 the date of commissioning of the first WEG in the bundle which falls between 1 January 2000 and the date of registration of the first project activity. The erection and commissioning certificate issued by the TNEB, providing information such as the High Tension Service Connection number (HTSC), the capacity of the WEG, location of the WEG and the Date of Commissioning the WEG which stands has a proof, has been submitted to the DOE. This project activity has been submitted for Validation well before 31/12/2005 and the Host Country Approval was also received by then. Thus the Project Claims a crediting period before the Date of Registration of the project activity with the CDM EB of UNFCCC.

(**b) Provide evidence that the incentive from the CDM was seriously considered in the decision to proceed with the project activity. This evidence shall be based on (preferably) official, legal and/or other corporate) documentation that was available at, or prior to, the start of the project activity.**

The project proponents were clearly aware of the fact that their project activity results in GHG abatement and the existence of an international binding mechanism in the form of a protocol. Moreover at that time the proponents also envisioned the uncertainties about the protocol, in spite of these uncertainties the project proponents vested their faith in the Kyoto mechanisms and initiated others in the bundle to consider CDM for their machines too. The documents pertaining to this would include letter of communication/minutes of the expert review meeting/minutes of the board meeting have been submitted to the DOE.

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

***Sub-step 1a. Define alternatives to the project activity:***

1. **Identify realistic and credible alternative(s) available to the project participants or similar project**

**a) The proposed project not undertaken as a CDM activity**

**b) Equivalent capacity of electricity generated from thermal power plants**

***Sub-step 1b. Enforcement of applicable laws and regulations:***

***a) The proposed project not undertaken as a CDM activity***

Generally investment in wind sector essentially involves high capital cost, technology transfer and low capacity utilization factor as compared to the conventional power plants which could eventually end up in low returns hence making the project financially less attractive. The above discussion is clearly demonstrated with the help of the investment analysis taking the IRR (*Internal Rate of Return*) as the financial indicator.

***b) Equivalent capacity of electricity generated from thermal power plants***

Reports from the Ministry of Power, Central Electricity Authority and 'Blueprint for Power Sector Development' Report all indicate that the most possible alternative is fossil fuel based generation, typically coal. The Five Year Plans have throughout indicated that although there is coal shortage in the country, all efforts are being to made to increase the installed capacity of thermal plants and generation.

In Tamilnadu as well, especially with the tremendous energy demand and supply gap, thermal stations are being planned and executed.

There are no laws and regulations which restrict the use of wind energy or the type of industry that can set up wind machines. Currently in view of the Power Sector Reforms being undertaken, only transmission and distribution is restricted in a limited capacity, while wind energy generation as such is neither mandatory nor restrictive.

***Proceed to Step 2 (Investment analysis) or Step 3 (Barrier analysis). (Project participants may also select to complete both steps 2 and 3.)***

***Step 2. Investment analysis***

***Determine whether the proposed project activity is the economically or financially less attractive than other alternatives without the revenue from the sale of certified emission reductions (CERs). To conduct the investment analysis, use the following sub-steps:***

***Sub-step 2b. – Option I. Apply simple cost analysis***

***Sub-step 2c. – Option II. Apply investment comparison analysis***

***Sub-step 2d. – Option III. Benchmark analysis***

The purpose of investment analysis is to determine whether the proposed project activity is economically or financially less attractive than other alternatives without the revenue from the sale of certified emission reductions (CERs ). According to *The Tools for the Demonstration and Assessment of Additionality* recommends three analysis methods, including simple cost analysis (Option I), investment comparison analysis (Option II) and benchmark analysis (Option III).The proposed Project generates financial and economic benefits through the sales of electricity other than CDM related income therefore the simple cost analysis (Option I) cannot be taken. And the investment comparison analysis (Option II) is only applicable to projects where alternatives should be similar investment projects. Out of the investment comparison analysis (Option II) and the benchmark analysis (Option III), the benchmark analysis (OptionIII) shall be chosen. In accordance with benchmark analysis (Option III), the financial indicators of the proposed project, such as the project IRR was taken. The Internal Rate of Return of any investment activity is one of the most commonly used tools to establish the financial viability of the project. The benchmark Return on Equity of an IPP in India is 16%. (Source: CERC Annual Report 2003-2004). Taking all this into account the investment analysis was carried out taking the following assumptions into consideration.

**Assumptions for Investment Analysis**

| | |
|---|---|
| Size of Project | 25.7 MW |
| No. of WEGs | 28 |
| Capacity of each WEG | 22 numbers of 0.750 MW<br>1 number of 0.950 MW<br>5 numbers of 1.650 MW |
| Generation per WEG | 1838636 units for 0.75 MW<br>2350000 units for 0.95 MW<br>5600000 units for 1.65 MW |
| Life of WEG | 20 yrs |
| Total project cost | INR 1,153,321,000 |
| Wheeling charges | 5% |
| O&M Cost as an % of the total Project Cost | 1.23% |
| Escalation on O&M cost | 6.16% |
| Insurance cost | 0.26% |
| Interest on loan | 7.96% |
| Buy-back rate | INR 2.70 (For Sale to Board)<br>INR 3.50 (For Captive Consumption)<br>INR 5.50 (For Captive Consumption 2012onwards for Wind Mills HTSC No 581 &,801) |
| Income Tax Rate & MAT | 36.41% and 7.80% |
| Accelerated Depreciation | 80% |
| TUFS Benefits for Textile Mills | 5% |

Considering the above mentioned assumptions over a period of 20 years, without considering the CDM revenues the Project IRR is 12.28% and the Equity IRR is 14.37% . When the revenues from CDM are considered the Project IRR improves to 14.02% and the Equity IRR to 17.30%. (Source: Project Cash flow submitted to DOE in addition to the PDD)

***Sub-step 2d. Sensitivity analysis (only applicable to options II and III):***

**9. Include a sensitivity analysis that shows whether the conclusion regarding the financial attractiveness is robust to reasonable variations in the critical assumptions.**

However wind being a variable resource it is extremely difficult to accurately predict the future generation trends. Also, proper and well documented wind data required to reach a level of considerably confident prediction is not available in our country. Therefore, a sensitivity analysis had been conducted to see the variation in the IRR by assuming that the Wind Uncertainty impacts the generation from the project activity by either +5% or -5%. The reason for assuming a variation of only 5% is because of the fact that most of the WEGs in the project bundle are Stall Regulated WEGs, (Output from the WEGs remains constant beyond the rated wind speeds) thus the variation in the wind speeds above the rated speed does not have a great impact in the generation achievable. Thus a very conservative 5% variation in the generation is assumed which is arising out of the variations in the wind flow patterns, to study the financial behavior of the project.

| **Parameter** | **Wind Uncertainty** | **Equity IRR %** |
|---|---|---|
| Generation | "+" 5% | 15.81% |
| | "-" 5% | 12.93% |

| **Parameter** | **Price Uncertainty** | **Equity IRR %** |
|---|---|---|
| Tariff | "+" 5% | 15.81% |
| | "-" 5% | 12.93% |

| **Parameter** | **O&M Cost Uncertainty** | **Equity IRR %** |
|---|---|---|
| O&M Cost | "+" 5% | 14.24% |
| | "-" 5% | 14.50% |

Therefore, it is evident from the above figures that even if the base generation or tariff increases by 5% the ROE does not cross the benchmark of 16%, moreover O&M cost fluctuation by +/-5% doesn’t crosses the benchmark. Thus CDM becomes an inevitable part of the project activity to make it feasible enough for the project promoter.

Sensitivity at +/-10% doesn’t cross the benchmark of equity IRR of 16% , as for tariff the PPA is signed for 20 years (lifetime of project activity) and for captive 10% sensitivity leads to maximum project IRR of 15.78%.

For generation sensitivity at +10%, even after 9 years of operation, the cumulative generation of power has not crossed more than 2% of expected power generation which is way inside the limit of 5% sensitivity already demonstrated in above table.

For O&M, the sensitivity would never cross benchmark as O&M costs always increase with wind turbine power generation life. Old turbines incur more O&M cost because of regular wear and tear.

***Step 3. Barrier analysis***

**If this step is used, determine whether the proposed project activity faces barriers that:**

**(a) Prevent the implementation of this type of proposed project activity; and**
**(b) Do not prevent the implementation of at least one of the alternatives.**

In this case, we establish that significant barriers exist and would have prevented the Project from being undertaken or completed and also establish that the CDM activity would act as an impetus for this Project to survive.

**Higher Capital Cost:**

Investment in wind sector involves high capital cost, as majority of the equipments or the wind turbine parts are imported from other developed countries; this involves huge logistic related expenses. The fact that the wind sites are in remote areas of Palghat Pass or Shenkotta Pass in Southern India practically there is no access to these regions which would once again increase the cost of logistics tremendously. Thus leading to a higher capital cost of equipments, as against fossil fuel based generating systems. The cost per MW for the WEGs in this project activity is 4.48 Crores/MW.

**Tariff Barrier:**

The price being paid for wind energy is one of the lowest in the country at Rs.2.70 with no escalation over the term of PPA. This is much lower than what most of the other States are paying for wind power. The tariff has only changed marginally over the last couple of years and third party sale is not allowed. The current model for calculating tariff for wind power is the same as used for conventional energy sources wherein most provisions are not applicable for wind power.

**Technological Barrier:**

The technological risks associated with WEG's are high due to the fact that the majority of the WEG parts are imported and highly advanced. Therefore, larger operation and maintenance reserves would need to be maintained for such eventualities. In this context the project involves the installation of 750kW, 950kW and 1650kW machine of NEG-Micon which has more than 60% of the parts imported from other countries. Thus CDM revenues can be used as a guarantee fund for the operation and maintenance of Wind turbines hence mitigating the potential risks.

**Low Capacity utilization Factor:**

The capacity utilization factor for wind power in the state of Tamilnadu is 25.29% (Source: TNERC Order 2006). In case of a thermal power plant the capacity utilization factor is 74.67% which is nearly three times more than what is compared to the wind. This Capacity utilization factor would mean low generation and hence would affect their consumption to a greater extent (Source: Thermal Performance Review 2004-2005).

**Step 4. Common practice analysis *Sub-step***
***Sub-step 4a. Analyze other activities similar to the proposed project activity:***
***Sub-step 4b. Discuss any similar options that are occurring:***

As per the 2004-2005 report the installed capacity of wind was 2443.94 MW out of total 37751.51 MW which is about 6.5%. The level of grid penetration as in the year 2004 – 2005 is a mere 6.47% as against 35% from the fossil fuel based power plants. This substantiates that although the state of Tamilnadu is in the forefront of wind farm development, in terms of grid penetration levels and the percentage contribution to the grid system, the wind farms are still in developing stages. (Source: Southern Regional Electricity Boart Annual Report 2004-2005).

***Step 5.Impact of CDM registration***

**Explain how the approval and registration of the project activity as a CDM activity, and the attendant benefits and incentives derived from the project activity, will alleviate the economic and financial hurdles(Step 2) or other identified barriers (Step 3) and thus enable the project activity to be undertaken.**

The Internal Rate of Return of the Project (Equity IRR) of the project is less than the benchmark of 16%, which increases by 2.93 % when CDM is taken into account. The Equity IRR without considering CDM benefits is 14.37% and with CDM benefits is 17.30 ~~2~~%.Thus it can be established that the CDM registration can only improve the financials of the Project, and make it viable for the Project Promoters.

**B.6. Emission reductions**

**B.6.1. Explanation of methodological choices**

>>

ACM0002 "Approved Consolidated Baseline Methodology for grid connected electricity generation from renewable sources", Version 06 (19th May, 2006), Sectoral scope: 1.The consolidated baseline methodology for grid connected electricity generation from renewable sources (ACM0002) describes a stepwise approach to apply the methodology to the project activity. Baseline emission factor is calculated as combined margin, consisting of a combination of operating margin (OM) and build margin (BM) factors.

Approved consolidated monitoring methodology ACM0002/Version 06 (19th May, 2006) Sector Scope: 1, "Consolidated monitoring methodology for zero-emissions grid connected electricity generation form renewable sources" by CDM Meth Panel. The monitoring methodology lists the parameters that need to be monitored for estimating the baseline and project emissions as well as leakage.

**B.6.2. Data and parameters fixed ex ante**

a) $EG_y$

| | |
|---|---|
| **Data / Parameter** | $EG_y$ |
| **Unit** | MWh |
| **Description** | Electricity supplied to the grid by the project |
| **Source of data** | www.power2customer.com |
| **Value(s) applied** | 47.3 Units |
| **Choice of data or Measurement methods and procedures** | Electricity measured is used in calculation of emission reductions.<br>- The electricity generated by the WTG is measured at the local control system (LCS reading) which can be cross verified from the Energy meter installed at the transformer yard.<br>- The data is measured instantaneously with Generation and recorded monthly<br>- 100% of the data is monitored<br>- The data is archived electronically |
| **Purpose of data** | As per Vestas's IQMS (Integrated Quality Management System), the generation reports of the WTG are observed instantaneously and uploaded on a daily basis and the data is archived as daily, weekly, monthly and yearly generation reports in the electronic database of the organisation – www.power2customer.com |
| **Additional comment** | Electricity is supplied by the project activity to the grid. |

b) $EF_y$

| | |
|---|---|
| **Data / Parameter** | $EF_y$ |
| **Unit** | $tCO_2/MWh$ |
| **Description** | $CO_2$ emission factor of the grid |
| **Source of data** | $CO_2$ Baseline Database for the Indian Power Sector (User Guide V1.1-Latest) |
| **Value(s) applied** | Details of the data values are given in the baseline calculations |
| **Choice of data or Measurement methods and procedures** | - Emission factor is used in the calculation of emission reductions (ex-ante only). |
| **Purpose of data** | Default data for emission factors is used to check the local data. |
| **Additional comment** | Calculated as weighted sum of the OM and BM emission factors. |

c) $EF_{OMy}$

| Data / Parameter | $EF_{OMy}$ |
|---|---|
| **Unit** | $tCO_2$/MWh |
| **Description** | $CO_2$ Operating margin emission factor of the grid |
| **Source of data** | $CO_2$ Baseline Database for the Indian Power Sector (User Guide V1.1-Latest) |
| **Value(s) applied** | Details of the data values are given in the baseline calculations |
| **Choice of data or Measurement methods and procedures** | - This is used in calculation of emission factor $EF_y$(ex-ante only). |
| **Purpose of data** | Default data for emission factors is used to check the local data. |
| **Additional comment** | Calculated as indicated in the simple OM baseline method |

d) $EF_{BMy}$

| Data / Parameter | $EF_{BMy}$ |
|---|---|
| **Unit** | $tCO_2$/MWh |
| **Description** | $CO_2$ Build margin emission factor of the grid |
| **Source of data** | $CO_2$ Baseline Database for the Indian Power Sector (User Guide V1.1-Latest) |
| **Value(s) applied** | Details of the data values are given in the baseline calculations |
| **Choice of data or Measurement methods and procedures** | - This is used in the calculation of emission factor EFy (ex-ante only). |
| **Purpose of data** | Default data for emission factors is used to check the local data. |
| **Additional comment** | Calculated as indicated in the simple OM baseline method |

e) COEFi

| Data / Parameter | $COEF_i$ |
|---|---|
| **Unit** | $tCO_2$/ mass or volume unit |
| **Description** | $CO_2$ Emission coefficient of each fuel type I |
| **Source of data** | $CO_2$ Baseline Database for the Indian Power Sector (User Guide V1.1-Latest) |
| **Value(s) applied** | Details of the data values are given in the baseline calculations |
| **Choice of data or Measurement methods and procedures** | - Emission coefficients are required for calculating emissions from each power producer (ex-ante only). |
| **Purpose of data** | Default data (for emission factors) and IEA statistics (for energy data) are used to check the local data. |
| **Additional comment** | Plant or country specific values of COEF are preferred to IPCC values. |

**B.6.3. Ex ante calculation of emission reductions**

>>

The emission reductions ERy by the project activity during a given year y is the difference between Baseline emissions (BEy), project emissions (PEy) and emissions due to leakage (Ly).

$$ERy = BEy - PEy – Ly$$

Emissions by sources of GHGs due to the project activity within the project boundary are zero since wind power is a GHG emission free source of energy. Also, the renewable energy technology used is not equipment transferred from another activity. Therefore, as per ACM0002, no leakage calculation is required. Since the project emissions and the leakage are zero, the emissions reductions are equal to the baseline emissions.

This project uses the Combined Margin methodology as suggested in ACM0002. The consolidated baseline methodology for grid connected electricity generation from renewable sources (ACM0002) describes a stepwise approach to apply the methodology to the project activity. Baseline emission factor is calculated as combined margin, consisting of a combination of operating margin (OM) and build margin (BM) factors. Calculation of Combined Margin (CM) is being done in accordance with the following three steps:

**Step 1**: **Calculating the Operating Margin emission factor ($EF_{OMy}$)**

The consolidated methodology ACM0002 provides four options for calculating the operating margin, and guidance for how to choose which options for the corresponding project activity. The options are:

a) Simple OM, or
b) Simple adjusted OM, or
c) Dispatch Data Analysis OM, or
d) Average OM.

The **Simple Operating Margin** can be used for the proposed project activity because low-cost/must run resources constitute less than 50% of total generation.

$$\sum_{i,j} F_{i,j,y} \cdot COEF_{i,j}$$

$$EF_{OM,\,simple,\,y} = \frac{\qquad}{\sum Gen_{j,\,y}}$$

The Operating Margin emission factor is calculated with the most recent data available and uses the weighted average emission per electricity unit of all electricity generating sources supplying the grid.

**Operating margin $CO_2$ emission factor**

For each generation type that composes the operating margin, fuel consumption data is obtained from official sources and used in the following calculation.

$$COEF_{i,\,j} = NCV_i \otimes EF_{CO2i} \otimes OXID_i$$

The total $CO_2$ emission for the grid's operating margin is obtained by summing for all generation types, excluding low-cost/must-run facilities. Where official emission factors by generation type are available, the above calculation is not necessary. On the other hand, where reliable fuel consumption data is not available, estimated plant efficiency may be used to calculate the fuel consumption.The total electricity generated minus low-cost/must-run plants is again obtained from official sources and used to derive the $CO_2$ emission factor for the operating margin.

**Input variables**

The Baseline calculations details the inputs required: Net calorific value, Carbon emission factor, Fraction of Carbon oxidized, Fuel consumption according to generation type (operating margin), Electricity generation according to generation type (operating margin), Fuel consumption for recently built plants (build margin), Electricity generation for recently built plants (build margin), Grid electricity generation, Electricity exported by project. )

**Step 2: Calculating the build margin ($EF_{BM,y}$)**

The build margin is selected from the following, whichever is greater (i.e. greater number of plants):

a. The generation-weighted average emission rate of the most recent 20% of plants built, on a generation basis (OR)
b. The most recent five (5) plants built.

For the purpose of calculation for this Project, the first option of the emission factor of generation-weighted average emission rate of the most recent 20% of plants built, on a generation basis is being calculated.

$$EF_{BM,\,simple,\,y} = \frac{\sum_{i,j} F_{i,j,y} \,.\, COEF_{i,\,j}}{\sum Gen_{j,\,y}}$$

**Build margin $CO_2$ emission factor**

The most recent five plants and the most recent 20% of plants on a generation basis are to be extracted. Whichever gives the greater generation is determined to be the build margin. For each of the plants, fuel consumption data is obtained from official sources and used in the following calculation.

The $CO_2$ emission for the conventional power plants is summed to obtain the total $CO_2$ emission. Where official emission factors for the individual plants are available, the above calculation is not necessary. As with the operating margin calculation, where reliable fuel consumption data is not available, estimated plant efficiency may be used to calculate the fuel consumption.

**Step 3: Determining the combined margin**

As per the ACM0002 methodology, the combined margin is calculated based on the weighted average of the operating margin emission factor and the weighted average of the build margin emission factor. Equal weights have been provided by default as per the norms. The project is seen to have equal effects on both the operating and build margins. However, it is important to note that wind power plants are different to most types of power plants, both conventional and new, in the variability of the resource.

$$EF_y = w_{OM} \cdot EF_{OM,y} + w_{BM} \cdot EF_{BM,y}$$
$$ER_y = BE_y - PE_y - L_y$$
$$BE_y = EG_y * EF_y$$

Having established the baseline scenario through the preceding steps, this methodology uses official data for the national/regional/local electricity grid to calculate the emission factor for the combined margin. The $CO_2$ emission displaced by the project is calculated by multiplying the combined margin $CO_2$ emission factor obtained above by the amount of electricity produced and exported to the grid by the project activity. The above calculation does not take into account transmission losses for either the grid electricity or the Project's electricity. It is assumed that the transmission losses for both sides are equivalent.

Fuel consumption data and Generation details for all the sources were collected and used to arrive at the Baseline emission factor. Since the calculation procedure for the operating margin and build margin are similar, the exercise was repeated with appropriate values.

*The Baseline Study is as per the CEA's (Central Electricity Authority) CO2 Database, the information pertaining to the Southern Region Electricity Board Grid has been used for this Project Activity. Refer link for details –*

***http://www.cea.nic.in/planning/c%20and%20e/Government%20of%20India%20website.htm***

The emission factor calculated will be ex-ante throughout the crediting period.

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

| Year | Baseline emissions (t $CO_2$e) | Project emissions (t $CO_2$e) | Leakage (t $CO_2$e) | Emission reductions (t $CO_2$e) |
|---|---|---|---|---|
| 2005 – 2006 | 40756 | 0 | 0 | 40756 |
| 2006 – 2007 | 40756 | 0 | 0 | 40756 |
| 2007 – 2008 | 40756 | 0 | 0 | 40756 |
| 2008 – 2009 | 40756 | 0 | 0 | 40756 |
| 2009 – 2010 | 40756 | 0 | 0 | 40756 |
| 2010 – 2011 | 40756 | 0 | 0 | 40756 |
| 2011 – 2012 | 40756 | 0 | 0 | 40756 |
| 2012 – 2013 | 40756 | 0 | 0 | 40756 |
| 2013 – 2014 | 40756 | 0 | 0 | 40756 |
| 2014 – 2015 | 40756 | 0 | 0 | 40756 |
| **Total Tonnes of $CO_2$e** | **40756** | **0** | **0** | **40756** |

**B.7. Monitoring plan**
**B.7.1. Data and parameters to be monitored**

| | |
|---|---|
| **Data / Parameter** | $EG_y$ |
| **Unit** | MWh |
| **Description** | Net Electricity supplied to the grid by the project |
| **Source of data** | ~~www.power2customer.com~~ Monthly Electricity Generation Statements issued by Tamilnadu Electricity Board ~~Reports~~ |
| **Value(s) applied** | 47,300 ~~Units~~ |
| **Measurement methods and procedures** | Net Electricity measured is used in calculation of emission reductions.<br>-The electricity exported to the grid and the electricity imported from the grid ~~generated~~ by each WTG is measured at the energy meter installed at the transformer yard ~~local control station (LCS reading)~~ which can be cross verified from the local control system (LCS) ~~Energy Meter installed at the transformer yard .~~ |
| **Monitoring frequency** | The data is measured instantaneously with Generation and recorded monthly<br>- 100% of the data is monitored<br>- The data is archived electronically |
| **QA/QC procedures** | As per Vestas 's IQMS (Integrated Quality Management System), the generation reports of the WTG are observed instantaneously and uploaded on a daily basis and the data is archived as daily, weekly, monthly and yearly generation reports in the electronic database of the organisation – www.power2customer.com. The generation details so archived will be kept two years beyond the crediting period.<br>The energy meter will be tested and calibrated periodically by TNEB as per the guidelines of TNERC |
| **Purpose of data** | To calculate baseline emissions |
| **Additional comment** | Electricity is supplied by the project to the grid. It is verified by the receipt of sales. |

**B.7.2. Sampling plan**

>>

As Net electricity to grid is the only parameter and the same is monitored 100% hence no sampling plan is used

**B.7.3. Other elements of monitoring plan**

>>

As per Approved Consolidated Baseline Methodology for ~~zero emissions~~ grid connected renewable electricity generation projects (ACM0002), leakage calculation is not required for electricity generation from wind. The project activity essentially involves generation of electricity from wind, the employed WEG only converts wind energy into electrical energy and does not use any other input fuel for electricity generation. Thus no special ways and means are required to monitor leakage from the project activity.

The primary monitoring of the electricity fed to the state utility grid will be carried out jointly at the incoming feeder of the state power utility (TNEB). Machines for sale to utility/captive will be connected to the feeder and the joint measurement will be carried out once in a month in presence of both parties (the developer's representative and officials of the state power utility). Both parties will sign the recorded reading.

The secondary monitoring, which will provide a backup (fail-safe measure) in case the primary monitoring is not carried out, would be done at the individual WEGs. Each WEG is equipped with an LCS wherein the generation details are recorded, in case of failure of primary monitoring; generation of individual machine can be cross verified from an LCS reading. The same is archived daily in the customer database in the website www.power2customer.com.

**SECTION C. Duration and crediting period**
**C.1. Duration of project activity**
**C.1.1. Start date of project activity**
>>
18/03/2004

**C.1.2. Expected operational lifetime of project activity**
>>
20 years

**C.2. Crediting period of project activity**
**C.2.1. Type of crediting period**
>>
Fixed

**C.2.2. Start date of crediting period**
>>
24/06/2005

**C.2.3. Length of crediting period**
10 Years 0 Months 0 Days

**SECTION D. Environmental impacts**
**D.1. Analysis of environmental impacts**
>>
Wind power is one of the cleanest sources of renewable energy, with no associated emissions and waste products. In India, wind power projects do not require an Environmental Impact Assessment. As per the Schedule 1 of Ministry of Environment and Forests (MoEF - Government of India) notification dated September 14,2006, - 39 activities are required to undertake environmental impact assessment studies. For details refer: http://envfor.nic.in/legis/eia/so1533.pdf

The proposed project does not fall under the list of activities requiring EIA as it will not involve any negative environmental impacts. Thus no EIA study was conducted. However certain significant impacts are discussed below:

**Land use**
Extremely stringent measures are taken to ensure that the land available for wind farm development has no alternative use. The land for the Udumulpet Wind Project was barren land which could not be used for any agricultural cultivation. Furthermore, no forest land was used for the purpose.

**Noise pollution**

Most of the wind turbines are in isolated areas or on designated wind zones and hence do not cause residents of the area any concern. In the same vein, construction activities so far also have not caused noise pollution due to the isolated nature of the area and actually only has a positive impact of producing employment for the village people in nearby areas.

**Water pollution**

No water bodies exist in the area of the Project and hence there was no contamination destruction of water bodies during and after the construction activities.

**Flora and fauna**

As mentioned above, the land used for the purpose was barren land and no flora was destroyed for the setting up of the project. The only vegetation in the area of the project was shrubs and weeds, which grow abundantly. Further, many wind farm investors are actually using the land around the wind machines to grow aloe vera and other xerophytes that require little or no water. This is proving to have a good environmental impact on the area.

Bird hit in these areas is not a common phenomena. The Udumalpet Wind Project is not in the path of migratory birds. Local birds are accustomed to the wind structures and fly at a lower level near areas of dense vegetation. There have been no serious incidents involving birds and wind turbines in the area to the best of our knowledge.

**Visual impact**

As gathered in the stakeholder analysis, the presence of the wind farms does not have a negative impact on the surrounding villagers in terms of visual impact. The majority of the persons spoken to were least concerned of the wind farms in the area.

**Air pollution**

Minimal air pollution might have occurred during the construction of the Project due to transportation. However, these were not found to affect the surrounding persons nor the environment in a very drastic manner.

**Social Impacts**

The social impacts of the Project were more positive than negative. The Project did not displace any people nor interfere in their daily life. It provided employment for the first 6 months prior to installation and then for a lesser number of people on a day to day basis. The Project has also had positive impacts since infrastructure like roads and communication was developed in the area.
Thus there are no negative impacts of the Project.

**D.2. Environmental impact assessment**

>>

As mentioned above, wind projects in India do not require an Environmental Impact Assessment. The only document which is remotely connected is the ‘No Objection Certificate’, which has been approved by the State Electricity Government in the case of all the wind farms in the Project.

**SECTION E. Local stakeholder consultation**

**E.1. Solicitation of comments from local stakeholders**

>>

Between 2002 and 2003, a survey was conducted in the area of the Udumalpet Wind Project. Although the immediate surrounding area is sparsely populated, a sample survey was conducted in the neighboring areas to gather views on the various turbines that were being installed.

Primary data was collected through questionnaires and focus group discussions. Responses were tabulated on a Likert scale and then coded and classified to arrive at the final analysis.

The Stakeholder’s considered are the residents of the nearby villages and the Panchyat. As there is no community living close to the wind farms, there is no direct impact on the livelihood of the villagers by any means. Even the distance of the nearest village is at least 5 km from the wind farm were the WEG’s are installed. As the residents were predominantly illiterate the questionnaires were read aloud before the gathering and the responses were suitably recorded.

The orientation and questionnaire addressed the following:

1) Project introduction
2) Reasons for setting up the Project
3) Costs and benefits of setting up the Project
4) How did they think it would affect them?
5) Do they perceive that the Project will have negative or positive impacts on their livelihood?
6) Are they bothered about the noise pollution?
7) Have there been any difficulties faced during construction?
8) What are some of the other issues that concern them?
9) Do they have any other suggestions or queries?

The survey had a 90% response rate. The reason for this high response rate was the fact that the local Panchayat was involved in mobilizing people for this survey. The respondents felt confident that the local municipal body was involved.

**E.2. Summary of comments received**

>>

The people who attended the stakeholder's consultation process were predominantly male. It was observed that almost 95% were strongly in favor for the Project. The rest 5 % were concerned about certain rumors they had heard about wind mills which is addressed below.

**E.3. Report on consideration of comments received**

>>

The issues discussed were well understood and the local stakeholders did not have any issues with the Project being in the area. They well understood the fact that it would not interfere with their village and community. However some perceptions were interesting to note. The villagers felt that the presence of the wind turbines moved away rain clouds and that was the reason the monsoons were not bringing in any rain to the area and causing crop failure. Further, they had heard that wind mills increased the heat in the neighboring areas. Both of these false perceptions were explained in detail by us, especially the fact the clouds are much higher than the height of the wind mill and it is highly unlikely that it would cause the problem. Further, information for the Center for Wind Energy Technology based in Chennai also conveyed the same. They also wanted to know why the Project could not directly supply their village instead of having to depend on the grid. Some of the villagers from a neighboring village which was off the grid, were also keen on this issue. It had to be explained that wind mills supply much more power than what can be used by them, which would result in considerable wastage, Furthermore, wind power in the State is bought at Rs.2.70, which would be unaffordable for the village which is receiving subsidized power. Once the wind power is fed into the grid, it is impossible to distinguish which is wind power and hence would make no difference apart from the fact that they would be dependent on the grid again. The concept of distributed generation was explained to them to help them understand how and why the Project would not be suitable for their needs.

However, during the latest phase of the stakeholder analysis the villagers themselves said that their misconceptions have all been cleared and they had no issues with the installation of the wind turbines. Thus there were no negative comments received about the Project and hence the Project activity was carried out as per schedule.

**SECTION F. Approval and authorization**

>>

Project Activity is a CDM registered project activity. Reference No. 1015

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## Appendix 1: Contact information of project participants

| | |
|---|---|
| **Organization** | Vestas Wind Technology India Private Limited |
| **Street/P.O. Box** | No. 298, Rajiv Gandhi Salai, Sholinganallur |
| **Building** | |
| **City** | Chennai |
| **State/Region** | Tamilnadu |
| **Postcode** | 600119 |
| **Country** | India |
| **Telephone** | +91 44 2450 5100 |
| **Fax** | +91 44 2450 5101 |
| **E-mail** | response@vestas.com |
| **Website** | www.vestas.com |
| **Contact person** | |
| **Title** | |
| **Salutation** | Mr |
| **Last name** | Maniyan |
| **Middle name** | Vanu |
| **First name** | Narayanan |
| **Department** | CDM-Desk |
| **Mobile** | +91 87544 00416 |
| **Direct fax** | |
| **Direct tel.** | +91 44 2450 5225 |
| **Personal e-mail** | navma@vestas.com |

## Appendix 2: Affirmation regarding public funding

Details on public funding have been provided in Section A.5 of this PDD

## Appendix 3: Applicability of selected methodology

Details on applicability of selected methodology have been provided in Section B.2 of this PDD

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

Details on ex-ante calculation of emission reductions have been provided in Section B.6 of this PDD

## Appendix 5: Further background information on monitoring plan

In addition to the Monitoring Plan listed below, there is a local control system (LCS) ~~NEG Micon also has an Integrated Quality Management System~~ which will be used to verify all data that has been collected. NEG Micon (now renamed as Vestas Wind Technology India Private Limited) is the first wind manufacturing company to have this system. Data is continuously updated on a daily basis and an internal survey conducted in the last few months has indicated that there has been minimum or no error in the readings. The use of ~~IQMS~~LCS would greatly benefit the Monitoring Plan for this Project especially with regard to reliability and consistency.

**Metering**

The energy that is generated will be metered at the Project site. ~~The Project has a two metering system, in which the main meter is owned by the project developer and the secondary meter is owned by the Tamil Nadu Electricity Board~~. The metering equipment ~~at both points~~ is maintained according to strict standards laid down by the Tamil Nadu Electricity Board.

In keeping with the standards and regulations laid down by the Tamil Nadu Electricity Regulatory Commission, all points regarding inspection, checking and meter reading is listed below.

(a) Both kWh and kVARh flow are measured at interconnection points, and power transformer locations
(b) Each metering point associated with determination of energy exported or imported is provided with ~~both main and check meter~~ energy meter or as per the agreement between the State Utility and the company
(c) Minimum standards of accuracy of meter shall be of class ~~0.2~~ 0.5 or as stipulated by utility.
(d) All current transformers and voltage transformers used in conjunction with Commercial (Tariff) metering conform to the relevant Indian Standards. These are of an accuracy class ~~0.2~~ 0.5and of suitable rating to cater the meter and lead wire burden.
(e) Voltage supply to the metering is assured with necessary voltage selection schemes. Loss of potential relays is provided which shall initiate alarms on loss of one or more phases of the voltage supply to any meter.
(f) Meters are tested and calibrated by a neutral agency at least once in a year or such as mutually agreed between the utility and the entities according to the guidelines in the standards / supplier's recommendations. Records of meter calibration test are maintained for future reference.
(g) A schedule is drawn up between the utility and the entities covering summation, collection, processing tariff meter readings at various connection sites.
(h) The generating company furnishes recorded data of all electric measurements and events recorded by the operational metering to the utility at least once in a week or more often if required.
(i) The utility is responsible to formulate the metering procedure and implement it. Hence all information metering data collected will be as accurate as possible and will be officially certified.

Thus from the above it can be established that the monitoring plan that will be adhered will be of the highest quality and standard as by law generating companies are required to follow certain norms NEG Micon (now known as Vestas Wind Technology India Private Limited) with the help of the IQMS will also ensure the same. All documents will be officially verified and certified on an annual basis for the purpose of monitoring.

## Appendix 6: Summary of post registration changes

Following table shows the changes in project activity post registration;

| Sl. No. | Project Promoter | WEG Capacity in MW | Date of Commissioning | HTSC No. | PPA / EWA | PPA / EWA CHANGED ON | OWNERSHIP CHANGED ON |
|---|---|---|---|---|---|---|---|
| 1 | Golden Sun Industries sold WEGs to V.V. Minerals | 0.750 | 18.03.2005 | 643 | EWA | No Change | V V Minerals became owner on 25.10.2012 |
| 2 | | 0.750 | 22.03.2005 | 673 | EWA | No Change | |
| 3 | Firm Sri Gowarishankarar to Shri Gowarishankarar Agencies Private Ltd. | 1.650 | 05.05.2005 | 801 | EWA | 01.11.2012 | 08.07.2011 (Firm to Pvt. Ltd.) |
| 4 | Asian Handlooms to Asian Fabricx Private Limited to Asian Wind Energy Private Limited | 1.650 | 30.09.2004 | 581 | EWA | 22.10.2012 | Name Change |
| 5 | Classic Knit Processors to Royal Classic Mills (P) Ltd. (Name Change) | 0.750 x 1 | 18.03.2004 | 368 | EWA | No Change | 01.04.2010 (Name Change) |
| 6 | Royal Classic Mills to Classic Knit Processors (P) Ltd. (Name Change) | 0.750 x 3 | 18.03.2004 | 574<br>600<br>601 | EWA | No Change | 24.12.2012 (Name Change) |
| 7 | Zigma Technologies sold WEGs to R B Woven Private Limited | 0.750 | 31.12.2004 | 599 | PPA | No Change | RB Wovens became owner on 22.09.2006 |
| | | 0.750 | 18.03.2005 | 645 | PPA | No Change | |

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**History of the document**

| **Version** | **Date** | **Nature of revision** |
|---|---|---|
| 04.1 | 11 April 2012 | Editorial revision to change version 02 line in history box from Annex 06 to Annex 06b. |
| 04.0 | EB 66<br>13 March 2012 | Revision required to ensure consistency with the “Guidelines for completing the project design document form for CDM project activities” (EB 66, Annex 8). |
| 03 | EB 25, Annex 15<br>26 July 2006 | |
| 02 | EB 14, Annex 06b<br>14 June 2004 | |
| 01 | EB 05, Paragraph 12<br>03 August 2002 | Initial adoption. |
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